Research Article

Academic and Clinical Nurses' Perceptions and Experiences on Academic-Practice Partnership in Evidence-Based Practice: An Interpretive Description

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Aim. To explore academic and clinical nurses' perceptions and experiences on academic-practice partnership in evidence-based practice. *Background*. Academic-practice partnership could promote evidence-based practice which is crucial for high-quality care. Academic and clinical nurses are the foundation of the partnerships; however, there is little knowledge of their perceptions and experiences on academic-practice partnership in evidence-based practice. *Methods*. This is an interpretive description study. Twenty-two eligible participants were interviewed through face-to-face or online videoconferencing meetings. Guiding questions for the interviews focused on the perceptions and experiences of academic-practice partnership in the context of evidence-based practice. Interviews were recorded, transcribed, and checked verbatim. We used constant comparative analysis to analyze the qualitative data. *Results*. Four themes with fifteen subthemes were generated: necessities, modes, challenges, and benefits of the academic-practice partnership in evidence-based practice. Participants believed that academic-practice partnership was a necessary strategy to promote evidence-based practice and could be built through different modes. Nevertheless, most academic-practice partnerships were superficial because of specific types of challenges. However, a good academic-practice partnership could create a win-win situation for both nursing academia and clinical practice. *Conclusion*. Academic-practice partnership is a win-win strategy for both the academic side and clinical side to promote evidence-based practice. Different modes of academic-practice partnership provide academic and clinical nurses with more opportunities to promote evidence-based practice with a higher likelihood of successful implementation. However, related challenges require multilevel measures to provide better environments to initiate, build, and maintain intensive collaborations between academic and clinical nurses. *Implications for Nursing Management*. Academic and clinical organizations, leaders, and individuals should take multilevel measures to initiate, build, and maintain a close academic-practice partnership to promote evidence-based practice, which is crucial for high-quality nursing care, patient safety, and nursing discipline development.

1. Introduction

Evidence-based practice (EBP) in nursing involves using the best available evidence to make nursing care decisions, by combining nurses' clinical expertise, the client's values and preferences, and the available resources [1]. EBP has been recognized as an effective way for nurses to provide patients with high-quality and safe nursing care [2]. It is also crucial for promoting the development of nursing as a profession and a discipline [3, 4]. The benefits of EBP have been recognized and appreciated by many healthcare policymakers, nursing executives, clinical nurses, and academic nurses [3, 5]. The foundations for EBP in nursing (e.g., nursing evidence based on high-quality studies, theoretical frameworks for EBP, and education resources) have been developed for decades [5, 6]. However, there are many barriers to EBP, leading to an unfortunate lack of EBP in most clinical settings, especially in low- and middle-income countries [7].

A systematic review of EBP in low- and middle-income countries found that there were multilevel barriers to implementing and sustaining EBP: institutional barriers, intradisciplinary barriers, and individual nurse-related barriers [7]. Institutional barriers to EBP included scant resources, limited access to information, inadequate staffing, and a lack of institutional support. Intradisciplinary barriers included a lack of communication between academic and clinical nurses, inconsistencies between education and practice in the nursing discipline, and lack of teamwork. Individual nurse-related barriers included the individual clinician's lack of time, high workload, inadequate knowledge and skills, and resistance to changes. However, among these barriers, lack of resources, insufficient evidence-based practice knowledge and skills, and low English proficiency of clinical nurses (in non-English-speaking countries) are the key barriers requiring solutions [1, 4, 8, 9]. Addressing these key barriers is the foundation for further providing institutional resources to promote EBP; academic-practice partnership offers a critical strategy for overcoming these barriers.

Academic-practice partnership has been recognized as having great potential to promote the implementation of EBP in nursing [10–12]. Academic-practice partnership is a formal or informal arrangement between cooperating parties to advance mutual interests [13]. The American Association of Colleges of Nursing (AACN) suggested that "academic-practice partnerships are an important mechanism to strengthen nursing practice and help nurses become well positioned to lead change and advance health" [14]. Researchers have suggested that academic-practice partnership may address the key barriers to EBP (i.e., lack of resources, insufficient knowledge and skills, and low English proficiency) by sharing resources across academic and clinical settings [10–12].

Based on a systematic and comprehensive literature search, we found that the existing evidence on academic-practice partnership in EBP was limited. Only 26 case reports were identified as related evidence in the systematic literature search and screening [15]. Furthermore, most literature discussed academic-practice partnership on an institutional level with a macro perspective, with limited focus on the individual perspectives of academics and clinicians regarding academic-practice partnership [10, 13, 16].

Yet, individual academic nurses (i.e., academic staff and postgraduate students in university nursing departments) and clinical nurses (i.e., head nurses and bedside nurses in hospitals) form the foundation and core of academic-practice partnerships because they are the persons involved in the specific collaboration activities [11]. A recent quantitative study indicated that academic and clinical nurses all have a high demand for collaboration in EBP [17]. Therefore, more individual-level studies focusing on academic and clinical nurses are necessary for the promotion of academic-practice partnership in EBP. To promote individual-level studies, it is essential to have a comprehensive understanding of the perceptions and experiences of academic and clinical nurses on academic-practice partnership in EBP. Such evidence is crucial for the development of related theoretical frameworks, models, and interventions for promoting academic-practice partnership in EBP. However, there is a lack of individual-level evidence on specific perceptions and experiences of academic and clinical nurses on academic-practice partnership in EBP.

2. Methods

2.1. Aim.
This study aimed to explore academic and clinical nurses' perceptions and experiences of academic-practice partnership in EBP.

2.2. Design.
This is an interpretive description study based on the interpretivist paradigm [18]. This methodology could orient data analysis towards the development of findings that contribute to the final goal of our project, which is to develop a theoretical model and an intervention for academic-practice partnership in EBP [18, 19]. This study was reported following the COREQ checklist.

2.3. Participants.
In this study, we defined "*academic nurses*" as academic staff or postgraduates in university nursing departments and "*clinical nurses*" as head nurses and bedside nurses working in hospitals.

Inclusion criteria for academic nurses were as follows: (1) nursing academic staff were responsible for teaching and/or research in nursing schools or universities and had completed a systematic EBP training program(s); (2) postgraduate nursing students were master or doctoral students who had completed an EBP course in a university nursing department. Inclusion criteria for clinical nurses were as follows: (1) head nurses were responsible for managing at least one unit in a hospital setting and had received EBP-related training. (2) Bedside nurses were responsible for providing direct care to patients in a hospital unit and have received EBP-related training. The inclusion of these four types of nurses was to provide diverse perspectives from both academic and clinical nurses, who are the most involved stakeholders in the academic-practice partnerships.

Participants were recruited through purposive and snowball procedures to improve the representativeness of the study sample [20]. One clinical nurse declined to participate in the interview due to heavy workload. 22 interviews were conducted to reach data saturation. General information about the participants is shown in Table 1 and the Supplementary Material Table S1, which was helpful for readers to understand the quotes cited in the results.

2.4. Data Collection. The data were collected between November 2021 and March 2022. Individual semistructured interviews were conducted through online videoconferencing meetings or face-to-face meetings in hospitals or in the office of the interviewer. The duration of the interviews ranged from 23 to 63 minutes.

The interviews were conducted by the first author (Q.C., Ph.D.) who has prior experience in conducting qualitative studies and is a core member of a JBI Affiliated Group for promoting EBP in a School of Nursing. Before the formal data collection, the interview questions were piloted in two interviews, and no adjustments were required. Therefore, the data collected from these piloted interviews were also included in the data analysis. The following key questions guided the interviews: (1) How do you think about academic-practice partnership in EBP? (2) Could you describe your experience of academic-practice partnership in EBP? (3) Will you participate, or why have you participated, in an academic-practice partnership for EBP?

Interviews were recorded, transcribed, and checked verbatim. Furthermore, a self-designed questionnaire was used to collect demographic information and some general information related to EBP (e.g., training experience and experience in academic-practice partnership) of participants. EBP competencies of participants were also measured by the Evidence-Based Nursing Practice Competence Scale which has good reliability and validity [21].

2.5. Data Analysis. The 22 interview transcriptions were uploaded and analyzed in NVivo 12.0. After transcribing the data, the first author (Q.C.) worked closely and intensively with the texts to conduct inductive coding for insights into the participants' experiences and perspectives. The second author, a Ph.D. candidate who has completed the qualitative study course and has experience in conducting qualitative studies, checked the coding of the texts. The constant comparative analysis involves the following six steps: immersing in the data, developing an initial thematic template, organizing the data based on the template, condensing data and reflecting, comparing and contrasting data within similar participant categories, and comparing and contrasting data with different participant categories [19, 22]. The identification of themes and subthemes evolved as both authors had multiple discussions. Four of the participants (one nursing academic staff, one nursing postgraduate student, one head nurse, and one bedside nurse) were invited to discuss and verify the results of the data analysis.

2.6. Rigour. The following strategies were used to improve the trustworthiness and rigour of this study [19, 23]. (1) We thoroughly immersed ourselves in collecting, analyzing, and understanding data, in order to ensure the saturation of data. Furthermore, data analysis was performed along with the data collection. (2) Participants had the freedom to speak, participants' voices were fully heard, and participants' perceptions were accurately represented. (3) Considering the role of promoting EBP and academic-practice partnership, the primary researcher may hold an inclination towards academic-practice partnership in EBP. Therefore, the primary researcher used a reflexive diary to maintain reflexivity and delimit subjectivity. (4) Member checking: member checking is a qualitative technique used to establish the tenet of credibility in trustworthiness. Two researchers were responsible for data analysis. Considering the time, cost, efficiency, and effectiveness comprehensively, we invited four of the participants to individually check our results to confirm the interpretation. (5) Thick and contextualized description: we provided specific information about the participants, which could help readers to understand the context of this study better. (6) Researcher credibility: the researchers either have Ph.D. degree or are Ph.D. candidates and all of them have completed systematic training in qualitative research.

2.7. Ethical Considerations. This study was approved by the Institutional Review Board of Xiangya School of Nursing, Central South University (No. E2021130). Informed consent was obtained from all participants. Each participant was informed of the goal and methods of this study, received a guarantee of confidentiality and anonymity, and agreed that the interview would be recorded. Only research group members could access the data, and potential identifiers of participants were removed from the quotes in the results.

3. Results

Four themes with fifteen subthemes relating to academic-practice partnership in EBP (Table 2) were generated: necessities, modes, challenges, and benefits of the academic-practice partnership. Participants believed that academic-practice partnership is a necessary strategy to promote EBP, and such partnerships could be built through different modes. Nevertheless, most current academic-practice partnerships are superficial and tokenistic because of common and specific challenges. A good academic-practice partnership could ideally create a win-win situation for both nursing academics and clinicians.

3.1. Necessities of Academic-Practice Partnership in Promoting EBP. All participants considered academic-practice partnership to be an indispensable for implementing and sustaining EBP. The complementary competencies and resources of the academic and clinical roles can offset the limitations of each other to promote EBP.

Table 1: Basic characteristics of participants ($n = 22$).

	Mean ± SD, range
Age (years)	31.14 ± 6.39, (22–48)
Evidence-based Nursing Practice Competence Score[a]	74.36 ± 6.46, (65–92)
	n (%)
Gender	
Female	28 (81.82%)
Male	4 (18.18%)
Educational degree	
Baccalaureate	5 (22.73%)
Master	10 (45.45%)
Ph.D.	7 (31.82%)
Position	
Academic staff	6 (27.27%)
Master's student (professional degree)	2 (9.09%)
Master's student (academic degree)	3 (13.64%)
Doctoral candidate	4 (18.18%)
Head nurse	3 (13.64%)
Bedside nurse	4 (18.18%)
Experience in EBP projects	
Yes	19 (86.36%)
No	3 (13.64%)
Experience in academic-practice partnership in evidence-based practice	
Yes	14 (63.64%)
No	8 (36.36%)

Note. [a]Total score on the evidence-based nursing practice competence scale ranges from 0 to 92. This Chinese measurement was developed and validated by Wang et al. in 2017 [21]. More details of this scale can be found in the note of Supplementary Material Table S1.

Table 2: Themes and subthemes generated in this study.

Themes	Subthemes
(1) Necessities of academic-practice partnership in promoting EBP	(1.1) Complementary competencies for partnership (1.2) Complementary resources for partnership
(2) Modes of academic-practice partnership in EBP	(2.1) Various academic-practice partnerships (2.2) Superficial academic-practice partnerships
(3) Challenges of academic-practice partnership in EBP	(3.1) Lack of supportive policies (3.2) Limited training in EBP (3.3) Invisible hierarchy between academics and clinicians (3.4) Insufficient attention to clinical nursing practice (3.5) Lack of interactive communication (3.6) Nonmutual needs on specific steps of EBP (3.7) Lack of theoretical guidance on collaboration
(4) Benefits of academic-practice partnership in EBP	(4.1) Improving competencies in EBP and collaboration (4.2) Promoting resource integration (4.3) Promoting EBP (4.4) Bridging research-education-practice gaps

3.1.1. Complementary Competencies for Partnership. All participants described that academic and clinical nurses had necessary and complementary competencies for conducting the key steps of EBP (i.e., proposing clinical problems, generating structured questions for evidence search, searching for evidence, appraising evidence, synthesizing evidence, disseminating evidence, and implementing evidence). All participants acknowledged that "*Academic nurses have more theoretical and methodological knowledge related to evidence-based practice. ... Clinical nurses have more clinical expertise, experience, and context knowledge.*" (Participant 10, Ph.D. student)

Considering that EBP is a combination of theory and practice, the complementary academic and clinical competencies of academic and clinical nurses are necessary for EBP. Academic nurses focus more on the steps requiring theoretical and methodological knowledge and thus are more competent in working with literature (i.e., evidence search, appraisal, and synthesis). As stated by one participant, "*Overall, in evidence search, appraisal, and synthesis, academic nurses have significantly better competencies than clinical nurses.*" (Participant 6, academic staff) However, clinical nurses have lived experience in dealing with complex and emergent clinical problems and thus offer valuable

insights into proposing clinical problems for further research. For example, *"Clinical nurses could propose many current and real-world clinical problems which are urgent to be solved. These problems are often specific and the starting points of evidence implementation projects. For academic nurses who do not have current clinical knowledge and experience, and do not know organizational environments and culture, it is impossible to propose these clinical questions."* (Participant 4, academic staff)

For other steps of EBP (i.e., generating structured questions for evidence search, evidence dissemination, and implementation), academic and clinical nurses play complementary roles, rather than one role being more competent in these specific steps. For example, one participant suggested that *"Academic nurses could better frame clinical questions into structured questions for evidence-based practice projects."* (Participant 10, Ph.D. student) Another participant shared, *"If the PICO [EBNP question] is related to clinical practice, it may be addressing issues that I have clinical blindspots or limited knowledge of. I will need help from clinical nurses to determine the specific inclusion and exclusion criteria of PICO."* (Participant 12, master student) For evidence dissemination, participants mentioned *"Academic nurses have a better competence in academic writing and presentations, which is essential for disseminating evidence through academic journals or conferences. . . . Clinical professionals have a better competence in patient education and communication, which is essential for disseminating evidence to patients and relatives in the clinical practice context."* (Participant 19, clinical nurse) For evidence implementation, participants described that *"Clinical nurses always know the crux of the matter better. They know the feasibility of the evidence implementation plan better."* (Participant 8, Ph.D. student) *"Academic nurses could provide us with some suggestions related to theoretical frameworks and methodology when we are designing the evidence implementation projects."* (Participant 21, clinical nurse)

3.1.2. Complementary Resources for Partnership. Most clinical participants expressed that they have insufficient resources for evidence synthesis. *"When I did the evidence searching, . . . I was not confident whether my literature search was comprehensive because I do not have the access to many databases. This limited me a lot. . . . If we were in an academic-practice partnership, we hope we could get database support from universities."* (Participant 22, clinical nurse) The academic-practice partnership could offset the limited resources for evidence synthesis on most clinical sides.

For evidence dissemination, the academic side and clinical side have different resources (e.g., human resources, media resources, and available targeted populations). *"For evidence dissemination, academic organizations have better resources for disseminating evidence through academic publications, conferences, and academic media mainly targeted on healthcare professionals and academics, while clinical organizations mainly disseminate evidence through clinical professionals, booklets, and patient groups mainly*

targeted on clinical nurses, patients, and relatives in the hospital." (Participant 17, head nurse)

Clinical organizations had exclusive resources for evidence implementations, such as clinical nurses, patients, head nurses with leadership, and clinical practice environments. *"Clinical side has its unique advantage-it is both the starting point and ending point of evidence because we need to first generate and finally use evidence in the clinical context."* (Participant 6, academic staff) *"The clinical side has evidence recipients, evidence implementers, and clinical practice environment for evidence implementation. . . . Universities do not have these."* (Participant 6, academic staff)

Meanwhile, a few participants noted that academic-practice partnership was not a "half and half" mode of partnership for the academic and clinical sides. This idea was embodied in two aspects. Firstly, the academic side needs to play a leading role in evidence synthesis, while the clinical side needs to play a leading role in evidence implementation. They do not share half and half the responsibilities in each stage of EBP. Secondly, two participants envisioned that *"With the improvement of evidence-based practice education of clinical nurses, in the future, academics may not be needed for the implementation of evidence-based practice. Although academics will still be needed to explore the theoretical and methodological topics and conduct novel research for generating evidence which could be used in future clinical implementation."* (Participant 9, Ph.D. student)

3.2. Modes of Academic-Practice Partnership in EBP. Participants described that academic-practice partnership had been built through many approaches. However, most partnerships were superficial without intensive collaborations.

3.2.1. Various Academic-Practice Partnerships. The academic-practice partnership in EBP could be and has been built through different forms. *"It (academic-practice partnership) has different forms. The role and responsibility of different persons may be different in different forms."* (Participant 5, academic staff)

The academic-practice partnership in EBP mentioned by participants could be divided into different types, such as formal and informal partnerships; individual level, organizational level, and individual-organizational level collaborations; and academic nurse-dominated and clinical nurse-dominated partnerships. Seven participants mentioned the informal and individual academic-practice partnership. For example, *"During that period (of making evidence synthesis), I contacted many people, such as Ph.D. candidates and master students in a nursing school. I consulted them on many issues."* (Participant 20, clinical nurse) Four participants mentioned the formal and organizational academic-practice partnership. For example, *"Our hospital signed with RNAO (Registered Nurses' Association of Ontario) to collaborate in evidence implementation. We will use their guidelines in our hospital."* (Participant 21, clinical nurse) One participant mentioned *the* formal and individual-organizational academic-practice partnership. *"We signed a contract of*

one year with a Ph.D. candidate of the University of *** who was experienced in evidence-based practice. Based on clinical nurses' needs, he shared lectures on evidence translation with us every month." (Participant 21, clinical nurse) The forms of academic-practice partnership described by participants indicated that most partnerships dominated by academic nurses were used for evidence synthesis, while partnerships dominated by clinical nurses were for evidence implementation.

The partnerships between EBP organizations (such as JBI, JBI Collaboration Entity, and RNAO) and clinical nurses were the form most frequently mentioned. "We (a JBI collaborating centre) trained many head nurses and clinical nurses in hospitals. ... and we decided to use the (evidence implementation) project-based training programs for promoting the academic-practice partnership in evidence-based practice." (Participant 2, academic staff)

3.2.2. Superficial Academic-Practice Partnerships.
Most existing partnerships described by participants were superficial although they had been built through different forms in different settings and contexts. These characteristics of superficiality were reflected by scattered tasks, independent working, and a lack of mutual and intensive interaction.

Most collaborators in academic-practice partnership regarded EBP as scattered tasks without a holistic view. They worked independently and just looked for temporary collaboration, i.e., help from the other role in a specific aspect of EBP, rather than persistent collaboration throughout the whole project. As one participant shared:

"We consulted academic staff in some steps. After we transferred the best evidence to the audit criteria in the evidence implementation project, we asked the academic staff for suggestions. They did not provide us with comments for revision. ... However, after I completed the paper of this evidence implementation project and asked for academic staff to review our paper, they found problems with audit criteria, such as not being comprehensive and specific enough." (Participant 19, clinical nurse)

Another participant explained: "There wasn't a good collaborative atmosphere, you do your things and I do mine." (Participant 9, Ph.D. student) There was a lack of interaction among collaborators. "There were no close connections between the clinical nurses and the mentors (academic nurses who were experienced in evidence-based practice) in the training program of evidence-based practice." (Participant 21, clinical nurse) There are many challenges to academic-practice partnership in EBP which could explain the superficial partnerships.

3.3. Challenges of Academic-Practice Partnership in EBP.
Participants reported multilevel challenges which hindered initiating, building, and maintaining the partnerships between nursing academics and clinicians for supporting EBP.

3.3.1. Lack of Supportive Policies.
Supportive policies from governments and organizations, which create a more friendly and encouraging environment for EBP and academic-practice partnership, are required for fostering, stimulating, and realizing the full potential of academic-practice partnership in EBP. These supportive policies are essential for strategic partnerships on organizational levels and intensive individual partnerships. However, participants reported that there was a lack of supportive policies from governments and organizations for EBP and academic-practice partnership.

"There are few supportive policies on evidence-based practice in our country and hospital. Clinical nurses do not think that evidence-based practice could bring them direct benefits. ... Many head nurses pay more attention to original research which could bring them more benefits than evidence-based practice. [This is] because achievements in scientific research are important indicators of many individual and organizational evaluation systems." (Participant 16, head nurse)

"The policy (which only recognizes the first and corresponding authors) on achievements identification in most organizations hinder the collaboration (between academic and clinical nurses)." (Participant 1, academic staff)

"Many supports are just limited [to a superficial positive] attitude [towards evidence-based practice], ... There is no specific support at the policy and practice level. For example, we do not have the policy to promote plans for human resources, time, and financial support to support evidence-based practice. Just saying "This is a good thing, and we need to do it."" (Participant 5, academic staff)

3.3.2. Limited Training in EBP.
Participants perceived that training was limited to equipping the academic and clinical nurses with essential evidence-based knowledge and skills. Insufficient and ineffective training on EBP could not provide qualified collaborators for academic-practice partnership in EBP.

"In our nursing school, only two academic staff received training programs on evidence-based practice. ... How can you talk more about an academic-practice partnership in the condition that there is very limited academic staff mastering the methodology of evidence-based practice? It is a real problem." (Participant 3, academic staff)

"(In the ward I worked before,) most senior clinical nurses are around 40 to 50 years old. Most of them never even heard about evidence-based practice. Although most young clinical nurses in hospitals know evidence-based practice. They did not receive systematic training programs on evidence-based practice." (Participant 7, Ph.D. student)

"(As a teacher of evidence-based practice,) I only accept systematic training programs on theoretical knowledge of evidence-based practice. However, I never conduct an evidence implementation in the real world. This brought me some problems in my teaching." (Participant 3, academic staff)

3.3.3. Invisible Hierarchy between Academics and Practitioners.

An invisible hierarchy between academics and practitioners was found in the interviews. In this hierarchy, academics were treated as being of a higher rank. Many participants' wording and statements reflected this subtle hierarchy although only one participant directly mentioned the exact word "hierarchy."

"I feel that some nursing academics sometimes are arrogant. . . ."Compared to clinical nurses," they think they are more. . . (pause). There is a hierarchy. Although we never talk about this frankly. But it indeed exists. Clinical nurses find it difficult to collaborate with academics." (Participant 9, Ph.D. student)

"Professors from universities guided us in the whole process of the project." (Participant 22, clinical nurse)

*"I'm a little embarrassed. Because I think the professors *** and *** in nursing school are so successful and busy. I feel embarrassed to bother them and ask too many questions." (Participant 18, Head nurse)*

This invisible hierarchy was an unspoken truth but hindered clinical nurses from establishing partnerships with academic nurses.

3.3.4. Insufficient Attention to Clinical Nursing Practice.

Insufficient attention to clinical nursing practice, especially by academic nurses, hindered the academic-practice partnership in EBP. Many participants mentioned that consistency in the concerned areas is important for establishing and maintaining a partnership. *"I have the research areas I am interested in, and my energy is limited. Therefore, I cannot help other people to realize (the things they are interested in)." (Participant 1, academic staff)* However, *"Many academic staffs in nursing schools do not focus on research closely related to clinical nursing practice. This would lead to a gap between research and practice. And can we find appropriate academic staffs and students to collaborate with clinical nurses to promote evidence-based practice?" (Participant 1, academic staff)*

The lack of evidence on many clinical nursing problems also suggested that there was a lack of nursing academics focusing on clinical nursing practice. *"We often found there was no evidence which could answer our clinical questions. Therefore, in evidence implementation projects, we have deliberately ignored these clinical problems without evidence." (Participant 22, Clinical nurse)*

3.3.5. Lack of Interactive Communication.

Lack of interactive communication between partners led to a lack of mutual and intensive interaction in academic-practice partnership. A common format of communication in the partnerships was *"[We] just asked and answered questions without fully understanding and discussing."* An academic participant shared, *"I felt that they (clinical nurses) often want a specific and clear answer. When they answer questions, they often expect an answer of YES or NO." (Participant 5, academic staff)* Conversely, a clinical nurse shared that *"Academic nurses do not have enough understanding of the issues related to our specialty. . . . Therefore, they did not understand some small points in nursing practice which we thought were important. We explained that to them. However, we found they did not accept and understand very well." (Participant 16, Head nurse)*

Furthermore, the different understandings of academic nurses and clinical nurses on evidence implementation also indicated that there was a lack of interactive communication between partners. Many clinical nurses thought evidence implementation should be conducted strictly following related methodology and steps. They often use words like "right" and "wrong" in their description of their experience in evidence implementation. *"I often felt that my theoretical knowledge is limited during every phase in the evidence implementation project. . . . I often worried I did something wrong." (Participant 18, Head nurse)* Three academic nurses mentioned clinical nurses were trapped by methodology in EBP. *"Evidence-based practice means the implementation of evidence. We have a set of methods. However, we should not be restricted by the methodology. Actually, it is a kind of practice model." (Participant 8, Ph.D. student)* We found that, because of the different understandings, clinical nurses focused more on the methodology and procedures of evidence implementation projects, while academic nurses thought clinical nurses should focus more on problems in the real context rather than be limited by the methodology.

3.3.6. Nonmutual Needs on Specific Steps of EBP.

Academic nurses and clinical nurses had collaboration intentions and needs for the overall EBP process. However, they did not have mutual needs on specific steps. For example, clinical nurses required the assistance of academic nurses in evidence synthesis, while they did not need academic nurses during the evidence implementation in the clinical context which was indeed the part academic nurses were interested in. In contrast, academic nurses required clinical nurses to implement evidence in nursing practice, while they did not need clinical nurses during the evidence synthesis–which was indeed the part clinical nurses were often most interested in learning about. The inconsistency of needs on specific steps led to independent work on scattered tasks, which hindered the establishment and maintenance of a strong partnership.

"I am most interested in the part of evidence implementation." (Participant 13, Master student)

"To be honest, I think I do not need the help (from academic nurses) relating to clinical issues." (Participant 16, Head nurse)

"For example, he/she (the clinical nurse) has gotten evidence from us. Once he/she started (the evidence implementation), he/she would not fully involve us in the process of the evidence implementation in the clinical context. . . .We did not need them (clinical nurses) in evidence synthesis once the PICO was confirmed." (Participant 4, academic staff)

3.3.7. Lack of Theoretical Guidance on Collaboration. Academic-practice collaborations in EBP described by participants were limited to the practice level and often lacked a theoretical basis. The lack of theoretical guidance for academic-practice partnership in EBP made it difficult to build and sustain effective and successful cooperation.

> *"I want to know how a clear pathway of collaboration deal with clinical problems. However, there is no clear pathway of collaboration (between academics and practitioners)."* (Participant 10, Ph.D. student)

> *"The problem is how to do this mode (of academic-practice partnership in evidence-based practice) in detail and what is the mode in detail, this is no relevant guidance yet. . . . How can cooperation be more effective and feasible?"* (Participant 5, academic staff)

Notably, all participants directly or/and indirectly mentioned that there were many barriers to evidence implementation (including institutional-related barriers, interdisciplinary barriers, individual-related barriers, and evidence-related barriers). However, many barriers could not be solved only by the academic-practice partnership. *"I felt that many people were reluctant to change because we are used to staying in an environment that we are very familiar with. If the working environment still works and it doesn't bring me any trouble, why should I change it? This kind of common thinking may be a big obstacle."* (Participant 7, Ph.D. student) These barriers (e.g., inadequate staffing, lack of institutional support, and lack of teamwork with other professionals) would also hinder the evidence implementation even under the academic-practice partnership.

3.4. Benefits of Academic-Practice Partnership in EBP. Still, for all of these challenges, participants believed that both academic and clinical nurses could benefit from the academic-practice partnership, and improved collaboration would influence the quantity and quality of the benefits of EBP. They listed several potential benefits: (1) improving competencies in EBP and collaboration, (2) promoting resource integration, (3) promoting EBP, and (4) bridging research-education-practice gaps.

3.4.1. Improving Competencies in EBP and Collaboration. Academic-practice partnership could improve competencies in EBP and collaboration. The group-level competency in EBP of academic nurses and clinical nurses could be improved immediately, once the partnership is established. *"As a group of clinical and academic nurses, we are certainly more capable and resourceful than the two parties alone in the practice of evidence-based nursing. And they can achieve the effects of that one plus one is more than two."* (Participant 6, academic staff) The individual-level competencies in EBP and collaboration could be improved through learning by doing and collaborative communications. *"While we were communicating with clinical teachers, they provided us with many suggestions from clinical perspectives. We had many*

communications, even only during the process of identifying a clinical problem, every person may have an improvement in evidence-based practice and collaboration competencies."* (Participant 7, Ph.D. student)

3.4.2. Promoting Resource Integration. Academic-practice partnership could integrate organizational resources of the academic side and clinical side required by EBP. *"When we were in the partnership, we shared the resources of our organizations."* (Participant 22, Clinical nurse) Academic-practice partnership can provide partners with more available resources, for example, academic resources of the universities such as training programs and databases, the clinical practice environment in the hospital, professionals in other disciplines, and leadership in evidence-based nursing."* (Participant 6, Academic staff)

3.4.3. Promoting EBP. Participants shared that academic-practice partnership could increase the quantity and quality of EBP. They suggested that partnerships could lead to persistence and success in implementing EBP initiatives:

> *"It would be great if academic nurses collaborate with us. If you can ask for some help when you are in trouble, . . . I will not feel it is difficult to achieve the desired goal. . . . In addition, when I want to give up, the academic partners can give me a push to persist and complete the evidence-based practice project."* (Participant 19, clinical nurse) *"The support from academic staff helped us to insist and then complete the project better."* (Participant 18, Head nurse)

3.4.4. Bridging Research-Education-Practice Gaps. Academic-practice partnership could bridge the gaps between research, education, and practice which are critical barriers to EBP. For bridging the research-education gap, the academic-practice partnership in EBP could promote academic and clinical teachers to provide nursing students with more knowledge based on research in nursing education. *"I found some contents in the textbooks were inconsistent with available and best evidence. . . . If the academic and clinical teachers could not provide nursing students with evidence-based knowledge. This would limit evidence-based practice. I think the academic-practice partnership may solve this problem."* (Participant 6, academic staff)

For bridging the education-practice gap, the academic-practice partnership in EBP could provide nursing students with more context-related knowledge and practice experience in the education of EBP. *"When I took courses in evidence implementation for students, it was hard for me to give many examples. If I could collaborate with clinical nurses on more evidence implementations. I think the courses will be more interesting and practical."* (Participant 4, academic staff) *"I only have the experience of evidence synthesis. . . . I went through a period of self-doubt and thought the things I did were useless. . . . If I could join this kind of (academic-practice partnership) group, I could go to the next steps (i.e., evidence dissemination and evidence implementation) rather than only limit myself to evidence synthesis."* (Participant 11, Ph.D. student)

For bridging the research-practice gap, the academic-practice partnership in EBP could promote more clinical-related nursing studies to provide more applicable evidence for nursing practice. *"Co-creating knowledge can make our research more likely to be used in practice."* (Participant 9, Ph.D. student)

4. Discussion

The study aimed to explore academic and clinical nurses' perceptions and experiences of academic-practice partnership in EBP. In this study, participants believed that academic-practice partnership was a necessary strategy to promote EBP and to create a win-win situation for both academic and clinical nurses and their organizations. Partnerships could be built through different modes. Nevertheless, most current academic-practice partnerships were superficial.

The complementarity of the academic side and clinical side leads to the necessity of academic-practice partnership in EBP [17, 24]. Considering clinical practice setting is the starting point and ending point of evidence (i.e., research questions and evidence implementation), clinical nurses and healthcare organizations are the essential elements in EBP. As some participants mentioned in this study, clinical nurses' need for academic nurses in EBP may decrease, with the popularization of high-quality education on EBP. However, as revealed in this study, the limited education opportunities available for clinical nurses are a big challenge that will not be solved in the short term. Similarly, other studies indicated that lack of relevant knowledge and skills has long been one of the biggest barriers for clinical nurses to conduct evidence-based practices [5, 25]. Our study findings showed that through the collaboration with academic nurses, clinical nurses could obtain immediate and complementary resources and guidance for evidence-based practice. Therefore, the academic-practice partnership would be an essential model for promoting high-quality EBP in a long time.

Different collaboration forms provide the academic-practice partnership with more possibilities for promoting EBP. However, most collaboration activities between the academic side and clinical side were superficial, which limited the effectiveness of academic-practice partnership. Close partnerships should be based on substantial, interactive, frequent, and lasting collaboration activities, which often occur in the context of strategic partnerships with organizational and leadership supports [14]. However, most collaboration activities described by participants in this study involved scattered tasks, independent working, and lacked mutual and intensive interaction.

We found that multilevel challenges hinder EBP. This finding is corroborated by previous research, which found multiple barriers to the initiation, building, and maintenance of the partnerships between the academic side and clinical side for supporting EBP. These barriers included the lack of supportive policies; limited training about EBP; invisible hierarchy between academics and clinicians; insufficient attention to clinical nursing practice; lack of

interactive communication; nonmutual needs on specific steps of EBP; and lack of theoretical guidance on collaboration [16]. Multilevel strategies are required to overcome these challenges to reach close academic-practice partnerships.

Firstly, policy supports are essential for long-term collaboration in that policies are essential for cultivating innovation-encouraging and collaboration-friendly environments which is the basis for close partnerships to promote EBP [26, 27]. Particularly, governments, academic, and clinical institutions should develop policies that integrate EBP-oriented and academic-practice partnership-oriented requirements and performance appraisal on staff and working teams. In addition to providing a supportive atmosphere, policies could also strongly push institutions and individuals to take measures to overcome other barriers to academic-practice partnership in EBP.

Secondly, individual education on EBP provides the basis for academic-practice partnership in EBP. Collaboration on activities of EBP requires academic nurses and clinical nurses to be equipped with basic knowledge and skills provided by effective EBP courses and training programs. However, the quantity and quality of education on EBP are still limited [28]. To present more EBP education opportunities, we should cultivate more academic and clinical staff to be equipped with the necessary competencies to teach EBP [5]. Meanwhile, we should include EBP into the curriculum at all stages of nursing professional higher education (i.e., bachelor, master, and Ph.D.) [5, 29, 30]. Registered Nurses'. A systematic review [5] proposed several suggestions to improve the effectiveness of teaching EBP: using the educational strategy of combination and married with clinical exposures; adequately contributing to the student nurses' acquisition of EBP knowledge and implementation; using theoretical frameworks and models, interactive teaching styles, and appropriately sequencing duration, timing, and content for teaching EBP within the curriculum; and using academic-practice partnerships for teaching EBP, especially in the resource-constrained settings.

We also found that an invisible hierarchy between academic and clinician nurses limits deep collaborations because real partnerships cannot be built when there is imbalanced power-sharing between the academic and the clinical staff [14]. In this study, the relationship between the two sides was more like guidance by academics to clinicians, rather than partnership. Other scholars have found that insufficient attention to clinical nursing practice leads to a lack of motivation for EBP and few academic nurses focusing on research related to clinical nursing practice, which hinders the academic-practice partnership in EBP [4]. To deal with these two challenges (i.e., invisible hierarchy and insufficient attention to clinical nursing practice), the emphasis on "high-quality practice-oriented" should replace the emphasis on "research-oriented" in policies and performance appraisal systems to reduce the invisible hierarchy between academics and practitioners, increase the attention of academics on clinical nursing practice, and promote "interactive communication" rather than "consultation

conversations" between academics and practitioners. Furthermore, the lack of interactive communication in the academic-practice partnership may be also because there was an "academic-practice gap" [31]. In other words, academic nurses and clinical nurses have different professional experiences and training systems, leading to gaps in theoretical knowledge, clinical experience, and ineffective communication between academic and clinical nurses. Therefore, compatible and understandable languages to achieve shared understanding for both sides, voluntary and frequent communications, deeper understanding of the context, and experience of the other side are crucial to overcoming the academic-practice gap for promoting interactive communication [31].

Finally, there is a lack of specific theoretical guidance on academic-practice collaborations in the context of EBP although there are models, frameworks, and principles guiding EBP and academic-practice partnerships, respectively [14, 32, 33]. Meanwhile, although there is theoretical guidance (i.e., academic-practice partnership logic model and AACN's guiding principles for academic-practice partnerships) proving implications for academic-practice partnerships on the organizational level, there is a lack of theoretical guidance on individual collaborations [14, 33]. Considering individual-level collaborations are the prerequisite and core elements of organizational-level partnerships, the specific and theoretical research guiding the organizational-level partnerships and individual-level collaborations are both necessary to promote effective academic-practice partnership in EBP. It is noted that, excepting dealing with the above challenges of academic-practice partnerships, the measures of other barriers to EBP are also crucial for promoting academic-practice partnership in EBP [4, 7].

This study suggested that successful academic-practice partnership could improve competencies in EBP and collaboration, promote resource integration, EBP, and bridge research-education-practice gaps. The quality and degree of academic-practice partnership would influence the quantity and quality of the benefits, which were supported by other studies [11, 16]. However, existing evidence on approaches to develop academic-practice partnership is limited. More high-quality studies with rigorous research designs (e.g., experimental trials) and applying multimethods (e.g., mixed-method studies) are required to evaluate the short-term and long-term outcomes effectively and comprehensively [13, 16].

5. Limitations

There are three main limitations in this study. Firstly, most of the participants (i.e., 19 participants) are from central China (which is at a median level on economic and healthcare service levels); other regions with different contexts might have different modes of collaboration. Secondly, participants having the experience of deep collaboration and close partnership in this study were limited because the academic-practice partnership in EBP was limited in the context of this study. The participants with

rich experience in close partnerships may provide richer or even different information on academic-practice partnership in EBP. Thirdly, the experience of academic-practice partnership in EBP of participants was in the past. The recall difficulty could also limit the information's accuracy and adequacy.

In the future, other qualitative data collections (e.g., observational method and timely interviews) during the process of academic-practice partnership in EBP are important, which could provide more exact and vivid examples of views and experiences on academic-practice partnership in EBP.

6. Conclusions

Academic-practice partnership is a win-win strategy for both the academic side and clinical side to promote EBP. Different modes of academic-practice partnership provide academic and clinical nurses with more possibilities and better chances to promote the EBP. However, challenges in academic-practice partnership in evidence-based nursing require multilevel measures to provide a better environment to initiate, build, and maintain intensive collaborations between academic and clinical nurses.

6.1. Implications for the Profession and/or Patient Care. The collaborations between academic and clinical nurses are the basis and core of academic-practice partnerships. The individual-level collaborations on EBP activities could improve EBP competencies, resources, and education, to promote EBP and the professional development of academic and clinical nurses. Meanwhile, to effectively initiate, build, and maintain close collaborations on the individual level, leaders in academic and clinical organizations should make efforts (e.g., providing supporting policies, signing a memorandum of cooperation, providing time, resources, and incentive system) to cultivate a friendly environment for academic-practice partnership in EBP.

Data Availability

The data that support the findings of this study are available upon request from the corresponding author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Acknowledgments

Supplementary Materials

Table S1: general information of participants at the time of interview. (*Supplementary Materials*)

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Research Article

Adaptation and Validation of the Readiness for Practice Instrument for Senior Undergraduate Nursing Students in China

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Background. The high turnover rate of new nurses is significantly impacted by the transition issue. Practice readiness has been identified as a key factor in ensuring a smooth transition, but there is currently a lack of specific instruments available in China to measure it. *Aims.* To translate and adapt the Casey-Fink Readiness for Practice Survey and validate its psychometric properties in senior nursing students in the Chinese cultural context. *Methods.* The descriptive cross-sectional study design was used. The English version of the Casey-Fink Readiness for Practice Survey was translated into Chinese according to Brislin's translation guidelines. A total of 590 senior nursing students from three nursing schools in China were surveyed with the Chinese version of the Readiness for Practice Instrument. Data analyses were performed to assess the reliability and validity of the instrument. The STROBE guidelines were used as the reporting method. *Results.* The validated Chinese version of the Casey-Fink Readiness for Practice Survey contained 18 items in the same four dimensions as the original English version. The internal consistency was satisfactory, with Cronbach's α and composite reliability values for all four dimensions above 0.70. The final confirmatory factor analysis model also demonstrated good fit indices, with the average variance extracted values for all dimensions above 0.50. *Conclusion.* The validated Chinese version of the Casey-Fink Readiness for Practice Survey is a reliable and effective instrument for measuring the readiness for practice among senior nursing students in China. *Implications for Nursing Management.* This study presents a valuable contribution to adapting an effective and reliable tool to assess readiness for practice among Chinese senior undergraduate nursing students. This will enable the development of specific strategies based on cultural context to optimize the readiness for practice for senior nursing students and smooth the transition of new nurses in China.

1. Background

Newly graduated nurses (NGNs) play a critical role in the nursing workforce as a human resource supply. The State of the World Nursing Report 2020 proposed by the World Health Organization (WHO) highlights that the nursing profession receives an influx of 1.7 million NGNs each year [1]. However, the turnover rates of NGNs were especially high, ranging from 8% to 69% in the first year and 26.2% to 57% in the second year worldwide [2, 3]. In the United States, NGNs' turnover rate was 27.6% in the first year, accounting for 32.1% of all nursing turnover in 2019 [4]. A longitudinal study in China also demonstrated that the turnover rate of NGNs was approximately 33.2% [5].

The high turnover rate further exacerbated globally the nursing shortage problem.

Previous studies have shown that a variety of factors contribute to the high turnover rate among NGNs, including their low clinical competence, coping self-efficacy, and working environment. Among these reasons, low competency is identified as one of the main reasons for their intention to leave and actual turnover [6]. Low competency usually leads to negative experiences and feelings for new nursing graduates, such as low professional confidence, high confusion and challenges, and even transition shock [7]. NGNs often express feelings of being unprepared to apply clinical knowledge and technical skills in practical settings to perform the expected professional roles and responsibilities

when transitioning from an academic to a professional clinical setting. Thus, practice readiness is believed to be the key element in understanding reality/transition shock among new graduate nurses [8].

Readiness is usually described as a feeling or state of being fully prepared for the required action [9]. Practice readiness typically refers to the extent to which individuals are perceived to possess the knowledge and skills to practice autonomously [10]. Mirza et al. identified three attributes of practice readiness for newly graduated nurses, including clinical capability, cognitive capability, and professional capability [11]. Baumann et al. also identified the personal, clinical, and relational characteristics and organizational acuity as the four characteristics of practice readiness for new nurses [12]. Although different scholars may report different components of practice readiness, the maturity of nursing students, the knowledge and skills they learned in school, and their clinical practice experience during clinical practicums are believed to be the antecedents of new nurses' practice readiness [8].

Nursing students are an important resource for new nurses. Thousands of nursing students enter the nursing workforce and profession every year. In Australia, 10,000 nursing graduates enter the profession each year, and the majority of them work in acute care settings [13]. In China, 203,000 nursing graduates with advanced nursing degrees begin nursing practice each year [14]. Although nursing students do not carry the same level of roles and responsibilities as qualified clinical nurses, they still need to care for patients during clinical practicum with the professional knowledge and skills they learned in educational institutions [15]. They also face transition issues and encounter high levels of stress due to their limited clinical experience and insufficient readiness [16, 17].

Senior nursing students' readiness for practice refers to their perceptions of readiness and preparation for professional nursing roles, which are usually regarded as their ability to fulfill professional roles incorporating knowledge, behaviors, skills, and attitudes [2, 18]. Their readiness for practice largely hinges on their exposure to opportunities to practice the key dimensions of nursing during their education [19]. It has been proved that senior nursing students who possess a high level of practice readiness often experience less anxiety when transitioning to qualified nurses and are more likely to adapt to the work environment [20].

Due to the importance of practice readiness, many strategies and supports have been suggested to achieve and enhance the level of practice readiness of nursing students. The most widely employed strategies are the final clinical practicum and internship [21]. Undergraduate nursing education in China consists of a four-year program, with a clinical internship lasting over eight months in the fourth year [5]. However, nursing students are still intended to report their stressful and helpless experiences upon entering the clinical workplace [5]. Since nursing education does not always prepare nursing students for practice during the clinical practicum, they were not confident in their practice readiness [22]. Casey et al. [18] reported that only 3% of senior nursing students felt capable of independently

carrying out specific skills and procedures, such as urinary catheter insertion, in an actual clinical context.

The assessment of senior nursing students' readiness for practice with a culturally appropriate assessment tool is crucial in addressing low readiness upon entering the clinical workplace. However, specific instruments to evaluate the readiness for practice of senior nursing students in China are lacking. Since many instruments have been developed in this regard, adapting and validating an appropriate instrument are more efficient solutions. There exist several assessment tools that may be used to assess the readiness for practice among senior nursing students in the Chinese cultural context. The Work Readiness Scale [23] is one of the widely used assessment tools, but its evaluation is time-consuming due to its 64 items in four dimensions. Walker improved the original Work Readiness Scale to the Work Readiness Scale for Graduate Nurses (WRS-GN), adding 9 nursing items based on the original items [24]. While Li translated and validated the WRS-GN into Chinese [25], the scale is more suitable for assessing the work readiness of new nurses rather than senior nursing students. Shahsavari developed the Perceived Professional Preparedness of Senior Nursing Students questionnaire (PPPNS, [19]), but it is more effective to evaluate nursing students' perceived preparedness to enter the clinical setting. The Casey-Fink Readiness for Practice Survey (CFRPS) [18] was developed to assess the practice readiness of senior nursing students in the United States. It was further revised and validated in the New Zealand context [26].

Therefore, this study aims to translate and validate the CFRPS and evaluate its psychometric properties in Chinese senior nursing students to provide a culturally appropriate tool for assessing their practice readiness in senior nursing students in the Chinese cultural context.

2. Methods

2.1. Parallel Translation. With the permission of the scale developer, the original English CFRPS was translated into Chinese using a parallel blind technique to facilitate an open discussion and collaboration. Two associate professors with Ph.D. degrees and experiences as visiting scholars in Britain and the United States, respectively, completed the independent translation. Then, two English teachers working in nursing colleges with master's degrees completed the independent back-translation. Subsequently, different versions of CFRPS are cross-checked and modified. The final Chinese version of the instrument was confirmed after any discrepancies were resolved through consensus among the translators.

2.2. Study Design and Participants. In this study, a descriptive cross-sectional design was utilized and STROBE was employed as the reporting method. Participants were recruited from three nursing schools in North China. Senior undergraduate nursing students were invited to fill out a questionnaire including demographics and the Chinese version of the CFRPS, by convenience sampling from May

2021 to May 2022. The inclusion criteria were senior nursing students who (1) were in the last year of undergraduate study; (2) complete the practicum internship; (3) were preparing for clinical practice; and (4) were willing to participate in the survey. The exclusion criteria were as follows: senior nursing students who plan to work in non-nursing fields after graduation. The minimum sample size of this study was calculated on the principle of "above ten participants per scale item" [27]. Finally, 591 senior nursing students that met the criteria above accomplished the questionnaire, and 590 samples were included in the analysis after deleting one sample questionnaire with incomplete answers and missing values.

2.3. Measures. In this study, two parts of the survey questionnaire were used to measure participants' practice readiness. Section A collected demographic information, including age, gender, educational level, and questions related to clinical practicum. Section B used the Casey-Fink Readiness for Practice Survey-Chinese Version (CFRPS-C) to collect data about the practice readiness of participants. The original CFRPS is a 4-point Likert scale consisting of 18 items (1 = strongly disagree to 4 = strongly agree). It has four subdomains: clinical problem-solving (7 items), learning techniques (2 items), professional identity (5 items), and trials and tribulations (4 items). Higher scores in clinical problem-solving, learning techniques, professional identity, and lower scores in trials and tribulations indicate a higher level of readiness for practice. Cronbach's α of the original CFRPS was 0.69 for all items and 0.80 for clinical problem-solving, 0.50 for learning techniques, 0.65 for professional identity, and 0.63 for trials and tribulations, respectively, which indicates good internal consistency reliability. Exploratory factor analysis suggested that the four-factor set of correlated subscales accounted for 48.2% of the variance across all survey items [18].

2.4. Statistical Analysis. A descriptive analysis was employed to examine participants' demographic characteristics. Pearson correlation analysis was employed to examine the correlation between the four subscales of CFRPS-C. A four-factor confirmatory factor analysis (CFA) with oblique rotation was performed to evaluate the reliability and validity of CFRPS-C. Due to the ordinal nature of items in CFRPS-C, mean-variance-adjusted weighted least squares (WLSMV) estimation was employed to estimate the parameters of the factor model. The structural validity of CFRPS-C was evaluated by Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity, and the model fit indices included χ^2, df, root mean square error of approximation (RMSEA), comparative fit index (CFI), Tucker–Lewis Index (TLI), and standardized root mean square residual (SRMR). The criteria of a good model fit were: χ^2/df < 5, RMSEA < 0.08, CFI > 0.90, TLI > 0.90, and SRMR < 0.08 [28]. The reliability and convergent validity of the model were evaluated by standardized factor loadings, Cronbach's α, composite reliability (CR), and average variance extracted (AVE), where CR > 0.80 and AVE > 0.50 indicate good reliability and convergent validity

[29]. The discriminant validity of the model was evaluated by the bootstrap confidence interval test, where the bootstrap confidence interval not including one suggests discriminant validity [30, 31]. Statistical analysis was completed with SAS 9.4 and Mplus 8.3.

2.5. Ethical Considerations. Ethical approval for the survey was obtained from the Ethics Committee of the University of the Corresponding Author. All participants were informed of the purpose of this study and were free to participate in this survey. All participants gave written informed consent for their anonymized data to be used for research purposes, including publication. We also received permission from Dr. Casey (e-mail communication with Kathy Casey, 26 April 2020), the author of the CFRPS, to adapt and validate the scale in the Chinese context.

3. Results

3.1. Participant Characteristics. In this study, a total of 590 nursing students were enrolled, comprising predominantly female participants (83.1%, $n = 490$). The mean age of the participants was (21.73 ± 0.33). Notably, all of the senior nursing students had undergone an 8-month practicum in various clinical settings, including medical, surgical, gynecological, pediatric, emergency, and intensive care units.

3.2. Structural Validity. The KMO measure of CFRPS-C was 0.909, indicating enough items are predicted by each factor in the current study. The result of Bartlett's test of sphericity was statistically significant ($\chi^2 = 4874.185$, $P < 0.001$), suggesting the study data is suitable for factor analysis. The model fit indices of the confirmatory factor analysis (CFA) are illustrated in Table 1. The initial CFA model (Table 1, Model 1) with full items showed χ^2/df = 17.181, RMSEA = 0.166, CFI = 0.771, TLI = 0.735, and SRMR = 0.104, suggesting an unacceptable model fit. After deleting two items ("I am comfortable delegating tasks to the nursing assistant" and "I have had opportunities to practice skills and procedures more than once" in Trials and Tribulations) with low standardized factor loadings (<0.5), the CFA model (Table 1, Model 2) showed improved fit indices: χ^2/df = 7.329, RMSEA = 0.104, CFI = 0.922, TLI = 0.907, and SRMR = 0.060. To obtain the optimal and most parsimonious model, modification indices were evaluated and the correlations between error terms were added to further improve the model fit. The final model fit indices (Table 1, Model 3) were χ^2/df = 4.562, RMSEA = 0.078, CFI = 0.958, TLI = 0.948, and SRMR = 0.046, indicating the final CFA model showed good structural validity. Figure 1 displays the standardized loadings for the final 18-item CFA model of CFRPS-C.

3.3. Reliability and Convergent Validity. All four dimensions of the 18-item CFRPS-C showed statistically significant and satisfactory reliability and convergent validity, as evidenced

TABLE 1: Model fit of the confirmatory factor analysis.

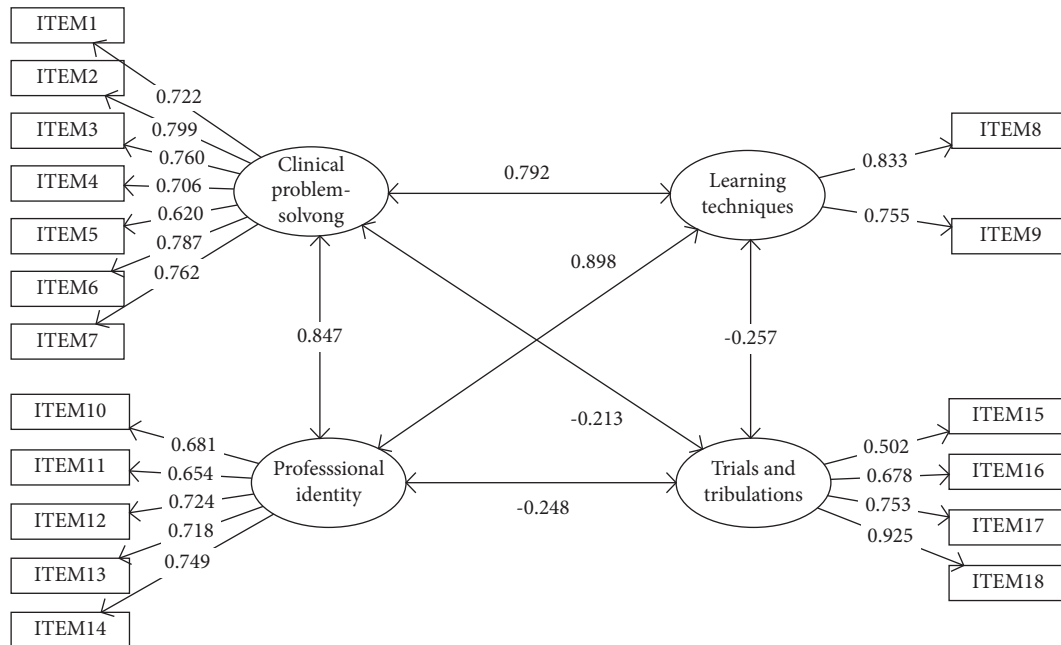| Model	χ^2	df	χ^2/df	RMSEA	CFI	TLI	SRMR
Model 1	2817.675	164	17.181	0.166	0.771	0.735	0.104
Model 2	945.510	129	7.329	0.104	0.922	0.907	0.060
Model 3	565.700	124	4.562	0.078	0.958	0.948	0.046

FIGURE 1: Confirmatory factor analysis of the 18-item CFRPS-C with standardized loading.

by the standardized factor loadings above 0.5 and significant (see Figure 1 and Table 2), Cronbach's α and composite reliability values (CR) above 0.7 (see Table 2). The average variance extracted values (AVE) of the four dimensions were all equal to or above the recommended value of 0.5 (see Table 2).

3.4. Discriminate Validity. The absolute values of the correlation coefficients between the four dimensions of the 18-item CPRS-C ranged from 0.213 to 0.898 (see Table 3). The confidence interval of correlations derived from 5000 bootstrap samplings all did not include 1, suggesting acceptable discriminate validity of the 18-item CFRPS-C [30, 31].

4. Discussion

Clinical internships are a crucial period for nursing students to experience clinical nursing and develop a professional identity, enabling them to transit smoothly into professional clinical nurses [32]. Yet we have no specific instruments to evaluate the practice readiness of senior nursing students during this critical period in China. Therefore, the primary objective of this study was to translate and adapt the Casey-Fink Readiness for Practice Survey (CFRPS) into the Chinese version through a parallel translation process.

The Chinese version of the CFRPS, which is an 18-item scale, has been validated through a parallel translation process. The results of the confirmatory factor analysis (CFA) showed that all the standardized factor loadings of the final 18-item CFRPS-C was statistically significant and above the recommended value of 0.5, indicating good commonalities of items [33]. Furthermore, the values of Cronbach's α and CR for the four dimensions were above 0.7, and the average variance extracted (AVE) of the dimensions was above 0.5. This suggests that the Chinese version of CFRPS has acceptable reliability and convergent validity [28]. In addition, the discriminate validity of the CFA model was acceptable according to the correlation coefficients between the four dimensions [30, 31]. Therefore, the findings indicated that the Chinese version of CFRPS is reliable and valid for the evaluation of readiness for practice in Chinese senior nursing students.

In the original CFRPS, Casey identified four factors closely related to the readiness for practice, including clinical problem-solving, learning techniques, professional identity, and trials and tribulations. Previous studies also focused on these domains singly or combined to reflect the practice readiness of nursing students or new nurses [8]. In our study, we found the final Chinese version of CFRPS has 18 items in the same dimensions as the original CFRPS. What's more, all the items in the dimensions of clinical problem-solving skills, learning techniques, and professional identity

TABLE 2: Reliability and convergent validity of the 18-item CFRPS-C.

Dimension	Indicator	STD	SE	Z	P	Cronbach's α	CR	AVE
Clinical problem-solving	Feel confident communicating with physicians	0.722	0.022	32.536	<0.001	0.828	0.893	0.546
	I am confident in my ability to problem solve	0.799	0.017	46.505	<0.001			
	I use current evidence to make clinical decisions	0.760	0.018	42.834	<0.001			
	I am comfortable communicating and coordinating care with interdisciplinary team members	0.706	0.022	32.439	<0.001			
	I feel comfortable knowing what to do for a dying patient	0.620	0.023	27.022	<0.001			
	I feel comfortable taking action to solve problems	0.787	0.018	43.402	<0.001			
	I feel confident identifying actual or potential safety risks to my patients	0.762	0.018	42.243	<0.001			
Learning techniques	Simulations have helped me feel prepared for clinical practice	0.833	0.018	46.488	<0.001	0.701	0.774	0.632
	Writing reflective journals/logs provided insights into my own clinical decision-making skills	0.755	0.019	38.86	<0.001			
Professional identity	Feel comfortable communicating with patients and their families	0.681	0.020	33.957	<0.001	0.781	0.832	0.500
	My clinical instructor provided feedback about my readiness to assume an RN role	0.654	0.022	29.165	<0.001			
	I am comfortable asking for help	0.724	0.020	37.088	<0.001			
	I am satisfied with choosing nursing as a career	0.718	0.021	34.68	<0.001			
	I feel ready for the professional nursing role	0.749	0.020	38.216	<0.001			
Trials and Tribulations	I have difficulty documenting care in the electronic medical record	0.502	0.038	13.338	<0.001	0.778	0.814	0.534
	I have difficulty prioritizing patient care needs	0.678	0.030	22.709	<0.001			
	I feel overwhelmed by ethical issues in my patient care responsibilities	0.753	0.028	27.338	<0.001			
	I have difficulty recognizing a significant change in my patient's condition	0.925	0.022	41.464	<0.001			

Note. STD, standardized factor loading; SE, standard error.

Table 3: Pearson correlation and discriminate validity of the 18-item CFRPS-C.

	D1	D2	D3	D4
D1	1			
D2	0.792 (0.691~0.892)	1		
D3	0.847 (0.801~0.891)	0.898 (0.801~0.994)	1	
D4	−0.213 (−0.361~−0.064)	−0.257(−0.412~−0.102)	−0.248(−0.405~−0.091)	1

Note. D1 = clinical problem-solving; D2 = learning techniques; D3 = professional identity; D4 = trials and tribulations.

have completely remained, indicating that these factors can also assess the practice readiness of Chinese senior nursing students. But in this study, two items in the "Trials and Tribulations" dimension were deleted from the original CFRPS, namely, "I am comfortable delegating tasks to the nursing assistant" and "I have had opportunities to practice skills and procedures more than once" due to their poor interpret-ability to the whole Chinese version of the CFRPS. In addition, these items are not consistent with the Chinese nursing education background. During the 8-month clinical internships, the roles and responsibilities of Chinese senior nursing students are almost the same as those of clinical nurses. They all have many opportunities to practice nursing skills and procedures [5]. But they have to practice under the supervision of experienced clinical preceptors without nursing licenses [34]. Thus, the deletion of these two items also implied the importance of the scale cultural adjustment.

5. Strengths and Limitations

From a methodological perspective, this study has notable strengths. First, to ensure the accuracy of the translation and adaptation process, four experts who are knowledgeable about undergraduate nursing education issues in China and possess good English language skills were involved. Second, the use of CFA in the validation process enabled the assessment of construct validity. Finally, with a sample size of 590 Chinese senior nursing students who fully completed the questionnaires, this study had a sufficiently large sample for psychometric testing.

This study has several limitations. First, the convenience sampling method used in this study may limit the generalization of the findings. In addition, the study only included senior nursing students from one region in China, which may not be representative of senior nursing students in other regions. Further studies that include participants from various regions are necessary to confirm the validity of the Chinese version of CFRPS. Another limitation of the study is that the CFRPS is a self-report instrument, which may be influenced by social desirability bias. Participants may give a subjective or socially appropriate answer that does not accurately reflect their actual level of practice readiness. Future studies that use a combination of qualitative and quantitative methods may provide more comprehensive and accurate data. Besides, the survey was conducted from May 2021 to May 2022. The clinical experience of senior nursing students may be limited due to the online clinical practicum during the COVID-19 pandemic. Thus, the result obtained in this study is difficult to work as the norm for practice readiness of Chinese senior nursing students to compare with other studies.

6. Conclusion

The 18-item CFRPS-C demonstrated good construct validity and provides stronger psychometric support for the original CFRPS. Thus, the CFRPS-C is a useful tool to assess practice readiness among Chinese senior nursing students. Its brevity also enhances its convenience and practicality in clinical settings.

7. Implications for Nursing Management

New Nurses are the main supplier to the nursing workforce, and the transition issue contributes a lot to their retention rate. Nursing management should recognize the importance of practice readiness in the clinical practicum for senior nursing students, as it is a critical factor in their transition to professional clinical nurses and can affect their high turnover rate. Yet there is a lack of specific instruments to evaluate the readiness for practice in China. This study's adaptation and validation of the Readiness for Practice Instrument for Chinese senior undergraduate nursing students provide a valuable tool for evaluating practice readiness in China. Data from surveys with this scale in China may enrich and deepen the understanding of readiness for practice. Culturally specific strategies should be developed based on different cultures to optimize the readiness for practice and promote retention of the nursing profession.

Data Availability

The datasets generated and analyzed during the current study are not publicly available to ensure data confidentiality.

Additional Points

What Does This Paper Contribute To the Wider Global Clinical Community? (1) It adapts and validates a reliable and valid instrument to measure the readiness for practice among Chinese senior nursing students. (2) It provides increased psychometric support for the original Casey-Fink Readiness for Practice Survey. (3) It makes it possible to enrich the understanding of readiness for the practice among different cultures with the same instrument, to optimize the readiness, and help retention of the nursing profession.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Adaptation of the Safety Climate Survey: A Contribution to Improving Patient Safety

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Aims. The aim of this study was to adapt the Safety Climate Survey and examine its validity and reliability for use in the Turkish healthcare context. *Background.* Maintaining patient safety is a challenge for healthcare systems world-wide, and healthcare professionals need valid and reliable tools to measure improvements in safety. *Methods.* The Safety Climate Survey is unidimensional and contains 19 items, which are all five-point Likert-type scales as follows: 1 (totally disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree), and 5 (totally agree). Language adaptation of the Safety Climate Survey conducted in accordance with the International Society for Pharma economics and Outcome Research (ISPOR) and expert assessments to calculate the content validity indices was undertaken in the first phase of the study. In phase two, a survey of 434 nurses employed in three hospitals in İzmir (Turkey) was conducted to test the construct validity with confirmatory factor analysis and internal consistency with Cronbach's alpha, split-half reliability, and item-total correlation. The intraclass correlation coefficient was also checked via test-retest reliability for stability. *Results.* The content validity index score was 0.97 for the scale and above 0.90 for the items, confirming excellent validity. The confirmatory factor analysis showed an adequate fit, and all the factor loadings were positive and greater than 0.30. Cronbach's alpha was 0.90, and Spearman–Brown coefficient 0.83, indicating good internal consistency. The item-total correlation coefficients were between 0.33 and 0.70, exceeding the acceptable level. The intraclass correlation coefficient value obtained was 0.84, reflecting a good level for time stability. *Conclusion.* The Turkish version of the Safety Climate Survey is a valid, reliable, and practical tool which can provide essential data on safety issues for healthcare professionals and administrators. *Implications for Nursing Management.* The instrument can be used in hospital settings to measure the safety climate among nurses, and the results obtained can be used to inform the development of safety improvement strategies.

1. Introduction

Patient safety concerns the prevention of patient harm caused by healthcare-related errors [1]. However, only 60% of care is based on evidence, or in accordance with guidelines, systems waste about 30% of all health expenditure, and 10% of patients experience harm [2]. The World Health Organization (WHO) also estimated that 1 in 10 patients in high-income countries is harmed while receiving hospital care, and in low and middle-income countries, 134 million adverse events occur, resulting in 2.6 million deaths [3]. This indicates that it is crucial to establish high-quality and safe system designs to provide optimal healthcare services [1].

The prevention of errors in healthcare services and the elimination or reduction of harm require a patient safety culture characterised by continuous improvement involving repetitive evaluations of the safety climate [4, 5]. For a safety culture to be adopted and embedded in institutions, healthcare professionals need to work with the wider health care team in the assessment and improvement of the safety climate [1], and strategies to involve them in decisions and activities that affect them would increase the likelihood of safety initiatives being successful [6]. For example, it would

be beneficial for healthcare organizations to formally assess patient safety processes at regular intervals (e.g., every six months) to identify the weaknesses in the system. One element of such an approach could be to examine safety climate [5]. Moreover, developing an approach to organizational learning focused on what works well in complex healthcare systems would result in more rapid improvement than relying solely on conducting investigations when processes fail [7].

The concept of a "safety culture" generally refers to the corporate values, and practices necessary to ensure safety are maintained, whereas the term "safety climate" focuses attention on employee perceptions of how patient safety is defined and managed [5, 8]. Studies which have examined the nature and scope of the safety climate have identified a number of common dimensions. These include the following: leadership commitment to safety, prioritization of safety, teamwork, communication, and safety systems [9–11]. Challenges to the delivery of effective, high-quality, and safe care tend to be the obverse of those listed above including lack of leadership support, staff work pressures, inadequate risk management, communication barriers, and limited resources [12]. Therefore, it is essential to monitor the extent and impact of these factors using robust methods to gather reliable data on safety issues [5]. Tools designed for this purpose include the Safety Attitudes Questionnaire [13], Patient Safety Culture in Healthcare Organizations [14], Hospital Survey on Patient Safety Culture [15], and the Safety Climate Survey [16].

In the present study, the Safety Climate Survey (SCS) was selected because it is unidimensional, yet takes account of complex nature of safety climate, and focuses on institution-wide improvement processes. Its unidimensional format with its 19 items was also a factor in its selection as this was likely to increase the likelihood that participants would complete the survey [5]. A large number of the items with multiple subdimensions in a survey tool scale can be off-putting and result in participants failing to complete an instrument [17]. Hence, the survey length may affect the reliability of the results obtained [18]. The fact that the scale has also been used successfully in different cultures/settings was also a factor in its selection [19].

1.1. Aim.
The aim of this study was to adapt the SCS and examine its validity and reliability features when applied to the Turkish nursing population.

2. Methods

2.1. Design.
The study was conducted in two phases as given as follows: (1) Translation and language adaptation of the survey. (2) Administration of the survey to nurses working in the Turkish health care settings. The translation and adaptation of instruments for cross-cultural research require rigorous planning and a robust methodological approach. We followed three sets of guidelines [20–22] for the reporting of the psychometric and psycholinguistic properties of the scale.

2.2. Setting.
To increase the likelihood of the generalizability of the findings, a university hospital and two public hospitals were selected, as providers in other parts of the country were similar in size and structure. The university hospital employed 748 nurses; one public hospital employed 376 nurses, and the other 761 nurses.

2.3. Sampling and Participants.
It has been recommended that to perform confirmatory factor analysis (CFA) effectively in validity and reliability studies, the number of participants (varying between 100 and 1000) should be at least seven times (in between 3 and 20) the number of items on the scale [23]. For test-retest, the recommended number of participants is between 50 and 100 [24, 25]. Taking these recommendations into account, we aimed to recruit a minimum of 418 participants (20×19 items require 380 participants, plus a nonresponse rate of %$10 = 418$). The final sampling frame was set at 434 nurses for the survey and 82 for the test-retest reliability element.

2.4. Measurement/Tool

2.4.1. Safety Climate Survey (SCS).
The unidimensional SCS, developed by Sexton, Helmreich, Pronovost, and Thomas [16], consists of 19 items whose responses are rated on a five-point Likert-type scale. The participants are asked to rate the items of the survey as follows: 1 (totally disagree), 2 (disagree), 3 (neither agree nor disagree), 4 (agree), and 5 (totally agree), 6 (have no idea/comment). The option "I have no idea/comment" is not included in the calculations. Item 18 is reversely scored. The total score is calculated by summing the scores given to all the items and dividing the result by the number of the items. At the end of the procedure, a mean score ranging from one to five is obtained. A score ≥3.75 indicates a positive safety climate perception. The reliability coefficient of the scale was 0.87 in the original study [16]. We also included questions about age, sex, education, length of service, unit worked in, and weekly working hours in addition to the SCS items in order to identify the participants' characteristics.

2.5. Data Collection.
Nurses were invited to participate if they met the following inclusion criteria: working full-time providing direct patient care for at least one year post-qualification. These criteria were necessary because some of the survey items require direct patient care and nursing experience. Nurses not providing direct patient care (e.g., polyclinics) or on sick/annual leave were excluded. A convenience sampling approach was used. During data collection, the researchers visited the hospitals according to the nurses' shifts -initial visit with two additional reminding visits- and distributed the survey to the staff nurses by hand in sealed envelopes. As there was no collection point, the researchers received the completed forms back in sealed envelopes, in person. The returns were given sometimes just immediately after the first visit. In others, it was in a week. Participation was voluntary. The researchers gave

information on the survey form and asked participants to fill in it. The final sample who agreed and completed the survey form was 434 in total.

2.6. Data Analyses. SPSS 22.0 (IBM Corp., Armonk, NY, USA) and LISREL 8.80 (Lincolnwood, IL: Scientific Software International, Inc.) programs were used for the analysis. Analyses involved confirmatory factor analysis (CFA), split-half method, and item-total correlation, as these have not been undertaken in previous studies. In the assessment of reliability of the instrument for use in the Turkish nursing setting, the test-retest method was used to measure stability, and Cronbach's α coefficient, Spearman-Brown coefficient, and item-total correlation were examined to measure internal consistency. For the validity analyses, content validity was assessed. The CFA was performed for construct validity. The statistical significance level was set at $p < 0.05$ (See Table 1 for a summary of the analytical approaches used).

2.7. Translation. In the adaptation process, it is crucial to select idioms and sentence structure that are understandable in the target language but which are consistent with the meaning in the original instrument. This may involve the replacement of particular phrases to ensure they are suitable for the target culture. For this purpose, a pilot study is recommended following the forward and back translations [22].

Forward-back translation was undertaken. Three translators with a good command of English performed the forward translation from the original language (English) to the target language (Turkish). Following forward translation, the researchers (authors), as recommended in the guidelines, checked and modified the items as necessary to eliminate the inconsistencies in the translations (For example, in item 6, "paid attention" was changed to "acted upon"). During the back-translation process from Turkish to English, two different translators, who did not see the scale items beforehand, translated the scales. The researchers then combined the two translations into a single form, and on receipt of approval from its authors [16], a pilot study was conducted with ten nurses to evaluate the items in terms of clarity. In the final part of the translation process, the researchers amended and revised the scale items based on the nurses' recommendations (for example, the wording of item 2, in which "unit" was changed to "clinical area").

2.8. Validity. We used the content validity index for content validity and confirmatory factor analysis for construct validity.

2.8.1. Content Validity. It is recommended that at least 5–8 experts are involved in evaluating the extent to which a survey tool addresses the phenomenon of interest [22, 26] and that the content validity index (CVI) is used [27]. For CVI, the measurement tools are first scored by experts (1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant). Then, the number of experts who gave

TABLE 1: Analyses used in the study.

Validity	Reliability
Language adaptation (face validity)	Stability
(i) Forward-back translation	
(ii) Pilot testing	(i) Test-retest
Content validity	Internal consistency
(i) Content validity index	(i) Cronbach's α
Construct validity	(ii) Split-half reliability
(i) CFA	(iii) Item-total correlation

"three" and "four" points for each item is calculated and then divided by the total number of experts. The result gives the CVI value. The threshold CVI value is 0.78 and above for the scale items (0.75 and above with 10 or more experts) and ideally 0.90 and above for the total scale [28]. In the present study, ten experts (eight nursing faculty members from different departments - experienced in methodological studies, and two clinical nurse managers - one from the ward, one from the critical care unit) assessed the scale items for their suitability. In line with these expert suggestions, the researchers reviewed the scale items' content and made changes in the words used and sentence construction before the survey was conducted [28]. For example, the fifth item was changed after the recommendations, that is, from "There is a leadership approach that focuses on patient safety throughout the institution" to "There is a leadership approach in this institution that directs employees to focus on patient safety." The CVI was between 0.80 and 1.00 for the scale items and 0.97 for the total scale. We found the CVI value calculated for experts to be 0.97. The expert panel agreed that the scale items are related to the scope of the scale with an agreement rate of over 80% (Table 2). See Table 2 for the CVI indices.

2.8.2. Construct Validity. Construct validity is the level of representation of the factors/items that are related to the construct in the measurement tool [27]. Examining the accuracy of these factors in the scale structure helps determine the suitability of the subdimension items. Two forms of factor analysis (exploratory and confirmatory) and structural equation modeling are the main methods for determining the level of construct validity. While variables in exploratory factor analysis (EFA) produce loadings on all factors, only factors assigned to the model produce loadings in confirmatory factor analysis (CFA). Therefore, CFA is regarded as the approach of choice for the cultural adaptation of measurement tools [29, 30]. Acceptable values for fit indices obtained as a result of CFA are as follows: Chi-square/Degrees of freedom: $2 \leq 3$, Normed Fit Index–NFI: ≥ 0.90, Comparative Fit Index- CFI: ≥ 0.95, Incremental Fit Index- IFI: ≥ 0.95, Goodness of Fit Index–GFI: ≥ 0.90, and Root Mean Squared Error of Approximation- RMSEA: ≤ 0.08 [31].

2.9. Reliability. We used the test-retest method to measure the stability of the scale. Cronbach's α coefficient, split-half analysis, and item-total correlation were selected to determine its internal consistency.

Table 2: Content validity indices.

Expert–item	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	Agreement	CVI (agreement/total)
1	+	+	+	+	+	+	+	+	—	+	9	0.90
2	+	+	+	+	+	+	+	+	+	+	10	1.00
3	+	+	+	+	+	+	+	+	+	+	10	1.00
4	+	+	+	—	+	+	+	+	+	+	9	0.90
5	+	+	+	—	+	+	+	+	—	+	8	0.80
6	+	+	+	+	+	+	+	+	+	+	10	1.00
7	+	+	+	+	+	+	+	+	+	+	10	1.00
8	+	+	+	+	+	+	+	+	+	+	10	1.00
9	+	+	+	+	+	+	+	+	+	+	10	1.00
10	+	+	+	+	+	+	+	+	+	+	10	1.00
11	+	+	+	+	+	+	+	+	+	+	10	1.00
12	+	+	+	+	+	+	+	+	+	+	10	1.00
13	+	+	+	+	—	+	+	+	+	+	9	0.90
14	+	+	+	+	+	+	+	+	—	+	9	0.90
15	+	+	+	+	+	+	+	+	+	+	10	1.00
16	+	+	+	+	+	+	+	+	+	+	10	1.00
17	+	+	+	+	+	+	+	+	+	+	10	1.00
18	+	+	+	+	+	+	+	+	+	+	10	1.00
19	+	+	+	+	+	+	+	+	+	+	10	1.00
Agreement	19	19	19	17	18	19	19	19	16	19		CVI item 0.97
CVI	1.00	1.00	1.00	0.89	0.95	1.00	1.00	1.00	0.84	1.00		CVI expert 0.97

2.9.1. Test-Retest. This involves the measurement of the tool using the same sample group twice at a specified interval [27]. A recommendation for the sample size is between 50 and 100 [24, 25], and the interval between the two measurements should be at least 10–14 days to avoid the possibility of participants remembering the items [32]. The intraclass correlation coefficient (ICC) was used for interpretation with the ICC values being evaluated in four classifications (<0.5: poor, 0.5–0.75: moderate, 0.75–0.9: good, >0.9: excellent) [33].

2.9.2. Cronbach's Alpha. The alpha coefficient (or Cronbach's alpha) is normally calculated to evaluate internal consistency [27]. The range value varies between 0 and 1. High values support the internal consistency of the scale [27]. Ideally, threshold values should be equal to or above 0.70 [34].

2.9.3. Split-Half Method. It is another method for determining levels of internal consistency. It is calculated by dividing the total of items into halves. The Spearman–Brown coefficient is used [35], and 0.70 and above are regarded as acceptable [34].

2.9.4. Item-Total Correlation. It indicates the items' suitability (whether they will change or not) and the correlation values with the score of each item that is examined. An acceptable level value is above 0.20 [36].

2.10. Ethical Considerations. Ethical approval for the conduct of the study was provided by a University Research Ethics Committee (Decision No: 2015/02–20). Agreement to recruit nursing staff was obtained from the executive nursing management of the respective hospitals, and permission via e-mail to use the SCS was confirmed by its developers.

3. Results

The mean age of the participants was 35.29 (SD = 7.12), and the majority (92.9%) were female. Two-thirds of the nurses (66.6%) held an undergraduate degree. The distribution of nurses by hospitals was similar in numbers. The average length of professional experience was 13.38 (SD = 7.85) years, and the average weekly working hours were 45.42 (SD = 6.51) (further information about the respondents' socio-demographic details and work-places can be found in Table 3).

3.1. Psychometric Properties

3.1.1. Validity. Table 4 shows the confirmatory factor analysis results, presenting the fit indices for the current study findings and acceptable level indices. The scores indicate that the model satisfies the threshold values. Additionally, all the factor loadings of the items were positive and standardized loadings ranged from 0.31 to 0.78, which are above the accepted cut-off value of 0.30.

3.1.2. Reliability. We evaluated the scale's stability with test-retest (two weeks apart). During the analysis, we marked two-way mixed as the model and absolute agreement as the type. We then identified the intraclass correlation coefficient as 0.84 (95% confidence interval, lower limit 0.71, upper limit 0.91) between first and post-test total mean scores ($n = 82$). The results obtained indicate that the time invariance is good.

TABLE 3: Participants' socio-demographic and work-related characteristics ($n = 434$).

Characteristics	n	%
Age (35.29 ± 7.12)		
Sex		
Women	403	92.9
Men	31	7.1
Education		
High school graduate	26	6
Associate degree	66	15.2
Bachelor's degree	289	66.6
Graduate degree	53	12.2
Hospital		
University hospital	169	38.9
Public hospital 1	125	28.8
Public hospital 2	140	32.3
Units		
Internal medicine units	171	39.4
Surgical units	174	40.1
Critical care units (intensive care and emergency services)	89	20.5
Tenure (13.38 ± 7.85)		
Weekly working hours (45.42 ± 6.51)		

TABLE 4: Confirmatory factor analysis indices.

Fit indices	Acceptable fit	Present study
$\chi(2)/d.f.$	$2 \leq 3$	3.28 $\chi(2) = 482.2$, d.f. = 147, $p = 0.01$
NFI	≥0.90	0.95
CFI	≥0.95	0.97
IFI	≥0.95	0.97
GFI	≥0.90	0.90
RMSEA	≤0.08	0.07

We tested the internal consistency with Cronbach's alpha, split-half reliability, and item-total correlation. The score for the Cronbach alpha was 0.90 and for Spearman–Brown coefficient 0.83, which are above the acceptable level. Table 4 presents the item-total correlations.

We determined the item-total correlation coefficients to be between 0.33 and 0.70 (acceptable level). The lowest scores are in the first and nineteenth items, and the highest score is in the fifth item (Table 5). The original survey items presented in Table 5 are reproduced from [16].

4. Discussion

The analysis demonstrated that the scale has acceptable psycholinguistic and psychometric properties in the Turkish nursing context, which was confirmed on examination of CFA, split-half reliability, and item-total correlations. We discussed the results of the analysis under separate subheadings in the following sections.

4.1. Reliability

4.1.1. Stability. As a result of the test-retest performed at two-week intervals, the ICC coefficient in this study was 0.84. Kho et al. [37] determined the ICC value as 0.92 in their study conducted in four intensive care units in a tertiary medical center in Ontario, Canada. The results obtained support the good level of time stability for both studies.

4.1.2. Internal Consistency. In the current study, Cronbach's alpha value was 0.90, and the item-total score correlation coefficients were between 0.33 and 0.70. Kho et al. [37] found the Cronbach's alpha value to be 0.86, and in work with surgical residents in the Netherlands, it was 0.87 [38]. Similarly, a study involving 523 physicians and 1321 nurses

working in the operating rooms and surgical services of Swiss hospitals found a value of 0.86 for the German version and 0.84 for the French version [19]. A Cronbach alpha value of 0.70 and above in these adaptation studies in different countries provides evidence for the internal consistency of the scale.

We could not locate an adaptation study comprising split-half reliability and item-total score correlation analysis, and so, these analyses in the present study are the first to provide evidence of these elements of the internal consistency of the scale.

4.2. Validity

4.2.1. Content Validity. CVI values were equal to or above 0.80, which exceeded the threshold value of 0.78 in this study. Martowirono et al. [38] focused on the "appropriateness" of the items, in terms of their scale and scope, rather than of the CVI, and resident physicians evaluated the scale items against this criterion. They concluded that the scale items were appropriate for determining the nature of the safety climate. In the same study, the percentage values of the responses of "(6) I have no idea/comment" were calculated for each scale item to support the content validity. The percentage was below 10% for all scale items, and a value of ten percent was considered acceptable [38].

4.3. Limitations. Since the data reflect the participants' perceptions, it is important to take this into account when evaluating and interpreting the findings. In addition, nurses working in private hospitals did not participate, and so, caution may be needed when generalising to other settings.

5. Implications for Nursing Management

For patient safety to become embedded in the culture of an organisation, all management levels and the healthcare teams need to prioritize patient safety, establish manager-employee cooperation, and regularly revise patient safety policies and procedures and implement them [39]. The present study demonstrates that the SCS is suitable for use in the Turkish healthcare setting and could be used as part of a continuous programme of quality improvement. It is unidimensional, has 19 items, is acceptable to nurses, and helps highlight issues that require action to improve patient safety. It is not a solution but could certainly be part of a comprehensive approach to prioritizing patient safety, leadership, and learning from mistakes [10, 40]. The data

TABLE 5: Item-total correlation coefficients.

Items	r
(1) The culture of this clinical area makes it easy to learn from the mistakes of others	0.33
(2) Medical errors are handled appropriately in this clinical area	0.63
(3) The senior leaders in my hospital listen to me and care about my concerns	0.52
(4) The physician and nurse leaders in my areas listen to me and care about my concerns	0.67
(5) Leadership is driving us to be a safety-centered institution	0.70
(6) My suggestions about safety would be acted upon if I expressed them to management	0.66
(7) Management/leadership does not knowingly compromise safety concerns for productivity	0.40
(8) I am encouraged by my colleagues to report any safety concerns I may have	0.61
(9) I know the proper channels to direct questions regarding patient safety	0.61
(10) I receive appropriate feedback about my performance	0.52
(11) I would feel safe being treated here as a patient	0.64
(12) Briefing personnel before the start of a shift (i.e., to plan for possible contingencies) is an important part of safety	0.57
(13) Briefings are common here	0.62
(14) I am satisfied with the availability of clinical leadership	0.61
(15) This institution is doing more for patient safety now, than it did one year ago	0.66
(16) I believe that most adverse events occur as a result of multiple system failures, and are not attributable to one individual's actions	0.41
(17) The personnel in this clinical area take responsibility for patient safety	0.66
(18) Personnel frequently disregard rules or guidelines that are established for this clinical area	0.68
(19) Patient safety is constantly reinforced as the priority in this clinical area	0.33

also suggest that the SCS can be used successfully in a range of other geographical and health care settings [5, 19, 38].

6. Conclusion

The SCS is reliable, has good time stability, a good Cronbach's alpha value, and acceptable item-total correlation coefficients for use in Turkish health care. It is also valid in terms of language, content, and the model fit. These findings reinforce the evidence for the suitability of the scale for use in a range of settings. However, further work is needed to investigate the impact of the use of the SCS on patient safety outcomes.

Data Availability

Data are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Review Article

Applications of Artificial Intelligence in Nursing Care: A Systematic Review

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Aim. To synthesise the available evidence on the applicability of artificial intelligence in nursing care. *Background.* Artificial intelligence involves the replication of human cognitive abilities in machines, allowing to perform tasks that conventionally necessitate human cognition. However, its application in health sciences is a recent one, and its use is currently limited to supporting the diagnosis and prognosis of hospitalised patients, among others. *Evaluation.* A systematic review was conducted in the PubMed-Medline, Scopus, CINAHL, Web of Science, and Nursing & Allied Health databases until September 2022, following the PRISMA guidelines. *Key Issues.* A total of 21 articles were selected for the review. The different applications of artificial intelligence in nursing identified comprised (i) advances in early disease detection and clinical decision making; (ii) artificial intelligence-based support systems in nursing for patient monitoring and workflow optimisation; and (iii) artificial intelligence insights for nursing training and education. *Conclusion.* Artificial intelligence-based systems demonstrated increased autonomy of patients and professionals in care processes such as wound management through guided instructions, improved workflows, and efficiency in terms of time, materials, and human resources. *Implications for Nursing Management.* Artificial intelligence applied to nursing practice can be a very useful resource for professionals, managers, and supervisors. It has the potential to change current working flow systems and may serve as a down-to-earth resource to support nursing professionals in their decision-making process that ensures high quality and patient safety care.

1. Introduction

Artificial intelligence (AI) refers to the simulation of human intelligence in machines that are designed to perform tasks that typically require human cognition, such as problem solving, decision making, and pattern recognition [1, 2]. Due to its access to information, AI-based support systems can assist in making clinical decisions and therefore achieve better medical attention based on evidence [3–5]. In order to understand what AI entails, it is important to consider the various functions that contribute to its intelligence. These functions include machine learning (ML), natural language processing (NLP), behavioural pattern recognition, search engine capabilities, image and sound analysis, environmental perception, databases, information classification, and artificial neural networks. Additionally, another important aspect of AI is robotic process automation (RPA), which refers to the use of software robots to automate repetitive and routine tasks and physical robots, which are physical machines that can be programmed to perform tasks in the physical world [6, 7] (Figure 1).

Machine-learning-based systems	Robotic process automation	Natural language processing systems	Physical robots
• Data analysis method based on algorithms to automatically improve their performance on a specific task through experience. • Automatic improvement through trial and adaptation. • Complex structures: neural network and profound knowledge. • Their success depends on the quality and quantity of data used for training, the choice of algorithm, and the design of the system.	• Allows for the automation of manual, repetitive, and time-consuming tasks through software robots. • Digital programmes that perfect workflows. • Ability to extract relevant data and update previous records. • They offer benefits such as increased efficiency, reduced errors and manual intervention, improved compliance, and lower costs compared to traditional manual processes.	• Ability to extract and analyse clinical information from descriptive data. • Classifies and predicts responses based on previous consultations. • Mimetic systems of expert reasoning based on a set of rules, favouring dynamic and adaptive knowledge. • Advancements in deep learning and language models have significantly improved the accuracy of NLP systems in recent years.	• Machines that usually have a human appearance designed to perform a specific task or set of tasks. • Ability to collaborate in healthcare processes. • They can range from simple, single-function devices to complex, multi-functional systems capable of operating in various environments, including industrial, domestic, and hazardous settings.

FIGURE 1: Types of artificial intelligence and their main characteristics in selected articles.

The application of AI as a support system in healthcare has gained special relevance in recent decades, mainly as a result of growing data ecosystems in healthcare systems [8, 9]. In general terms, AI-based support systems offer a potential resource for reducing the cost of healthcare, increasing the efficiency of said services, and creating a highly valued support system for the well-being of patients and the healthcare sector in general, contributing to the satisfaction and clinical safety of patients and their family members [3–5]. However, the introduction of AI-based support systems in nursing care continues to cause concerns and debates due to the fear that this type of technology could eventually replace human interactions, jeopardising the ethics of care, and above all, that AI could eventually replace the functions of nurses [10]. Other ethical issues include the management of bias in data and its use to generate algorithms [11]. Despite the challenges, the use of AI in nursing aims to provide support and improve outcomes. As observed in the literature, the technology can address certain issues such as lack of expertise or inadequacy in experience, streamline documentation, and provide access to current evidence-based practices to ensure high-quality patient care, thus reducing the feeling of frustration that professionals have due to the organisational burden [10, 12]. Nurses play a crucial role in the delivery of patient care, and the increasing demand for high-quality, evidence-based practices has put pressure on the nursing workforce to stay up to date with the latest technological advancements [12]. In this regard, AI has the potential to support nursing practices by providing real-time decision support, reducing the time spent on administrative tasks, and facilitating the efficient management of patient data and care [13, 14].

In light of the rapidly evolving technological advancements in healthcare, it is important to evaluate the potential applications of AI on nursing practice. In this vein, recent systematic reviews have revealed promising results that AI can offer in the area of diagnosis and prognosis of certain clinical situations, such as cancer or new-onset pathologies in hospitalised patients [15, 16]. However, to our knowledge, the current body of literature that focuses on the application of different types of AI-based support systems in nursing is still limited, despite constituting one of the largest potential users of this type of technology as experts in caregiving. Thus, the aim of this review was to synthesise the available evidence on the applicability of artificial intelligence in nursing care.

2. Methods

2.1. Design. A systematic review was conducted in September 2022, following the recommendations of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statements [17] (Supplementary File 1). The clinical question that responds to the aim of this review used a PCC structure (population-concept-context) [18] and is stated as follows: What is the applicability of artificial intelligence (C) in nursing (P) for patient care (C)? The review protocol was not registered.

2.2. Search Strategy. The databases that were consulted include PubMed-Medline, Scopus, CINAHL, Web of Science, and Nursing & Allied Health. In order to identify potential studies in the different databases, a search strategy was developed in collaboration with a research librarian and an information specialist that combined natural and structured language through the Medical Subject Headings (MeSH) (Table 1).

2.3. Selection Criteria. The inclusion criteria for the study were as follows: (i) original studies that focused on the use of AI in nursing and healthcare practice or (ii) nursing education, (iii) published in English or Spanish, and (iv) published until September 2022. Articles relating to nursing education were regarded as an integral part of nursing practice, as it furnishes the necessary knowledge and skills for providing quality patient care. On the other hand, (i)

TABLE 1: Search strategies used in each database.

Database	Search strategy
PubMed-Medline	((Artificial intelligence[Title/Abstract]) OR (artificial intelligence[MeSH terms])) AND ((((nurse[Title/Abstract]) OR (nurses[Title/Abstract])) OR (nursing[Title/Abstract])) OR (nursing[MeSH terms]))
Scopus	TITLE-ABS-KEY ("nurses") OR TITLE-ABS-KEY ("nurse") OR TITLE-ABS-KEY ("nursing") OR INDEXTERMS ("nursing") AND TITLE-ABS-KEY ("artificial intelligence") OR INDEXTERMS ("artificial intelligence")
CINAHL	(((((MH "nursing") OR (TI "nursing") OR (AB "nursing")) OR ((TI "nurses") OR (AB "nurses")) OR ((TI "nurse") OR (AB "nurse")))) AND ((TI "artificial intelligence") OR (AB "artificial intelligence") OR (MH "artificial intelligence")))
Web of Science	(((((((TI=(nurse)) OR AB=(nurse)) OR TI=(nurses)) OR AB=(nurses)) OR TI=(nursing)) OR AB=(nursing)))) AND ((TI=(artificial intelligence)) OR AB=(artificial intelligence))
Nursing & Allied Health	(MESH(nursing) OR AB(nursing) OR TI(nursing) OR AB(nurse) OR TI(nurse) OR AB(nurses) OR TI(nurses)) AND (MESH(artificial intelligence) OR AB(artificial intelligence) OR TI(artificial intelligence))

review studies, (ii) republications, (iii) editorials, and (iv) studies on animals were not considered.

2.4. Data Screening. The initial selection process in this study involved searching through the main health science databases (as listed in Table 1) to locate relevant evidence on the topic being addressed. This was followed by a two-stage screening process. In the first stage, two researchers (A.M.-O. and M.R.-A.) conducted an independent and parallel reading of the titles and abstracts of the available articles, taking into account the predefined selection criteria [19]. After this stage, duplicates were removed.

In the second stage, the selected articles underwent a more in-depth reading by the reviewers. To ensure methodological rigidity, a third auditor (P.R.) was consulted in case of any discrepancies, and a consensus on article eligibility was reached through rechecking the information [20]. Finally, the authors evaluated the methodological quality of the selected articles and classified them based on the type of AI used, the target population, and the purpose for which it was implemented [21].

2.5. Quality Evaluation. Appropriate methodological quality analysis tools were utilised for each study, using the Joanna Briggs Institute (JBI) Critical Appraisal Tools [22]. For articles with a mixed design, methodological quality was assessed with the Mixed Methods Appraisal Tools (MMAT) [23, 24].

2.6. Data Abstraction and Synthesis. The reviewers held discussions to determine the variables, as well as the nature and extent of the information to be extracted from the eligible articles, to ensure consistency and clarity of charted data [25]. After piloting on a sample of 5 articles, a custom data extraction was created in Microsoft Excel and iterated on. The most significant data of the selected studies included (i) author(s) and publication year, (ii) study design, (iii) participants and population, (iv) variable(s), (v) type of artificial intelligence, (vi) application in nursing practice,

(vii) main findings, and (viii) mean level of compliance in the evaluation of methodological quality. Meta-analysis was not considered due to the heterogeneity of methodologies among the selected articles. Once the data were extracted, they were reviewed and discussed to deductively organise the main findings into clear and explicit categories in order to provide a critical synthesis of the cumulative evidence [26, 27].

3. Results

The initial search yielded a total of 3,443 documents. After eliminating duplicates and selecting the articles by title and abstract, 56 full-text publications were reviewed according to the established selection criteria. In the end, a total of 21 articles were included in this review (Figure 2).

3.1. Included Studies. The synthesis of the included studies can be seen in Table 2. The sample size of the studies ranged from 10 participants to 230,936 participants, with a mean sample size of 14,948 participants. The predominant study population consisted of ambulatory patients ($n = 10$), healthcare professionals ($n = 7$), hospitalised patients ($n = 5$), students ($n = 3$), and caregivers ($n = 1$). Regarding the aim of the study, the different applications of artificial intelligence were differentiated as a support system for early disease detection ($n = 4$), clinical decision making ($n = 3$), patient monitoring ($n = 7$), workflow optimisation ($n = 3$), and nursing training and education ($n = 3$). In addition, some descriptive studies ($n = 1$) analysed the acceptance of the use of AI in the healthcare setting from a social and occupational perspective. Overall, 18 studies (85.7%) showed positive results in the application of this technology in nursing practice, while 3 studies (14.28%) indicated no impact on their results.

3.2. Methodological Quality: Assessment of Bias. The evaluation of the methodological quality of the articles included in this review showed a mean level of compliance of 74.60%. The interval risk of bias between the studies was
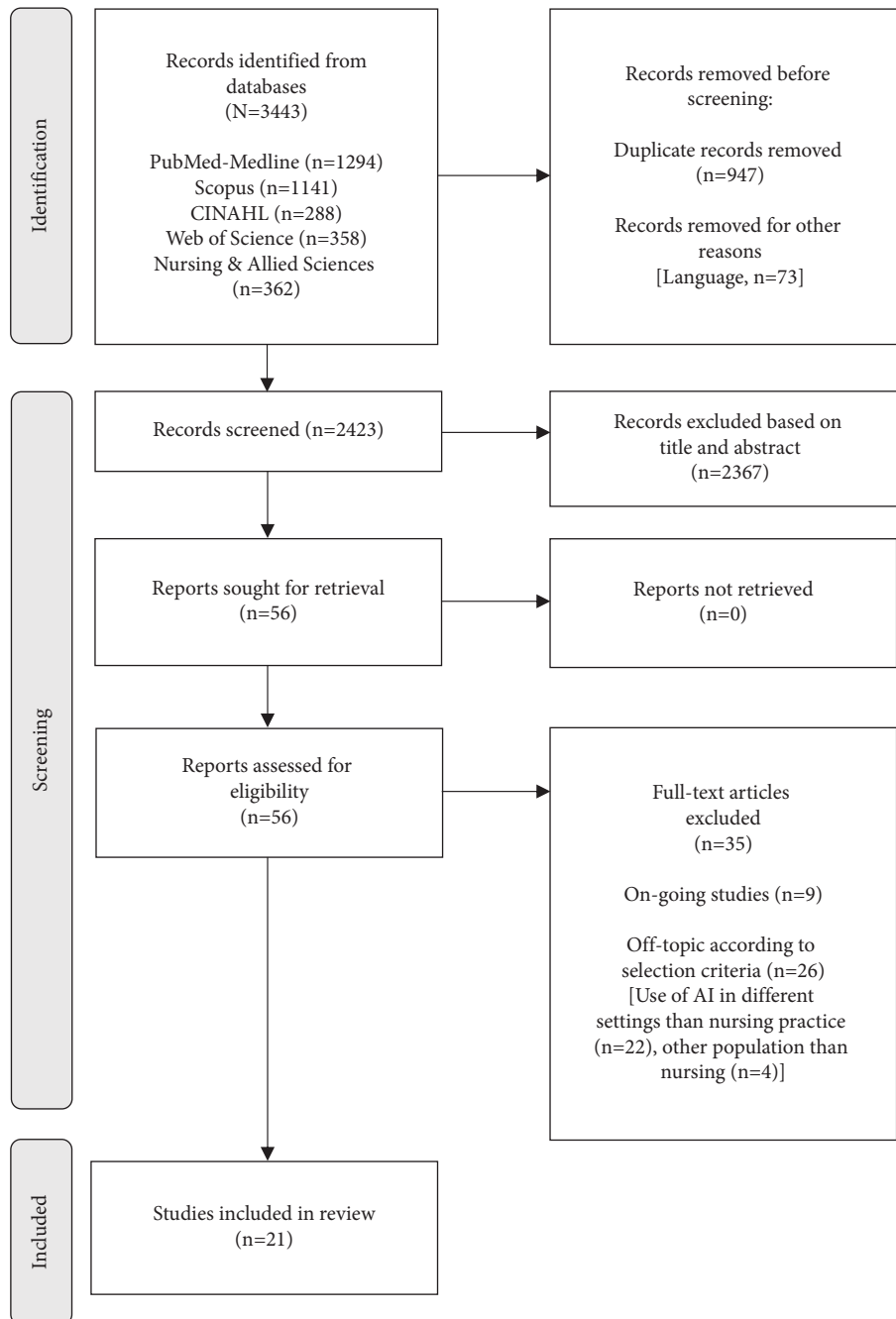
FIGURE 2: Flowchart depicting the article selection process.

88.8% ($n = 2$) to 42.85% ($n = 1$) (Supplementary File 2) [22, 23].

The results of this review were presented based on the application of each type of AI discussed in the selected articles [28]. Thus, the categories used for the qualitative comprised the advancements in early disease detection and clinical nursing decision making, the utilisation of AI-based support systems for patient monitoring and workflow optimisation, and the use of AI for nursing training and education. The main AI-based systems studied include ML, RPA, NLP, and physical robots (Figure 1) [29–31].

3.3. Advances in Early Disease Detection and Clinical Decision Making. Of the selected studies, 33.33% ($n = 7$) applied AI technology based on ML models, of which 57.14% ($n = 4$) were used for the early disease detection. The diagnostic criteria of nurses and doctors improved by 12% and 10%, respectively, as a result of assistance from AI. This led to improved diagnosis of complex conditions, enhancing the accuracy and effectiveness of patient care. Likewise, the professionals who used AI reported an increase in their confidence in evaluations and clinical decision making by providing real-time analysis and interpretation of patient data and a decrease in biopsy requests, highlighting the

TABLE 2: Overview of selected articles.

Authors (year)	Design	Participants (n) and population	Variable (s)	Type of AI	Application in nursing	Main findings	MLC (%)
Dinesen et al. (2022)	Exploratory study	39 patients with dementia	Perceptions about the response in the mood of the patients	Physical robot	Social work and accompaniment	The patient's mood improved, making them feel calmer and improving the interaction with the subject	88.88
Chang (2022)	Quasi-experimental study	43 postgraduate nursing students	Teaching intervention with virtual reality and learning achievements	NLP	Nursing education	The most valued positive aspects were the availability of a safe environment, the possibility of multiple attempts, overcoming difficulties, the consolidation of knowledge, and professional empowerment	88.88
Cho et al. (2022)	Prospective intervention study	19 triage nurses	Time, completion rate of records, and accuracy	NLP	Registration and classification of patients by voice	Improved patient registration and classification time, requiring a technical complement for improved sensitivity and accuracy	81.81
Chan et al. (2022)	Cross-sectional prospective descriptive study	28 ambulatory and hospitalised patients	Wound length, width and area, device reliability	Robotic process automation	Wound treatment	Excellent reliability. Useful for monitoring diabetic foot ulcers with a statistically significant difference compared to traditional measures.	87.5
Jain et al. (2021)	Case series study	40 doctors and nurses	Agreement with dermatologists and confidence in the diagnosis	Machine learning	Diagnosis and decision making	Improved nursing diagnosis by 10% and 12%, respectively	80.0
Lima-Roque et al. (2021)	Descriptive study	17 ambulatory patients, main caregivers, and nurses	Content validity (identify characteristics of the wound and healing process). Participant satisfaction.	NLP	Wound treatment	Excellent content validity. A great help for wound management and easy to use. Adapted to the general population.	50.0
Chang et al. (2021)	Quasi-experimental study	36 nursing students	Learning, student confidence in the course, and user satisfaction	NLP	Nursing education	The chatbot improved student learning compared to traditional teaching techniques with statistically significant results	77.7
García-García et al. (2021)	Retrospective cross-sectional descriptive study	11,586 ambulatory and hospitalised patients	System sensitivity, specificity, and precision with AI	Machine learning	Diagnosis and decision making	Able to better identify cases of cardiac amyloidosis when the sample contained many patients with heart failure. No external validity.	87.5

TABLE 2: Continued.

Authors (year)	Design	Participants (n) and population	Variable(s)	Type of AI	Application in nursing	Main findings	MLC (%)
Hong et al. (2021)	Randomised clinical trial	447 ambulatory patients with COPD	Quality of life, hospital stay, admissions for exacerbations, and visits to the doctor. Patient satisfaction.	Physical robot	Remote monitoring	Remote monitoring alerted healthcare providers to COPD complications. The exercises carried out with the robot reduced hospital admissions and improved the quality of life of patients.	53.8
Jang et al. (2021)	Descriptive study	117 doctors and nurses	Perceptions about the necessary functions of the robot	Physical robot	Remote monitoring	The most requested functions in the surveys were measuring vital signs, obstacle detection, and the alarm system, among others	62.5
Bian et al. (2020)	Mixed exploratory study	270 outpatients	On-call time, feedback, and type of patient feedback	NLP	Remote monitoring	The nurse received less feedback than the AI. The on-call time was similar in both. The AI tracked 5–7 patients at a time.	71.4
Poncette et al. (2020)	Descriptive study	86 ICU nurses and doctors	Opinions and perceptions of AI to improve work in the ICU	Machine learning	Remote monitoring	93% were in favour of using wireless sensors and reducing false positive alarms. Refusal to use a smart watch and augmented reality glasses for patient monitoring.	62.5
Shorey et al. (2020)	Qualitative study	30 nursing students and clinical professors	Advantages and disadvantages of virtual reality in learning communication skills	NLP	Nursing education	The most cited positive aspects were the availability of multiple attempts, a comfortable and safe environment, and instant feedback from the virtual patient	80.0
Lee et al. (2020)	Mixed study	198 hospitalised and healthcare centre patients	Perceptions about the necessary functions of the robot	Physical robot	Remote monitoring	Some of the advantages cited were access to clinical reports, communication with health professionals, and physical and emotional support	85.7
Sandhu et al. (2020)	Qualitative study	15 nurses and emergency room doctors	Perceptions and experiences about the usefulness of the application and considerations when implementing AI	Machine learning	Diagnosis and decision making	Triage nurses had a positive impression of sepsis control, while clinicians suggested that they would be more confident in the model if it had fewer false positives	80.0

TABLE 2: Continued.

Authors (year)	Design	Participants (n) and population	Variable (s)	Type of AI	Application in nursing	Main findings	MLC (%)
Ginestra et al. (2019)	Descriptive observational study	287 doctors and nurses	Usefulness of the alert, impact on care	Machine learning	Diagnosis and decision making	Despite the excellent predictive characteristics of the EAS, new clinical information or changes in treatment were rarely reported	87.5
Boumans et al. (2019)	Randomised clinical trial (pilot)	42 outpatients	Time to complete the interview. Fragility, well-being, and resilience index. Acceptance of the robot.	Physical robot	Diagnosis	The questionnaires were completed faster by the nurse than the robot. Resilience index data were more accurate in the nurse than in the robot.	76.9
Rojas et al. (2018)	Retrospective cohort study	24,885 hospitalised patients in the ICU	Sensitivity, specificity, and ABC of the AI system	Machine learning	Remote monitoring	The GBM obtained significantly higher sensitivity and ABC ($p < 0.001$) than the SWIFT and MEWS scales	63.6
Jibb et al. (2018)	Randomised clinical trial (pilot)	40 oncology Paediatric ambulatory	Pain and fear with FPS and BAAS scales. Time needed to complete interaction. Acceptance of the robot.	Physical robot	Management of pain and fear	The control group with a distracting robot felt more relaxed than the intervention group with a conductive therapy robot. Both managed to relieve pain and stress.	84.6
Horng et al. (2017)	Retrospective cohort study	230, 936 emergency room patients	Sensitivity, specificity, and ABC of the AI system	Machine learning	Diagnosis and decision making	The use of vital signs together with freely formulated text improved the criteria for an infectious diagnosis, increasing the sensitivity and specificity of the system. The ABC was higher in the model that evaluated all of the variables.	72.7
Parimbelli et al. (2016)	Mixed study (pilot)	10 ambulatory patients with AF	Compliance with prescribed treatment	NLP	Remote monitoring	MobiGuide increased treatment adherence for AF patients and the availability of up-to-date clinical data. Interdisciplinary work was improved.	42.8

ABC: area below curve; BAAS: behavioural approach-avoidance scale; COPD: chronic obstructive pulmonary disease; EAS: early alert system; AF: atrial fibrillation; FPS: face pain scale; GBM: gradient boosting machine; AI: artificial intelligence; MEWS: modified early warning score; MLC: mean level of compliance; NLP: natural language processing; SWIFT: stability and workload index for transfer; ICU: intensive care unit.

improvement in the dermatological field and in the detection of certain cardiac diseases, such as cardiac amyloidosis [31, 32]. In the same manner, the research by Ginestra and collaborators [33] and Sandhu and collaborators [34] used different AI-based support systems for early warnings of sepsis risk through static (demographics and previous illnesses) and dynamic (vital signs and laboratory data) patient characteristics. Conversely, Horng and collaborators [35] used a ML system combined with NLP to assess the ability to diagnose patients by adding comments that doctors and nurses wrote in medical records. Thus, the specificity, sensitivity, and area under the curve for the detection of sepsis were higher in the model that used the comments from medical records than those intelligent systems that only evaluated static and dynamic characteristics.

Finally, one of the main measures used in the studies to assess the effect of AI on clinical nursing practice was the use of reference diagnoses. [31, 32], in which at least three certified physicians independently reviewed each case. These diagnoses were obtained through a collective intelligence approach, in which the different differential diagnoses of each physician were ranked through a voting system to finally obtain a principal or reference diagnosis, in order to assess the effect produced by the AI in each case [7, 32, 36]. On the other hand, satisfaction surveys were used as a method of measuring the effect of AI on nurses, patients, and students [30, 36, 37].

3.4. AI-Based Support Systems in Nursing for Patient Monitoring and Workflow Optimisation.

Poncette and collaborators [38] demonstrated in their results that 93% of participants from intensive care units (ICUs) were in favour of the use of AI-based support systems, specifically the use of wireless sensors to reduce false positive alarms. In regard to predicting the risk of readmission in these units, the conventional scales used obtained significantly lower sensitivity and area under the curve, compared with models that used ML algorithms [39]. In 4.76% ($n = 1$) of the studies included in this review, programmes that integrated image recognition were also analysed to extract data and update the medical records of patients [40]. Specifically, programmes carried out to manage diabetic foot ulcers were evaluated by three different devices and their effectiveness was compared with an expert wound care nurse, demonstrating excellent intra-reliability and inter-reliability in their results with a value greater than 0.9 in length, width, and wound area.

Regarding the use of a conversational agent or chatbots, authors such as da Silva Lima Roque et al. [41] examined its use for examining and identifying personalised wound treatments. The content validity of this resource was rated as excellent by healthcare experts in wounds, and the images shown to the users were comprehensible in 88% of the cases. Among the participants, the most repeated assessments of the AI-based support system were easy to use, suitable for any user, dynamic, entertaining, and quick to

respond. However, they also pointed out negative aspects such as a lack of realism or failures to capture long sentences [29, 36]. Lastly, another AI modality, rule-based expert systems, was studied in 4.76% ($n = 1$) of the studies, with the aim of telemonitoring patients with known atrial fibrillation [42]. These intelligent systems were programmed with established guidelines recognised in a clinical practice guide with personalised recommendations for each patient, improving adherence to treatment, availability of clinical data in real time, and its control from the medical community. Likewise, another resource used was telephone follow-up for postsurgical patients [43], comparing the call time and the feedback received between an AI system and a nurse. The call time was shorter in the intelligent system (1-2 min) and with better feedback when compared to that of the nurse (3–6 min) ($p < 0.01$), though the effectiveness of the follow-up was the same in both situations.

Of all the articles analysed, 28.57% ($n = 6$) used robots with AI-based technology for various uses in patient monitoring and workflow optimisation, including rehabilitation and respiratory exercises [44], evaluation of the elderly and accompaniment of people with dementia [45, 46], and behavioural therapy [47]. Likewise, the characteristics and aspects to consider in the design and inclusion of robots in the healthcare field were examined [48, 49]. Using robots for rehabilitation and respiratory exercises in patients with COPD has been shown to be effective in reducing hospital readmissions, the workload of nursing professionals, and visits to health centres or surgeries [44]. On the other hand, in other studies that used these devices to study frailty in the elderly [45, 46] or in behavioural therapy to relieve pain in subcutaneous punctures in infants [47], no differences were observed in the average time of execution or precision and no statistically significant differences were observed in pain control. However, it did prove to be an effective way to distract children.

3.5. AI Insights for Nursing Training and Education.

There is a growing interest exploring the potential of AI-based support systems to improve nursing training and education. A recent study by Chang [37] investigated the use of AI-powered simulation to enhance nursing clinical decision-making skills. The results showed that students who underwent AI-enhanced simulation training performed significantly better on clinical decision-making assessments compared to those who received traditional simulation training. Chatbots were used with similar results to support nursing training about vaccines for pregnant women, showing significantly better results ($p < 001$) regarding the expertise and level of knowledge on the subject, thereby improving the care and safety received by the patient [36, 37]. Similarly, other studies concluded that AI-based educational resources have the potential to increase engagement and enhance their learning outcomes in nursing education. These findings suggest that AI has the potential to

play an important role in improving nursing training and education [29, 36].

4. Discussion

The aim of this review was to synthesise the available evidence on the applicability of artificial intelligence in nursing care. After analysing the selected studies, contrary to other studies on this topic, our findings suggest that the application of AI in the nursing field could improve care delivery, contingent on the type of artificial intelligence used and its various applications, such as early diagnosis, clinical nursing decision making, patient care management and monitoring, workflow optimisation, and nursing education [29, 41, 50].

Among the uses analysed in this review, similar to other recent reviews, one of the most commonly used types of support systems was based on ML models for diagnosis [15, 33–35, 51]. One possible explanation for the predominant use of this type of AI may be due to the use of its learning system for activities that are traditionally carried out by humans, but with much less time and expense [52]. These technological advances in AI are currently and predominantly focused on diagnosing diseases such as Alzheimer's, cancer, chronic or dermatological diseases, and more. This allows health professionals to have more time with their patients, use a holistic approach, and even improve patient satisfaction with health organisations [14, 15, 32, 40]. Therefore, diagnostic reliability should be considered in these studies, increasing the presence of comorbidities with the possibility of combining it with NLP models to improve the interpretation of comments from clinical histories [31, 33–35].

One of the types of artificial intelligence that has perhaps received the most attention in recent years within NLP is the rule-based expert system, not only for managing cases of COVID-19 symptoms, but also providing care for patients with social anxiety and older adults who are immunocompromised or at risk of isolation [46, 53]. These types of systems have proven to be effective in monitoring patients remotely in real time, improving the availability of updated clinical data, allowing more time for nursing care, and improving patient safety in primary care, special services, and remote areas [39, 42, 44, 54]. However, like other types of AI, the majority of systems that are based on monitoring patients from a distance still require longer learning phases to achieve clinical reliability, which impedes its implementation [54]. On the other hand, the use of other types of AI, such as the automation of robotic processes or physical robots [45–47], has been shown to be satisfactory in some studies through their use as a mobile application, by increasing the effectiveness and efficiency of nurses' work in the field of tissue injuries and optimising the identification and management of wounds, pain control during venepuncture, or adherence to treatment, among others [29, 55]. Nonetheless, there is still little known about these types of AI, unlike other more widespread ones such as systems based on natural language processing or explainable artificial intelligence [56].

The conversational agents developed through dialogue systems, NLP, and statistical models have demonstrated positive results in reducing the workload of nursing professionals in hospital administrative tasks [57], treatment and follow-up of wound management [41], triage and nursing diagnosis [11, 30], and the training of future professionals [29, 58]. Despite the growing amount of evidence on this type of AI, other authors point out the shortcomings that this type of technology still has, including poor voice recognition, lack of expression and emphasis in speech, and frequently interrupted conversation, all of which prevent results with clinical relevance greater than usual practices from being reached [36, 43, 50]. Having said that, there are a growing number of relevant organisations, such as the Nursing and Artificial Intelligence Leadership Collaborative group, as well as important tech-companies, such as OpenAI, that are currently thriving to identify priority areas for action, opportunities, and recommendations to address these concerns in healthcare practice [59–61].

However, there are some limitations to this study that should be noted. First, AI applied in healthcare and nursing care is still a growing practice with limited evidence due to studies which are in development and have a great heterogeneity in AI types and settings. Therefore, generalisations of the proposed results should be made cautiously. On the other hand, only the term "artificial intelligence" was used as a keyword to describe all AI methods. Although the MeSH term "artificial intelligence" includes most of AI-based systems in its tree structures, some features utilising specific AI methods but are not explicitly labelled as AI may have been overlooked. Carrying out a meta-analysis or meta-regression was not considered in this review due to the heterogeneity in the types of AI, populations, and study variables. In general, this review contributes to the existing knowledge of applying AI-based systems in the healthcare field and nursing practice. Although positive results were shown for most of the analysed types, a greater number of studies are needed to consider the current limitations of these systems and the needs of professionals-users for the development of AI-based systems. There is still abundant room for further progress with these systems in terms of guaranteeing not only professional autonomy but also improved access to health information sources in order to optimise their use in multitasking to cover the greatest number of variables that may affect the patient, environment, clinical practice, and different medical services. Further research is needed to investigate how previous research findings using AI-based systems with virtual reality or simulated scenarios can be implemented in real-life clinical nursing practice or analyse how these AI-based support systems may improve patient safety and assist nurses in particular clinical settings.

4.1. Implications for Nursing Management. AI applied to nursing practice can be a down-to-earth resource for professionals, managers, or supervisors, with positive results in

patient care and safety. It has the potential to change current working flow systems and provides support to nursing professionals when making decisions. AI-based systems are flexible tools which can adopt various essential functions in nursing care, such as guiding the patient with personalised instructions or remotely monitoring the patient in real time. Furthermore, it can be used in community care, remote areas, or in the hospital setting by identifying the possible diagnosis of the user early on, thereby accelerating the healthcare process. The greatest challenge in the development and implementation of this type of technology, however, continues to be the involvement and active participation of healthcare professionals and their commitment to its use.

5. Conclusions

This review offers a compilation of the available evidence on the different applications of AI-based support systems that can be implemented in nursing practice. The systems which are based on machine learning and natural language processing are the most widely used, demonstrating better results in different healthcare processes. Despite the limitations that still exist with this type of technology, the results of the different types of AI are promising. AI-based systems can assist in early diagnosis, clinical decision making, patient monitoring, and workflow optimisation. However, it is important to consider ethical and privacy concerns as well as ensure that AI is used to augment and enhance the role of nurses rather than replace them [61].

Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

Supplementary Materials

Supplementary File 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist of our systematic review report. Supplementary File 2: risk of bias summary using JBI Critical Appraisal Tools and Mixed Methods Appraisal Tools for included studies. (*Supplementary Materials*)

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Research Article

Band 5 Nurses' Leadership Development as a Current Care Priority in England: A Qualitative Study of Perceptions, Barriers, and Ways Forward

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Aims. To explore band 5 staff nurses' perceptions of leadership and leadership development and derive insights and recommendations to inform future practice. *Background.* Band 5 staff nurses are increasingly expected to develop leadership skills but are not always well supported in this. *Method.* A qualitative methodology situated within a constructivist paradigm explored the shared meanings and understandings of band 5 nurses' leadership development within the context of current organisation, policy, and culture. *Results.* Three principal themes representing band 5 nurses' perceptions of leadership were identified: defining leadership, opportunities to lead, promoting leadership development. *Conclusion.* Band 5 nurses' leadership development is highly variable in frequency and quality. Key barriers and facilitators to development are discussed, including the wide provision of formally validated and bespoke leadership programmes that combine practice-based, informal training. *Implications for Practice.* Nurse leadership development at all levels remains integral to high-quality and safe health care. High rates of senior staff attrition and recent guidelines in England reinforce the need for band 5 nurse leadership. The multiple challenges impeding this are discussed, alongside ways of overcoming them.

1. Background

In England, there is at present a relatively heavy emphasis on nurses' development of leadership skills [1] to ensure the care nurses provide and delegate is person-centred and of a consistently high standard [1], and to act as a role model for others [1]. The NHS Healthcare Leadership model [2] emphasises how all individuals in a healthcare organisation can develop their leadership skills, not only those with formal leadership roles. Current workforce policy, therefore, requires all nurses to develop leadership skills, irrespective of band or grade. A strong relationship has been found to be linked between nurses' leadership skills and patient outcomes [3], including that good nursing leadership supports the provision of high-quality care [1, 2, 4, 5], improvements in quality of care provided [6], patient safety [7, 8], patient-centred care [9], patient satisfaction [10], staff recruitment, retention and job satisfaction [11, 12], effective change

management [13], costs reduction [14, 15], and financial performance [16].

Even newly qualified nurses are expected to lead on a day-to-day basis; however, they often lack the confidence to lead [17]. Nurses who are qualified for university degree level enter the NHS at band 5 and are expected to provide excellent professional, skilled, and effective person-centred, evidence-based nursing care [18]. At the current pay scale, band 5 nurses earn £27,055 to £32,934 [19]. As they gain further knowledge, skills, and experience, they may progress to higher bands within the nursing banding system [20].

Arguably, the current situation in England in which newly qualified nurses often do not receive the training they require to develop their leadership skills early in their careers, risks leaving a crucial skills gap that may extend into the longer term, stymying important leadership development and losing a valuable opportunity to enable nurses to further improve the quality of their patient care [17].

Conversely, there are multiple benefits associated with proactively identifying and developing internal candidates, yet fewer than 7% of healthcare organisations have implemented formal leadership succession planning programmes [14].

A strong argument exists therefore for prioritising nurse leadership training, with potential benefits for individuals and organisations, with "the need for leadership at all levels of nursing... overwhelmingly evident" [21]. Despite this, clinical leadership training has been predominantly focused on managers and management-focused training [22], a situation which has historically excluded band 5 nurses from leadership training [23] with a negative impact on workforce effectiveness, efficiency, and quality of care delivery [24]. Transitioning from band 5 to band 6 arguably demands high levels of leadership skills, and band 5 nurses may not possess which has led to calls for immediate action to prepare a new generation of nursing leaders [25]. Such calls take on greater urgency given high levels of attrition among experienced nurses in England, who are either leaving the profession or widely anticipated to through a combination of age (1 : 5 nurses in England are 56 years of age or over) and escalating work pressures [26].

Moreover, care service and quality demonstrate improvements where health professionals *at all levels* have access to appropriate leadership education [22]. Current leadership programmes tend to prepare nurses for leadership roles only *after* promotion [27], with scant opportunity to develop skills in advance. This may hamper leadership development at band 5 and impede the transition to higher levels within the service.

2. Leadership in Nursing

Despite current requirements for all nurses to develop leadership skills [1], there remains a lack of consensus regarding how "leadership" should be defined in nursing [28]. The essence of leadership includes nurses' ability to influence and direct patient care by demonstrating exemplary care [29]. However, leading care is not directly synonymous with leading other staff [30] although there may be much overlap between the two.

Additionally, there is a lack of consistency concerning the styles of leadership employed by senior staff that can be a pivotal role in inspiring band 5 nurses' own leadership development. Winston and Patterson [31] identified in excess of 90 dimensions of leadership which demonstrates the complexity of leadership as a concept. These can be combined and contribute to leadership styles in highly variable ways that may range along a spectrum from autocratic to transformational [32, 33].

While taxonomies detailing key attributes of leadership exist (e.g., NHS [2]), it is less clear how band 5 nurses themselves perceive leadership or opportunities to lead, how different perceptions emerge, how these may differ depending on different settings and circumstances, and which specific contexts currently contribute to leadership development or impede it. Leadership and how it is defined and practiced is likely to vary according to different care settings, bands, and grades that calls for greater specificity and a move away from using the term "leadership" too generically [34].

Although preceptorship programmes are highly valued by nurses [35], they are not a substitute for continuing leadership development [36] that is underpinned by active, structured support [37].

These issues have added gravitas given the significant attrition of nurse leaders in the UK within an ageing workforce [38] which necessitates the recruitment of younger and less experienced nurses to fill the gap. This is a situation further exacerbated by low staffing levels and high workloads during the pandemic [39] and subsequently that has led to less experienced staff having to take on significant levels of responsibility.

This study explored these issues and challenges by engaging with band 5 nurses across a diverse range of healthcare contexts, settings, and circumstances. Given the NMC's requirement for nurse leaders to manage and lead care [1] and RCN's [40] call to promote nurse leadership development to ensure high quality, safe, and compassionate health care, this represents a timely juncture to explore the issues and challenges surrounding band 5 nurses' leadership, alongside ways of overcoming them, and to use the insights gained to add to the current knowledge base.

3. Methods

The research team consisted of three academic staff who contributed equally to data collection and subsequent analysis. The lead researcher was an assistant professor of nursing with expertise in leadership and management. The other team members were an associate professor of nursing and a senior research assistant, both with research expertise in workforce development. The research team felt that this study's exploration of shared understandings within organisational, policy, and cultural contexts aligned well with Crotty's [41] view, "that all knowledge, and therefore all meaningful reality as such, is contingent upon human practices, being constructed in and out of an interaction between human beings and their world, and developed and transmitted within an essentially social context." This supported the rationale for adopting a qualitative methodology situated within a constructivist paradigm.

3.1. Sample. To gain insights into band 5 nurses' experiences of leadership across a diverse range of contexts, the plan was to locate the study in NHS primary care, community care, secondary care, and care homes operated by private and voluntary sector providers across North East England. Participants were accessed via gatekeepers who were service managers working in these providers (matrons, GP practice managers, care home managers, and lead community nurses). Gatekeepers provided their band 5 nursing staff with study information explaining the purpose/aims of the study and what participation involved. Staff were given time to read information sheets which emphasised participation was voluntary and that deciding not to participate would not

TABLE 1: Participants' characteristics.

Care provider organisation	Care service location	Care service	Participant	Gender	Age	Years qualified	Country of birth
NHS trust 1	Hospital 1	Surgical ward	P1	Female	20–29	<1 year	UK
NHS trust 1	Hospital 1	Medical ward	P2	Female	20–29	<1 year	UK
NHS trust 1	Hospital 1	Emergency department	P3	Male	20–29	6–10 years	UK
NHS trust 1	Hospital 1	Critical care	P4	Female	30–39	3–5 years	UK
NHS trust 1	Hospital 1	Emergency department	P5	Male	40–49	10–15 years	Philippines
NHS trust 1	Hospital 2	Medical ward	P6	Female	20–29	1–2 years	UK
NHS trust 1	Hospital 2	Theatres	P7	Male	30–39	3–5 years	UK
NHS trust 1	Hospital 2	Theatres	P8	Female	30–39	3–5 years	UK
NHS trust 2	Hospital 1	Medical ward	P9	Female	40–49	1–2 years	UK
NHS trust 2	Hospital 1	Medical ward	P10	Female	40–49	6–10 years	UK
NHS trust 2	Hospital 2	ITU	P11	Female	40–49	21–25 years	Czech Republic
NHS trust 2	Hospital 2	Theatres	P12	Male	50–59	2–5 years	Philippines
NHS trust 2	Hospital 2	ITU	P13	Female	20–29	<1 year	UK
NHS trust 2	Hospital 2	Admissions unit	P14	Female	30–39	<1 year	UK
NHS trust 3	Community 1	Community	P15	Female	20–29	<1 year	UK
Care home company 1	Care home 1	Care home for older people	P16	Female	30–39	1–2 years	UK
Care home company 2	Care home 1	Care home for older people	P17	Female	30–39	3–5 years	Romania
Care home company 3	Care home 1	Care home for older people	P18	Female	60–69	>30 years	UK

affect staff's employment in any way. Information sheets invited nurses to contact the researchers with any questions before agreeing to participate. Participants provided written consent.

In total, 18 band 5 nurses responded to the invitation to participate. All were accepted as participants in the study, and all consented to participate. The response rate was lower than predicted due to the outbreak of COVID-19. This impacted the availability of staff to participate, necessitating some scaling back of recruitment, particularly from primary care and voluntary sectors. Despite this, the remainder of the study protocol remained intact and recruitment possible from secondary care ($n = 14$), care homes ($n = 3$), and community nursing services ($n = 1$), reflecting a diverse range of nursing roles, NHS trusts, and care-provider operators (Table 1). As well as representing heterogeneity in terms of being drawn from different clinical settings, the sample was varied regarding age groups (20 to 69 years of age), sex, nursing experience from <1 year to >30 years, and country of birth.

3.2. Data Collection. Data were collected via individual semistructured interviews. All members of the research team conducted data collection. The first three interviews were face-to-face. Subsequent interviews were conducted online or by telephone due to COVID-19. Interview questions were informed by the findings of the literature review and explored participants' own experiences of leadership development and practice, and reasons underpinning them. Average length of interviews was 46 minutes, and none exceeded one hour. This afforded time to record participants' in-depth accounts of their experiences.

3.3. Data Analysis. Interviews were audio-recorded and transcribed verbatim. Thematic analysis (TA) was used to analyse the data and selected for its proficiency in organising, analysing, and reporting patterns (themes) within data in rich detail [42]. An inductive analytical approach was adopted, i.e., data-driven. The six-phase guide to conducting TA, as outlined by Braun et al. [42], was employed:

  (i) Familiarisation with the data
  (ii) Generating initial codes
  (iii) Organisation of the initial codes into patterns to generate themes
  (iv) Reviewing themes (checking themes against raw data to ensure a good fit and reclassification of themes into levels)
  (v) Defining and naming themes
  (vi) Interpretation

Trustworthiness was enhanced using three methods. Firstly, all transcripts were independently coded by all three members of the research team, and the codes were compared. This supported validation of codes, supporting valid theme development. Theme development was a collaborative process involving all three researchers meeting together to discuss themes. Secondly, attention was given to negative cases, which allowed for discussion of different perspectives and contradictions in the data. Analysis of negative cases helped to refine the interpretation of the data. Finally, reflexive strategies were used to reduce the risk of researcher bias. This was particularly important as the research team had prior knowledge and expertise in leadership and management, and workforce development. Two reflexive strategies were used: (i) "oppositional arrangement of perspectives" supports researchers to become aware of the range of perspectives at work within established frames of social norms [43] and (ii) "backgrounding" whereby "background" data (data that on first analysis may seem less significant) are foregrounded. The transformation from background to foreground prompts researchers to investigate whether any topics of potential significance that had not been expected were encompassed within the text [43]. Member checking by sending draft codes and themes to participants was attempted. However, none of the participants were able to respond, as they generally felt that time constraints due to COVID-19 made responding difficult.

4. Results

Findings from the thematic analysis revealed three key themes representing the staff's experiences of leadership: (i) defining leadership, (ii) opportunities for leadership, and (iii) promoting leadership development. Each of these and interview evidence supporting them will be presented in turn.

4.1. Theme 1: Defining Leadership. Participants struggled to agree on a clear definition of leadership in the context of nursing; in particular, there was some tension about whether nature/innate ability or nurture was most critical to leadership development. This respondent felt that leadership was contingent on experience; i.e., it was nurtured over time:

P1: ...if there's no manager or sister then the most experienced nurse on the ward [takes charge].

One participant felt leadership was contingent on the combination of nurture/nature:

P4: I think it's a product of your experience, but unless you've got the inherent qualities you can't just create a leader.

However, the general consensus was that leadership relied on nature/innate qualities, rather than a set of qualities that could be nurtured:

P6: . . .it's about having a natural trait.

P9: . . .unless you've got the inherent qualities you can't just create a leader.

These comments are interesting for their emphasis on leadership as primarily innate and an inherited trait, rather than universal, and how this appears to run counter to recent directives calling for all nurses to fulfil the requirement to develop leadership skills which assume it is a universal quality.

Participants also associated leadership with a higher level of seniority, beyond their own band 5 status and entrenched within the organisational, hierarchical structure:

P2: [Leadership is] The ward manager, the sisters, the band 6's.

P12: It's your senior staff-your Band 6s and 7s, Matrons and definitely the nurse-in-charge on that shift.

Despite this, some participants recognised that although (as band 5 nurses) they wielded less authority compared with higher bands, they nevertheless carried out a leadership role:

P3: My experiences are. . .right from a band 5 you're leading because you're delegating tasks [to health care assistants]. . .finding out who is competent to do those skills.

Participants, therefore, associated leadership with seniority/delegating responsibility to others, requiring a sound knowledge of other staff's competencies.

Despite the apparent majority view that leadership relies on inherent qualities, other evidence appeared to contradict this; i.e., a number of participants felt in nursing it relied on nurture/experience as opposed to natural talent:

P13: I don't think people take you seriously to do leadership when you're a little bit younger. . .

Moreover, this view seemed to present a bias as well as a barrier for younger staff who might aspire to lead:

P6: I find it hard to lead someone who is older or been on the job longer.

Despite these tensions/contradictions, there was consensus among participants that as band 5 nurses they may not specialise in leading staff, but they nevertheless specialised in leading care and participants acknowledged this important distinction:

P11: I am a leader of my own care for my own patients.

P1: Leading patient care, being in control of your own pod. . .

Taking leadership/responsibility for patient care was generally viewed as separate and discrete from leading staff but certainly not inferior to it:

P9: I think leading patient care, to me, is the most important part of leadership.

P3: [As leaders] we all have responsibility to strive and deliver best outcomes for patients.

While promotion beyond band 5 was perceived to increase opportunities to lead/manage others, it was also viewed by several participants as shifting away from leading patient care; something, they were opposed to:

P5: I don't want to lose patient contact and still be a nurse. I wouldn't want to be a band 6 because of the loss of patient contact.

Despite some reservations, the majority of respondents felt band 6 offered the best compromise between allowing nurses to continue to lead care while also leading staff. However, promotion to band 7 was perceived by many to denote the demarcation point at which directly leading patient care abruptly ended:

P2: The idea of being a sister is great, but I don't want my day monopolised by doing rotas/staffing. I want patient contact.

Furthermore, participants perceived band 7 as a point of departure from close, collegiate working towards a more distal, managerial role:

P11: I think we've got one Band 7 in the building. We rarely see her.

P11: I've never met a Matron.

While a range of perceptions, some contradictory, were uncovered regarding how band 5 nurses viewed leadership, greater consensus was found concerning leadership style. In general, participants' nurses preferred more democratic leadership styles, especially their perceived capacity to offer motivation/inspiration/mutual respect:

P5: Leadership is a person who you can always turn to who knows the answers but who will talk to you in a way that is encouraging. . . [not] in a derogatory fashion.

P10: I know my band 6, I can ask her anything. . .She just rings me all the time and tries to motivate me.

By contrast, autocratic leadership styles were generally viewed negatively:

P5: Very, very dominant. "I am the boss! This is how it's going to be!" I feel like she's very strict.

This participant highlighted how the autocratic leadership style discouraged close, collegial working, even where nurses demonstrated high levels of competency, inducing feelings of negativity:

P1: So, even if you might be a good nurse, I think, "well they're not going to like me as a person." Even if I do the job well. . .and that's disheartening.

By contrast, more democratic leadership styles were perceived in a positive light and as providing good guidance, especially where there was more an exchange of knowledge (transactional leadership) as opposed to a more didactic approach/style:

P13: [Leaders]. . .give clinical guidelines, policies and procedures for effective practice based on the knowledge and NICE guidelines as well, so they become our standard operating procedures to guide us.

A notable finding also was that transactional style was more likely to be evidenced in very acute care settings such as emergency departments, theatres, and critical care wards. This suggests that leadership style is not only determined by individual choice but also by context/setting which may be instrumental in facilitating (or impeding) certain styles. One explanation for the salience of transactional style found here in emergency departments/theatres/critical care wards may be that these settings require rapid, expert decision-making, and timely adherence to protocols that make good guidance/effective knowledge exchange a priority.

Moreover, leadership style may not only be influenced by context/setting but more specifically still the unique circumstances currently unfolding within that context/setting. This means leadership style may be more fluid than fixed:

P7: [He is] a democratic leader, but he can be a transactional leader and a rational leader.

In summary, band 5 nurses' perceptions of leadership and how it is best defined revealed a range of interpretations that were sometimes contradictory. Leadership in the context of nursing appears to be nuanced, complex, and variable and influenced by multiple factors, rather than representing a fixed/immutable concept that is easily pinned down.

4.2. Theme 2: Opportunities to Lead. Discussing band 5 leadership, many participants indicated their experience of leading people as a hallmark of leadership (as distinct from

leading patient care) was determined by *opportunities* to lead. This appeared very much contingent on work setting/working arrangements/practical necessity, rather than strategic or planned professional development. For example, participants who worked in care homes highlighted that they were often the only registrant nurse on their unit and therefore automatically expected to lead in terms of staffing/resources/resident care. This expectation fed into nurses' perception leadership was integral to this particular role:

P1: I think for each care home the nurse is like a leader. You need to take responsibility of your floor and your staff. . .

Similarly, participants working on wards in secondary care revealed opportunities to take charge of their ward that entailed leading both staff and patient care:

P12: There's always a nurse in charge for the shift. . .you're still in charge of the full 27 patients as well as the staff.

Opportunities for band 5 nurses to lead were especially prevalent where senior staff were unavailable and, of practical necessity, responsibility for leadership was delegated:

P3: You're leading the whole ward when your manager is not there.

Respondents working on wards in secondary care welcomed opportunities to take on a stronger leadership role, but some would like more frequent opportunities:

P1: I would like to get some more experience of being the nurse in charge of the ward when the sisters aren't there.

P13: I would really like to be the nurse in charge and get my skills. . .

Participants from the emergency department also reported opportunities to lead, though this tended to be limited to a lower level of leadership:

P13: I would normally lead on the floor. . .I will look after. . .health carers or a junior member of staff. . .the majority of the time. . .

By contrast, participants working in ITU settings indicated there were generally few opportunities for leadership. One respondent revealed that in their area of practice, band 5 staff is actively discouraged from leading:

P6: I am. . .more encouraged to stay at the bedside and try to limit my job to. . .doing observations-not expressing leadership skills.

Care setting also limited opportunities to lead where participants worked in the community. Although band 5 nurses were assigned case-loads conferring much responsibility, they primarily operated as lone workers that restricted them to leading patient care:

> P14: I am a leader of my own care for my own patients.

A key finding in general was that although band 5 nurses had ample opportunity to lead patient care, opportunity to lead people was highly variable and contingent on context/circumstances. Some participants were seldom offered the opportunity to lead people, while others were comparatively overwhelmed with opportunities. Often, this meant an imbalance regarding opportunities to lead people, as highlighted by these participants working in theatres and EAU who often faced emergency situations:

> P7: . . .a band 6 as team leader. . .rang in sick so I was moved up as the team leader. . .It was quite a struggle, obviously. I said. . ."it's not my choice to be the team leader, I was put here and I'll play that role, but if something happens, it's my name they're going to. . .chase up."

> P14: We went on shift one night-it was me and another junior member of staff. . .we were left in charge of the patient services as well because they'd gone off sick and no one could cover. So, we were in charge of bed management in the hospital, as well as running the suite. . .I was nervous. . .

While more experienced band 5 nurses may be very capable of taking on intensive leadership roles, there needs to be a choice, rather than an expectation of compliance. Such decisions should always place patient safety first. Band 5 nurses made a clear distinction between leading care and leading people with opportunities to develop the latter being highly variable and contingent on individual context/circumstances.

4.3. *Theme 3: Promoting Leadership Development.* Responses indicated a paucity of formal development via bespoke training/development programmes. In lieu, all participants reported heavy reliance on *informal* development that could be limited to being self-directed/opportunistic, i.e., observing colleagues, rather than planned or more deliberately co-ordinated:

> P3: I think from being a Band 5 I might not necessarily have done a course, but I've reflected. . .It's about observing leaders. Picking bits of how you would want to be and how you don't want to be develops me.

> P12: I think shadowing and mirroring are how I've learned. I wouldn't necessarily say that anyone has taken me aside

and taught me anything. . .when I've led, I've picked up on a lot of things that I've seen other people do.

However, that informal training can be effective is illustrated here:

> P14: I get the most out of the time I've shadowed "X" who is the band 6 because she is making all of these decisions. . .she's explaining how processes work, she'll go through anything with me and explain why she's made the decision. She's got all the qualities of a leader. . .

Where informal training seemed particularly effective was when senior staff demonstrated a transformational leadership style that inspired trust, motivation, and empowerment in band 5 nurses:

> P13: . . .if I work alongside the Band 7's they are good at developing us or empowering us to do some leadership assignment. Usually, this goes with the patient care itself, like managing the zone and. . .I can perceive a sense of empowerment. That they're trying to input encouragement for me.

While the opportunity to shadow/mirror good leadership and receive encouragement/opportunities to develop it may be vital, arguably band 5 leadership should also be encouraged through formal leadership training as an adjunct to this:

> P3: Watching and learning-that helps develop me as a leader. That's a challenge I would give myself. I would read some reading material. . .like if there's a new [leadership] practice of interest to me. . .

Participants also perceived how the provision of formal leadership training could benefit not only themselves but also the team and the wider organisation:

> P3: [Formal leadership]. . .to actually understand with theory how you put that into practice. How the theory can make you a better leader. How this will make you more insightful. . .to develop myself, to develop the service, to develop others.

Despite respondents' enthusiasm for formal leadership training, several band 5 nurses reported difficulties accessing it and even open discouragement:

> P6: They don't like that when I'm doing that [requesting leadership development]. They always try to keep me in the corner. So, it's very difficult to express or maybe to learn how to be a leader.

> P8: . . .they don't really emphasise leadership when you're a Band 5

P11: If I ask for leadership development I will get laughed at.

These examples illustrate how band 5 nurses may often be motivated/dedicated to the formal development of leadership skills, in accordance with guidelines recommending this (e.g., [1]), but can face systemic bias that prevents them. Moreover, this systemic bias appears to persist even among band 5's employed in settings where good leadership is essential to their role:

P7: . . .we're team leaders for night shifts, but we didn't get the formal training of what being a team leader is, what qualities you need to lead a team.

Even where an exception was found and one participant initially granted support for formal leadership training, the promised support was unforthcoming:

P8: I'm doing the Nightingale course so I'm meant to have a 1:1 mentor and to actually do some shadowing and things with them, but that hasn't happened. . .

Moreover, the Florence Nightingale Leadership Development Course represents one of only a handful of formal leadership courses currently available to band 5 nurses in England.

In summary, band 5 nurses valued good quality informal leadership training that included shadowing/mirroring. This could be facilitated by the senior staff's adoption of a transformational style [44]. However, informal training could be limited to being self-directed/opportunistic, rather than planned/more deliberately co-ordinated. Opportunities for formal training were limited/not fully supported.

5. Discussion

Thematic analysis of the data elicited several key findings, and a robust attempt was made to ensure proportionality between the data and the analytical claims and conclusions presented in this discussion.

Consistent with previous findings (e.g., [28, 45]), this study found a lack of consensus regarding how band 5 nurses perceived "leadership" in the context of nursing. While one participant held the view that leadership is created by an amalgam of nature/nurture, others felt that strong leadership required a particular set of innate qualities closely intertwined with personality traits. This latter view runs counter to recent evidence that traditional trait or personality approaches are of little value when it comes to delivering leadership training (e.g., [16]). Contradictions were also found in this study; e.g., while many respondents perceived leadership to be an innate quality, they also felt entitlement to lead was based on nurture/experience, rather than innate abilities/talents. This also appeared to present a bias against younger staff leading or aspiring to lead. These comments are interesting for the way they appear to run counter to recent directives calling for *all* nurses to fulfil the requirement to develop leadership skills (e.g., [1]) that carry

the assumption all nurses are capable of leading both care and people.

Leadership was most frequently associated with hierarchical staffing structures and "top down," from the management level to the staff nurse on the ward and particularly the managers and those who held band 7 and band 6 positions. This required the ability to delegate responsibility to others and sound knowledge of other staff's competencies. Notably, however, the majority of participants felt leadership was associated with higher seniority, *beyond* band 5, and therefore largely outside their domain. There was consensus that band 5 nurses had a leadership role in terms of leading *patient care*. Notably, though, leading care was perceived to be quite different and discrete from "leadership of other people." Participants perceived "leading care" to be as vital as "leading people," if not more so, but viewed them as mutually exclusive. A few band 5 nurses recognised that although they wielded less authority, they carried out a leadership role-albeit at a different, often lower hierarchical level. Taken together though, the findings support Stanley's [22] contention that more work is needed to outline what clinical nurse leaders are, and how they can recognise themselves as leaders.

The findings further reveal that band 5 nurses strongly perceive they work within a fairly rigid hierarchy in which clear divisions exist between themselves as subordinates on one side and leaders/management on the other in which "leadership" was frequently perceived to be synonymous with "management," especially beyond band 6. As Stanley [46] emphasises, "leadership" and "management" are not interchangeable concepts and there is danger in using them indiscriminately to delineate roles within healthcare systems. Management is primarily concerned with assuming control and maintaining a clear division between workers/patients [47], and this should not be conflated with leadership in healthcare which should ideally involve a more closely bound relationship between staff [48] and also patients [24]. Adherence to older 20th-century management models that promote hierarchical ordering of staff in which leaders and "subordinates" work in separate spheres have come under criticism for being outmoded/ineffective [49], particularly where they continue to be applied within the NHS [9].

A related finding was band 5 nurses' perceptions that promotion automatically signals a shift towards management and a concomitant move away from nurses' principal vocation to provide the patient care in close collaboration with colleagues. Such perceptions potentially presented serious barriers to seeking promotion or fulfilling aspirations towards leadership. These perceptions appeared to be reinforced when senior staff adopted more autocratic leadership styles consistent with more rigid/hierarchical ways of working, and the more arcane management models discussed earlier.

Greater consensus was found regarding band 5 nurses' perceptions of what constituted optimal leadership style where high value was placed on senior staff's adoption of more democratic styles. Regarding this, the transformational style of leadership was valued highly, especially where it was

manifest in senior staff's adoption of an approachable, motivating and reassuring stance that presented a good role model to follow and inspired trust [44]. As Gopee and Galloway [50] note, effective leaders tend to focus on influencing staff's behaviours and especially motivating, inspiring and energising individuals. It is not only how band 5 nurses perceive/define leadership that may be important but also the example/influence set, reflected in senior staff's leadership style. By contrast, autocratic leadership styles were perceived negatively.

Of note, this study found evidence that senior staff who promoted knowledge exchange in an approachable and collaborative way were more likely to be found in very acute care settings such as emergency departments, theatres, and critical care wards. This perhaps reflects the need in such settings for rapid, expert decision-making, ensuring the team closely adheres to set protocols in a timely manner. This finding underscores the importance not only of leadership style but also context/setting in providing ideal environments for certain styles to flourish. Participants working on wards in secondary care similarly reported opportunities to take charge of their ward and lead staff and patient care. Nevertheless, there needs to be a balance. Some band 5 nurses expressed concerns they sometimes felt overwhelmed with opportunities to lead and out of their depth. Arguably, there is a requirement for training in leadership in advance that should accompany opportunities to lead.

Meanwhile, band 5 nurses who worked in care homes were often the only registrant nurse on their unit and automatically expected to lead in terms of staffing, resources, and resident care. This expectation-reinforced nurses' perception leadership was integral to their role but not necessarily supported by specific leadership training.

By contrast, participants working in ITU settings indicated that, in general, there were limited opportunities for leadership with one participant reporting active resistance to this by senior staff. Similarly, band 5 nurses working in community settings rarely encountered opportunities to lead due to their role as lone workers.

Evidence was found for participants' motivation to acquire leadership skills. However, while this could be encouraged where senior staff adopted more democratic leadership styles (e.g., transactional or transformational styles), opportunities for leadership development were frequently found to be contingent on conducive care contexts/settings which were only available to some band 5 nurses. Moreover, leadership development trended to be limited to being self-directed and opportunistic, rather than planned and deliberately co-ordinated.

This study highlights how both these factors make access to informal leadership development by band 5 nurses highly variable and not always equitable. This inequity was likely to be exacerbated where there was a lack of support for band 5

nurses' *formal* leadership training, which this study also uncovered. This is a situation also made problematic by the paucity of training programmes currently available in England.

One way to restore equity/increase opportunities for leadership for *all* nurses would be the creation of nationally available, formally validated leadership development programmes dedicated to promoting *leadership of people* as distinct from leading care and bespoke/available to all band 5 nurses who wanted it, irrespective of age. Programmes should ideally focus on developing clinical leadership skills and potential, as distinct from managerial skills training and complement rather than detract from leading good patient care. Ideally also, training should be resourced and overseen by an external governing body to ensure that it combines formal training supported by mentors with ample opportunities for practice-based training alongside informal shadowing/mirroring of good practice as an important adjunct rather than a replacement to this.

5.1. Limitations. This was a relatively small-scale cross-sectional study involving 18 participants from North East England. The response rate was lower than planned due to the outbreak of COVID-19 which impacted on the availability of primary care and voluntary sector staff. Further research is needed in this area, including consultation with larger samples from other regions and a wider range of clinical settings to establish how band 5 leadership training could be better designed, resourced and implemented, and externally governed and validated.

6. Conclusions

This study explored band 5 nurses' perceptions of leadership across a diverse range of different healthcare contexts/settings in England. This revealed a number of deficiencies and inconsistencies regarding how leadership is defined, characterised, and promoted. Ways of improving quality and provision are discussed. Given high rates of senior staff attrition in England and recent guidelines promoting nurse leadership development at *all* levels as a prerequisite to high quality, safe, and compassionate health care, there is a burgeoning need for renewed discussion of band 5 nurses' leadership development.

Data Availability

The data supporting the current study are available from the corresponding author upon request.

Ethical Approval

Ethical approval for this study was granted by Northumbria University on 25/09/19, reference number 16423.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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Research Article

Assessing the Validity and Reliability of the Russian Version of the Leading a Culture of Quality in Infection Prevention Scale among Nurses in Kazakhstan

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Background. Worldwide, hospitals are required to prioritize the culture of quality in infection prevention (CQIP) for patient safety. Assessing CQIP is crucial, but there is limited research, especially regarding nurses' perceptions. Insufficient information exists due to scarcity of validated instruments in local languages to measure CQIP internationally. *Purpose.* This study assessed the "Leading a Culture of Quality in Infection Prevention Scale" Russian version's (LCQ-IPS-R) validity and reliability to assess the CQIP of hospitals in Kazakhstan based on nurses' perceptions. *Methods.* This study utilized a methodological design and analyzed data from 204 nurses at the "National Research Center for Maternal and Child Health" in Astana City, Kazakhstan. The "cultural and linguistic adaptation" process involved a "forward-backward translation" technique. Content validity and construct validity were examined. Internal consistency reliability was explored for scale reliability. *Results.* The scale's mean item range was from 3.56 (SD = 1.22) to 4.40 (SD = 0.85; SD = 0.92). The corrected item-total correlation ranged from 0.321 to 0.707. Six experts rated the I-CVI from 0.83 to 1.00, with an S-CVI/Ave of 0.90. The principal component analysis with Varimax rotation produced four distinct components of the LCQ-IPS-R, explaining 69.8% of the total variance. The tests of correlation between the LCQ-IPS-R's four components revealed medium to large positive associations among the components ($r = 0.25–0.55$, $p < 0.001$). The computed α for the LCQ-IPS-R was 0.909 while α values from four subscales ranged from 0.809 to 0.921. *Conclusions/Implications for Practice.* This study provides evidence of the LCQ-IP-R's reliability and validity in evaluating Russian-speaking nurses' perception of their hospital's CQIP. These findings open the door for further research on CQIP in healthcare settings in Kazakhstan, Central Asia, and other Russian-speaking countries. The scale provides essential baseline information to design effective interventions for achieving hospitals' infection prevention objectives.

1. Introduction

Healthcare administrators and policymakers are continuously engaging in developing an infection prevention culture that is very extensive, convenient, and economical in healthcare settings. According to Cruz ([1]; p. 3), a "culture of quality in infection prevention" (CQIP) is defined as the "shared perception among healthcare professionals towards

hospital infection prevention." Hospitals worldwide are expected to have the highest level of CQIP to ensure patient safety and better patient outcomes. The World Health Organization [2] reported that routine infection prevention practices in Kazakhstan are well documented, including risk assessment for infectious diseases, patient safety, and establishing primary healthcare coordination centers staffed by healthcare professionals.

The roles of nurses are critical in ensuring a CQIP in hospitals [3]. They are expected to comply with infection prevention measures and to participate in interventions and activities that promote a culture of infection prevention [3]. They are also a good source of information when assessing the CQIP of hospitals. However, despite the important part of nurses in infection prevention in hospitals, nurses' compliance with infection prevention measures remains substandard [3–5]. Abed Alah et al. [6] reported that inconsistent infection prevention and control (IPC) interventions increased the chances for healthcare-associated infections (HAIs), leading to prolonged hospital stays. Hence, efforts should focus on nurses, who play a vital role in infection prevention, to prevent the detrimental effects of noncompliance to infection prevention practices on patient safety [4]. Establishing baseline data on the organizational culture of infection prevention could lead to better infection prevention management. It could enable nurses to improve their compliance with infection prevention policies and guidelines [7].

The significance of assessing the CQIP in hospitals cannot be overstated. However, there needs to be more information on this area of research in Kazakhstan, specifically on the perceptions of practicing nurses. The lack of a validated instrument in the country's language to measure the CQIP of a hospital is one of the main reasons for the lack of data from this country. A recent study conducted by Abed Alah et al. [6] has thoroughly investigated this tool which contributed to the understanding of how to assess the reliability and validity, assuring its usefulness and robustness in several research settings. Likewise, having a valid and reliable tool will be instrumental in accurately measuring the perceptions of healthcare workers about their hospital's infection prevention climate, which could prompt improvements and innovations in infection prevention practice within healthcare settings [4, 8]. By using a valid and reliable LCQ-IPS-R, researchers and healthcare administrators can effectively assess nurses' infection prevention efforts, recognize improvement areas, and implement strategies in preventing and reducing HAIs. Hence, it is crucial to have a validated and reliable version of a tool that can be used to assess the CQIP of hospitals in Russian-speaking countries to ensure that studies in this area can be done in those countries. Conducting validity and reliability test on LCQ-IPS-R is also key in ensuring that this scale's version is a robust and accurate measurement tool for assessing the culture of quality in infection prevention within healthcare organizations.

2. Background

Healthcare-associated infections (HAIs) remain a significant challenge among hospitals worldwide, posing significant risks to patient safety and outcomes [9]. According to "European Center for Disease Prevention and Control" ([10], para. 1), "healthcare-associated infections are infections acquired by patients during their stay in a hospital or another healthcare setting." These preventable infections negatively impact the patient's "health, increasing their stay in the hospital and hospital costs, and causing considerable distress to these patients" ([10], para. 1). Some literature reported that HAIs increase the occurrence and undesirable complications. For example, before the pandemic, more than 4 million patients in Europe every year acquired HAIs, while approximately 37,000 died because of direct contact consequences [11]. In the United States, HAIs were listed as the fifth most common mortality causes in clinical settings [12]. In Africa, poor infection control practices in public hospitals pose a significant adverse public health challenge due to healthcare provider or patient-related factors.

In Kazakhstan, HAIs had increased, and the country's epidemiological situation is still a concern [13]. The COVID-19 pandemic contributed to many cross-infections between patients and nurses in the country, which posed a considerable challenge to healthcare institutions [14]. Due to this increase in HAI cases, the country's healthcare ministry has demonstrated its commitment to mitigating the impact of HAIs. The ministry also ensured access to essential healthcare services to accelerate improvement in health outcomes and respond better to its people's ever-changing needs and expectations [15]. The ministry promoted multidisciplinary teams in hospitals, supported by various health systems, to provide guidance in public health protection, one of which is IPC intervention.

IPC measures decrease the burden of unwanted hospital incidences and enhance the quality of health care in hospitals [9]. Accordingly, ensuring CQIP significantly impacts patient outcomes, including increased effectiveness of prevention strategies for hospital infections, promotion of effective communication, and encouraging individuals to learn from their mistakes [1, 16]. Hence, creating a CQIP in hospitals should be a joint priority among healthcare professionals, policymakers, administrators, and managers.

Nurses, who are primary care providers and have close contact with patients, are obligated to provide safe and effective nursing care and contribute to creating an infection-free environment [17]. Nursing has a crucial role in ensuring a safe patient care environment; thus, they must be competent in infection control skills. Moreover, they should also be competent in patient need prioritization, teamwork, and collaboration, which are essential in developing CQIP in hospitals [1]. Healthcare workers' lack of knowledge and competence in infection prevention often leads to failed CQIP [18]. Hence, assessing the hospital's CQIP as perceived by healthcare workers is critical to identify the areas that need to be intervened and develop interventions to ensure high IPC knowledge and competence.

The literature supports ways to improve knowledge and compliance on IPC among nurses. Alshammari et al. [7] found that IPC training seminars significantly influenced IPC compliance. Furthermore, attending "risk assessment seminar training, having sufficient personal protective equipment, and being completely aware of safety guidelines were related to better IPC practices" [5]. Data from this previous literature provide a valuable baseline understanding of nurses' knowledge and practices of IPC,

which could be essential in understanding the CQIP of the healthcare setting.

Considering the relevance of CQIP to patient safety, it is vital to use psychometrically sound tools in measuring the CQIP. A validated tool for assessing a hospital's CQIP is the "Leading a Culture of Quality in Infection Prevention Scale" (LCQ-IPS) [19]. The LCQ-IPS is the most widely used tool to measure healthcare workers' perceptions about CQIP in a clinical health setting. It measures four dimensions of CQIP: "improvement orientation," "psychological safety," "supportive work environment," and "prioritization of quality" [19]. To date, the psychometric properties of the LCQ-IPS have been tested in the US [19] and Saudi Arabia [1]. No Russian version of the tool is currently available, and no study has attempted to adapt and test the tool's validity and reliability among nurses in Kazakhstan. A valid and reliable Russian language version of the tool is necessary to assess the CQIP of hospitals in the country and other Russian-speaking countries. This situation will also hinder the conduct of cross-cultural comparisons on the CQIP between countries. Therefore, this study endeavored to produce a Russian version of the LCQ-IPS (LCQ-IPS-R) and test its psychometric properties among nurses in Kazakhstan.

3. Aim

This study assessed LCQ-IPS-R's validity and reliability to assess the CQIP of hospitals in Kazakhstan based on nurses' perceptions.

4. Research Questions

(1) To what extent can the LCQ-IPS-R demonstrate content and construct validity when administered to Kazakh nurses?

(2) What internal consistency reliability level does the LCQ-IPS-R and its subscales exhibited when administered to Kazakh nurses?

5. Method

5.1. Design. This study is a quantitative investigation utilizing a methodological design.

5.2. Samples and Setting. The data for this study were collected at the "National Research Center for Maternal and Child Health" (NRCMCH). The NRCMCH is a clinical research facility, one of the three medical centers under the "University Medical Center Corporate Fund" (UMC) in Astana City, Kazakhstan. There were approximately 950 nurses employed in the UMC hospitals, and invitations were extended to them to participate voluntarily. However, due to the nature of convenience sampling, only 204 nurses responded and voluntarily completed the questionnaire (response rate: 25.3%). However, since this is a validation study, the researchers used the "sample to scale item ratio" (1 : 10 ratio) in identifying the sample size, which is the commonly used method in identifying the adequate sample

size when conducting factor analysis [20]. Since there are 19 items in the scale, the needed sample size was 190 nurses. Hence, the present sample size was more than adequate for the study [20]. The following were the inclusion criteria: (1) citizen of Kazakhstan, (2) staff nurse at NRCMCH, (3) with nursing or midwifery certificate, (4) reads and understands the Russian language, and (5) with at least six months working experience at the NRCMCH.

5.3. Instrument. The online survey contained questions to elicit data for the respondents' age, sex, marital status, education, and length of experience. The online survey also contains the LCQ-IPS-R, translated from the original English version by Pogorzelska-Maziarz et al. [19]. The "cultural and linguistic adaptation" process followed a "forward-backward translation" technique [21]. Two translators independently translated the scale from English to Russian language. Another translator synthesized the two translations to develop a single tentative Russian translation. Two translators separately back-translated the tentative Russian version to English. The tentative Russian version and the two back translations were presented to a panel of experts (on infection control and prevention) with six members. The panel examined the "semantic, idiomatic, experiential, and conceptual equivalence" between those versions. The panel also examined the tool's content validity following Polit and Beck's [22] recommendations.

The LCQ-IPS comprises 19 items that capture the central dimensions of a healthcare organization's climate of quality of IPC. The items of the scale were originally from the "Leading Culture of Quality" questionnaire created by the "Institute for Clinical Systems Improvement and Satisfaction Performance Research" in Minnesota to be used by healthcare organizations to assess their "quality-oriented climate." Pogorzelska-Maziarz et al. [19] adapted the items and revised them to be focused on infection prevention. The scale can measure four aspects of the IPC climate of a hospital, including "psychological safety, prioritization of quality, supportive work environment, and improvement orientation." The items are responded to using a 5-point Likert scale (1 = "strongly disagree" to 5 = "strongly agree"). Mean dimension scores are calculated after reverse scoring item number 16 as it is a negatively worded item. Higher mean scores indicate a better or more positive IPC climate of the hospital. The scale had been used to assess the nurses' [4] and nursing students' [1, 8] perceptions of their hospitals' IPC climate. The LCQ-IPS had good internal consistency (Cronbach's $\alpha = 0.926$), criterion validity, and construct validity [19]. The copyright holder of the LCQ-IP permitted the use and translation of the tool through e-mail (M. Pogorzelska-Maziarz, personal communication, August 20, 2021).

5.4. Ethical Considerations. This report is part of a research protocol approved by the Institutional Research Ethics Committee of Nazarbayev University (Register Number: 448/24092021) and the Research Ethics Committee of UMC. The study strictly adhered to the guidelines set by these

committees in the ethical conduct of research and the Declaration of Helsinki on ethical principles in researching human subjects. The IRB assessed the study protocol, research instruments, and ethical considerations to ensure compliance with ethical guidelines and regulations. The approval was obtained before initiating data collection. Information about the study (study's purpose, procedures, risks and benefits, and voluntary nature) and the rights (right to refuse and withdraw from participating) of the respondents was provided at the beginning of the online survey. The contact information of the principal investigator was provided on the same part of the survey in case the respondents have clarifications or questions about their study. Participation in the study was voluntary, and those who decided not to participate were free to ignore and leave the online survey. Those who volunteered to join signed an electronic informed consent form by clicking the "I agree" button at the end of the consent. No personal information that can identify the respondent was collected, and data were treated and reported aggregately. The researchers programmed Survey Monkey to collect strictly anonymous responses (i.e., no IP address, e-mail address, or name will be saved). Moreover, in the tool settings, nurses were allowed to submit their responses only once, preventing them from submitting multiple responses. A rigorous data cleaning procedure was also conducted to identify and remove any duplicated entries. Data were handled carefully, with aggregated and nonidentifiable results presented. By upholding this ethical consideration, the online survey was conducted with integrity, ensuring that the participant rights, privacy, and confidentiality were protected.

5.5. Data Collection. The researchers sought permission to conduct the study from the head of NRCMCH, outlining the purpose, objectives, and methodology of the study. The data for the study were collected from November 2021 to April 2022 using an online survey (Survey Monkey). The online survey's link, containing the study's information, electronic informed consent, and questionnaire, was forwarded to the nurses working in NRCMCH through e-mail and WhatsApp. A reminder message was sent to the potential respondents every two weeks to remind them about the survey. The collected data downloaded from Survey Monkey were securely stored and managed to ensure confidentiality and data integrity. The research team organized and documented the data in a structured format, making it ready for analysis.

5.6. Data Analysis. Analyses were conducted using SPSS version 22.0. Descriptive analyses were performed to analyze the demographic variables in the study. The "item-level" (I-CVI) and "scale-level" content validity indices (S-CVI/Ave) were computed from the ratings given by a panel of six experts. The acceptable I-CVIs and S-CVI/Ave for a six-member panel of experts are ≥0.78 and ≥0.90, respectively [22]. Item-to-total correlation (ITC) was analyzed to support the scale's internal structure validity. Items with ITC values less than 0.30 and more than 0.80 and items that will cause ≥10% increase in the scale's "Cronbach's alpha score when

removed" were dropped from the scale. For construct validity, PCA with Varimax rotation was carried out. The "sampling adequacy" and the "appropriateness of the factor model" were determined by calculating the "Kaiser–Meyer–Olkin index" (KMO value ≥ 0.60) and "Bartlett's test of sphericity" ($p < 0.05$), respectively. Extraction of factors will consider an eigenvalue >1 and factor loading of >0.40 [23]. For reliability, internal consistency reliability was determined. Cronbach's alpha ($\alpha \geq 0.70$) was calculated for the scale's reliability [24].

6. Results

The nurses' age ranged from 20 to 60 years ($M = 34.63$; SD = 10.73) years. Less than 10% of the respondents were males, and more than half of the sample was married (56.9%). Most of the respondents had finished a certificate in nursing or midwifery in a nursing college (56.9%). The year of experience as a nurse ranged from 0.80 to 40 years ($M = 12.33$; SD = 10.12) (Table 1).

6.1. Item Analysis on the LCQ-IPS Russian Version. The results of the item analysis conducted on the LCQ-IPS-R are summarized in Table 2. The mean range of the scale's items was from 3.56 (SD = 1.22) to 4.40 (SD = 0.85; SD = 0.92). The corrected ITC ranged from 0.321 (item 16) to 0.707 (item 8). Cronbach's α values "if the item is deleted" ranged from 0.901 (items 5 and 13) to 0.910 (items 17 and 18).

6.2. Validity of the LCQ-IPS Russian Version. The six experts rated the I-CVI from 0.83 to 1.00, with an S-CVI/Ave of 0.90. All the items were subjected to the PCA. The KMO value was 0.87, and Bartlett's test of sphericity was significant ($p < 0.001$); thus, the sample was adequate to continue with the PCA. The PCA with Varimax rotation produced four distinct components of the LCQ-IPS-R with an eigenvalue greater than 1 (range = 1.23 to 7.80). The overall explained variance of the four components was 69.8%. Seven of the 19 items were loaded in component 1 (factor loading range = 0.724–0.862) with the highest explained variance (41.0%). Component 2 explained 14.3% of the variance with seven items loaded (factor loading range = 0.482 to 0.795). For component 3, four items were loaded on it with factor loading from 0.528 to 0.868 and an explained variance of 8.0%. Three items were loaded in component four (factor loading range = 0.687 to 0.878), contributing to 6.5% of the variance explained. However, items 13 and 14 were cross-loaded in components 2 and 3. The researchers decided to retain both items in component 3. Therefore, the final model comprises the following: component 1, "psychological safety" (7 items); component 2, "prioritization of quality" (5 items); component 3, "supportive work environment" (4 items); and component 4, "improvement orientation" (3 items) (see Table 3).

The tests of correlation between the four components of the LCQ-IPS-R revealed medium to large positive associations among the components ($r = 0.25–0.55$, $p < 0.001$) (see Table 4).

Table 1: Demographic characteristics of the respondents ($n = 204$).

Variable	Mean (SD)	Range
Age	34.63 (10.73)	20–60
Years of experience	12.33 (10.12)	0.80–40
	n	%
Gender		
Male	20	9.8
Female	184	90.2
Marital status		
Single	68	33.3
Married	116	56.9
Separated/divorced/widow/er	20	9.8
Highest educational attainment		
Certificate in nursing or midwifery (nursing college)	116	56.9
Certificate in nursing or midwifery (higher medical college)	15	7.4
Feldsher	12	5.9
Baccalaureate in nursing (applied bachelor)	15	7.4
Baccalaureate in nursing (academic bachelor)	41	20.1
Graduate program (master or doctorate)	5	2.5

Table 2: Item mean, corrected item-total correlations, and Cronbach's α if item is deleted for the Leading a Culture of Quality in Infection Prevention Scale Russian version ($n = 204$).

No.	Item	Mean	SD	Corrected item-total correlation	Cronbach's α if item is deleted
1	The climate in the organization promotes the free exchange of ideas	4.22	0.97	0.545	0.905
2	Staff will freely speak up if they see something that may improve patient care or affect patient safety	4.35	0.92	0.643	0.903
3	I feel free to express my opinion without worrying about the outcome	4.17	1.02	0.650	0.902
4	In general, people in our organization treat each other with respect	4.22	1.02	0.566	0.905
5	People in this organization are comfortable checking with each other if they have questions about the right way to do something	4.27	0.96	0.695	0.901
6	The people in this organization value others' unique skills and talents	4.21	1.05	0.603	0.904
7	Members of this organization are able to bring up problems and tough issues	4.13	1.03	0.636	0.903
8	The healthcare-associated infection prevention goals and strategic plan of our organization are clear and well communicated	4.40	0.85	0.707	0.902
9	Results of our infection prevention efforts are measured and communicated regularly to staff	4.33	0.80	0.626	0.904
10	There is a good information flow among departments to provide high-quality patient safety and care	4.29	0.84	0.658	0.903
11	People here feel a sense of urgency about preventing healthcare-associated infections	4.22	0.98	0.565	0.905
12	Employees are encouraged to become involved in infection prevention	3.96	1.10	0.551	0.905
13	Senior leadership here has created an environment that enables changes to be made	4.00	1.06	0.691	0.901
14	Where I work, people are held accountable for the results of their work	4.35	0.97	0.667	0.902
15	The quality of work suffers because of the amount of work staff are expected to do	3.67	1.25	0.453	0.909
16	Most people in this organization are so busy that they have very little time to devote to infection prevention efforts	3.56	1.22	0.321	0.913
17	I can think of examples when problems with patient infections have led to changes in our procedures or equipment	3.87	1.09	0.377	0.910
18	I know of one or more healthcare-associated infection prevention initiatives going on within our organization this year	3.94	1.02	0.376	0.910
19	I have a clear understanding of the organization's mission, vision, and values	4.40	0.92	0.529	0.906

6.3. Reliability of the LCQ-IPS Russian Version. The computed Cronbach's alpha for the LCQ-IPS-R was 0.909. For the subscales, Cronbach's alpha values of 0.921, 0.855, 0.813, and 0.809 were computed for "Psychological safety," "Prioritization of quality," "Supportive work environment," and "Improvement orientation," respectively (see Table 5).

Table 3: Results of the principal component analysis for the Leading a Culture of Quality in Infection Prevention Scale Russian version ($n = 204$).

Item	Factor 1 Psychological safety	Factor 2 Prioritization of quality	Factor 3 Supportive work environment	Factor 4 Improvement orientation
Q5	0.862			
Q4	0.833			
Q3	0.819			
Q2	0.786			
Q6	0.770			
Q7	0.733			
Q1	0.724			
Q9		0.795		
Q8		0.764		
Q10		0.735		
Q11		0.687		
Q12		0.635		
Q16			0.868	
Q15			0.831	
Q13		0.448	0.579	
Q14		0.482	0.528	
Q18				0.878
Q17				0.865
Q19				0.687
Eigenvalue	7.80	2.71	1.52	1.23
Variance explained (%)	41.0%	14.3%	8.0%	6.5%
Cumulative variance explained (%)	41.0%	55.3%	63.3%	69.8%

Table 4: Correlation between the three factors of the Leading a Culture of Quality in Infection Prevention Scale Russian version ($n = 204$).

Factors	Psychological safety	Prioritization of quality	Supportive work environment
Prioritization of quality	0.55 ($<0.001^{***}$)		
Supportive work environment	0.34 ($<0.001^{***}$)	0.55 ($<0.001^{***}$)	
Improvement orientation	0.25 ($<0.001^{***}$)	0.37 ($<0.001^{***}$)	0.41 ($<0.001^{***}$)

Note. ***Significant at 0.001 level.

7. Discussion

This study showed evidence of the validity and reliability of the LCQ-IPS-R in assessing the CQIP of hospitals in Kazakhstan as perceived by nurses. When evaluating the various aspects of the hospital's CQIP from a nurse's standpoint, it is vital to use a valid and reliable measurement scale. This psychometric assessment is the first to test the suitability of LCQ-IPS in the Kazakhstan context and Russian language.

The result of the content validity test revealed that the IPC experts evaluated all the LCQ-IPS-R items as relevant or highly relevant in assessing the CQIP of hospitals in Kazakhstan context and language. The LCQ-IPS-R had undergone a rigorous translation process using the "forward-backward translation method" from the original language of the scale (English) to Russian. The excellent content validity indices of the Russian version ascertained its equivalency in both linguistic and cultural contexts with the original version [25]. This excellent content validity exhibited that the translated items effectively capture the content and the meaning of the original tool [19]. Thus, the Russian version is parallel with its intended construct and

maintains its validity when applied to Russian-speaking nurses in Kazakhstan. Previous studies reporting content validity of other scale versions also reported similar excellent content validity indices in various countries [1, 3, 19].

A descriptive analysis of the scale items was performed. The analysis reflected that "the healthcare-associated infection prevention goals and strategic plan of our organization are clear and well communicated" and "I have a clear understanding of the organization's mission, vision, and values" received the highest item mean. These high mean scores demonstrate that nurses clearly understood their hospital's goals and strategic plan related to HAI prevention goals, as well as their hospital's mission, vision, and values. This finding further suggests that the healthcare organization was successful in communicating with clarity regarding its infection prevention goals, strategic plan, and core values among its healthcare staff [16]. This result is worth noting since the health organization's values, goals, and strategic plan emphasizing the IPC climate are critical in promoting patient safety culture [6]. The nurses' knowledge and understanding of the hospital's mission, vision, and values could help them properly align their actions towards achieving quality and patient safety improvement, including

Table 5: Internal consistency reliability of the Leading a Culture of Quality in Infection Prevention Scale Russian version ($n = 204$).

Variable	Cronbach's alpha
Psychological safety	0.921
Prioritization of quality	0.855
Supportive work environment	0.813
Improvement orientation	0.809
Leading a Culture of Quality in Infection Prevention Scale Russian version	0.909

reducing infection risk and protecting the patients and other healthcare professionals (Alquwez et al., 2018). Additionally, ITCs were used to support the internal construct validity of the tool. The result showed that all ITCs were between 0.30 and 0.80, which implies acceptable ITC values based on the definition of Nunnally and Bernstein [24]. This also means that the items are reasonably connected to the overall construct and contribute significantly to its measurement [23]. The "Cronbach's alpha if the item is deleted" values also showed that none of the items, when deleted, will cause a substantial increase in the scale's overall Cronbach's alpha. The findings indicate that all the items are relevant to the totality of the scale. Thus, they were entered into the PCA.

The tool manifested a suitable construct validity, as shown by the 4-factor solution of the PCA explaining 69.8% of the overall scale's variance. This means that the four distinct factors in the scale contributed about 69.8% of the total variance in the nurses' perceptions of their hospital's CQIP. This overall explained variance of the four factors in the LCQ-IPS-R is indicative that the tool had a good construct validity [26]. This explained variance was higher than the explained variance of the English version (58.8%) but lower than that of the Arabic version (70.7%) [1]. Similar to the LCQ-IPS, the subscales were labeled "Psychological safety," "Prioritization of quality," "Supportive work environment," and "Improvement orientation" [19]. Our findings also confirm the previous results reported in the English and Arabic versions of the scale that "Psychological safety" (41.0%) has the most substantial contribution to the variance of CQIP, followed by "Prioritization of quality," "Supportive work environment," and "Improvement orientation" [1, 19].

However, items 13 and 14 were loaded on components 2 and 3. According to Al-Dwaikat et al. [27], if an item is loaded into two different domains, these items can be removed as it creates confusion in labeling all factors that share similar variables. However, Nunnally and Bernstein [24] argued that if items are loaded in at least two factors, they can be kept in the factor they had strong association. Item 13 states that "senior leadership here has created an environment that enables changes to be made," and item 14 states "where I work, people are held accountable for the results of their work." Both items were more related to the nurses' working environment than the concept of prioritizing quality. Also, items 13 and 14 were heavily loaded more on the "Supportive work environment" factor than in "Prioritization of quality." A supportive nursing leadership that promotes accountability is a characteristic of a positive work environment [3, 28]. A systematic review by Wei et al. [29] also reported that nurses' safe and positive work environment, empowerment, autonomy, positive relationships with

other team members, and organizational support significantly ensure IPC in hospitals. Therefore, in this study, we decided to retain both items in factor 3.

Factor 1, "Psychological safety," constitutes seven items. This factor is composed of items describing a hospital that promotes the free exchange of ideas about IPC and patient safety. It also includes issues and challenges related to these aspects in the hospital. This implies that the nurses value a hospital climate that promotes openness to these issues. They believed that having an organizational culture that allows a free exchange of ideas impacts the attainment of IPC and patient safety in the hospital. The data collection for this study was conducted between November 2021 to April 2022, when significant changes happened in Kazakhstan's healthcare work environment and practices. Several measures were carried out to mitigate the spread of COVID-19 infection in workplaces [15]. Smith et al. [30] explained that appropriate infection control measure implementation in the clinical setting might positively affect healthcare professionals, such as reducing anxiety and worries about contact/disease transmission while performing patient care. In a systematic review conducted by Lawrence and Kinnear [31], psychological safety promotes teamwork, open communication, and continuous improvement culture. When individuals feel safe psychologically, they are more likely to share their valuable insights, report errors or near misses, and actively participate in ward decision-making processes. Thus, psychological safety is crucial in healthcare facilities to ensure the effective implementation of IPC policies and guidelines and the attainment of patient safety goals.

The second factor, "Prioritization of quality," has five items. The items in this factor talk about the clarity of the hospital's IPC goals and plans, assessment of IPC efforts and communication of findings, effective communication regarding IPC, and the prioritization of IPC in the hospital. Hence, prioritizing the quality of IPC in hospitals during those times is essential to deliver safe and effective nursing care. Tumala et al. [8] reiterated that to ensure the best IPC practices in patient care, a clear technical guideline on IPC according to available resources and clear IPC goals and plans should be present. The "Ministry of Healthcare of the Republic of Kazakhstan" [32] mandated that all health centers, hospitals, and health clinics prioritize their IPC plan across all departments/areas to reduce the risk of infection and guarantee patient safety. Therefore, by prioritizing quality IPC, the country's healthcare system can enhance patient safety, improve healthcare outcomes, and reduce the HAI burden.

Four items constitute factor 3, "Supportive work environment." These items tackle leadership support to IPC, accountability of healthcare workers, and the effects of high workload and inadequate time on IPC practices. This factor generates an insight that nurses' working environment influences the nurses' provision of efficient nursing service and effective IPC initiatives [33, 34]. During the pandemic, nurses rendered most of their time to patient care, often facing a higher patient load that demands attention [35]. As this factor shows, the time and workload of nurses are crucial in determining if they can effectively practice IPC. According to Park and Kim [36], a nonsupportive work environment is associated with high burnout, higher turnover intention, and lower job satisfaction. Hence, the work environment is crucial to creating safe health care and reducing infection risks in a clinical setting.

Finally, three items made up factor 4, "Improvement orientation." This factor includes the following items: "I can think of examples when problems with patient infections have led to changes in our procedures or equipment," "I know of one or more healthcare-associated infection prevention initiatives going on within our organization this year," and "I have a clear understanding of the organization's mission, vision, and values." This factor highlights the alignment of IPC goals and the healthcare organization's "mission, vision, and values." Also, a healthcare organization that is serious about achieving IPC goals should have clear policies, guidelines, and plans in achieving its IPC goals. According to [9], regular assessments and monitoring practices and timely feedback for healthcare professionals are necessary to achieve continuous improvement orientation on infection control.

The scale's overall Cronbach'sα alpha is 0.909, with a range of 0.809 to 0.921 for its four subscales. According to Nunnally and Bernstein [24], a criterion of 0.70 or above indicates acceptable internal consistency. It suggests that the scale's items are highly correlated with each other and holistically evaluate the intended construct in a consistent and reliable manner. This result is higher than that of other previous studies, which reported similar good internal consistency reliability using the same tool. For example, Tumala et al. [8] conducted a survey using the Arabic version among 829 Saudi nursing students in six Saudi universities, which found Cronbach's alpha of 0.89. Meanwhile, in the study by Colet et al. [4] among nurses in Riyadh, Saudi Arabia, Cronbach's α was 0.87, signifying good internal consistency. In addition, it is crucial to note that Cronbach's alpha coefficients are affected by the item number on an instrument measurement [37]. Thus, the LCQ-IPS-R exhibits excellent internal consistency.

7.1. Limitations.

A few limitations need consideration when interpreting the study's results. The LCQ-IPS-R's validity was supported by "content validity" and "construct validity" through PCA. While these tests provided evidence for the tool's acceptable validity, other validity tests should be performed in the LCQ-IPS-R in the future. Also, the tool's structure was supported only by PCA. A CFA should be done to support LCQ-IPS-R's four-factor structure. The CFA omission might impact the validation process robustness and could influence the interpretation of the results. Therefore, further studies are warranted for CFA incorporation in enhancing the validity assessment and ensure a more comprehensive adapted scale validation. Also, the reliability of the tool was supported only by "internal consistency." Other reliability measures, such as stability reliability, can be done in the future to strengthen the evidence of the reliability of this version.

8. Conclusion

This investigation substantially contributes to the literature on the IPC of hospitals worldwide and in Kazakhstan by measuring the LCQ-IPS-R's psychometric properties. This research provides evidence of the LCQ-IP-R's validity and reliability in assessing the Russian-speaking nurses' perception of their hospital's CQIP. Specifically, the LCQ-IP-R's validity was supported by excellent "content and construct validity." The PCA affirmed the four subscales of the tool similar to the original versions, namely, "Psychological safety, Prioritization of quality, Supportive work environment, and Improvement orientation." The LCQ-IP-R and its four subscales had high internal consistency reliability. Therefore, the LCQ-IP-R can provide a valid and reliable assessment of the CQIP in hospitals in Kazakhstan and other Russian-speaking countries from clinical nurses' perceptions. This scale offers the opportunity to derive baseline information enabling the design and implementation of effective interventions to ensure the attainment of IPC goals of hospitals.

8.1. Implications.

The LCQ-IP-R was used for the first time among Kazakhstan's nurses, supporting the scale's validity and reliability. This result could pave the way for more research regarding CQIP of healthcare settings to be conducted in Kazakhstan, Central Asia, and other Russian-speaking countries. Also, the results are of great significance to the nursing profession as it established an effective measurement tool of CQIP, which can provide information for designing IPC policies and guidelines and planning IPC initiatives to ensure patient safety in clinical settings. Hospital administrators could use this tool to conduct continuous and regular assessments of the IPC situations in their hospitals. These assessments can improve the hospital's psychological safety, prioritize IPC, create a supportive working environment, and ensure quality improvement in IPC. Likewise, head nurses, managers, and nursing directors could actively promote CQIP by ensuring adequate resources for IPC measures using the baseline information gathered through the tool used and may stimulate the continuous improvement of IPC measures.

Data Availability

The data used to support the findings of this study have not been made available because participants were assured of their privacy and confidentiality.

Conflicts of Interest

Paolo Colet served as the academic editor of the journal. However, he is not involved in any way in the review process of the paper.

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Research Article

Association among Doctor-Patient Communication, Trust, and Patients' Negative Stereotypes for Healthcare Professionals during COVID-19: A Cross-Sectional Study

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Aim. The purpose of this study was to examine the association among doctor-patient communication, trust, and patients' negative stereotypes for healthcare professionals during COVID-19. *Background.* Patients' negative stereotypes for healthcare professionals have been considered a major cause of violence against healthcare professionals. During COVID-19, since the fear for illness could exacerbate patients' negative stereotypes for healthcare professionals, therefore, how to inhibit patients' negative stereotypes for healthcare professionals has become a top priority. *Methods.* From January 2020 to April 2020, a cross-sectional survey study was performed in which a total of 2000 patients were convenience-sampled from different regions of China. The survey measured doctor-patient communication, institutional trust, interpersonal trust, and patients' negative stereotypes for healthcare professionals, respectively. After standardizing the total data scores, the association between doctor-patient communication, trust and patients' negative stereotypes for healthcare professionals using the bootstrap method was built. *Results.* There was a moderate to the high correlation between doctor-patient communication, patients' negative stereotypes for healthcare professionals, interpersonal trust, and institution trust ($r = 0.36$–0.68, $p < 0.01$). Mediation analysis showed that patients' interpersonal trust ($\beta = -0.25$, 95% CI: -0.312–-0.209) than patients' institution trust ($\beta = -0.02$, 95% CI: -0.042–-0.007) played a greater role in suppressing negative stereotypes through doctor-patient communication. *Conclusions.* Through communication, healthcare professionals and patients increase their familiarity and identification, thereby reducing patients' negative stereotypes. Moreover, because interpersonal trust connotes emotional and cognitive trust, it was more beneficial than institution trust in reducing negative stereotypes. *Implications for Nursing Management.* The results of this study can tell governments, healthcare organizations, communities, and healthcare professionals that reducing violent behaviors based on negative stereotypes requires attention to institutional trust building, interpersonal trust development, and communication improvement.

1. Introduction

In China, the incidence of violence against healthcare workers reached 59.64%–76.2% [1]. In this regard, patients' negative stereotypes for healthcare professionals are identified as the main reason [2]. Stereotypes are defined as fixed, generalized, and abstract perceptions about a certain type of person or thing, and having negative stereotypes can interfere with an individual's cognitive work and lead to negativity and prejudice against the target group [3]. It was found that when patients have negative stereotypes for healthcare professionals, they are less likely to seek care and have fewer patient-provider interactions during the consultation process [4], which ultimately affects patient satisfaction with the providers.

During COVID-19, patients' negative stereotypes for healthcare professionals may be further amplified. Because of the rapid contagiousness and seriousness of COVID-19,

patients feel significantly more anxious and out of control [5]; meanwhile, the healthcare sector has implemented a series of policies to reduce the risk of COVID-19 transmission, such as patient isolation, and limiting the number of visits etc., all of which may lead to patients' negative stereotypes for healthcare professionals. Recently, a meta-analysis involving 11,938 healthcare professionals around the world confirmed that there was a general increase in stigma and violence induced by patients' negative stereotypes during COVID-19 [6]. Therefore, there are significant practical implications on how to effectively inhibit patients' negative stereotypes for healthcare professionals.

Intergroup contact theory states that intergroup contact can lead to more positive attitudes and a decrease in negative stereotypes [7]. In which communication, as the main mode of intergroup contact, has an important influence on negative stereotypes. Particularly in China, doctor-patient communication is a key indicator affecting patients' stereotypes for healthcare professionals. China has over 1.4 billion people but less than 5 million doctors [8]. The severely imbalanced doctor-patient ratio has led to a tendency for healthcare professionals to compress communication time with patients, in order to ensure that more patients are served in a given amount of time [9]. In this situation, Chinese healthcare professionals usually focus on disease in the process of communication with patients, neglecting emotional communication and lacking information sharing with patients, thus forming patients' negative stereotypes for healthcare professionals, such as hard attitude and lack of empathy [10, 11]. However, through high-quality doctor-patient communication, it will help convey positive messages and eliminate treatment misunderstandings between doctors and patients, which will improve patients' positive stereotypes for healthcare professionals [12]. Research confirms that by increasing the frequency of doctor-patient communication, patients conveyed more positive messages about healthcare professionals among themselves, while expressing more positive stereotypes for healthcare professionals [13]. In addition, during the communication process, both shared information and joint decision-making also suppressed negative stereotypes for healthcare professionals [14].

Although there is some research support for the effectiveness of doctor-patient communication in reducing patients' negative stereotypes, however, communication as a two-way interactive process, the effect of communication is influenced by the psychosocial aspects of the message sender and the message receiver [15]. For example, in the theory of information transfer, the sender and receiver of information consider the possible costs of sending or receiving information. Therefore, during the transmission of information, the receiver of the message critically evaluates the transmitted information, which in turn affects the effectiveness of the communication [16, 17]. On this account, psychological factors are important drivers for the effectiveness of doctor-patient communication. So, which psychological factors play a key role between communication and negative stereotyping?

It was found that trust is an essential element linking communication and stereotypes [18]. By trust, patients can feel the kindness conveyed in the doctor-patient communication [19], enhancing the patient's identification with the healthcare provider [20]. Besides, patient trust also helps sharing treatment information during communication [21], which in turn influences patients' stereotypes for healthcare professionals. According to Luhmann's (2018) classification of trust, trust is divided into interpersonal trust and institutional trust, which have different roles and psychological mechanisms, respectively. Specifically, interpersonal trust is an expected judgment and psychological state, in which patients and healthcare professionals believe that the other party will not act against them during the interaction [23]. Institutional trust is the expectation and belief whether the healthcare system is credible in the doctor-patient interaction [24]. Compared with interpersonal trust, institutional trust can control people's behavior within a certain range by approving and encouraging behaviors that conform to institutional regulations, and punishing behaviors that violate institutional regulations, hence greatly reducing social uncertainty and risk [25]. Thus, in the medical process, patients are able to demonstrate high interpersonal trust if the healthcare provider is an "acquaintance" or a family member or friend, but if the patient has low interpersonal trust in the healthcare provider, they are likely to seek institutional trust as a substitute [26]. During the effect of doctor-patient communication on negative stereotypes, interpersonal trust and institutional trust also have different psychological mechanisms. On the one hand, interpersonal trust builds mutual emotions and awareness among individuals in interpersonal interactions, which depend on mutual rational thinking and emotional identification [27]. Thus, interpersonal trust contains both cognitive and affective elements [28]. However, institutional trust is built by combining regulations, discipline, and preventive mechanisms, where people's trust in the institution depends mainly on its rationality and legitimacy excluding emotional elements [22]. Therefore, in the effect of doctor-patient communication on stereotypes, interpersonal trust can affect stereotypes through the tone emotion and content cognition in the communication process, but institutional trust only works by influencing the cognitive component of the communication process. Studies confirmed that interpersonal trust relies on influencing listener emotions to enhance the effectiveness of communication during COVID-19 [29], and that institutional trust is dependent on honest and transparent communication content acting on patients' cognitive [30]. On the other hand, interpersonal trust involves interdependence among individuals and promotes cooperation mainly by reducing the fear of individuals being used by others [31]. Once there is a breach of trust in others, individuals tend to pay attention to negative stimuli of others evoking negative stereotypes [32]. By contrast, institutional trust promotes cooperation through deterrence and balance [33]. When people do not trust the system that protects their rights and interests, they become less tolerant of the outgroup, which in turn increases

hostility toward the outgroup and creates negative stereotypes of the outgroup [34].

In summary, doctor-patient communication is closely related to patients' negative stereotypes for healthcare professionals, and also, trust as a psychological driver affecting communication and negative stereotypes, with different trust mechanisms playing different roles between communication and negative stereotypes. Especially during COVID-19, the emotional and rational components carried by interpersonal and institutional trust are likely to be further prominent in communication and stereotypes. Based on this, the study investigated doctor-patient communication, interpersonal trust, institutional trust, and patients' stereotypes for healthcare professionals during COVID-19 using a questionnaire method, aiming to further elucidate the association among doctor-patient communication, trust, and patients' negative stereotypes for healthcare professionals.

2. Methodology

2.1. Sample and Process. From January 2020 to April 2020, a nationwide cross-sectional survey was conducted using a convenience sample at hospitals from 28 provinces in China, including Beijing, Shanghai, Jiangsu, Anhui, Hunan, Xinjiang, and Guangxi, and a total of 2,000 participants were recruited. If the patients were 18 years of age or older, volunteered to participate in the study, and provided verbal informed consent, they were eligible to participate. After completing the research, patients will receive gifts that will be randomly selected. Regarding the survey process, we used a specialized survey platform "Questionnaire Star" for data collection. This platform has stable and reliable system and diversified service functions, which can guarantee the stability of access and data security. At the beginning of the web-based questionnaire, the researchers used standardized instructions about the purpose of the study and informed participants that they could leave the study at any time. Besides, the responses are administered online, allowing patients to fill out the questionnaire at their convenience and have the opportunity to ask the researcher questions. All study data were collected anonymously and confidentially. After the data collection was completed, we performed data cleaning to remove invalid samples, which involved excluding duplicate samples, logically contradictory answers, incorrect values, and clearly inattentive responses. When the data were deemed to have content accuracy, we further excluded data beyond 3 standard deviations of the mean response time, resulting in a total of 1445 valid data. Permission for this study was obtained from the Ethics Committee of Shanghai Normal University.

2.2. Questionnaire Measurement. The SEGUE Framework, developed by Makoul [35] and revised by China Medical University in 2006, was used to measure patient ratings for healthcare professionals' communication skills. This scale has five dimensions: preparation, requesting information, providing information, understanding the patient, and ending the consultation. These five dimensions consist of a total of 25 entries, such as "the doctor will greet me politely during the visit" and "the doctor will pick up on my cues." All questions were scored on a five-point Likert scale (1 = "never" and 5 = "all the time"), with higher scores reflecting better patient ratings for physicians' communication skills. Cronbach's alpha coefficient for the scale was 0.878.

The medical stereotype questionnaire developed by Ye et al. [36] was used to measure patients' stereotypes for healthcare professionals. The scale has a total of 24 items, such as "respect for life" and "professionalism," all of which are rated on a five-point Likert scale (1 = "completely disagree" and 5 = "completely agree"), with lower scores indicating a stronger patients' negative stereotypes for healthcare professionals. Cronbach's alpha coefficient for this scale was 0.980.

The Chinese version of the Wake Forest Trust Scale (CWFPTS) is used to assess patients' interpersonal trust in their physicians. The scale was originally developed by Hall et al. and was introduced and revised in Chinese in 2012 [37]. The scale consists of 10 items that cover topics such as "my doctor has my best interests at heart" and "I trust my doctor." All questions were scored on a five-point Likert scale (1 = "strongly disagree" and 5 = "strongly agree"), with higher scores reflecting higher levels of interpersonal trust. Cronbach's alpha for CWFPTS was 0.89.

A self-administered questionnaire was used to measure patients' institutional trust in the healthcare system. The scale assesses patients' trust in the process of access to care, trust in the professional practices of healthcare providers, trust in the quality and safety of the healthcare system, and trust in health insurance. All items were validated by seven front-line medical staff from different regional hospitals using the Delphi method, and there were 31 items, such as "the current medical system is not against social ethics" and "the current medical system reflects fairness." In addition, all questions were rated on a five-point Likert scale (1 = "completely disagree" and 5 = "completely agree"), with higher scores reflecting greater institutional trust. Cronbach's alpha coefficient for this scale was 0.899.

2.3. Analysis. Data analysis was performed using SPSS version 23.0. We performed descriptive analysis, Pearson correlation analysis, and mediation analysis (Model 4 of SPSS Hayes process macro3.3). We normalize all continuous variables and use Hayes' bootstrapping method to test the model. The bootstrapping method is less affected by sample size and does not assume the normality of the mediated paths, so it yields more accurate confidence estimates.

3. Results

3.1. Sample Characteristics. In this study, 2000 patients were invited to participate voluntarily in the survey. As subjects were allowed to freely choose to withdraw from this study, and also freely choose the time and place of completion, so after we implemented the exclusion criteria in strict

accordance with the statistical guidelines of psychometrics and epidemiology, the total number of valid samples recovered was 1445 (72.2%), of which the mean age of the patients was 35.9 years (SD = 11.5). The specific characteristics of the patients are shown in Table 1.

3.2. Descriptive Statistics and Correlation Analysis. Table 2 shows all mean scores, standard deviations, and Pearson correlation of the main variables. As expected, doctor-patient communication, interpersonal trust, and institution trust were positively correlated ($r = 0.36$–0.67, $p < 0.01$). The patients' negative stereotypes for healthcare professionals were negatively correlated with doctor-patient communication, interpersonal trust, and institution trust ($r = -0.36$ to -0.68, $p < 0.01$).

3.3. Mediation Role Analysis. When testing the relationship between doctor-patient communication and patients' negative stereotypes, we found a significant effect of doctor-patient communication on the total effect of negative stereotypes. After adding in interpersonal trust and institution trust, doctor-patient communication had a direct effect on interpersonal trust ($\beta = 0.67$, $p < 0.001$) and institution trust ($\beta = 0.36$, $p < 0.001$). Interpersonal trust ($\beta = -0.38$, $p < 0.001$) and institution trust ($\beta = -0.07$, $p < -0.001$) had a direct effect on patients' negative stereotypes. Doctor-patient communication ($\beta = -0.40$, $p < 0.001$) had a direct effect on patients' negative stereotypes (see Figure 1).

Further, the mediating effect was tested using the bias calibration nonparametric percentile Bootstrap method, and the results showed that interpersonal trust and institution trust mediated significantly, with a mediating effect value of -0.28. Specifically, the mediating effect was generated through two mediating chains: first, an indirect effect consisting of communication ⟶ interpersonal trust ⟶ stereotypes (-0.26), with Bootstrap 95% confidence interval not containing 0, indicating a significant mediating effect on interpersonal trust, second, an indirect effect consisting of communication ⟶ institution trust ⟶ stereotypes (-0.02), with Bootstrap 95% confidence interval does not contain 0, indicating a significant mediating effect on institutional trust (see Table 3).

4. Discussion

Our main findings suggest that the doctor-patient communication during COVID-19 was the main factor in reducing patients' negative stereotypes for healthcare professionals. Moreover, doctor-patient communication can indirectly influence patients' negative stereotypes through trust, suggesting that patients' trust is an important psychological process that contributes to patients' negative stereotypes. In addition, at the level of patients' trust, interpersonal trust and institution trust played different roles in reducing patients' negative stereotypes. Of these, interpersonal trust has a greater impact on reducing negative stereotypes than institution trust, and it can be argued that developing interpersonal trust between patients and doctors

TABLE 1: Demographic characteristics of the patients.

Demographic variables		n	(%)
Gender	Male	659	45.6
	Female	786	54.4
Age	18–30	606	41.9
	31–40	416	28.8
	41–50	216	14.9
	51–60	169	11.7
	>60	38	2.6
Education	Primary school or below	55	3.8
	Junior/Senior high school	399	27.6
	College	902	62.4
	Postgraduate	89	6.2
Hospital grade	Tertiary hospital	1037	71.8
	Secondary hospital	161	11.1
	Primary care institution	34	2.4
	Have no idea	213	14.7
	Total	1445	100.0

TABLE 2: Mean, standard deviations, and correlations of the main variables.

	$M \pm SD$	1	2	3	4
(1) PPC	94.52 ± 16.13	1			
(2) PTP	30.12 ± 4.16	0.67^{**}	1		
(3) PTS	80.83 ± 9.80	0.36^{**}	0.48^{**}	1	
(4) PNSHP	49.97 ± 12.94	-0.68^{**}	-0.68^{**}	-0.39^{**}	1

$N = 1445$. PPC patients' evaluation of healthcare professionals' communication skills; PTP patients' interpersonal trust in their healthcare professionals; PTI patients' institutional trust in the healthcare system; PNSHP Patients' negative stereotypes for healthcare professionals. $^{**}p < 0.01$.

has a greater benefit in reducing patients' negative stereotypes for healthcare professionals.

Specifically, our study found that doctor-patient communication is effective in reducing patients' negative stereotypes. This finding is both consistent with intergroup contact theory and with previously related studies. It was previously found that contact with the target group increased familiarity, mutual knowledge, and information, and increased identification with the outgroup [38], thereby reducing negative stereotypes of the outgroup. Therefore, doctor-patient communication as the main mode of intergroup contact will increase doctor-patient identification by balancing doctor-patient information and thus reduce patients' negative stereotypes for healthcare professionals. Notably, intergroup contact theory suggests that intergroup contact includes more than direct contact interactions, imaginative and online contact can also have a stereotype-reducing effect. For example, Schumann and Moore [39] conducted an 18-month-long intergroup contact intervention, which showed a similar reduction in negative stereotypes when 547 participants interacted with outgroup members by means of synchronous chat or online games. Thus, although the government adopted a policy of social distance maintenance and isolation to prevent the spread of the epidemic during COVID-19, it is still possible to reduce the patients' negative stereotypes for healthcare
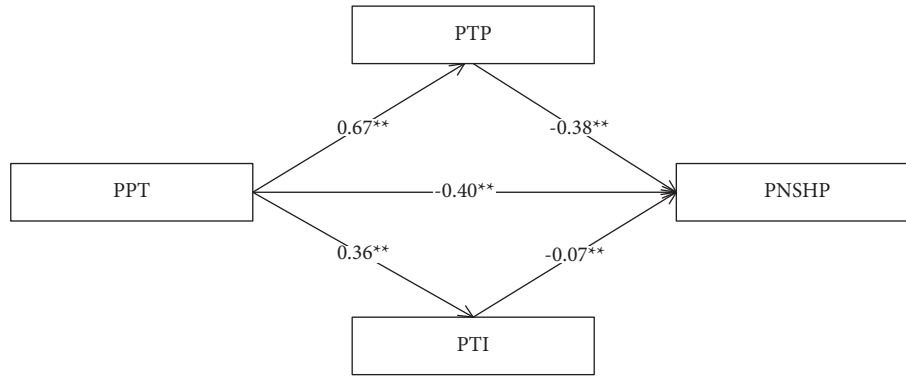
Figure 1: Mediated outcomes of trust in the provider and trust in the institution between communication and negative stereotypes. All paths are expressed as standardized regression coefficients. PPC patients' evaluation of physicians' communication skills; PTP patients' interpersonal trust in their physicians; PTI patients' institutional trust in the healthcare system; PNSHP patients' negative stereotypes of healthcare professionals.

Table 3: Mediating effects of interpersonal trust and institution trust between communication and negative stereotypes.

	Effect	BootSE	BootLLCI	BootULCI	Proportion (%)
Total indirect effect	−0.28	0.02	−0.33	−0.23	41.20
Indirect effect1	−0.25	0.02	−0.31	−0.20	37.63
Indirect effect2	−0.02	0.01	−0.04	−0.00	3.55

BootSE, BootLLCI, and BootULCI, respectively, refer to the standard error of indirect effect estimated by the percentile Bootstrap method with deviation correction, the lower limit, and the upper limit of 95% confidence interval.

professionals by using online web technologies, such as mobile devices, mobile apps, and rolling TV news.

We also found that interpersonal trust played a greater role than institution trust in the effect of doctor-patient communication on patients' negative stereotypes for healthcare professionals. In terms of the effect of doctor-patient communication on interpersonal trust and institution trust, doctor-patient communication has a greater contribution to interpersonal trust. This result is supported by previous studies. Previous research suggested that during COVID-19, real-world uncertainty increases and people face both emotional and cognitive stress. In this context, one is more likely to seek advice and trust individuals with whom one feels a sense of similarity or a close relationship [40]. In addition, social identity theory suggests that specific identity perceptions shape an individual's identification with the group, in which he or she lives and that individuals have positive evaluations in in-group members compared to outgroups. When there is no outgroup, shared destiny and similarity among members can also produce in-group identity [41]. As shared destiny is the result of two or more people experiencing congruence in response to external stimuli. Therefore, COVID-19 can be considered a shared destiny between doctors and patients. Accordingly, shared destiny can enhance the intergroup identity between doctors and patients, which in turn increases the interpersonal trust. On the other hand, between trust and patients' negative stereotypes, interpersonal trust has a stronger effect on reducing negative stereotypes. This result can be explained by risk perception theory. Risk perception theory suggests that people's subjective ratings and judgments of risk can trigger their own attitudes and decision-making tendencies [42]. Studies have found that individuals with high-risk perceptions are more likely to exhibit negative attitudes and evaluations of the target group [43], triggering negative stereotypes of the target. Meanwhile, people found that trust can help reduce patients' perception of risk [44]. However, trust from different sources is crucial when patients are assessing the risks of treatment. Hu et al. [45] used a scenario-based experiment to investigate the effect of trust on risk perception to 316 college students, finding that only individuals with high affective trust had high receptivity to risk, while cognitive trust had no effect on risk perception. Indeed, interpersonal trust has both emotional and cognitive dimensions, while institution trust has only cognitive dimensions. Thus, during COVID-19, where risk is uncertain, patients are more likely to reduce negative stereotypes through the affective dimension of interpersonal trust.

Although this study is based on a patient survey during COVID-19, the findings still have a guiding value for the issue of patients' negative stereotypes for healthcare professionals in nonepidemic periods. First, as for the effect of doctor-patient communication on negative stereotypes, patients' negative stereotypes are rooted in the asymmetry of doctor-patient information, which leads to patients' unreasonable expectations and subjective attitudes bias toward healthcare professionals [46]. However, doctor-patient communication is able to balance the information asymmetry between doctors and patients and change patients' unreasonable perceptions about healthcare professionals [47], which leads to the contextual universality in the effect of communication on stereotypes. Second, as for the effect of doctor-patient communication on interpersonal trust and institutional trust, there is still reason to believe that doctor-

patient communication has a stronger effect on interpersonal trust than institutional trust during the nonepidemic period, especially in light of the developing concept of "patient-centered communication." Because "patient-centered communication" emphasizes respect, empathy, and values between patients and doctors, which include positive emotions and attitudes [48], therefore, "patient-centered communication" is more conducive to the development of interpersonal trust between doctors and patients. Finally, as for the suppressive effect of interpersonal and institutional trust on negative stereotypes, interpersonal trust may still have played a greater role than institutional trust during the nonepidemic period. Because the healthcare situation is a risky environment with uncertainty, compared to institutional trust, interpersonal trust can further reduce patients' psychological defenses and enhance the shared value between doctors and patients through emotional connection [49]. Meanwhile, interpersonal trust has positive emotions which contribute to a more positive evaluation about others [50]. Accordingly, interpersonal trust remains more influential than institutional trust for negative stereotypes in nonepidemic periods.

There are several shortcomings in our study. First, this study used an online platform to distribute the questionnaire during COVID-19, so the survey sample mainly came from urban patients with developed online information and better medical conditions, which makes the results not generalized to all patient groups (e.g., patients in remote mountainous areas); however, considering the limitations of people mobility during the period of COVID-19, it will be a challenge to extend the coverage for more patient groups in the future during the period of major epidemics, which may require multisectoral cooperation among the government, healthcare sector, and scientific research institutes, and a combined online and offline method was used for questionnaire surveys. Second, the age of the patients in this study is concentrated between 18 and 40 years old, and less patients are older than 60 years old, which may be due to the fact that older patients cannot make good use of mobile devices, so the development of an intelligent web survey system faces challenges in the future, which requires a web survey system that can optimize the presentation of the questionnaire according to the reading habits and operating modes of different patients in the mobile smart terminals, offering a "user-friendly feedback interface," and providing intelligent auxiliary explanations for the corresponding groups. Finally, this study used a cross-sectional study, which has limitations on causal inferences; therefore, there are challenges in the future to provide more reliable causal evidence on communication, trust, and negative stereotypes, which may require the involvement of more rigorous experimental methods or longitudinal research methods.

In conjunction with the results of this study, we propose the following recommendations for inhibiting patients' negative stereotypes for healthcare professionals: first, doctor-patient communication is an important factor in reducing patients' negative stereotypes; therefore, it is necessary to train medical providers in communication skills by holding training sessions and standardizing the interpretation of questions. Besides, it is important to emphasize the appropriate emotional expression of medical staff and actively promote the sharing of information between doctors and patients [51]. Second, interpersonal trust and institutional trust both contribute to the reduction of negative stereotypes. In response, on the one hand, efforts should be made to develop interpersonal trust. For example, developing physicians' trustworthy traits such as competence, integrity, kindness, etc., and guiding patients to make proper attributions for negative events. On the other hand, attention should be paid to the building of institutional trust. In this regard, governmental departments should supervise the impartiality of the medicine institution design and facilitate the effective implementation of the medical institution, while medical organizations should ensure the openness and transparency of the institution to satisfy patients' security and to reduce their fear of epidemics, etc. Besides, it is important for communities to actively popularize the advocacy of the healthcare institution for further enhancing patients' understanding and recognition of the healthcare institution.

5. Conclusions

This study found that doctor-patient communication helped reduce patients' negative stereotypes for healthcare professionals; meanwhile, trust was an important psychological mechanism for communication to influence negative stereotypes, in which interpersonal trust played a greater role than institutional trust. These results also contributed to the reduction of negative stereotypes for healthcare professionals during the nonepidemic period. The government and the medical sector can provide an environment guarantee for institutional trust by improving institutional construction. The community and media can construct a culture environment for interpersonal trust by promoting and strengthening the image of healthcare professionals. Healthcare professionals can further enhance patients' interpersonal trust by developing "patient-centered communication."

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Disclosure

The funders had no role in the design of the study, in the collection, analyses, or interpretation of data, in the writing of the manuscript, or in the decision to publish the results.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Yao Wang was responsible for the design of the work, analysis, interpretation of data for the work, and draft

writing. Xiaoou Bu was responsible for proofreading the manuscript. Yanjiao Wang was responsible for revising it critically for important intellectual content. Yawen Du was also responsible for proofreading the manuscript. Yu Liu was responsible for collecting resources and project administration. Pei Wang was responsible for validation, investigation, writing, review, editing, supervision, project administration, funding acquisition, and final approval of the version to be published.

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Research Article

The Association between Operating Room Nurses' Characteristics, Competence, and Missed Nursing Care: A National Survey

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Background. Missed nursing care, which has been explored in various acute care settings, results in adverse patient outcomes and job dissatisfaction in nurses. However, little is known about missed care in the operating room. *Objective.* This study tested a hypothesised model to identify relationships between nurses' age, years of experience in the operating room, job satisfaction, and intention to leave which have direct and indirect effects on the frequency of missed care. The frequency of missed care was hypothesised to be mediated by nurses reported perioperative competence and the reasons for missed care. *Design.* A cross-sectional design using an online survey of Australian perioperative nurses was undertaken in 2022. *Methods.* All Australian College of Perioperative Nurses members were invited to participate. Missed nursing care was measured using the MISSCARE Survey-OR. Age, years of experience, and intention to leave were single-item measures. Satisfaction was a three-item scale. Competence was measured by the 18-item Perceived Perioperative Competence Scale-Short Form. Structural equation modelling was used to test our hypothesised model. *Results.* Of the 5,500 nurses invited, 853 (15.5%) responded, but only 602 (10.9%) participant responses were usable for inclusion in the model. The model demonstrates that participants' age directly predicted the frequency of missed care, nurse role satisfaction, perceived perioperative competence, and reasons for missed care. The reasons for missed care and perceived perioperative competence were mediators that were negatively associated with the frequency of missed care. *Conclusions.* While the final model explained 22.6% of the frequency of missed care, other variables not identified in this study may influence this outcome.

1. Introduction

Missed care is any aspect of care that is omitted or delayed, in part or whole [1]. There is a large body of research on missed nursing care in inpatient units, including medical-surgical and intensive care units [2–5]. One review of 18 studies identified that 75% or more of nurses reported omitting care [6]. An overview of seven reviews identified missed care fell into four categories: communication and information sharing; self-management, autonomy, and education, including care planning, discharge planning, and decision; fundamental physical care; and emotional and psychological care, including spiritual support [7]. An integrative review of

54 papers identified that a combination of nurse, patient, and organizational contextual variables explained 12 to 32% of the variance in missed care across studies reporting this [3]. This same review acknowledged that predictors of missed nursing care included perceived team interactions, adequacy of resources, safety climate, and nurse staffing. Patient outcomes negatively affected by missed nursing care include hospital-acquired infections, pressure injuries, falls, discharge planning, mortality, patient mobilisation, feeding, and psychological and emotional support [1, 8–11]. Clearly, missed care may compromise patient safety [7].

Several systematic reviews [3, 4, 6, 12–14] and an overview of reviews [7] have identified predictors of missed
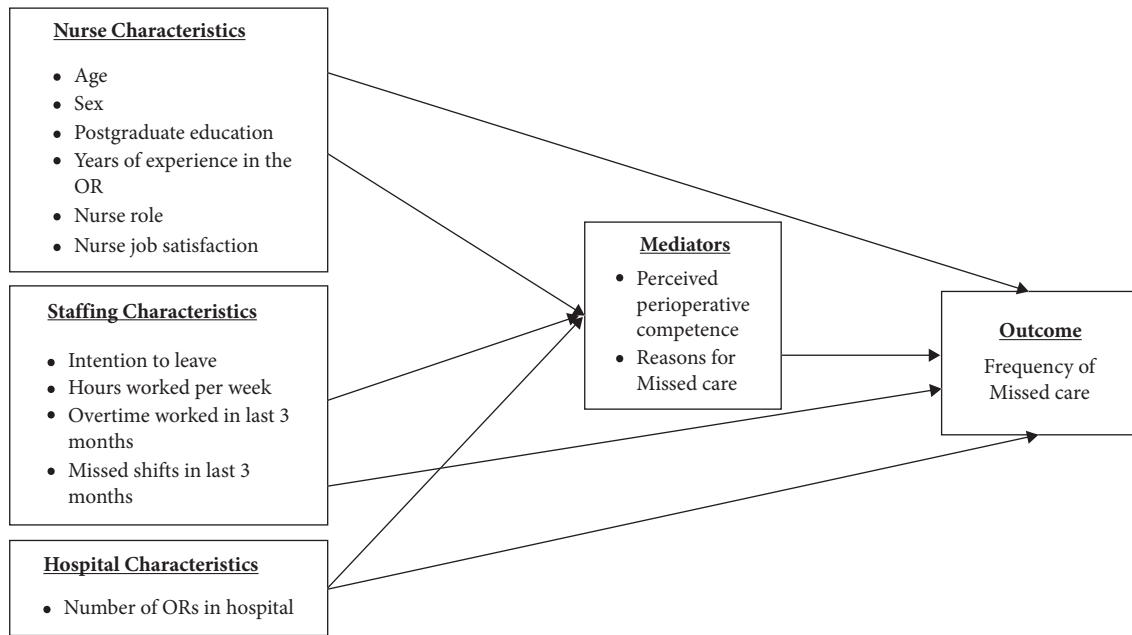
FIGURE 1: Hypothesised model indicating expected pathways of association.

nursing care across a variety of hospital contexts but predominantly in medical-surgical settings [7]. Across these reviews, factors found to be associated with missed nursing care included skill mix, i.e., combination and distribution of clinical skills and competencies in the nursing workforce [6], staffing levels [3, 6, 13], a lack of material resources [3], patient acuity [3, 13], and teamwork and communication [3, 12, 13]. Only one study of missed nursing care in the operating room (OR) setting was identified. In a survey of 1,593 US OR nurses, Marsh et al. [15] found significant associations between the number of operating rooms at a facility, nurse education, job title, perceptions of staffing adequacy, and frequency of missed perioperative nursing care.

Kalisch's Missed Nursing Care Model [1, 11] has been seminal in this field. The Missed Nursing Care Model illustrates the various attribute categories nurses report in acute care settings that contribute to missed nursing care. This framework examines three concepts; structure (e.g., hospital, patient care unit, and nurse characteristics), process (missed care), and outcomes (staff outcomes such as job satisfaction and patient outcomes). Interestingly, despite the importance of nurse characteristics in this model, there is a paucity of research on the effect of nurses' competence on missed nursing care.

Competence broadly encompasses nurses' knowledge, skills, and attitudes required to undertake their professional role and clinical practice effectively and safely [16]. While these generic attributes apply across any nursing setting and speciality, they do not reflect the behavioural markers that specifically apply to specialities such as OR nursing [17]. In this highly specialised context, competence is conceived relative to technical and nontechnical skills [18, 19]. For instance, technical skills encompass practical and foundational knowledge, whereas nontechnical skills include

teamwork, communication, leadership, and holistic and empathic care [19–21]. Competence is a critical determinant of role performance, and thus, it is reasonable to assume that perioperative competence is related to the quality of care that nurses provide. However, paradoxically, the relationship between perioperative competence and missed nursing care has never been tested.

1.1. Missed Nursing Care in OR Nursing: A Hypothesised Model. We have built on Kalish's model to incorporate nurse competence as an essential structural predictor of missed nursing care (Figure 1). The empirical relationships between nurses' demographic characteristics, unit, and missed care have been well established across a body of research over the past two decades [2, 8, 9, 22–24]. The results of several studies also suggest that nurse job satisfaction and staffing levels contribute to missed care [2, 11, 13, 22, 24]. Kalisch and others examined the relationship between missed care and staff outcomes of job satisfaction, intention to leave, hours worked per week, and overtime as outcomes. However, in our hypothesised model, we have treated these staff outcomes as potential predictors of the frequency of missed care. Therefore, in this model, hours worked and overtime have been considered surrogates of staff fatigue, which may contribute to missed care. We also hypothesised that there is a relationship between the number of ORs and the frequency of missed care: larger OR departments have implications for an increased workload and time pressures, staffing, and resources. Additionally, the relationship between reasons for missed care and its frequency has not previously been established. We hypothesised that nurses' age, years of OR experience, job satisfaction, intention to leave, hours and overtime worked, and the number of ORs

and reasons for missed care have direct effects on the reported frequency of missed care.

However, we also wanted to describe the contribution of nurses' perceived perioperative competence on the reported frequency of missed care. Safe nursing care in the OR environment requires competence in practice, as nurses need to apply nontechnical skills such as coordination, communication, teamwork, and empathy [19]. Therefore, we hypothesised that nurses perceived perioperative competence would be inversely related to the frequency of missed nursing care and mediate the effect of nurse, staff, and hospital characteristics. Findings generated through this study may help nurse managers identify areas of OR practice where missed nursing care most often occurs and enable them to develop strategies that specifically target these areas.

2. Materials and Methods

2.1. Design, Setting, and Sample. A cross sectional design using an online survey design was used. Two members of the research team pilot tested the survey for flow, structure, and ease of navigating the electronic interface. A census of all 5,500 operating room nurses who were members or associate members of the Australian College of Perioperative Room Nurses (ACORN) was undertaken in 2022. Eligible participants included registered nurses (RNs) working in clinical (i.e., circulating, instrument, anaesthetic, and recovery room roles) and education roles across public and private sectors. Enrolled nurses were excluded due to the differences in their scope of practice. The conduct and reporting of the study were guided by the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement [25].

2.2. Measures. The online survey had three components measuring (1) demographic characteristics; (2) preoperative and intraoperative missed care; and (3) perceived perioperative competence. The survey had 111 items and took approximately 25 minutes to complete. Fifteen questions were used to collect data on participants' age, sex, state or territory of residence, clinical role, years of OR experience, highest qualifications, job satisfaction, hours of overtime worked over the past three months, intention to leave current position, and staffing levels. Job satisfaction was measured using a 5-point Likert scale to indicate the degree of satisfaction ranging from *very satisfied* to *very dissatisfied* [24, 26]. We recoded this variable so higher scores indicated higher job satisfaction.

2.2.1. The MISSCARE Survey-Operating Room. Part A includes elements of preoperative and intraoperative missed nursing care, and part B includes reasons for this missed care [15, 27]. The 53-item survey with five subscales has been psychometrically validated in a US sample of 1,693 operating room nurses and has five subscales: legal, preparation, safety, communication, and closing routine. Response options for the preoperative and intraoperative care items include *never, rarely missed, occasionally missed, always,* and *not applicable.*

Response options for reasons for missed care include *significant, moderate, minor,* and *not a reason for missed care.* This measure was also recoded for interpretation, where higher scores indicated the item was frequently perceived as missed in the preoperative and intraoperative periods, as well as higher scores indicating agreement that the reason presented was a significant reason care was missed.

2.2.2. Perceived Perioperative Competence. Competence was measured with the Perceived Perioperative Competence Scale-Short Form (PPCS-SF) [28]. The scale has six dimensions of perioperative competence: foundational knowledge, proficiency, professional development, leadership, collaboration, and empathy. The short form 18-item scale was derived and psychometrically validated using items from the previously validated 40-item PPCS-revised form [19]. The PPCS-SF has been validated and includes the same six subscales that indicate different dimensions of perioperative competence: foundational knowledge, proficiency, professional development, leadership, collaboration, and empathy. Total scores for each subscale can be calculated and considered separately. Both measures were developed in Australia and tested with over 1,500 operating room nurses. Like the previous revised version, the short form has a five-point Likert scale: *never (1), sometimes (2), often (3), very often (4),* and *always (5).* Scale scores range from 18 to 90, with higher scores indicating greater levels of perioperative competence.

2.3. Data Collection. The university's research data capture (REDCap) hosted the online survey [29, 30] data management system. Recruitment was active for six weeks (March–April 2022), with three reminders emailed fortnightly to potential participants.

2.4. Data Analyses. Survey data were exported into SPSS version 27 (Armonk, NY: IBM Corp.) for data cleaning and assumption checks. The types of descriptive analyses used to describe the sample and both the competence and MNC scales were determined by the level of the data (i.e., categorical or continuous) and its distribution. For example, frequencies, including numbers and percentages, were used for categorical variables (e.g., gender, role, and type of facility), while means and standard deviation were calculated for continuous variables (e.g., age, years of OR experience, and scales: MISSCARE-OR and PPCS-SF).

In inferential analyses, the dependent variable was the overall missed nursing care score, based on the average amount of reported missed nursing care identified for each of the elements of nursing care for each participant on a five-point scale (i.e., 0 = *never missed* to 4 = *always missed*). Based on our hypothesis, we used a model-building approach [31], starting with bivariate correlations to determine associations between demographic factors (i.e., age, years of OR experience, education qualifications, role, and hospital facility), nurse factors (i.e., perceived perioperative competence, overtime worked, job satisfaction, intention to leave, and

Table 1: Sample characteristics.

Characteristics	Sample	n	%
Participant variables			
Age in years (M, SD), range	535	46.02 (11.39), 21–75	
Sex	539		
Female		497	82.6
Male		42	7.0
Primary role	538		
Circulating/instrument nurse		304	50.5
Postanaesthetic recovery unit		43	7.1
Anaesthetic nurse		91	15.1
First surgical assistant (RN)		7	1.2
Multiple roles		17	2.8
Management		49	8.1
Educator		27	4.5
Qualifications	533		
Undergraduate education		412	77.3
Postgraduate education		121	22.7
OR nurse years of experience (M, SD), range	531	18.59 (11.64), 1–57	
<10 years		145	24.1
>10 years		386	64.1
Number of hours worked per week (M, SD), range	520	32.14 (11.78), 0–80	
Currently working full-time load (≥35 hrs/wk)		212	35.2
Number of overtime hours worked in the last 3 months (M, SD) range	525	26.40 (33.28), 0–240	
Number of shifts missed due to illness, injury, etc. in the last 3 months (M, SD) range	522	2.81 (5.17), 0–40	
Intention to leave	527		
In the next 6 months		72	12.0
In the next year		98	16.3
No plans to leave		357	59.3
Satisfaction (M, SD) range	547	10.65 (2.83), 3–15	
Hospital characteristics			
Number of ORs	533	9.75 (7.08), 1–40	
<6		224	37.2
>6		309	51.3
Surgery type	540		
Outpatient surgery		382	63.5
Inpatient surgery		472	78.4
Adult surgery		490	81.4
Paediatric surgery		360	59.8
Location (state/territory)	528		
Australian Capital Territory		10	1.7
Queensland		122	20.3
Northern Territory		4	0.7
New South Wales		132	21.9
Victoria		136	22.6
South Australia		51	8.5
Western Australia		35	5.8
Tasmania		19	3.2
International		19	3.2
Surgical speciality	540		
General surgery		466	77.4
Gynaecology		391	65.0
Urology		379	63.0
Orthopaedics		394	65.4
Transplant		60	10.0
Trauma		207	34.4
Burns		41	6.8
Plastics		336	55.8
Ears nose and throat		320	53.2
Dental/oral		296	49.2
Neurosurgery		139	23.1

Characteristics	Sample	n	%
Ophthalmology		219	36.4
Vascular		217	36.0
Cardiac		100	16.6
Thoracic		124	20.6

Note. M = mean; SD = standard deviation; OR = operating room; RN = registered nurse.

staffing levels), and missed nursing care. Factors that shared a direct relationship that were statistically significant ($p < 0.05$) were subsequently entered into an SEM to predict any direct or indirect effects on the frequency of missed care in the operating room.

SEM was used because it allowed for the testing of both direct (observed) and indirect (latent) effects while accounting for mediating variables [32]. Additionally, one of the greatest advantages of using SEM is its ability to manage measurement error which may potentially weaken parameter estimates. The final hypothesised SEM was fitted to a covariance-based structural equation model with a maximum likelihood estimator using the lavaan package in R (lavaan version 0.6-13, R version 4.2.2. RStudio version 12.0). Standard errors and associated p values were calculated using the robust maximum likelihood (mlr) to account for any non-normality in the data. Maximum likelihood (ml) was also applied to account for missing data. Model fit was assessed using χ^2 Goodness-of-Fix Index, the Comparative Fit Index (CFI), and the Tucker–Lewis Index (TLI), which all should be above 0.9 for acceptable fit; the standardised root mean squared residual (SRMR), which should be below 0.08; and the root mean square error of approximation (RMSEA), which also should be below 0.08 and not significantly different from 0.05 ($\alpha = 0.05$, one-tailed). Standardised factor loadings over 0.4 were considered acceptable [33].

2.5. Ethical Considerations. Submission of the survey in the REDCap system implied consent. The study was reviewed and approved by the author's Human Ethics Review Board (HREC Griffith University reference number 2021/774).

3. Results

3.1. Sample Characteristics. Sample characteristics are displayed in Table 1. The total number of respondents was 853 (15.5% of an estimated 5500 invited). However, of the 853 that engaged with the survey, only 602 (70.6%) provided data that could be analysed as not all participants completed the demographic items. Thus, the sample used in the SEM was 602. The average age of the sample was 46 years (SD 11.4). Respondents were predominately female (82.6%), and their primary OR role was circulating/instrument nurse (50.5%). Under half of the sample held a bachelor's degree in nursing (40.4%). However, 121 (20.1%) reported having post-graduate education. The sample was highly experienced operating room nurses, with 64.1% indicating they had worked in an operating room for 10 or more years. All

surgery types and surgical specialists were represented in this sample.

3.2. Model Building. Before testing the model, a correlation matrix was used to examine the initial predictor relationships with the frequency of missed nursing care (Table 2). All potential predictors with a significant direct relationship were entered into the SEM model. The correlation matrix showed that the following variables were statistically associated with the reported frequency of missed care in the operating room: reasons for missed care in the operating room, perceived perioperative competence, age (years), intention to leave, and nurse satisfaction. Additionally, years of experience in the operating room were added to the model due to its moderate association with perceived OR experience. Overall, Spearman's correlations were weak to moderate ($|r| = 0.03–0.37$).

3.3. SEM of Frequency of Missed Care in the Operating Room. The model testing results demonstrate that participant age predicted the frequency of missed care, whereas younger participants reported higher frequency and satisfaction. In contrast, those with lower satisfaction in nursing roles reported a higher frequency of missed care. In relation to perceived perioperative competence, those with higher perceived competence reported less frequency and reasons for missed care. Respondents who reported higher agreement for potential missed care reasons also reported a higher frequency of missed care observed in their workplace. Reasons for missed care was the strongest predictor $\beta = 0.30$, followed by satisfaction $\beta = -0.20$ and perceived perioperative competence $\beta = -0.18$. However, in contrast to our hypothesised model, intention to leave in the next six months and years of OR experience in the operating room did not directly predict the reported frequency of missed care. Age and satisfaction also indirectly affected the frequency of missed care via reasons for missed care, as well as years of experience in the operating room mediated through perceived perioperative competence (Table 3). The total effect of age on the frequency of missed care was −0.23, while satisfaction was −0.32 and years of experience in the operating room was −0.10 (Table 3). The final model is displayed in Figure 2. The model predicted 15.1% of the variance in perceived perioperative competence, 15.9% of the variance in reasons for missed care, and 22.6% of the variance in frequency of missed care. All parameter estimates, including indirect and total effects, are presented in Table 3.

TABLE 2: Correlation matrix of study variables.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1	Frequency of missed care in OR[a]	—											
2	Reasons for missed care in OR[b]	0.372**	—										
3	Perceived perioperative competence[c]	-0.207**	-0.059	—									
4	Sex	0.068	-0.041	-0.147**	—								
5	Age (years)	-0.200**	-0.201**	0.305**	-0.140**	—							
6	Number of ORs in hospital	0.044	0.104*	-0.074	-0.042	-0.048	—						
7	Postgraduate education	0.034	0.04	0.067	0.068	-0.042	0.079	—					
8	Hours per week worked	0.039	-0.013	0.083	0.101*	-0.131**	0.098*	0.067	—				
9	Years of exp in OR	-0.082	-0.076	0.394**	-0.156**	0.782**	0.01	-0.062	-0.142**	—			
10	Intention to leave	0.096*	0.111*	0.023	0.00	0.043	0.031	-0.028	-0.058	0.079	—		
11	Overtime in last 3 months	0.053	-0.043	0.127**	0.044	-0.065	-0.072	0.007	0.340**	-0.048	-0.028	—	
12	Missed shifts in last 3 months	0.090	0.107*	0.002	0.003	-0.179**	0.06	-0.069	0.032	-0.138**	0.031	0.052	—
13	Nurse job satisfaction[d]	-0.306**	-0.299**	0.08	-0.004	0.111*	-0.027	0.122**	0.051	0.00	-0.302**	-0.044	-0.125**

OR = operating room. *Note*. *Spearman's correlation is significant at the 0.05 level (2-tailed); **significant at the 0.01 level (2-tailed). a = MISSCARE survey-operating room, b = perceived perioperative competence scale-short form (PPCS-SF), c = MISSCARE survey-operating room and d =job satisfaction scale.

TABLE 3: Parameter estimates for the model predicting frequency of missed care in the operating room.

Paths	B	SE B	p	β
Direct paths				
Age ⟶ frequency of missed care	−0.007*	0.003	0.021	−0.166
Years of experience ⟶ frequency of missed care	0.005	0.003	0.071	0.131
Intention to leave ⟶ frequency of missed care	−0.031	0.045	0.492	−0.032
Satisfaction ⟶ frequency of missed care	−0.094**	0.027	0.001	−0.203
PPC ⟶ frequency of missed care	−0.169***	0.046	<0.001	−0.183
RMC ⟶ Frequency of missed care	0.224***	0.041	<0.001	0.300
Age ⟶ PPC	0.002	0.003	0.512	0.046
Years of experience ⟶ PPC	0.015***	0.003	<0.001	0.351
Age ⟶ RMC	−0.015***	0.004	<0.001	−0.282
PPC ⟶ RMC	0.002	0.036	0.956	0.002
Years of experience ⟶ RMC	0.007	0.004	0.076	0.128
Intention to leave ⟶ RMC	−0.031	0.063	0.623	−0.024
Satisfaction ⟶ RMC	−0.220***	0.037	<0.001	−0.357
Covariances				
Age ↔ years of experience	105.37***	7.277	<0.001	0.797
Intention to leave ↔ satisfaction	−0.18***	0.024	<0.001	−0.396
Indirect effects				
Age ⟶ RMC ⟶ frequency of missed care	−0.004***	0.001	<0.001	−0.108
Years of experience ⟶ PPC ⟶ frequency of missed care	−0.003**	0.001	0.002	−0.069
Satisfaction ⟶ RMC ⟶ frequency of missed care	−0.054***	0.012	<0.001	−0.117
Total effects				
Age ⟶ frequency of missed care	−0.009***	0.002	<0.001	−0.227
Years of experience ⟶ frequency of missed care	−0.004*	0.002	0.043	−0.098
Satisfaction ⟶ frequency of missed care	−0.146***	0.026	<0.001	−0.317

PPC = perceived perioperative competence; RMC = reasons for missed care. *Note.* *p ≤ 0.050; **p = 0.01 level; ***p = 0.001 level.
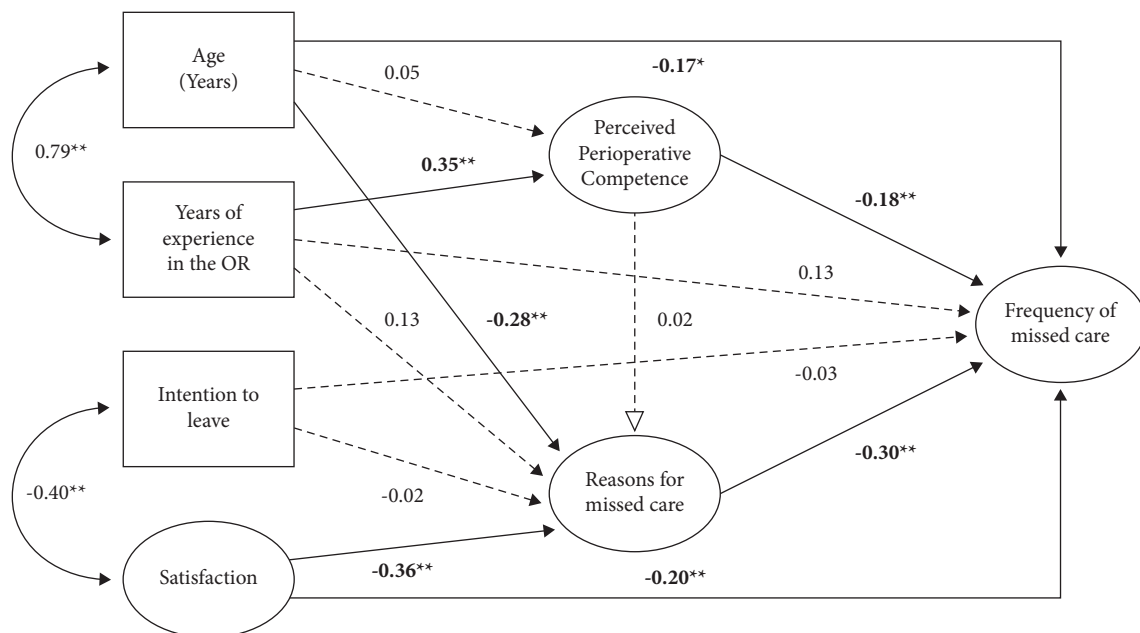

FIGURE 2: Final model with standardised coefficients. *Note.* The dashed lines with arrows represent nonsignificant relationships (p > 0.05). *p < 0.05, **p < 0.01. The dashed lines with arrows represent nonstatistically significant relationships (p > 0.05). *p < 0.05, **p < 0.01.

The analysis indicated an acceptable model fit to the data on most indices (CFI = 0.90; TLI = 0.90; RMSEA = 0.04 (0.037, 0.040), p = 1.00; and SRMR = 0.051) (Figure 2). However, the Chi-square value did not support good model fit (χ^2 (2499) = 4733.45, p < 0.001). In the measurement models, all items were significantly loaded onto their respective factors (all p's <0.05), and no items had negative variances or negligible standardised loadings (all loadings >0.4).

4. Discussion

To our knowledge, this is the first study to identify factors predictive of reported missed OR care using SEM. Previous research examining missed OR care [15] has only investigated the types and frequencies and relationships of missed care to facility characteristics. Generally, our findings relative to some nurse characteristics support the broader research in this area. Twelve nurse and hospital characteristics predictors were entered into the initial model as part of a model-building approach, but only five were explored in the final SEM. Moreover, some model paths were not statistically significant (i.e., intention to leave in the next six months and years of OR experience). We found that nurse age and job satisfaction had direct and indirect effects, and years of experience only indirectly influenced participants who reported perceived missed care in the OR. Reasons for missed care and perceived perioperative competence were mediators in the model. Relationships between reasons for missed care, perceived perioperative competence, and missed care have not been tested in *any* nursing context and thus are novel, adding new knowledge to what is already known. Notably, the reasons for missed care and perceived perioperative competence are amenable to change via interventions. Therefore, these results identify areas that nurse managers can focus on when developing strategies to address the reasons for missed care.

4.1. Mediators of Missed Perioperative Nursing Care. Reasons for missed perioperative care were the strongest predictor contributing to the reported frequency of missed OR care. Reasons for missed nursing care include team communications and interruptions, limited resources, and staff factors such as inadequate skill mix and staffing. Inadequate skill mix in the OR environment has been formerly identified as a major patient safety issue in previous research [34, 35]. An earlier literature review of 14 studies identified that lower staffing levels contributed to missed care across various nursing environments [6, 24]. In our study, other items with high loadings on the Reasons for Missed Care scale related to teamwork and communication breakdowns and lack of support from coworkers. Patients are at their most vulnerable during surgery; as such, the importance of effective teamwork and communication for safe OR care cannot be overstated [18, 19, 36, 37]. Notably, there is an even greater imperative for team members to work cohesively together in this high-dependency context [35–37]. Plausibly, ineffective teamwork in the OR can result in communication breakdowns, reduce efficiency and coordination, increase errors, and create an environment lacking support. Ultimately, this leads to job dissatisfaction, which in our study has been identified as a predictor of the frequency of missed nursing care. There is an abundance of research undertaken in OR contexts [36–39] describing the barriers to effective teamwork and communication among members of the interdisciplinary team. Our results support previous research undertaken in med-surg environments [11, 40] that has identified a lack of teamwork as a predictor

of missed nursing care. Clearly, the reasons for missed care are highly correlated to missed care and can potentially compromise patient safety.

Importantly, this study found a direct relationship between perceived perioperative competence and the frequency of missed care. This is the first study to identify a direct relationship between these constructs. Arguably, it is reasonable to expect that nurses reporting higher levels of perceived perioperative competence would also report fewer occasions of missed care. Competent nurses are often better at managing their time effectively, which can help them prioritise their tasks and ensure that important nursing care is not missed [16, 40, 41]. Additionally, more competent nurses are likely to have better clinical judgment. This can help them identify tasks requiring priority or immediate attention and ensure appropriate nursing care is provided [16, 19]. Second, competent nurses are likely to have a higher level of knowledge and skills related to patient care, which can help them provide more comprehensive and effective nursing care [17]. Third, competent nurses may be more confident and assertive in their interactions with patients and other healthcare professionals. This can help them advocate for their patients and ensure that important nursing care (e.g., pressure area care and intraoperative warming) is not overlooked.

The pressure to complete operations within tightly scheduled timeframes and finite resources may contribute to missed care. Additionally, there is often a disconnection between the priorities of surgeons, anaesthetists, and team nurse members [38]. Thus, establishing a hierarchy of priorities is important but not easy in this environment, as nurses must work interdependently with other disciplines, and these members have a different focus. OR nurses need to differentiate between care that must be immediately provided and care that can wait. Perhaps some tasks are viewed by nurses as not having any intermediate or measurable impact on patient outcomes, e.g., pressure area care, providing comfort measures, and communication of essential information. The results of this study may have implications for OR nurse education and on-the-job training. The emphasis on particular nursing tasks in the OR may shape the novice nurse's attitudes at the beginning and during their professional transition in deciding how to prioritise which care activities can be missed.

4.2. Limitations. We acknowledge several study limitations. First, because it was cross sectional, we identified associations but could not conclude causation; that is, our hypothesised predictors were the cause of the frequency of missed nursing care. Thus, results need to be interpreted with caution. Second, we cannot rule out selection bias despite inviting all OR nurses in Australia's peak professional organisation. Moreover, of the 5,500 perioperative nurse members, only 602 responded. To mitigate non-response bias, the survey was available for six weeks, with two email reminders and social media posts used to help advertise the survey (e.g., the ACORN Facebook page). Though the sample of those who responded was small, it was represented for all Australian states, and surgical specialities.

Third, variable effects were weak to moderate, and the total amount of variance explained by the model was 23%. This low amount of variance explained by our model indicates that other variables that influence the reported frequency of missed care in the operating room have not been identified.

Furthermore, while model fit statistics were acceptable, modification indices were not explored and may suggest measurement model improvements could be made. However, modification indices represent a statistical decision approach, and our model relied on previously validated scales (e.g., MISSCARE-OR, job satisfaction, and PPCR-SF). Thus, model improvement was not undertaken by removing poorly performing items, or correlating item and or latent variable pathways that were not hypothesised. Finally, this study's data source may be biased because all study variables were nurse reported. Future studies could include source data from patients to confirm the results, even though nurse-reported patient safety indicators have been used widely in research and are proven to be substantially associated with patient outcomes.

4.3. Implications for Nursing Management. The results of our study suggest that younger, more job-dissatisfied nurses reported higher frequencies of reasons for missed care and missed care in the OR. Nurse managers in the OR are critical in promoting nurses' job satisfaction, thus minimising the potential for missed care. To improve job satisfaction among OR nurses, nurse managers should invest in team-building exercises, effective communication training, and a culture that values collaboration, mutual respect, and continuous improvement. Nurse managers are well positioned to promote collaboration and interdisciplinary communication within the team. Fostering effective teamwork and communication can help prevent missed nursing care that arises from miscommunication or lack of coordination among different healthcare professionals. Additionally, providing support systems for OR nurses, such as debriefing sessions after challenging cases, can help alleviate stress and foster a sense of teamwork and job satisfaction. Nurse managers must advocate for necessary resources, including adequate staffing levels, appropriate equipment and supplies, and access to technology or tools that facilitate safe care provision. Appropriate resourcing will help to address job satisfaction and address some reported reasons for missed nursing care. Importantly, nurse managers are responsible for appropriate staffing levels and workload distribution and should ensure that an adequate number of qualified OR nurses are available to provide care to patients. By monitoring patient acuity and staff skill mix, staffing levels can be adjusted accordingly. Thus, OR nurse managers can help prevent situations where nurses are overwhelmed with excessive workloads, which may also lead to missed nursing care. Furthermore, they can encourage OR nurses to communicate their concerns, challenges, and workload issues.

5. Conclusions

This study showed that MNC in the OR setting is complex and is explained by several factors. Considering the modest effects found between the variables and the low variance explained by the final model, further studies are needed to identify other factors that may contribute to missed care in the OR. Nonetheless, our results are novel as we have identified relationships between the reasons for missed nursing care, competence, and frequency of missed nursing care, not previously explored. These relationships have not previously been identified, adding new understandings to this complex issue. Though further research is needed to confirm these findings, we present some key recommendations nurse managers can consider implementing to support their staff, reduce the missed care nurses are reporting in the OR, and improve patient outcomes.

Data Availability

The data are not publicly available due to ethical approval requirements.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

The Association between Working Hours with Vigilance and Executive Function of Intensive Care Unit Nurses

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Background. Vigilance and executive functions are integral to nursing practice. Prolonged working hours are associated with heightened fatigue and increased nursing errors. However, the impact of work duration on the vigilance and executive function of ICU nurses remains unexplored. *Objective.* This study aims to elucidate the association between ICU nurses' working hours, vigilance, and executive function. *Design.* A cross-sectional study. *Setting.* Intensive care medicine department of a tertiary hospital in Zhengzhou, China. *Participants.* A total of 51 registered nurses who participated in 12 h shifts in the ICU completed the survey. *Methods.* E-prime software was employed to develop four test tasks to measure the vigilance and executive functioning of ICU nurses. The test was performed before the start of the shift and after 4, 8, and 12 h. *Results.* The analysis revealed no statistically significant differences in the response time of vigilance for ICU nurses across shifts ($p = 0.503$) or working hours ($p = 0.078$). However, a significant difference existed in lapses across working hours ($p = 0.005$), significantly increasing after 8 and 12 h. The analysis indicated a significant difference in Flanker effect size across different working hours ($p = 0.035$). The analysis revealed no significant differences in the switch cost ($p = 0.200$) or response accuracy ($p = 0.479$) of the task switching across working hours. The response accuracy for the 2-back task differed significantly ($p = 0.003$) across working hours. *Conclusion.* Limited evidence demonstrated that vigilance and specific aspects of executive functioning (inhibitory control and working memory) of ICU nurses were negatively correlated with the duration of their work in a real clinical setting. Furthermore, no vigilance and executive function differences were identified between day and night shifts. *Implications for Nursing Management.* Nursing administrators should reconsider scheduling 12 h shifts, shortening shifts, or implementing short rest periods to reduce fatigue and cognitive load. In addition, flexible scheduling and rationalizing the order of work may help reduce the possible risks associated with prolonged work.

1. Background

It is well known that ICU patients have complex conditions, imparting a high workload on ICU nurses as they are responsible for observing patient condition changes and completing various nursing practices and records. Significant physical and mental demands pose significant challenges for ICU nurses [1]. ICU nurses must maintain high vigilance and executive function (EF) to ensure patient safety. However, research in psychology and neuroscience suggests that the human brain has limited cognitive resources, such as the attention span and working memory capacity. Multitasking and attentional interference can slow response times and increase the likelihood of errors [2, 3]. When ICU nurses lose vigilance in clinical settings, they may fail to detect patient condition changes, resulting in treatment delays. Furthermore, as EF declines, nurses may become more susceptible to interruptions, potentially leading

to nursing errors. Therefore, vigilance and EF are crucial for patient safety, and further research is being conducted in these areas.

Vigilance is the ability of an individual to maintain attention to tasks over time. Initially, vigilance research focused primarily on high-concentration occupations such as pilots and drivers [4]. Poor driver vigilance results in reduced sustained attention and increased risk of human error, which can have serious consequences. There is growing recognition of the importance of vigilance for the safety of both caregivers and patients. Monitoring and responding immediately to patient condition changes are fundamental nursing responsibilities, making vigilance at the core of nursing practice [5]. Subsequent nursing actions cannot be performed without constant patient observation.

Executive function is the ability of an individual to control and regulate complex cognitive tasks, which is a higher-order cognitive function [6]. Zelazo and Müller classified EFs into two types based on brain imaging: hot executive function and cold executive function [7]. Hot executive function involves emotional engagement and flexible evaluation of rewarding and stimulating tasks, whereas cold executive function lacks emotional involvement and is often characterized by logical and abstract thinking [7]. Numerous studies have been conducted on cold executive function, and the widely used model divides it into three aspects: inhibitory control ability, shifting, and working memory, each closely related to nursing performance [8]. Compared to other professions, nurses require multitasking skills and the ability to quickly shift attention and maintain memory between patients and different events. In nursing practice, nurses must carefully plan their workflow to avoid omissions or errors, a process requiring high executive capacity.

Vigilance and EF of nurses are not solely affected by disruption of the day-night sleep schedule but also the length of working hours, which should not be overlooked. In clinical practice, nurses routinely work 8 or 12 h shifts. Although a 12 h shift may reduce the number of shifts and commuting time while also allowing for more continuous patient care, it is believed that prolonged periods of uninterrupted work are associated with increased fatigue and poor performance [9]. A study demonstrated that nurses working 12.5 h or more had more than three times the risk of errors than those who worked less than 8 h [10]. Furthermore, a systematic review reported that nurses working 12 h shifts had a higher incidence of self-reported errors than those working 8 h shifts, posing a potential threat to patient safety [11].

Based on a comprehensive review of the existing literature, we found that vigilance and EF are impaired among day-night shift-working nurses. However, most studies attribute decreased vigilance and EF to shift nurses' circadian disruptions [12, 13]. The relationship between working hours, nurses' vigilance and EF has been widely underestimated. In addition, studies on the ICU nurse population are still lacking, and limited data on vigilance and EF of Chinese nurses are scarce. Furthermore, our study may be the first to assess EF through three computerized tasks based

on a theoretical model, which can contribute to further understanding of impaired EF in nurses [8]. Given these gaps in the literature, the present study used a computerized task to investigate the impact of working hours on the vigilance and executive function of ICU nurses. This study aimed to collect empirical evidence to help managers make informed decisions regarding scheduling practices.

The study is designed based on two hypotheses:

Hypothesis 1. ICU nurses' vigilance and EF were negatively correlated with work hours.

Hypothesis 2. Nurses exhibit lower levels of vigilance and EF during night shifts than day shifts.

2. Methods

2.1. Design. This study used a cross-sectional design with E-prime software for task programming and data collection. The practice session occurred from February 13 to February 26, 2023, and data collection was performed from March 6 to March 26, 2023. To ensure a thorough understanding of the task rules, all participants were required to practice for a minimum of 20 min with at least 80% accuracy during the practice session.

2.2. Participants. This study was conducted in the Department of Critical Care Medicine at Henan Provincial People's Hospital, Zhengzhou, China. The work schedule (day-night-off night and rest) aligns with hospital regulations and rules, ensuring continuous 24 h service for patient care, as is typical in ICUs in Chinese hospitals. Day-shift nurses worked from 8 a.m. to 8 p.m., and night-shift nurses worked from 8 p.m. to 8 a.m. Registered nurses working 12 h shifts were eligible for inclusion in the study. Individuals who had taken psychotropic drugs in the last three months or were pregnant were excluded. Considering that there were no relevant data in China before, the sample size was selected based on similar studies [14, 15]. A total of 52 nurses participated in the practice sessions. However, one nurse dropped out due to other training, resulting in a final dataset of 51 nurses.

2.3. Measures. The test task for the present study was developed using E-Prime 2.0, and the experimental paradigm is illustrated in Figure 1. The task was performed on a 14-inch laptop connected to an external 21.5-inch monitor with a 1920×1080 pixel screen resolution and a refresh rate of 75 Hz. The test was conducted in a quiet room approximately 50 m from the ward, with participants seated approximately 60 cm in front of a computer screen. Participants completed eight tests: before (day and night) shifts (T0), after 4 h (T1), after 8 h (T2), and after 12 h (T3) of work. Because clinical practice is unpredictable, data collection was permitted to be completed within 30 min before and after the scheduled time.

2.3.1. Vigilance. The present study used a 3 min version of the psychomotor vigilance task (PVT) to evaluate nurses' vigilance. PVT is widely recognized as the gold standard for
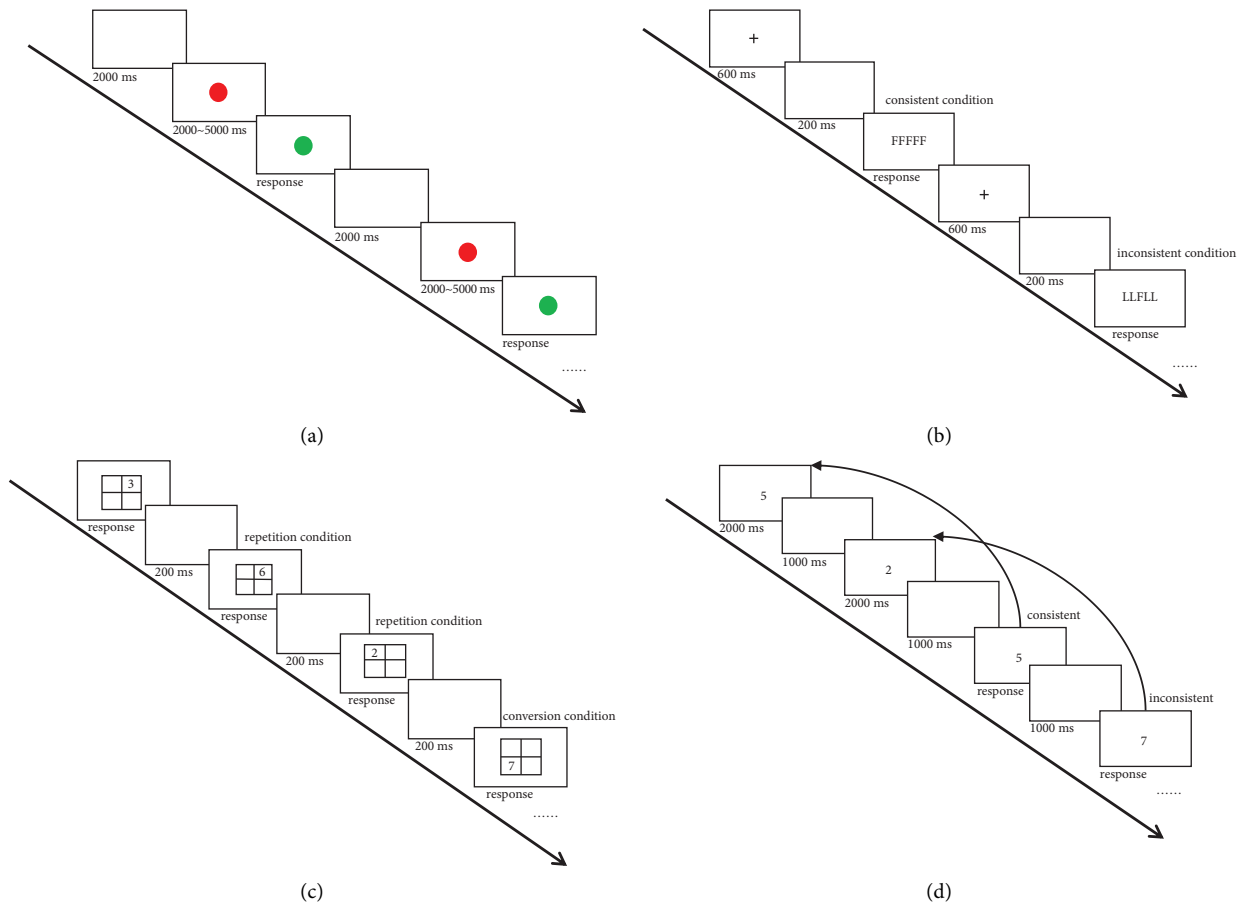
(a)

(b)

(c)

(d)

FIGURE 1: Experimental paradigm: (a) psychomotor vigilance task, (b) Flanker task, (c) task switching, and (d) 2-back task.

assessing behavioral vigilance and attention due to its high sensitivity to sleep deprivation [16]. Results of extensive experiments on PVT performance have demonstrated that the task is capable of capturing the effects of sleep loss on the stability of sustained attention and that it can reliably reveal the accumulation of cumulative state instability in chronic sleep loss. The reliability of the test has been reported to be 0.888, falling into the standardized "almost perfect" range for a measurement assay [17]. The test-retest reliability in our study was between 0.767 and 0.879. A red circle is displayed in the center of the screen in the PVT. When the color changes from red to green (randomly occurring between 2000 and 5000 ms) participants must press the "L" key as quickly as possible. The red circle reappears two seconds after the response, repeating the process. If no response was made within five seconds, the stimulus ended, and the timer for the subsequent stimulus was reset. A response time (RT) of less than 100 ms was excluded from the analysis, while more than 500 ms were recorded as lapses [16]. Longer mean reaction times or greater lapses indicated a lack of nurse vigilance.

2.3.2. Executive Function.
The Flanker, Stroop, and Simon tasks are commonly used to assess inhibitory control ability [18]. The letter version of the Flanker task was used in the present study to measure the inhibitory control ability of

TABLE 1: Demographic characteristics ($N = 51$).

Characteristics	N	%
Age		
<30	24	47.1
≥30	27	52.9
Gender		
Male	15	29.4
Female	36	70.6
Marital status		
Unmarried	24	47.1
Married	27	52.9
Working experience in ICU (years)		
<5	17	33.3
5–10	23	45.1
>10	11	21.6
Professional title		
Primary titles	28	54.9
Secondary titles and above	23	45.1

nurses. The validity of the task has been reported to be ≥0.73. The reliability of the task has been reported to be between 0.86 and 0.92 [19]. The test-retest reliability in our study was between 0.773 and 0.866. Four letter strings ("FFFFF," "LLLLL," "LLFLL," and "FFLFF") were randomly presented in the center of the screen. Participants were instructed to respond to the middle letter (e.g., pressing the "F" key if the

TABLE 2: Comparison of vigilance at different working hours ($N = 51$).

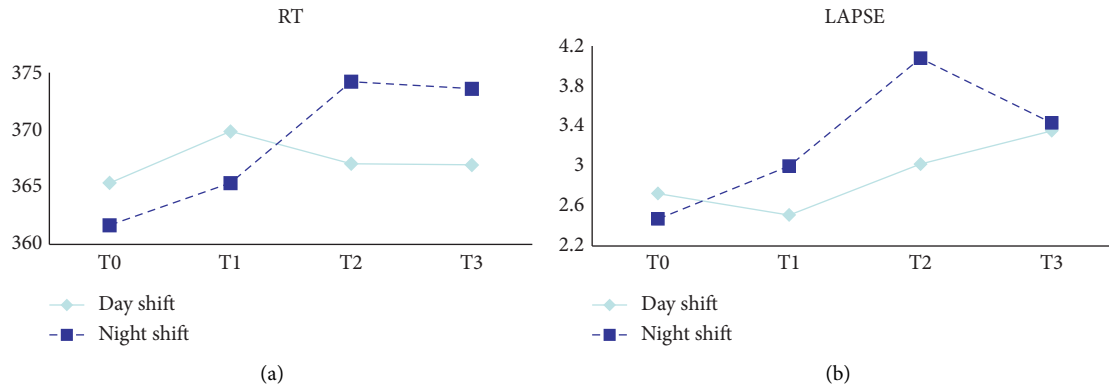| Variables | T0 | | T1 | | T2 | | T3 | | Statistical value (p) | | |
	Day	Night	Day	Night	Day	Night	Day	Night	Time	Shift	Interaction effect
RT	365.38 ± 33.12	361.68 ± 39.73	369.87 ± 39.09	365.36 ± 41.85	367.05 ± 37.88	374.21 ± 46.33	366.94 ± 37.80	373.60 ± 39.68	2.320[a] (0.078)	0.456[a] (0.503)	2.516[a] (0.069)
Lapse	2 (1, 4)	1 (0, 4)	2 (1, 4)	1 (0, 4)	2 (1, 5)	3 (1, 7)	2 (1, 5)	3 (1, 5)	12.844[b] (0.005)	1.699[b] (0.203)	4.460[b] (0.216)

Note. [a]F, [b]Waldχ^2.

Figure 2: Changes of RT and lapse of PVT.

middle letter was an "F") as quickly as possible. Both consistent and inconsistent conditions were randomly and equally presented. The Flanker effect size (FES) and incorrect responses (IR) for each subject were recorded during the task. The FES represents the difference in RT between consistent and inconsistent conditions. A smaller effect size indicates better inhibitory control ability.

Task switching was used to measure shifting [20, 23]. The high validity of the task has been demonstrated in extensive research. The reliability of the task has been reported to be between 0.859 and 0.910 [9, 22]. The test-retest reliability in our study was between 0.740 and 0.862. In this task, a 2×2 grid was displayed in the middle of the screen, and a number (randomly ranging from 1 to 9, excluding 5) was presented within the grid. The participants were asked to judge the size or parity of the number based on their location within the grid. They had to determine whether the number was greater or less than five if it appeared in the upper grid and its parity if it appeared in the lower grid. They were instructed to press the "F" key if the result was less than five or odd and the "L" key otherwise. The switch cost (SC), which is the difference in reaction time between the conversion and repetition conditions, and IR were recorded during the task. Lower SCs or higher accuracy suggest better cognitive flexibility.

A digital 2-back task was used to assess the working memory. The N-back task is a classical working memory paradigm frequently used in working memory-related studies [23, 24]. The validity of the test to measure working memory has been reported in several studies [25–28]. The split-half reliabilities of the test have been reported to be between 0.802 and 0.824 [29]. The test-retest reliability in our study was between 0.670 and 0.792. A series of stimuli were presented sequentially in the 2-back task, and participants had to judge whether the current number matched the number presented two stimuli earlier. They used the "F" key for a consistent match and the "L" key for inconsistency. The task recorded RT and IR. A shorter reaction time or higher accuracy indicates working memory.

2.4. Data Analysis. IBM SPSS version 26.0 was used to analyze the data. The demographic characteristics of ICU nurses were described using frequencies, percentages, mean/medians, standard deviation (SD), and range. MANOVA was used for the statistical inference of normally distributed data. Non-normally distributed data are presented as median (interquartile range), and nonparametric tests and generalized estimating equations (GEEs) were used for statistical inference. The statistical significance level was set at $p < 0.05$.

2.5. Ethical Approval. This study adhered to the 2000 revision of the Helsinki Declaration and followed the ethical standards outlined by the responsible committee on human experimentation. The study protocol was approved by the Institutional Review Board of Henan Provincial People's Hospital (approval date: 20220620). All participants provided written informed consent before they participated in the study.

3. Results

3.1. Demographic Characteristics of the Sample. Table 1 summarizes the demographic characteristics of ICU nurses. Most participants (70.6%) were females, and their mean age was 29.10 years, SD = 4.15. Over half of the participants (66.7%) had worked in the ICU for more than five years. All participants reported no symptoms of discomfort and were not colorblind. In addition, they reported no preference for coffee or tea at work.

3.2. Vigilance. Table 2 and Figure 2 reveal the changes in vigilance, RT, and lapse among ICU nurses. MANOVA revealed no statistically significant difference in RT for ICU nurses across working hours ($P_{\text{sphericity}} = 0.686$, $F = 2.320$, $p = 0.078$, $\eta^2 = 0.044$) and shifts ($F = 0.456$, $p = 0.503$ $\eta^2 = 0.009$). However, lapse occurrence varied significantly across working hours (Wald$\chi^2 = 12.844$, $p = 0.005$), with a significant increase observed after 8 and 12 h.

3.3. Executive Function

3.3.1. Inhibitory Control Ability. The changes in FES and IR among ICU nurses are presented in Table 3 and Figure 3. MANOVA indicated a significant difference in the FES across different working hours ($P_{\text{sphericity}} = 0.359$, $F = 2.943$,

Table 3: Comparison of inhibitory control ability at different working hours ($N = 51$).

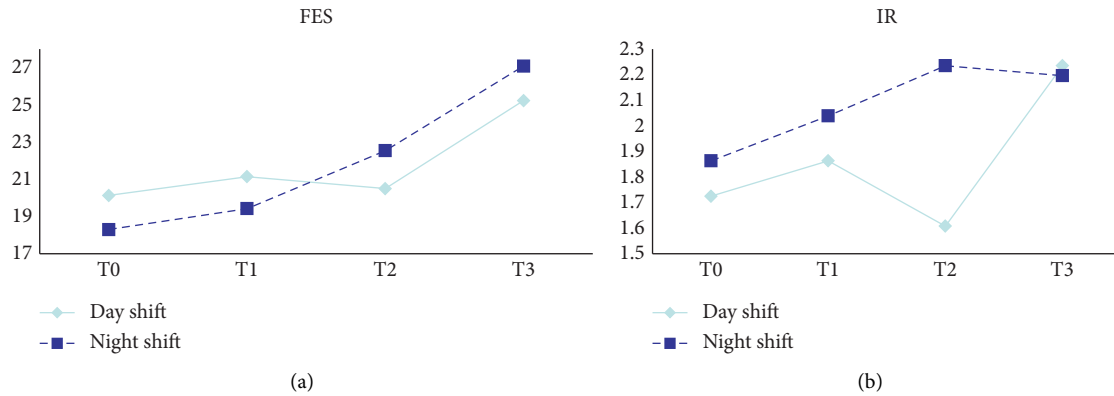| Variables	T0		T1		T2		T3		Statistical value (p)		
	Day	Night	Day	Night	Day	Night	Day	Night	Time	Shift	Interaction effect
FES	20.14 ± 18.96	18.30 ± 18.64	21.15 ± 18.37	19.43 ± 20.47	20.50 ± 16.24	22.54 ± 25.47	25.23 ± 22.05	27.08 ± 19.99	2.943^a (0.035)	0.002^a (0.963)	0.270^a (0.847)
IR	1 (1, 2)	2 (1, 3)	2 (1, 3)	2 (1, 3)	1 (0, 2)	2 (0, 3)	2 (0, 3)	2 (1, 3)	2.747^b (0.432)	1.477^b (0.224)	1.856^b (0.603)

Note. [a]F, [b]Waldχ².

FIGURE 3: Changes of FES and IR of Flanker test.

$p = 0.035$, $\eta^2 = 0.056$). However, the IR of the Flanker task did not differ significantly among different working hours (Wald$\chi^2 = 2.747$, $p = 0.432$) and shifts (Wald$\chi^2 = 1.477$, $p = 0.224$).

3.3.2. Shifting. Table 4 and Figure 4 represent the changes in SC and IR among the ICU nurses. MANOVA revealed no significant differences in the SC of the task switching among different working hours ($P_{\text{sphericity}} = 0.093$, $F = 1.568$, $p = 0.200$, $\eta^2 = 0.030$) and shifts ($F = 2.768$, $p = 0.102$, $\eta^2 = 0.052$). In addition, the generalized estimating equation indicated no significant differences in IR among different working hours (Wald$\chi^2 = 2.481$, $p = 0.479$) and shifts (Wald$\chi^2 = 0.588$, $p = 0.443$).

3.3.3. Working Memory. The changes in RT and IR to the 2-back task among the ICU nurses are presented in Table 5 and Figure 5. Repeated MANOVA revealed no significant difference in RT for the 2-back task among different working hours ($P_{\text{sphericity}} = 0.486$, $F = 1.483$, $p = 0.221$, $\eta^2 = 0.029$) and shifts ($F = 0.309$, $p = 0.581$, $\eta^2 = 0.006$). However, there was a significant difference in IR between working hours (Wald$\chi^2 = 13.916$, $p = 0.003$) for the 2-back task.

4. Discussion

Although previous studies have reported the impact of shifts and 12 h work on nurses' fatigue and vigilance, their findings remain contentious. Notably, the present study is possibly the first to investigate the vigilance and EF of Chinese ICU nurses in a real clinical setting. Furthermore, it may be the first to comprehensively assess EF using three computerized tasks based on a theoretical model. The present study contributes to our understanding of how consecutive 12 h rotating shifts affect the vigilance and EF of ICU nurses while providing research data from a different population to support the ongoing debate. There is limited evidence from our study that there is a negative correlation between vigilance and certain aspects of EF in ICU nurses and their working hours. Furthermore, our study revealed no

significant differences in vigilance and EF between night and day shifts among nurses.

The findings revealed that the vigilance reaction time of ICU nurses did not differ significantly across different working hours ($p = 0.078$), consistent with previous findings [14]. Although this result did not demonstrate statistical significance, we cannot conclude that the vigilance of ICU nurses is unaffected by working hours. Several factors may have contributed to these findings. First, given the busyness of clinical practice, we used a 3 min version of the PVT task rather than 5 or 10 min. Only 30 stimuli were presented in our task, which may have limited our ability to capture attention and effectively detect fatigue. Second, we set the lapse threshold to 500 ms. However, this threshold may have been relatively low for our PVT task. This is because, unlike some PVT tasks, our task did not present the RT after each stimulus presentation. This could have resulted in less positive feedback from our participants, resulting in longer RTs. Responses exceeding 500 ms were considered lapses and excluded from the average RTs analysis, which may have influenced our findings. Furthermore, the small sample size introduced sampling errors, which should not be overlooked as a contributing factor.

Another important observation indicator in the PVT task is the number of lapses, which reflects an individual's ability to maintain attention. Our study revealed that regardless of the day or night shift, the number of lapses among ICU nurses increased as the duration of work increased. This suggests a negative relationship between nurses' attention and work duration, implying that their vigilance decreases as nurses work longer shifts. This is unsurprising, given that nurses work 12 h shifts and accumulate significant fatigue and sleep debt. Nurses experience increased drowsiness and a gradual decline in vigilance as their shift lengthens [30].

Furthermore, pairwise comparison results indicate that the number of lapses among nurses at T2 and T3 was significantly higher than at T0 and T1. This suggests that ICU nurses consistently have low vigilance after 8 h. Therefore, we advise managers to reconsider the potential risks to patient safety associated with the current 12 h shift schedule in the ICU.

TABLE 4: Comparison of shifting at different working hours ($N = 51$).

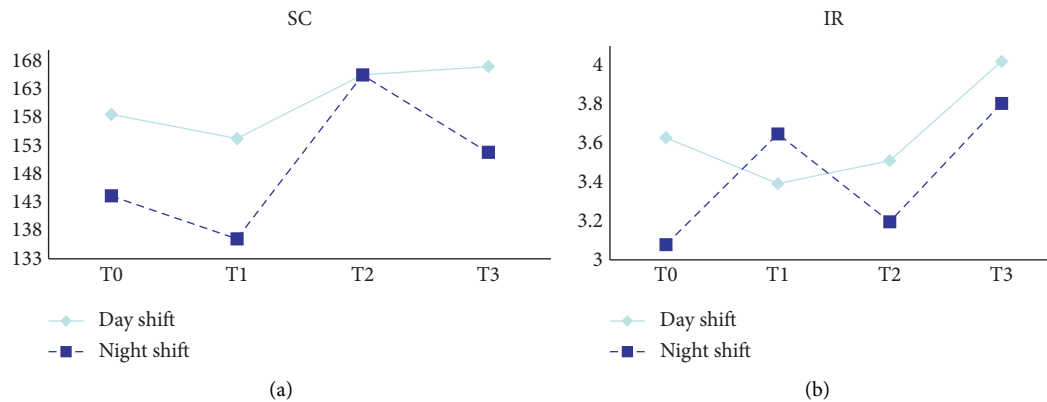| Variables	T0		T1		T2		T3		Statistical value (p)		
	Day	Night	Day	Night	Day	Night	Day	Night	Time	Shift	Interaction effect
SC	158.59 ± 103.22	144.15 ± 100.84	154.30 ± 118.83	136.54 ± 93.97	165.58 ± 109.07	165.56 ± 109.55	167.06 ± 114.10	151.85 ± 102.22	1.568^a (0.200)	2.768^a (0.102)	0.307^a (0.820)
	3 (1, 5)	3 (2, 4)	2 (2, 4)	3 (1, 5)	3 (2, 5)	3 (1, 4)	3 (2, 5)	3 (2, 4)			
IR									2.481^b (0.479)	0.588^b (0.443)	1.140^b (0.767)

Note. [a]*F*, [b]Waldχ^2.

FIGURE 4: Changes of SC and IR of task switching.

Most studies have indicated that night-shift nurses have lower and more unstable vigilance than day-shift nurses [31–33]. Although there is no interaction effect between working hours and shift for nurses' RT ($p = 0.069$) and the number of lapses ($p = 0.216$) and no within-group differences in terms of shift, the trend in changes in nurses' RT and the number of lapses (Figure 2) seems to suggest a similar pattern of instability in vigilance during night shifts. This is most likely due to circadian rhythm adaptation, as even experienced ICU nurses exhibit higher drowsiness during night shifts than during day shifts.

In summary, we conclude that the vigilance of ICU nurses decreases with increasing work duration, with more pronounced vigilance impairment after 8 h of work. Furthermore, the vigilance of ICU nurses during night shifts appeared to be more susceptible to work duration.

Another focus of our study was on the EF of nurses. Impaired EF among nurses in clinical settings can lead to serious medical errors. Inhibitory control is an important component of EF [34]. Individuals with poor inhibitory control may be easily distracted, have difficulty maintaining attention, and have difficulty suppressing impulsive behaviors. Nurses frequently encounter various distractions and stimuli during clinical work, such as noise from equipment and colleagues' interactions. Nurses with stronger inhibitory control can approach their work goals more rationally and efficiently. The findings of the present study reveal a significant difference in the FES of ICU nurses at different work durations ($p = 0.035$), implying that the inhibitory control of nurses decreases as work duration increases. This is mainly due to fatigue and stress caused by continuous work, which affect the activity of the prefrontal cortex, which is involved in higher-order cognitive processing. Therefore, the inhibitory control of nurses is compromised.

Shifting refers to the ability of an individual to switch behaviors flexibly in different contexts and is equally important for nurses. ICU nurses face other patients and situations at work, requiring them to adjust their care plans and behaviors based on the needs and conditions of their patients. The present study revealed no differences in cognitive flexibility among nurses with different work durations. This could be due to two factors. First, the participants

included in our study are relatively young (29.10 ± 4.08), and younger individuals often have an advantage in maintaining cognitive flexibility. Second, research suggests that learning and training can improve an individual's cognitive flexibility [35, 36]. Over half of the participants in the present study had more than five years of ICU work experience, which may have cultivated their flexibility and better adaptation to various cognitive tasks.

Working memory capacity is an important factor for nurses. In clinical practice, nurses must constantly grasp and remember patients' conditions, treatment progress, nursing measures, job tasks, and operational steps. These pieces of information must be acquired, processed, promptly, and accurately recalled. Consistent with a previous study [37], we identified statistically significant differences in the error rates of the 2-back task among participants with varying work durations ($p = 0.003$). This finding indicates a negative correlation between ICU nurses' working memory and work duration. Long periods of continuous work may deplete nurses' cognitive resources. As work duration increases, nurses must handle more tasks and information, which may exceed their working memory capacity, resulting in information loss or memory forgetting. Although there were no differences in working memory reaction times among nurses with different work durations in this study, we observed a slight increase in working memory reaction times at T1. We infer that this may be associated with the workload. Generally, T1 (12:00 p.m. or 12:00 a.m.) is one of the busiest times in clinical work, and nurses face a higher memory load when multitasking and memorizing multiple pieces of information simultaneously. This may affect the speed of memory retrieval during testing.

In summary, we believe that certain aspects of EF (inhibition control, working memory) of ICU nurses decline as work duration increases. Furthermore, ICU nurses have similar EF levels during night shifts compared to day shifts.

5. Limitations

The present study has several limitations. First, smoking and coffee consumption may have influenced the test results. However, only two participants in our study smoked, and none drank coffee at work. Therefore, we did not include

TABLE 5: Comparison of working memory at different working hours ($N = 51$).

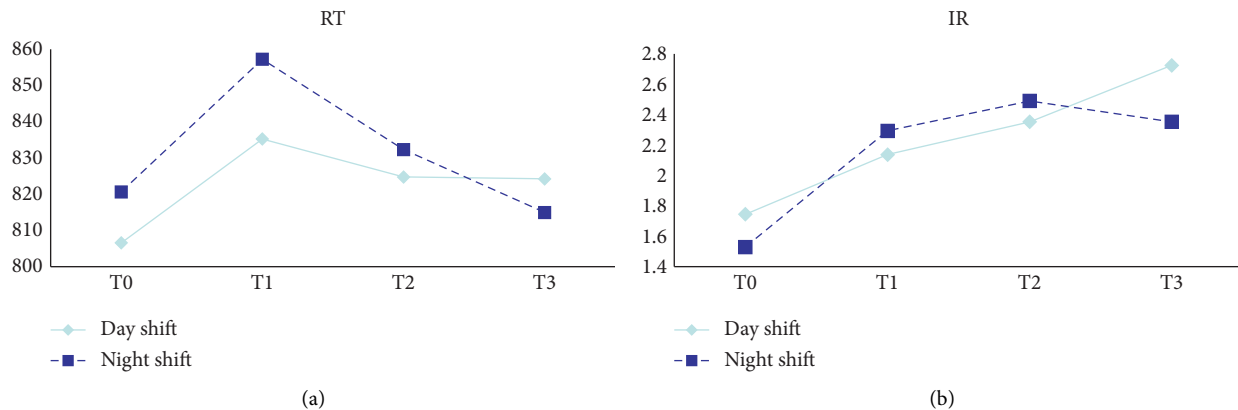| Variables | T0 | | T1 | | T2 | | T3 | | Statistical value (p) | | |
	Day	Night	Day	Night	Day	Night	Day	Night	Time	Shift	Interaction effect
RT	806.54 ± 152.66	820.63 ± 185.72	835.22 ± 172.16	857.23 ± 221.35	824.73 ± 187.91	832.30 ± 180.74	824.21 ± 190.78	814.95 ± 199.31	1.483[a] (0.221)	0.309[a] (0.581)	0.259[a] (0.855)
IR	1 (0, 2)	1 (0, 2)	2 (0, 3)	1 (0, 3)	2 (1, 3)	2 (1, 3)	2 (1, 4)	1 (0, 3)	13.916[b] (0.003)	0.091[b] (0.763)	1.944[b] (0.584)

Note. [a]F, [b]Waldχ^2.

Figure 5: Changes of RT and IR of 2-back.

these factors in our statistical analysis, which may have limited the extrapolation of our study. Second, because we only tested nurses from one ICU, our sample size was likely to be small, which could have resulted in sampling errors. Moreover, due to the small sample size, we did not conduct subgroup analyses based on gender or the menstrual cycle. Finally, despite including a practice phase to minimize practice effects, they may still exist to some extent.

6. Conclusions

Nurses serve as the "eyes and hands" of the ICU, monitoring and intervening in patients' health. The vigilance and EF of nurses are crucial for patient safety. Although longer shifts have been praised for increasing productivity and lowering staffing costs, our study examined ICU nurses working 12 h shifts using objective computer tasks. There is limited evidence showing that vigilance and some aspects of EF in ICU nurses are negatively correlated with the duration of their shifts in a real clinical setting. Furthermore, no vigilance or EF differences were identified between day and night shifts.

7. Implications for Nursing Management

To reduce fatigue and cognitive load, nursing administrators should reconsider scheduling 12 h shifts, shortening shifts, or implementing short rest periods. Such adjustments are beneficial and necessary for nurses' well-being and patient safety. Flexible work may be another approach to address this problem. Allowing nurses to adjust their working hours according to their habits and status may help staff perform at their best and improve the quality and efficiency of their work. In addition, managers should pay attention to staff fatigue, especially after working for more than 8 h. Managers can also adjust the order of work, such as scheduling complex tasks at the beginning of the work as much as possible, while simple executive tasks are scheduled later, which may reduce the possible risks associated with prolonged work.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Additional Points

Tweetable Abstract. Limited evidence has shown that vigilance and executive function of ICU nurses are negatively correlated with work duration.

Disclosure

Meng-Juan Jing and Hao Li are the co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest that could have appeared to influence the work reported in this study.

Authors' Contributions

Acknowledgments

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Research Article

The Associations among Destructive Leadership, Job Demands and Resources, and Burnout among Nurses: A Cross-Sectional Survey Study

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Background. Nurses demonstrate high burnout prevalence. Moreover, destructive leadership, as well as job demands and resources, are associated with burnout. However, these associations, particularly in the context of nursing, warrant further investigation. *Objective.* To explore the associations of destructive leadership, as well as job demands and resources, with burnout in registered nurses. *Design.* A cross-sectional survey. *Participants.* 2115 registered nurses in Finland. *Methods.* The self-administered questionnaire survey was distributed nationwide to 106,000 members of the Finnish trade union for health and social care professionals via an online newsletter in February 2023. Nurses' burnout was measured with the Burnout Assessment Tool (BAT). The data were analysed through descriptive statistics and linear regression analysis. *Results.* Destructive leadership and job demands were positively associated with burnout ($\beta = 0.39$ and 0.32, respectively; both $p < 0.001$), whereas job resources and burnout were negatively associated ($\beta = -0.41$, $p < 0.001$). The associations of destructive leadership and job demands with burnout became less positive when job resources were added to the regression model ($\beta = 0.21$ and 0.14, respectively; both $p < 0.001$). *Conclusions.* Job resources led to the greatest reduction in burnout among registered nurses. Moreover, job resources reduced burnout by diminishing the negative effects of destructive leadership and job demands. Providing a sufficient amount of job resources might reduce burnout and diminish the negative effects of destructive leadership and job demands among nurses. These relationships warrant examination in other cultural settings.

1. Introduction

The global shortage of the healthcare workforce, particularly nurses, is a major issue; the World Health Organization (WHO) projects that this shortage will reach 5.7 million by 2030. Population ageing has led to an increase in the demand for health services. However, the nursing workforce is ageing as well; approximately, one of six nurses is expected to retire by 2030 [1]. Other challenges, including the COVID-19 pandemic, have exacerbated these issues. Working in healthcare is stressful; furthermore, the nursing staff work under extreme pressure, which can lead to health problems, such as burnout, and to insufficient personnel retention and recruitment [2, 3]. Therefore, facilitating mental health improvement among nurses through the improvement of

their demanding working conditions is crucial. To support European countries with severely burdened healthcare systems, the WHO proposed 10 effective policy and planning responses; one of them is "protect the health and mental well-being of the workforce" [2].

Complex burnout syndrome, which most commonly results from prolonged exposure to work-related stress, is characterised by the dimensions of exhaustion, cynicism, and inefficacy [4]. In particular, overwhelming exhaustion is often the first sign of work-related health issues. Over time, it leads to detachment and withdrawal from work, as well as cynicism, followed by negative self-evaluation and the feeling of incompetence. The role of a few of these dimensions, particularly inefficacy, in burnout development has been re-examined; as such, the definition of burnout has

been revised [5, 6]. Schaufeli et al. [6] indicated four core elements of burnout, namely, exhaustion, mental distance, emotional impairment, and cognitive impairment. Exhaustion refers to an extreme lack of physical and mental energy, which reduces an individual's capacity to regulate emotions (e.g., anger and sadness) and cognitive processes (e.g., memory and attention). This results in the development of a coping strategy involving mental withdrawal and detachment from the job. In a Delphi study, an expert panel unanimously defined burnout as prolonged work-related exhaustion [7]. Exhaustion, generally considered the most essential dimension of burnout, is included in most burnout questionnaires [6].

The average burnout prevalence among nurses varies in different studies, ranging from 11% [8] to 52% [9]. The studies show differences between geographical regions and specialties [8] and educational levels [9]. The review by Ge et al. found a prevalence of 30% and indicated an increased trend over time [10]. However, the accurate estimation of this prevalence can be challenging because appropriate diagnostic criteria for burnout are unavailable [11] and burnout is not considered a medical condition in the International Classification of Diseases 11th Revision [12].

Burnout has several physical, psychological, and occupational consequences on workers' health and well-being; these consequences include type 2 diabetes, coronary heart disease, various types of pain and injuries, insomnia, job dissatisfaction, absenteeism, and the need for disability pension [13]. In addition, a positive association between burnout and depression among nurses has been found [14]. Furthermore, higher burnout levels appear to lead to a stronger occupational turnover intention [15–17]. Burnout-attributed turnover and burnout result in a major financial burden on organisations and societies [18–20]. Moreover, nurse burnout affects perceived patient safety, satisfaction, and quality of care [21]. Therefore, burnout is a severe health issue with individual, organisational, and societal consequences [22].

The job demands-resources (JD-Rs) model was originally tested in a study on German nurses and subsequently developed into a theory [23–25]. According to this model, different physical, psychological, social, or organisational aspects of a job, particularly if they are imbalanced, can affect employee health outcomes. Job demands, such as a high workload, require sustained effort and are associated with exhaustion. Job resources are job aspects that support the achievement of work goals and personal growth and development, reduce job demands, and protect from burnout; examples of these resources are autonomy and job security. In the JD-R model, resource insufficiency is associated with disengagement [24]. In the current study, we used the JD-R model as the theoretical framework.

The effect of job demands and resources among nurses have been studied comprehensively, and the association of job demands with burnout has been established [22, 26–28]. Among nurses, a high workload is also correlated with decreased patient safety and quality of care [26]. In contrast,

job resources are negatively associated with burnout [29, 30]; they may buffer the effects of job demands on strain [31, 32] and burnout [33].

A major determinant in work-related health outcomes in nurses is leadership, and the favourable effects of positive leadership styles are well known [34–36]. Recent management research has focused on adverse leadership styles and their effects on followers and organizations. One such adverse leadership style is the so-called destructive leadership style [37, 38].

Destructive leadership is a process involving a supervisor's systematic and repeated hostile behaviour or incompetence as perceived by their followers or subordinates. Destructive leadership can be intentional or unintentional and physical or verbal and has harmful consequences on the well-being, job satisfaction, and performance of the workers, and the goals of the organisation, or both [37, 39, 40]. Most empirical studies on destructive leadership have examined abusive supervision using Tepper's [41] abusive supervision scale [38]. In contrast to destructive leadership, abusive supervision excludes physical contact [41] and aims to control workers by creating fear and intimidation [39]. Furthermore, under toxic leadership, a leader's destructive behaviour or dysfunctional personal qualities have a debilitating effect on their followers [42]. In the toxic triangle model, toxic leadership is derived from the interaction between the leader, their followers, and the conducive environment [43]. Petty tyranny is described as authoritarian behaviour where a leader uses power oppressively, capriciously, and vindictively over their subordinates [44]. Einarsen et al. [39] categorised the leadership styles as tyrannical (including humiliation, belittling, and aggression), derailed (including bullying, manipulation, harassment, absenteeism, and shirking), supportive -disloyal, and constructive; these behaviours can have destructive and constructive effects on different dimensions simultaneously.

Destructive leadership is positively related to nurses' psychological strain, burnout, and intention to quit the job or leave the profession [31, 35, 45]. It is also associated with decreased work effectiveness and performance [46] and nurse-reported adverse events and quality of care [31, 47]. Strengthening nursing and midwifery leadership is one of the policy priorities of the WHO Global Strategic Directions for Nursing and Midwifery 2021–2025 [48].

Despite increasing scientific interest in destructive leadership, knowledge regarding this detrimental phenomenon, particularly in nursing, remains limited [36]. Thus far, the associations of destructive leadership, as well as job demands and resources, with burnout among nurses have not been explored. By gaining further insight into the roles of leadership and working conditions in burnout development among nurses, healthcare organisations may be able to develop and implement burnout prevention strategies. In the current study, we explored the associations of destructive leadership and job demands and resources with burnout among registered nurses in Finland. We also

analysed burnout by different background characteristics. Our results may clarify the need for leadership development and education for maximum staff retention.

2. Methods

2.1. Study Design. This was a cross-sectional study conducted in accordance with the STROBE guidelines for cross-sectional studies [49].

2.2. Data Collection and Participants. The data were collected over a 3-week period in February 2023 by using an online self-administered questionnaire. Participants were recruited via an online newsletter of a Finnish trade union for health and social care professionals, distributed to 106,000 of its members. The sampling method can be, therefore, called purposive sampling. We also sent a weekly reminder to every member, requesting them to respond to the questionnaire. In total, 4575 responses were received; of them, 2370 were from registered nurses. After respondents who performed supervisor tasks ($n = 247$) were excluded, the final sample size was 2115. Considering the survey invitation and distribution methodology, the accurate survey response rate could not be calculated.

2.3. Measurement Tools. The survey collected the following background characteristics: age, gender, education level, work experience (years), and workplace. Moreover, three scales were used to measure burnout, destructive leadership, and job demands and resources.

2.3.1. Burnout. Burnout was measured using the 4-item Burnout Assessment Tool (BAT-4) [50]—a shortened version of the original 23-item BAT (BAT-23) [6]. BAT-23 was developed to assess the four core dimensions of burnout, namely, exhaustion, mental distance from work, cognitive impairment, and emotional impairment. The BAT-23 can be applied based on group or individual assessments [6]; its applicability for the cross-country comparison of burnout has also been reported [51]. The BAT-23 has been validated and noted to have good psychometric properties; moreover, both the 12-item BAT (BAT-12) and the BAT-4 have shown to reliably explore the dimensions of burnout. The BAT-4 is strongly correlated with the BAT-12 ($r = 0.94$) and BAT-23 ($r = 0.92$), and its Cronbach's α is 0.73 [50, 52]. In the BAT-4, each item assesses one core dimension as follows: exhaustion ("at work, I feel mentally exhausted"), mental distance from work ("I struggle to find any enthusiasm for my work"), cognitive impairment ("at work, I have trouble staying focused"), and emotional impairment ("at work, I am unable to control my emotions"). Here, the frequency-based responses are scored on a 5-point Likert scale—ranging from 1 (never) to 5 (always); a higher score is considered to indicate more burnout [50].

2.3.2. Destructive Leadership Scale. Destructive leadership was measured based on nine statements related to the employee's relationship with the immediate supervisor as follows: authoritarian leadership (e.g., "I am treated in an authoritarian (i.e., bossy or commanding) way"), abusive leadership (e.g., "I am treated in an unfair or discriminatory way"), and aggressive leadership (e.g., "I am treated in an aggressive manner"). Similar questions have been used to measure the vulnerability caused by management as a dimension of precarious employment (e.g., [53]). The responses were scored on a 5-point Likert scale—ranging from 1 (completely disagree) to 5 (completely agree); a higher score was considered to indicate a higher prevalence of destructive leadership.

2.3.3. Job Demands and Resources Scale. Job demands and resources were measured using items that assess working conditions; these items have been widely used in surveys such as the European working conditions surveys [3]. The scale included the following 18 statements: 8 describing job demands and 10 describing job resources. Statements on job demands included those related to time pressure ("I have to work really fast" and "I have to work hard"), physical workload ("my job requires a lot of physical effort," "I often have to lift or move heavy loads," and "I have to work for long periods in uncomfortable positions"), decision-making opportunities ("I have few opportunities to decide how I do my work"), and insecurity ("I have no certainty about the future of my job" and "there is a danger that I will soon lose my job"), whereas statements on job resources include those related to participation in decision-making ("I have the opportunity to make a lot of decisions about my work" and "I have a say in many at my job"), task variety ("I am given a lot of different tasks" and "I have the opportunity to learn new things at my job"), professionalism ("my job requires a high level of professionalism"), the amount of time ("I have enough time to do my work"), work ("I do not have an unreasonable amount of work"), and security ("I could quickly get a new job if I wanted to"). The responses were scored on a 4-point Likert-type scale—ranging from 1 (completely disagree) to 4 (completely agree); a higher score was considered to indicate more job demands or resources.

2.4. Data Analysis. Descriptive statistics of all variables were calculated as frequencies and percentages, as well as means and standard deviations (SDs). Missing value analysis demonstrated low rates between 0.01% and 0.4% per scale; it was the highest at 2.0% for the variable of age. For each scale, the missing values were replaced with their respective mean values. The mean values for the study variables were calculated, and ANOVA was used to compare the average levels of burnout in terms of age, education level, and work experience. Independent sample t tests were used with dichotomous gender variables. A p value of <0.05 was considered to indicate statistical significance.

Scale reliability was analysed by calculating Cronbach's α, and the relationships between the variables were calculated as Pearson's correlation coefficients (Table 1). Multicollinearity of the data was also assessed. Furthermore, linear regression analysis was used to explore the associations of burnout with destructive leadership, as well as job demands

TABLE 1: Background characteristics of the nurses ($n = 2115$).

	Mean (SD)	n	%
Age (years)	45.6 (10.9)		
<35		423	20.0
35–50		867	41.0
>50		782	37.0
Gender			
Male		142	6.7
Female		1956	92.5
Education level			
Vocational degree		573	27.1
Bachelor's degree		1361	64.3
Master's degree		173	8.2
Work experience (years)	17.1 (10.8)		
<5		387	18.3
5–10		327	15.5
>10		1398	66.1

and resources. All models were adjusted for age, gender, and work experience. The assumptions of homoscedasticity and linearity of the models were tested and confirmed to not have been violated [54]. All statistical analyses were conducted using SPSS (version 27).

2.5. Ethical Considerations. There was no need for ethical approval; however, the Institutional Review Board of the participating trade union approved the study [55]. Our questionnaire cover letter included information regarding the study, and it indicated that by answering the questionnaire, the participants provided their informed consent. The questionnaire also included a privacy statement. No personal identification data were collected, and the data were stored on the university's secure server, protected by username and password. The data will be deleted three years after the end of the study.

3. Results

As listed in Table 1, the mean participant age was 46 years (range: 22–67 years). A majority of the participants were women (93%), had a bachelor's degree (64%), had >10 years of work experience (66%), and worked in the public sector (86%); of all the participants, 57% worked in hospitals, 21% worked in health and welfare centres and clinics, 13% were social service workers, 3% provided at-home services, 2% worked in private companies or were self-employed, and 4% provided other services such as state- or organization-level, or student, health services.

Table 2 presents the overall BAT scores as well as their distribution among different age, gender, education level, and work experience groups. The mean (SD) total BAT-4 score was 2.62 (0.64), with the score in the dimension of exhaustion being the highest (mean = 3.21 and SD = 0.86). Nurses aged <35 years demonstrated the highest BAT-4 scores, whereas those aged >50 years showed the lowest ($p = 0.003$). Women reported significantly higher scores

TABLE 2: BAT-4 scores (overall and stratified by background characteristics, scale 1–5).

	Mean (SD)	p
BAT-4	2.62 (0.64)	
Exhaustion	3.21 (0.86)	
Mental distance from work	2.66 (0.95)	
Cognitive impairment	2.60 (0.83)	
Emotional impairment	2.00 (0.77)	
Age (years)		0.003
<35	2.69 (0.63)	
35–50	2.64 (0.64)	
>50	2.56 (0.64)	
Gender		0.038
Male	2.51 (0.67)	
Female	2.62 (0.63)	
Education level		0.165
Vocational degree	2.58 (0.63)	
Bachelor's degree	2.63 (0.64)	
Master's degree	2.60 (0.65)	
Work experience (years)		0.016
<5	2.60 (0.63)	
5–10	2.71 (0.62)	
>10	2.60 (0.64)	

BAT = Burnout Assessment Tool.

than men ($p = 0.038$). The mean scores among nurses with work experience of <5 and >10 years were similar; however, after post hoc correction, nurses with work experience of 5–10 years demonstrated the highest scores ($p = 0.014$). No significant differences were noted between the different education level groups.

The results of the destructive leadership scale are presented in Table 3. The statement "my bosses make me feel like I am easily replaceable" demonstrated the highest score (mean = 2.76 and SD = 1.35), followed by "I am treated in an authoritarian (i.e., bossy or commanding) way" (mean = 2.57 and SD = 1.23). However, "I am treated in an aggressive manner" demonstrated the lowest score (mean = 1.57 and SD = 0.94).

On the job demands scale, the highest scores were demonstrated by the statements related to having to work hard (mean = 3.23 and SD = 0.72) and quickly (mean = 3.01 and SD = 0.78). The respondents also reported low job autonomy (i.e., having only few opportunities to decide how they perform their work; mean = 2.57 and SD = 0.78). In contrast, the statements that demonstrated the lowest scores were related to the uncertainty about the future of the job (mean = 1.82 and SD = 0.94) and the fear of losing the job soon (mean = 1.45 and SD = 0.69).

On the job resources scale, the highest scores were noted for the statements related to needing a high level of professionalism (mean = 3.82 and SD = 0.45) and learning new things (mean = 3.78 and SD = 0.46). In contrast, the lowest scores were demonstrated by the statements regarding not having sufficient time to do the work (mean = 2.25, SD = 0.84) and not having an unreasonable amount of work (mean = 2.24 and SD = 0.84), preceded by the statements

Table 3: Destructive leadership scale scores (scale 1–5).

	Mean (SD)
My bosses make me feel like I am easily replaceable	2.76 (1.35)
I am treated in an authoritarian (i.e., bossy or commanding) way	2.57 (1.23)
If I were treated unfairly, I would not dare to argue	2.26 (1.19)
If I wanted better working conditions, I would be afraid to ask	2.21 (1.10)
I am treated in an unfair or discriminatory way	2.10 (1.18)
I have to worry about being fired if I were to participate in a strike	1.67 (0.97)
I have to worry about being fired when I temporarily do not work as well	1.65 (0.92)
I have to worry about being fired if I do not immediately do what I am told	1.61 (0.91)
I am treated in an aggressive manner	1.57 (0.94)

regarding having the opportunity to make a lot of decisions about work (mean = 2.49 and SD = 0.77) and having a say in many things at work (mean = 2.49 and SD = 0.78).

Table 4 presents Cronbach's α values and Pearson's correlation coefficients of all the variables. All Cronbach's α values were acceptable. Moreover, burnout was moderately and positively correlated with destructive leadership and job demands but negatively correlated with job resources.

The bivariate associations of destructive leadership, job demands, and job resources with burnout were analysed in model 0 (Table 5). Background characteristics (i.e., age, gender, and work experience) that demonstrated between-group differences (Table 2) were adjusted in this model. Consequently, the association between destructive leadership and burnout was noted to be positive. Assessed as adjusted R^2, destructive leadership (along with age, gender, and work experience) explained 16% of the variation in burnout. Moreover, the association between burnout and job demands was positive, explaining 11% of the variation in burnout. In contrast, job resources were negatively associated with burnout, indicating that job resources reduce burnout and explain 17% of the variation in burnout. All these associations were significant.

Multiple regression analysis was conducted for the associations of destructive leadership and job demands with burnout in model 1, and the job resources variable was added to model 2 (Table 5). The positive association of destructive leadership and job demands with burnout remained significant in model 1. Based on their adjusted R^2 values, these variables explained 19% of the variation in burnout. After job resources were added, in model 2, these associations became less positive and they explained 24% of the variation in burnout overall.

4. Discussion

This study aimed to gain insight into the factors related to burnout in nurses. Our findings indicated that destructive leadership, as well as job demands and resources, are associated with burnout among registered nurses in Finland. To our knowledge, this is the first study to explore this multivariate association in the context of nursing. Moreover, job resources were noted to provide the strongest explanation for the variation in burnout; in particular, they were noted to be negatively correlated with burnout. Moreover, job resources were noted to diminish the negative effects of destructive leadership and job demands.

Burnout remains a major concern among nurses—as indicated by the mean exhaustion scores of 3.21 (on the 5-point Likert scale). Moreover, destructive leadership was significantly associated with burnout; therefore, destructive leadership may also be a serious threat to the well-being of nurses at work. The result was expected and is supported by previous relevant but scant research in the context of nursing [56, 57]. From the perspective of the JD-R model, destructive leadership can be considered a load factor. As a social and organisational factor, destructive leadership might lead to emotional exhaustion and a psychological withdrawal from the job [58]. Supervisors play an essential role in providing employees with job resources presented in the JD-R model (e.g., support, feedback, rewards, and various tasks) [24]. Therefore, a lack of job resources can be a result of destructive leadership. However, our results demonstrated that job resources can not only reduce burnout themselves but also mitigate the adverse effects of destructive leadership and job demands. Our results corroborate those of the JD-R model, which emphasises that job resources mitigate the negative effects of job demands [24].

Regarding the global shortage of nurses, our results indicated that the managers made the nurses feel easily replaceable, but they neither felt insecure about their job nor were they afraid about being terminated. In previous studies, nurses have reported that they felt easily replaceable, possibly because of a lack of professional respect and appreciation from their managers [59, 60]. In contrast, these feelings may occur in nurses who are temporary, from an agency or from a foreign country and have to prove their professional skills in several instances—all of which may lead to insecurity [61]. In nurses, significant associations have been noted between being temporary and vulnerability; this, in addition to some other factors, represents the feeling of being easily replaceable [62]. The amount of temporary work has increased in Nordic countries; in Finland, more than one-fifth of all nurses work under fixed-term contracts [63].

Our results also indicated that job demands are positively associated with burnout. Considering the current labour shortage, the most reported job demands include the workload and time pressure; these factors have generally

TABLE 4: Cronbach's α and correlation coefficients of all the study variables.

	Burnout	Destructive leadership	Job demands	Job resources
Burnout	0.731			
Destructive leadership	0.390*	0.897		
Job demands	0.328*	0.425*	0.719	
Job resources	−0.402*	−0.450*	−0.343*	0.665

$^{*}p < 0.001$.

TABLE 5: Linear regression models for the associations of destructive leadership, job demands, and job resources with burnout.

	Model 0		Model 1		Model 2	
	B	SE	B	SE	B	SE
Destructive leadership	0.387*	0.016	0.306*	0.017	0.209*	0.018
Job demands	0.323*	0.026	0.193*	0.027	0.141*	0.027
Job resources	−0.406*	0.036			−0.262*	0.040
R^2			0.19		0.24	

Model 0: bivariate associations. Models 1 and 2: multivariate associations. Models are adjusted for age, gender, and work experience. B = standardised beta and SE = standard error. $^{*}p < 0.001$.

been associated with increased burnout among nursing staff [64–66]. In contrast, job resources were noted to reduce burnout in the current study, which is in line with previous findings [65, 67]. In particular, in addition to job autonomy and learning opportunities [29, 67], social support and rewards are related to decreased burnout [65, 67]. The relationship between job resources and destructive leadership in nursing is unknown; however, in fields other than nursing, job autonomy has demonstrated protective effects similar to those of job resources. Job autonomy can buffer the impact of abusive supervision on factors such as job stress [68, 69]. Job crafting, which is a job resource, buffers the negative impact of abusive supervision on emotional exhaustion. The current respondents reported low job autonomy. Therefore, nurse managers should increase nurses' autonomy and decision-making opportunities, encourage them to proactively improve their work situation, and develop their job-related skills [58].

Burnout demonstrated a significant association with demographic characteristics among nurses. Notably, younger, less-experienced nurses reported the most burnout, whereas the oldest nurses demonstrated the least burnout. This result is supported by previous results [28, 70–72]. Older, more-experienced nurses might, therefore, cope better with job demands. In contrast, less-experienced nurses work longer shifts and overtime more often [73], both of which are related to higher levels of burnout [74, 75]. There might even be generational differences in work-life expectations and job resource perceptions among these age groups. For example, younger nurses report less satisfaction with the feedback and rewards they receive [76]; this feeling may be related to the feeling of not being acknowledged or respected [77]. In terms of the JD-R model, the lack of feedback and rewards are major predictors of disengagement [23]. Consequently, we suggest that these differences should be considered by supervisors from multiple generations;

nurse managers should foster respectful and appreciative behaviours, especially among temporary and young nurses; they have to concentrate on building trust and giving feedback about good work and, on the other hand, guarantee professional autonomy and decision-making opportunities [78].

In the current study, men demonstrated less burnout than women. However, although previous studies have reported contradictory results, comparing their results with ours is difficult because of the differences in the burnout measures used. In some studies, compared with women, men demonstrated more depersonalisation, but this difference was not found for the other burnout dimensions [70, 79, 80]. In a study of mental health nurses, male sex was positively associated with emotional exhaustion [81]. Moreover, male transplant nurses reported significantly higher levels of personal accomplishment than their female counterparts [82]. In a meta-analysis, most studies demonstrated that women were significantly more emotionally exhausted than men [83].

The relationships between the nurses' demographic variables and destructive leadership were noted to be nonsignificant, consistent with previous findings [38]. Notably, the perception of destructive leadership is subjective and perceptions demonstrate cultural differences [41, 84–86]. Cross-cultural research on cultural differences in the relationship between burnout and destructive leadership is warranted. In addition, to develop leadership practices, the organisational context needs to be considered; social, cultural, or institutional contexts can either facilitate or constrain leadership practices [87]. Furthermore, the need for accurate data collection tools in nursing is evident; very few measurement tools to quantify different destructive leadership styles have been developed [88]. In addition, empirical research with a longitudinal, qualitative approach may aid in gaining further insight into the impact of destructive leadership.

4.1. Implications for Nursing Management and Practice. To improve leadership quality within the nursing profession, it is essential to recognise and acknowledge destructive leadership styles in healthcare organisations. Targeted leadership intervention programs might help focus on supportive and transformational leadership styles to reduce burnout among nurses [89]. Burnout risk factors, such as excessive job demands and inadequate resources, should be regularly assessed by management, and necessary support should be provided to nurses. The support could include well-being promotion measures focusing on resilience building, stress management, and coping strategies to mitigate the impact of destructive leadership and high job demands. Burnout prevention and stress management skills must be considered in nursing education [90]. However, the best results are obtained by investing in sustainable solutions that address structural and systemic issues and focus on creating a positive work culture. Furthermore, the effects of destructive leadership on nurses' and patients' outcomes require further examination, considering various cultural and contextual factors.

4.2. Strengths and Limitations. A major strength of the current study was the large, nationwide sample of registered nurses. Because the assumptions of regression were met, our findings are also generalisable. However, despite the sufficient sample size, the lack of accurate response rate calculation must be considered a limitation. Furthermore, the cross-sectional design of the study remains a limitation in this study. Therefore, the causality of relationships noted in this study should be examined further. Furthermore, the burnout-related results could not be fully compared with those from previous studies because the BAT is a relatively new measurement tool; nevertheless, most burnout questionnaires also include exhaustion as a core dimension. In this study, the Cronbach's α for the burnout dimension was similar to that in the original study on the BAT-4 [50]. However, further research on the relationships between the BAT and different constructs in different cultural settings [6] is warranted.

5. Conclusions

The current results supplement and strengthen the scant evidence on the relationship between destructive leadership and burnout among nurses. Results also confirm that among nurses, the association between job demands and burnout is positive and that job resources may alleviate the adverse effects of destructive leadership and job demands.

In healthcare organisations, strengthening job resources is essential for improving work-related well-being in terms of burnout among nurses, particularly younger nurses. To further improve the nurses' working conditions, organisations should pay attention to the evaluation of job demands and leadership styles. Through the creation of health-promoting work environments, nurse turnover may be reduced. Improved work-related well-being affects nurses'

job performance, which is essential for healthcare organisations to function effectively and provide high-quality healthcare services.

The current results may be used when planning intervention studies on burnout prevention and reduction among nurses; they may also guide nurse leadership educators. However, additional studies on destructive leadership and burnout in different healthcare and cultural settings are warranted [91].

Data Availability

The survey data used to support the findings of this study have not been made available because it is part of the ongoing project.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Authentic Leadership and Psychological Well-Being of Nurses: A Mediated Moderation Model

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Aims. This study investigates how authentic leadership influences the psychological well-being of Australian nurses. We examined whether authentic leadership could reduce the prevalence of workplace incivility and tested whether shared values and person-organization (P-O) fit could moderate the relationship between workplace incivility and psychological well-being (PWB). A mediated moderation model underpinned by social learning theory was developed to test the influence of authentic leadership on PWB. *Design*. We adopted a descriptive correlational research design to test the hypothesized model with a cross-sectional sample of Australian nurses using an online survey. Data were collected across two-waves separated by a six-month interval ($N = 230$, response rate = 38.3%) to minimize the potential effects of common source bias. The hypotheses were tested using Hayes Process Macro (Model 14) on IBM SPSS. *Results*. The hypothesized model had good fit indices and supported the mediated moderation model. There was no support for the direct association between authentic leadership and PWB. The supervisor authentic leadership behavior was negatively associated with workplace incivility and PWB. The association between incivility and PWB was positively associated with P-O fit. Nurses with high P-O fit reacted strongly to the positive effect of authentic leadership in reducing workplace incivility, such that they experienced higher levels of PWB. *Conclusion*. Authentic leadership behavior is important in the healthcare workplace. It reduces workplace incivility and improves PWB for nurses with high levels of congruence. Implications: our study suggests that senior management should deploy strategies through which frontline supervisors can learn and enact authentic leadership behaviors. They will then be better equipped to improve the PWB of their followers by minimizing the prevalence of workplace incivility. Impact: the study found a significant indirect relationship between authentic leadership behavior and psychological well-being, as mediated by workplace incivility and moderated by person-organization fit. The findings highlight the importance of positive leadership behaviors on the well-being outcomes of nurses in Australia.

1. Introduction

Nurses work in a high-stress, high-demand environment that creates considerable job strain [1]. This challenging work context is made even more difficult by mistreatments such as workplace incivility [2], which is a source of psychological stress [3]. Workplace incivility is the result of workplace interpersonal as conflict, evident by rude, disrespectful, and discourteous behaviors that are in violation of mutual respect [4, 5]. Workplace incivility behaviors create situations where nursing and allied staff are distracted from their duties in ways that could

compromise the quality of nursing care [6]. Workplace incivility tends to be lower in intensity than most workplace deviant behaviors and has an ambiguous intent to cause harm to others, which makes monitoring and dealing with perpetrators and targets a challenging task [5]. Where it occurs, workplace incivility is disruptive to the work environment because it breaches accepted standards of professional conduct and norms of civility [7]. Such behaviors could result in significant harm to employees, to the organization, and patients [8] and could affect nurses' intention to stay [9]. In this study, we will focus on workplace incivility and the extent to which

authentic leadership can help reduce its prevalence and mitigate its negative effect on PWB. The influence of leadership behaviors on followers' well-being is an under-researched topic generally [10] and in the nursing management literature (see [11]).

In this paper, authentic leadership is defined as "a pattern of transparent and ethical leader behavior that encourages openness in sharing information needed to make decisions while accepting input from those who follow" [12], (p. 424). Lemoine et al. [13]; (p. 2051) noted that "authentic leadership is primarily concerned with a leader's self-awareness, self-regulation, and self-concordance, and modeling these characteristics to sub-ordinates. . . .." This positive, relational leadership behavior [14] is particularly relevant in the healthcare setting [15]. Authentic leaders promote healthy work environments to mitigate workplace incivility and, in turn, enhance their followers' well-being [13]. Authentic leaders are self-reflective, listen to feedback, and practice empowerment, which impact positively on nurses' well-being [15]. Nursing leaders who exhibit authentic leadership behavior are grounded in their moral and ethical values.

Nelson et al. [11] note that different ways of operationalizing PWB include a plethora of approaches that range from perceived work stress [16] to exhaustion [2] and psychological distress [17]. We deployed "psychological distress" to conceptualize and measure PWB [18] because PWB is an outcome of the interplay between interpersonal relationships at work [19]. This particular approach to operationalizing "psychological distress" is commonly found in other studies conducted on the work and well-being of nurses [17, 20, 21]. Psychological distress has been used as an indicator of well-being by the World Health Organization [22].

To the best of our knowledge, the hypothesized indirect relationships have not been empirically tested. The mediated moderation model we propose (see Figure 1) is theoretically informed by social learning theory (SLT) [23, 24]. SLT is used to conceptualize why followers learn from their leader's authentic, moral, and ethical behaviors to minimize workplace incivility. Followers learn what is socially acceptable by observing the values and behavior exhibited by their supervisors. When supervisors display authentic leadership behaviors, those they supervise are likely to adopt similar work values and behave accordingly. P-O fit is a form of subjective value congruence and is defined as the "compatibility between people and the organizations in which they work" [25], p. 1). The alignment of one's own values with their organization's values is critical to employees' work attitudes [26] and stress [27].

In this study, workplace incivility is an example of workplace mistreatment that impacts negatively on the PWB of nurses. It is hypothesized as a mediator, while person-organizational (P-O) fit is hypothesized as a moderating variable of the direct association between authentic leadership and PWB. This study contributes to the literature by unpacking the indirect (mediation and moderation) mechanisms driving the direct and indirect influence of authentic leadership on PWB.
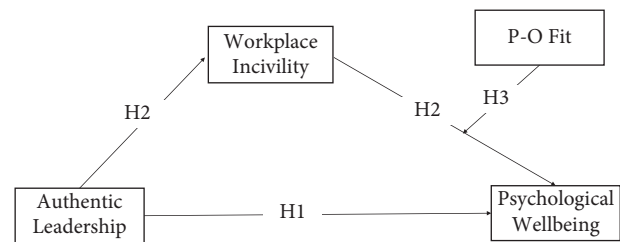
Figure 1: Proposed mediated moderation model.

2. Background

2.1. Direct Relationship: Authentic Leadership and PWB. Nursing is an occupation where employees regularly encounter high levels of psychological stress, which often leads to chronic health problems [1]. Psychological stress is defined as "a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being" [19], p. 19). As an example of PWB [18], psychological distress is an outcome of the interplay between a person and their work environment [19]. Underpinned by positive psychology, authentic leadership has been proposed to be an effective tool for improving the PWB of nursing professionals [28]. Authentic leaders "are guided by sound moral convictions and act in concordance with their deeply held values, even under pressure, and strive to understand how their leadership impacts others" [29], p. 332). Authentic leadership is comprised of four components: self-awareness, internalized moral perspective, balanced processing, and relational transparency [28]. Authentic leadership contributes to a healthy work environment, which is beneficial for staff and patients [28]. Authentic leadership has the potential to build trust and confidence, which in turn results in higher PWB when employees feel valued and respected [11]. Followers' experiences of leader authenticity can be conceptualized as a resource that can be deployed to help improve their well-being at work [16]. We hypothesized that:

H1. There is a positive, direct association between the supervisor's enactment of authentic leadership behaviors and followers' PWB.

2.2. Authentic Leadership, Workplace Incivility, and PWB. We theorize that the direct relationship between authentic leadership and PWB is mediated by workplace incivility. To our knowledge (see the systematic review by [28]), there are few empirical studies that examine this mediation relationship. To address this gap in our knowledge, we contend that authentic leadership can help to eliminate workplace incivility, which then improves followers' PWB. While authentic leadership has the potential to reduce the incidence of workplace incivility, our review of existing research brought to light only one study in the context of nursing [2].

Workplace incivility has received considerable research attention over the past three decades (e.g., [5]). Incivility is a "subtype of workplace mistreatment that is characterized by low-intensity social interactions that violate norms of respect and whose harmful intent is ambiguous" [30], p. 316.

It occurs far more frequently [4] and can be just as harmful [31] as other forms of harmful behavior. Workplace incivility has a negative association with the PWB of targets [31, 32].

Bandura's [23] SLT can be used to explain the indirect association between authentic leadership and PWB in that while authentic leaders influence the ethical conduct of their followers as a result of role modeling, they also create the work environment by signaling to their team the importance of respect and trust in the workplace [28]. These behaviors form the acceptable standard, which then diffuses across and trickles down the organization via social learning [33], encouraging others to behave in a similar manner. In this way, authentic leaders encourage employees to treat others fairly and with respect while discouraging violations of these expectations [34]. This social learning process can be an influential mechanism through which authentic leaders can affect followers' well-being at work [35] by encouraging civility norms [2]. We hypothesize the following relationship:

H2. Workplace incivility has an indirect mediation effect on the association between the enactment of authentic leadership behaviors and followers' PWB.

2.3. P-O Fit as Moderator. As an example of value congruence [36], P-O fit allows "judgments of congruence between an employee's personal values and an organization's culture" [36], p. 875). Avolio and Gardner [37] noted that leaders who exhibit authentic leadership behaviors tend to develop and foster high relational quality and close relationships with their followers, which, in turn, foster greater value congruence (or P-O fit) and follower reciprocation in the behaviors consistent with the leaders' values. Such reciprocity is acquired in the process of social learning and affects followers' well-being (Zheng et al., 2022). Mackey et al. [27] conceptualize P-O fit as a personal resource to buffer workplace stress "because perceptions of organizational fit are generally sought after and valued, which provides stress-resistance potential" (p. 459) as it improves employees' health and well-being. Meta-analytical review findings from Kristoff-Brown et al. [26] support the notion that higher levels of P-O fit are associated with lower levels of work-related stress as employees tend to express a higher level of well-being when they perceive a fit of their own values with their employers. Workplace incivility as an example of stressful work events in the healthcare setting [2, 28] could then be buffered by the extent to which nurses perceived P-O fit. We therefore hypothesize that:

H3. The relationship between workplace incivility and PWB is moderated by P-O fit such that when value congruence is high, the negative effects of workplace incivility on PWB will be weaker.

3. Methods

At the time of data collection, there were 352,838 registered nurses and midwives (including registered nurses, enrolled nurses, and midwives), as reported by the Australian Institute of Health and Welfare [38]. PureProfile, a research company based in Australia, was engaged to assist with sending out an online survey to their panel members (inclusion criteria: nurses from Australia, between 18 and 65 years old, full and part-time employment, employment in public, private, and not-for-profit hospitals). This recruitment strategy is common in the literature (e.g., [39]. Our exclusion criteria included those who were not residents of Australia at the time of the study, not qualified as "nurses" as defined by the Australian Health Practitioner Regulation Agency, and those who were older than 65 years old.

We received useable responses from 600 Australian nurses in Wave 1 of data collection. They provided data on demographic and control variables, authentic leadership and P-O fit, and workplace incivility. The respondents were contacted again six months later to provide their responses for their PWB at Time 2. In this cross-sectional study, we obtained 230 useable matched responses (response rate = 38.3%). We decided to use a six-month temporal separation between waves as informed by the incivility literature (see [40]). G∗Power analysis concluded that this sample size has sufficient power and effect size to yield significant accuracy and flexibility of predictions with three predictors [41].

3.1. Measures. We adopted previously validated scales in this study. The composite reliability coefficient (CR), average variance estimate (AVE), and maximum shared variance (MSV) are reported below.

3.1.1. Authentic Leadership. We used the 16-item Authentic Leadership Questionnaire (ALQ) from Walumbwa et al. [14] to measure respondents' perceptions of their immediate supervisor's authentic leadership behaviors. It is deemed appropriate to ask employees to provide an assessment of their supervisor's leadership behavior if they have daily interaction with them and can observe whether they demonstrate those behaviors [34]. Sample item includes "Displays emotions exactly in line with feelings." The items were rated on a five-point Likert type scale, ranging from 1 "not at all" to 5 "frequently, if not always" (CR 0.98, AVE 0.93, and MSV 0.32).

3.1.2. Person-Organization Fit (P-O Fit). We used the 3-item scale developed by Cable and DeRue [36] to operationalize P-O fit. This scale has been used in the literature [42]. A sample item reads: "My personal values match the organization's values." These were rated on a seven-point Likert type scale, ranging from 1 "strongly disagree" to 7 "strongly agree" (CR 0.95, AVE 0.83, and MSV 0.32).

3.1.3. Workplace Incivility. We used the 5-item scale from Cortina et al. [31] to measure workplace incivility. A sample item asks respondents if they had experienced various workplace incivility in the previous six months, such as "Addressed you in unprofessional terms, either publicly or privately?" (ranging from 0 "never" to 4 "frequently "at least

once a day")". The content and discriminant validity of this scale are well established [31]. In this study, we found the validity and reliability coefficients to be satisfactory (CR 0.95, AVE 0.74, and MSV 0.13).

3.1.4. Psychological Well-Being (PWB).

We used the Kessler K-10 Psychological Stress Scale [43] to measure PWB at Time 2. This scale is comprised of 10 commonly found stress symptoms, and in Australia, the K-10 scale has been used as an indicator of well-being in the 2017–18 National Health Survey [44]. It has been used to measure PWB in the nursing profession [17, 20] and in workplace incivility research [45]. Respondents were asked to indicate how frequently they have experienced these stress symptoms over the past 30 days (sample item: "Did you feel that everything was an effort?"). Responses were recorded on a five-point Likert type scale ranging from 1 "none of the time" to 5 "all of the time." This scale was reverse-coded such that low scores represent distress (low PWB). Validity and reliability coefficients were found to be satisfactory (CR 0.95, AVE 0.64, and MSV 0.13).

3.1.5. Control Variables.

In addition to adopting temporal separation in data collection [46], we also controlled for the effects of gender, age, the average number of patients per shift, and organizational tenure because these variables have previously been found to be associated with incivility [47].

3.2. Ethical Considerations.

Ethics approval was obtained before data collection from Curtin University (reference: SOM 19–12). Consistent with good practice, we assured the participants' anonymity and confidentiality in the participant information letter.

3.3. Data Analysis.

We used IBM SPSS v.25 to perform bivariate correlations and descriptive statistics. Confirmatory factor analysis was conducted within IBM AMOS v25, and model testing was completed using Model 14 of Hayes' [48] Process Macro within IBM SPSS v27.

3.4. Validity and Reliability.

All of the scales exceed the recommended reliability thresholds [49]. The Fornell and Larcker's [50] Average Variance Extracted (AVE) test was used to establish the discriminant validity of the scales used in the survey. All of the scales met the 0.50 threshold for AVE, and the square root of the AVE for each scale was higher than its correlation with any other scale. This finding indicates that the scales measured distinct latent constructs.

We used a time-lag research design [46] to minimize common method variance (CMV). As noted by Podsakoff et al. [46], the inclusion of a moderator (incivility × P-O fit) in the model ensures that CMV would not produce statistically significant effects. We also employed proactive procedural remedies such as the random ordering of survey items and ex-post statistical tests (see [46]) to further minimize any potential effects of CMV. To this end, we also

conducted Harman's single factor test by subjecting all items to an unrotated exploratory factor analysis which revealed a single largest factor that explained 29.9% of the variance. Given this result, we were confident that CMV effects were not present.

Before testing the 4-factor hypothesized model (that is, authentic leadership, workplace incivility, P-O Fit, and PWB), we conducted several nested measurement model comparisons against three (authentic leadership + workplace incivility, P-O Fit, and PWB), two (authentic leadership + workplace incivility, P-O Fit and + PWB) and single (authentic leadership + workplace incivility + P-O Fit + PWB), factor alternate models. The results indicate that the hypothesized 4-factor model was the best fit to the data ($\chi^2/df = 1.33$, CFI = 0.98, TLI = 0.98, RMSEA = 0.04, SRMR = 0.04) and corresponds with our hypothesized framework.

4. Results

As previously reported, 230 Australian nurses completed the two-wave online questionnaire. The majority of the respondents were female (84.3%). Half of the respondents worked part-time (53.5%), and most were employed by public and not-for-profit sector health care organizations (66.1%). Respondents were from New South Wales (33.9%), Victoria (23.0%), Queensland (16.5%), South Australia (12.6%), and Western Australia (9.1%). Over half of the respondents were between 41 and 60 years old (53.9%), followed by those who were 31–40 years old (20.0%), which matches the 2017 data produced by the [51] report (53.6% and 19.6%, respectively) and is consistent with the nationwide health workforce data for nurses and midwives. The largest group of nurses had greater than ten years of organizational tenure (30.4%), followed by those with six to ten years (23.9%), and then those with three to five years (16.1%). The respondents had on average 18.7 patients per shift (SD = 36.7).

Descriptive statistics and zero-order correlations are reported in Table 1. On average, nurses reported their immediate supervisor's leadership behavior to be moderately authentic ($M = 3.27$, SD = 0.87). Ratings of incivility frequency showed 40 nurses had no experience with incivility (17.4%), 78 experienced incivility once every few months or less (34.0%), 51 experienced incivility once a month (22.2%), 46 experienced incivility at least once a week (20.0%), and 15 nurses experienced incivility at least once a day (6.4%). This finding is consistent with the literature, as nurses tend to experience a high level of workplace incivility (see [45, 52]). They also reported a moderate level of value congruence with their organization ($M = 4.06$, SD = 1.55).

To test the hypothesized relationships, we conducted a multiple regression analysis using Model 14 of Hayes's [46] PROCESS macro with 10,000 bootstrapped subsamples using IBM SPSS v25. Control variables were also entered into the model. There was a positive association between workplace incivility and average patients per shift ($\beta = 0.17$, $p < 0.05$) and a negative association with age ($\beta = -0.07$, $p < 0.05$). There was a positive association between PWB and

TABLE 1: Descriptive statistics and intercorrelations.

	Mean	SD	1	2	3	4
1. Authentic leadership (T1)	3.27	0.87	**0.98**			
2. Workplace incivility (T1)	1.14	1.03	−0.40***	**0.95**		
3. P-O fit (T1)	4.05	1.54	0.53***	−0.34***	**0.95**	
4. Psy well-being (T2) (Low scores in psychological well-being scale represent distress)	2.06	0.94	0.09	−0.49***	0.07	**0.95**

Note. $N = 230$. ***$p < .001$. Correlations of control variables are not reported. Bold, italicized text: Composite Reliability Coefficient. T1: time 1. T2: time 2.

gender ($\beta = 0.31$, $p < 0.001$) and a negative association with supervisory position ($\beta = −0.23$, $p < 0.01$). There was no support for a direct relationship between authentic leadership and PWB (hypothesis 1), while the remaining hypotheses were supported (see Table 2). There was a negative association between nurses' perception of their supervisor's authentic leadership and workplace incivility ($\beta = −0.33$, $p < 0.001$). Workplace incivility had a negative association with PWB ($\beta = −0.53$, $p < 0.05$).

Results of the indirect paths are reported in Table 3. Workplace incivility mediated the effect of authentic leadership on PWB (effect −0.13, SE 0.05, 95% CI [−0.24, −0.03]), and there was support for P-O fit to moderate the full mediation of authentic leadership on PWB (effect −0.048, SE 0.017, 95% CI [−0.084, −0.016]). Hypothesis 2 was supported. Nurses' P-O fit moderated the negative relationship between workplace incivility and PWB ($\beta = 0.16$, $p < 0.01$). The moderation plot (see Figure 2) indicates that P-O fit minimized the negative association between workplace incivility and PWB. As shown in Table 3, these results provide evidence to support a mediated moderation model.

5. Discussion

The main aim of this study was to respond to the call in the literature to investigate the impact of leadership behaviors on the well-being of followers. As part of this research, we tested the mediator effect of workplace incivility and value congruence (measured by P-O fit) as a moderator. Our findings have three main implications.

First, our study contributes to the literature by enhancing our understanding of authentic leadership [2, 28] in PWB, especially in minimizing psychological distress. This finding contributes to the underresearched topic of how leadership behaviors affect followers' well-being [10, 11]. By establishing an indirect association between authentic leadership and PWB, our study has provided additional evidence of the effect of authentic leadership in minimizing workplace incivility, and in doing so, sheds light on how authentic leadership influences the PWB of nurses at different stages of their work tenure beyond early career and initial job experiences [2, 53].

The application of social learning theory [23] allows us to unpack how this process takes place in the nursing context [24]. Supervisors who engage in authentic leadership behaviors are likely to discourage workplace incivility by openly displaying and upholding ethical norms and values regarding acceptable workplace conduct [2]. Followers learn that this is the accepted social norm and imitate their leader's positive behaviors. This in turn reduces the prevalence of workplace incivility and improves PWB. Authentic leadership behaviors enable nurse managers to create a more civil work environment and enhance employees' well-being at work (e.g., [35]).

Second, we found workplace incivility (a form of workplace deviance) had a negative association with nurses' PWB. While there are a variety of approaches to operationalizing and measuring PWB evident in previous research, in this study we have demonstrated how psychological distress as an indicator for PWB [18] could be enhanced by minimizing interpersonal deviance at work. Workplace incivility depletes the psychological resources of those who are affected by the behaviors [27]. Employees could learn positive leadership behaviors by mirroring the authentic behaviors of their supervisors, which in turn helps to minimize the prevalence of workplace mistreatment across the organization [54].

Third, P-O fit was found to be a moderator of the association between workplace incivility and PWB. As indicated by the moderation plot, the moderation effect occurs when the P-O fit is high. What we have is a situation where the enactment of authentic leadership behaviors leads to less workplace incivility. This leads to a higher level of PWB for nurses who exhibit a high level of P-O fit. P-O fit, as a form of value congruence, could be treated as a resource that nurses could draw upon to maximize the positive consequences of civility. This moderation finding represents a contribution to the literature as it has not been empirically tested [27]. Our finding also adds to our understanding of the contribution of P-O fit on employee well-being outcomes at work [26].

5.1. Practical Implications. This study has implications for nurse managers as well as managers in the health and public sectors generally. Our findings suggest that health care managers should be trained to develop their positive, relational leadership styles. The enactment of authentic leadership behaviors by frontline supervisors combats workplace stressors and improves well-being by minimizing workplace incivility in healthcare settings. Authentic leadership could lead to the development of more civil [2], heathy, and safe workplaces that minimize employee mistreatment [54]. This influence is reinforced through an improvement in the P-O fit between nurses' personal values and those of the organization where they work. As a form of ethical leadership behavior, authentic leadership has the potential to significantly reduce workplace incivility and increase PWB among employees in high-demand work environments like nursing.

Table 2: Results of mediated moderation analysis using Hayes process macro model 14.

	Unstandardized β	SE	T	p	LLCI	ULCI
DV = workplace incivility (R-sq = 0.2522)						
Constant	−0.0498	0.1049	−0.4744	0.6357	−0.2565	0.1569
Gender	−0.0650	0.0636	−1.0225	0.3077	−0.1904	0.0603
Employment status	0.0004	0.0011	0.3842	0.7012	−0.0017	0.0025
Average patients per shift	0.1725	0.0854	2.0199	0.0446	0.0042	0.3408
Age	−0.0687	0.0283	−2.4298	0.0159	−0.1245	−0.0130
Authentic leadership T1	−0.3247	0.0425	−7.6362	0.0000	−0.4085	−0.2409
DV = PWB (R-sq = 0.1208)						
Constant	2.5356	0.3226	7.8599	0.0000	1.8998	3.1714
Gender	0.3064	0.1011	3.0318	0.0027	0.1072	0.5055
Employment status	0.0279	0.0621	0.4487	0.6541	−0.0945	0.1502
Average patients per shift	−0.0005	0.0010	−0.4706	0.6384	−0.0025	0.0015
Supervisory position	−0.2252	0.0829	−2.7170	0.0071	−0.3885	−0.0618
Age	−0.0340	0.0285	−1.1932	0.2341	−0.0901	0.0221
Authentic leadership T1	0.0273	0.0531	0.5153	0.6069	−0.0772	0.1319
Workplace incivility T1	−0.3366	0.1419	−2.3714	0.0186	−0.6163	−0.0569
P-O fit T1	−0.0706	0.0420	−1.6834	0.0937	−0.1533	0.0121
Wk incv × P-O fit (interaction)	0.1227	0.0384	3.1943	0.0016	0.0470	0.1984

$N = 230$.

Table 3: Results of mediated moderation analysis.

Direct effect of authentic leadership on PWB (hypothesis 1)					
Effect	se	t	p	LLCI	ULCI
0.0273	0.0531	0.5153	0.6069	−0.0772	0.1319
Conditional indirect effects of X on Y					
Indirect effect: authentic leadership→workplace incivility→PWB (hypothesis 2)					
P-O fit (moderator)		Effect	BootSE	BootLLCI	BootULCI
2.2765		0.0186	0.0263	−0.0319	0.0717
3.6357		−0.0356	0.0222	−0.0807	0.0071
4.995		−0.0897	0.0314	−0.1541	−0.0300
Index of mediated moderation (hypothesis 3)					
		Index	BootSE	BootLLCI	BootULCI
P-O fit (moderator)		−0.0398	0.0137	−0.0680	−0.0140

Workplace incivility could be minimized by introducing workplace civility programs, which could be used to reduce incivility in order to improve job attitudes and well-being [2, 55]. An example is the 6-month workplace intervention model known as CREW - Civility, Respect, and Engagement at Work [56]. As part of the intervention, nurses would meet with their coworkers within their workplace on a " weekly or biweekly basis to work on effective interpersonal interactions at work" [56]. Trained facilitators would provide guidance to the groups on how to improve workplace communication. This intervention seeks to improve workplace social relationships in order to enhance respect. A civility toolkit could also be produced, similar to the one proposed by the UK's National Health Service (NHS). The NHS used the toolkit to create a civil and respectful culture to improve employee well-being and patient care [52]. These organizational practices are important as they could improve nurses' person-organization fit and are likely to reciprocate with affective commitment and a greater sense of belongingness. Nursing supervisors who exhibit authentic leadership behavior in the workplace by striving to build open, genuine relationships and by helping their followers fit in with their workplace create more civil work environments that promote employees' well-being and, ultimately improve the quality of care [6].

5.2. Limitations and Future Research Implications. Focusing on nurses in the Australian health care sector limits the generalizability of our findings. We applied procedural and statistical remedies to provide assurance that common method bias did not affect our results [46]. Control variables were incorporated to control for confounding effects. We should note the potential for reverse causality remains. Future studies should test the possibility of a reverse causal relationship between authentic leadership and PWB by collecting longitudinal data. Multisource data could be used to develop our findings by better isolating the predictors of PWB. It might also be valuable to explore further the extent to which and how authentic leadership is being measured by using experimental design or implicit measures, or to
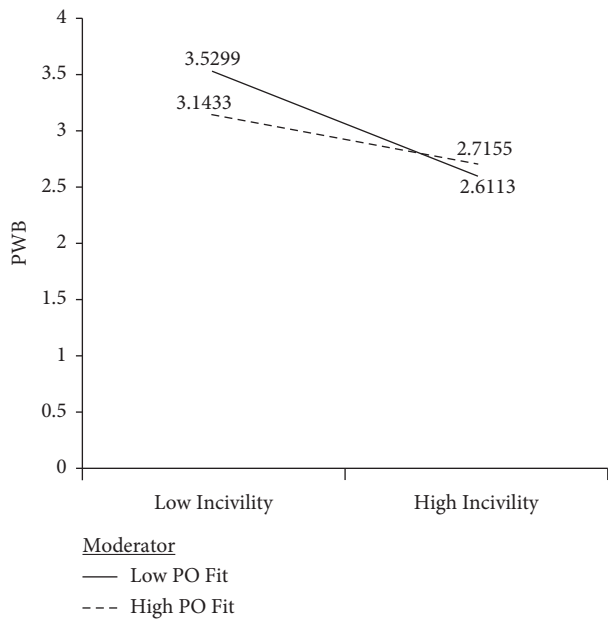
FIGURE 2: Moderation effect of P-O fit. Note: control variables are not shown in the figure.

explore the relationship between leaders' intentions and followers' perceptions of authentic leadership behavior [57]. Recall bias could be another potential limitation, which can be addressed by using a daily diary design [58].

6. Conclusion

Our study aimed to examine how authentic leadership behavior affects the well-being of nurses where workplace incivility is present. Using data collected from a sample of nurses working in Australian health care organizations, we found evidence to support the argument that workplace incivility has a deleterious effect on PWB. Our study suggests that nursing managers have an important role to play in protecting and improving the well-being of those they supervise, and authentic leadership behavior is an additional and effective skill in this endeavor [59–63].

Data Availability

The survey data used to support the findings of this study have not been made available because of restriction imposed by institutional review board for sharing data. This was part of the ethics approval conditions.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Research Article

Effect of Job Crafting Intervention Program on Harmonious Work Passion and Career Commitment among Nurses: A Randomized Controlled Trial

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Aim. This study aimed at evaluating the effects of a job crafting intervention program for nurses on their job crafting behaviors, harmonious work passion, and career commitment. *Background*. Nurses generally work in suboptimal environments with chronic low resources and high demands. Job crafting may be a cost-effective strategy to deal effectively with such environments. However, its effectiveness as a nursing intervention program remains unclear. *Methods*. An open-label randomized controlled trial was conducted at a hospital in Port Said, Egypt. The study enrolled 94 nurses. Participants were assigned randomly to the intervention group ($n = 47$) or the control group ($n = 47$). The intervention group had a 2-day workshop, 3 weeks of job crafting implementation, and a reflection session, whereas the control group participated in a 1-day workshop. Data were collected at baseline, 2 weeks, and 3 months after the intervention in both groups by using the Job Crafting Scale, Job Crafting Knowledge Questionnaire, Harmonious Work Passion Scale, and Career Commitment Scale. *Results*. Compared with the control group, the intervention group experienced a higher level of job crafting behaviors and reported a greater improvement in harmonious work passion, but not in career commitment. *Conclusion*. Nurses can be trained on job crafting behaviors, which can lead to the maximization of job resources, optimization of job demands, and enhancement of nurses' harmonious work passion. *Implications for Nursing Management*. Nursing managers should train nurses regularly on how to be job crafters because it is an effective tool that helps nurses deal with limited job resources and increased job demands and makes them more harmoniously passionate about their work.

1. Background

Nursing is a highly challenging profession [1]. Nurses worldwide are always under intense pressure [2, 3]. By their professional nature, they work in an environment with chronic high job demands and low resources [4]. In Egypt, nurses work in more complex conditions characterized by poor staffing, long shifts, extensive responsibilities, unclear job description, increased stress, high workload, and demotivation [5]. Working in such a suboptimal environment has adverse effects on nurses and places them in unfavorable circumstances [6]. To address these problems, nurses have proposed job crafting as a strategy to maximize these limited resources and optimize the increased job demands [7, 8]. Job crafting may be the solution for many problems nurses face in their workplace [9].

Wrzesniewski and Dutton initially presented the term "job crafting," resulting from the physical and mental changes that people experience in a certain task or relationship boundary of their profession [10]. Recently, job

crafting was viewed as a self-initiated behavior aimed at balancing between demands and resources of job [8]. Job crafting was operationalized from two dominant perspectives. The first is the Wrzesniewski and Dutton perspective, which theorizes that job crafting has three aspects, namely, task, relational, and cognitive crafting. Task crafting involves altering the scope or number of job tasks (e.g., considering taking an additional task as enjoyable). Relational crafting means improving the quality and/or the quantity of work relationships (e.g., less interaction with an unfavorable person). Cognitive crafting is changing the way people view their jobs (e.g., a nurses reframe their job from serving patients to saving patient's life) [10].

The second and most recent perspective is Tims et al.'s perspective, which is based on the Job Demands-Resources (JD-R) model. This study adopted this perspective. According to this perspective, job crafting is categorized into three aspects: increasing job resources, seeking challenge, and decreasing job demands [7]. Job resources are job elements that help in accomplishing work goals (e.g., colleagues' support, job autonomy, and supervisors' feedback). Challenging a job means accepting demands that are perceived as rewarding and worthy of one's effort (e.g., sharing of knowledge, participating in a certain committee, and mentoring nursing students). Job demands are job elements that need consistent physical, mental, and emotional efforts (e.g., time pressure and dealing with difficult patients) [8].

Practicing job crafting among nurses has become critical and can lead to multiple positive outcomes [11]. It is a cost-effective strategy by which nurses can improve their functioning at work [12]. Nurses who can craft their job are more able to balance between the needs of the organization and their preferences and abilities [13], to have higher levels of well-being, productivity, and meaningful work, and to give high-quality care [14]. Further, job crafting increases nurses' identity and autonomous internalization, which foster work passion [15]. One of the most important forms of work passion is harmonious work passion [16].

Harmonious work passion is a new concept in organizational behavior that has gained increased attention in the recent nursing management literature [17]. It is related to the autonomous internalization of one's activity, allowing one to perform such an activity freely and willingly [16]. Notably, work passion is categorized into two types: harmonious work passion and obsessive work passion [18]. In this study, we adopt harmonious work passion as it represents the former type of passion, characterized by individuals' identity towards an activity and their internal motivation for doing it [17], making it a suitable target for the study. Studying factors that foster nurses' harmonious passion has become crucial because this type of passion has tremendous benefits [19]. For example, harmoniously passionate nurses are highly intrinsically motivated to seek more information [17], are more satisfied with their work, are less susceptible to conflict, are less prone to burnout [20], engage more in their work, and experience less exhaustion and job stress [21].

Nurses are the main source of healthcare services in health institutions [22]. They are responsible for patient care

and treatment against disease and mortality [1]. Thus, enhancing nurses' career commitment is necessary [23]. Career commitment is described as individuals' identification with and attachment to their profession [24]. Nurses with a high level of career commitment are more likely to show favorable work consequences, including higher citizenship behaviors and organizational commitment and decreased deviant behaviors and intentions to quit their profession [25].

Generally, nurses have a unique role in modern medicine [26]. However, nurses' poor work conditions have deleterious consequences, putting the safekeeping and quality-of-care standards at risk [27]. Therefore, nursing scholars become more interested in studying job crafting [11], and others recommend interventions to foster it among nurses because of the urgent concern and the belief that it is a powerful strategy that can change their work environment positively [13]. Job crafting training empowers nurses to have greater control over their work, build a motivating work climate, maximize job resources, optimize increased job demands, enhance cognitive and behavioral attitudes towards change, and reduce exhaustion [28]. Additionally, it has been shown to enhance work engagement [29] and self-efficacy [30]. These benefits underscore the importance of providing job crafting training for nurses. However, job crafting studies in nursing are still few [31], and among them, only one focused on job crafting intervention [12]. Moreover, in the non-nursing field, studies that included job crafting intervention yielded contradictory results, and job crafting as a trainable behavior remains uncertain [32]. Therefore, to address these gaps, this study primarily aimed at testing if job crafting intervention can stimulate job crafting behaviors among nurses.

Training nurses on how to craft their job may lead to many positive outcomes. Job crafting training previously improved nurses' well-being and performance [12]. However, researchers found no published studies investigating the effect of job crafting intervention program on harmonious work passion or career commitment in nursing or non-nursing field, despite the critical need of studying factors that can increase nurses' harmonious work passion [19] and career commitment [33]. Hence, the secondary objective of the present study was to fill these gaps by examining the effect of job crafting intervention program on nurses' harmonious work passion and career commitment.

2. Theoretical Framework

Job crafting intervention is a training program designed to encourage individuals to proactively redesign their jobs by optimizing available job resources, managing increased job demands, and adapting to new job challenges [34]. Job crafting intervention is based on two main approaches: (1) the Wrzesniewski and Dutton approach, which frames job crafting as proactive changes in task, relational, and cognitive job aspects [10], and (2) the Tims et al. approach, which is based on the Job Demands-Resources (JD-R) theory [7].

The JD-R theory postulates that individuals require a sufficient amount of job resources to effectively cope with

the demands they encounter in their work. According to this theory, organizations play a crucial role in providing optimal job demands and resources to their employees. However, individuals also possess the autonomy to proactively modify their job demands and resources, thereby contributing to a better alignment between individuals and their jobs. Consequently, this leads to enhanced optimal functioning within the workplace [35]. Job crafting, when framed within this context, refers to the ability of individuals to change three types of job characteristics: job resources, seeking challenge, and job demands [7].

Previous studies have explored the outcomes of job crafting intervention and demonstrated its positive effect on enhancing work engagement, job performance [29], career satisfaction [36], and well-being [12]. Job crafting intervention increases individuals' awareness of their own preferences and needs, empowering them to take action to make changes. The job crafting intervention provides individuals with specific techniques and tools they can use to identify areas where they can make changes to manage their job resources and demands. Moreover, job crafting intervention encourages them to formulate a job crafting plan, which increases their adherence to job crafting behaviors [37]. Hence, job crafting intervention leads to an increase in job crafting behaviors and all related dimensions. Therefore, the study hypothesized that

> H1. Nurses participating in the job crafting intervention will exhibit higher levels of job crafting behaviors and all related dimensions after the intervention compared with those in the control group.

2.1. Job Crafting Intervention and Harmonious Work Passion.
Harmonious work passion is an essential factor that has significant implications for the well-being and performance of nurses [38]. However, nurses can lose their harmonious passion due to the intense physical, emotional, relational, and social pressures they face while practicing their profession [39]. Additionally, a lack of control over their work environment can also lead to reduced passion [40]. Training nurses on how to craft their job can be an effective strategy to help them manage physical, emotional, relational, and social pressures and gain control over their work environment [10]. Hence, training nurses on how to craft their job can enhance their passion towards their work. Therefore, the study hypothesized that:

> H2. Nurses participating in the job crafting intervention will experience a higher level of harmonious work passion after the intervention compared with those in the control group.

2.2. Job Crafting Intervention and Career Commitment.
Career commitment is achieved when nurses are able to align their career path with their personal preferences and interests [25]. Job crafting training equips individuals with the necessary tools to proactively shape their work environment to better fit their skills, values, and interests [41].

Additionally, practicing job crafting and gaining increased control over their work can foster a sense of ownership and investment in their careers [42]. Furthermore, job crafting training can enhance nurses' job engagement and well-being [12], which can further contribute to their career commitment [43]. Hence, job crafting training can improve career commitment among nurses. Therefore, the study hypothesized that

> H3. Nurses participating in the job crafting intervention will have a higher level of career commitment after the intervention compared with those in the control group.

3. Subjects and Methods

3.1. Study Design. This study was a two-arm, parallel, open-label randomized controlled trial (RCT) that conforms to the Consolidated Standards of Reporting Trials (CONSORT) guidelines [44]. The study protocol was registered at ClinicalTrials.gov (Identifier code: NCT05329805; 15/04/2022).

3.2. Participants and Setting. This study recruited nurses working 12 hours per shift for 186–195 hours a month at one of the universal health insurance hospitals in Port Said Governorate, Egypt. Nurses who were licensed staff nurses, worked in a ward, and had at least 6 months of experience were included in the analysis. In contrast, nurses who were involved in any other intervention program within the last 12 months, working in clinics, or holding an administrative position were excluded. Of the 224 invited participants, 58 did not meet the inclusion criteria, 62 declined to participate, and 10 were piloted. Ultimately, 94 were included and randomly allocated to the intervention group ($n = 47$) or the control group ($n = 47$). Overall, 79 (39 in the intervention group and 40 in the control group) completed the intervention up to T2 data collection. The attrition rate from the baseline (T0) until T2 data collection was 15.95%. Figure 1 illustrates the consort flow diagram of the participants.

3.3. Sample Size Calculation. A prior sample size was estimated using the G*Power 3.1.9.7 Software [45] for repeated measures analysis of variance (ANOVA) design (within-between interactions) with effect sizes of 0.26 and was obtained from the meta-analysis on job crafting intervention that included healthcare professionals [29] (α error = 0.001, power = 0.95). A sample of 72 participants (36 for each group) was estimated. Considering the possibility of a 30% attrition rate resulting from high dropout/loss to follow-up among Egyptian participants [46], the recruitment target was 94 participants (47 in each group).

3.4. Randomization and Blinding. An independent researcher randomly assigned the participants to the intervention or control group by using the "Research Randomizer" web-based program [47]. The number of groups needed and the number of potential participants
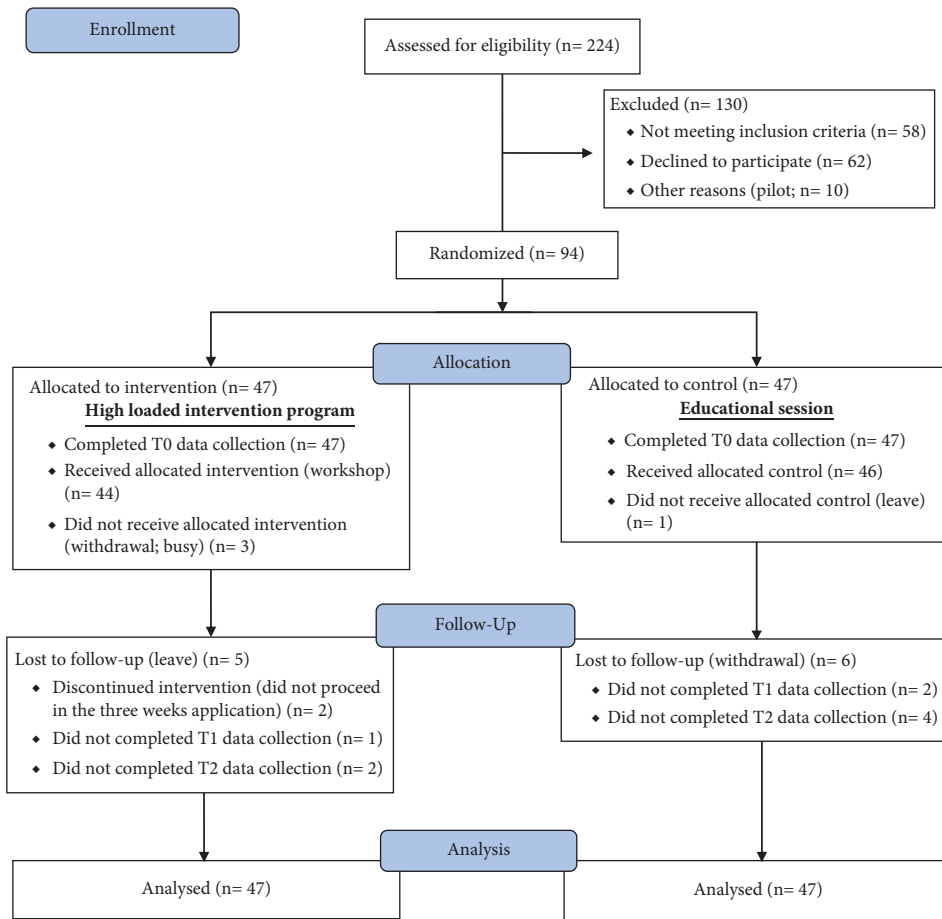
Figure 1: Consort flow diagram.

were input into the program, which generated two sets of 94 unique, sorted numbers arranged from the least to the greatest and allocated randomly to either Group 1 (representing the control group) or Group 2 (representing the intervention group) in a 1 : 1 ratio. The allocation sequence was concealed by using opaque sealed envelopes.

Blinding was not feasible in this study because the intervention provided was an educational program, which made the blinding of the researcher or the participants to the group allocation difficult [48]. Nevertheless, to minimize the risk of bias, the data collection and analysis were performed by authors (SM, MS, and MZ) were not involved in providing the intervention program conducted.

3.5. Intervention. The job crafting intervention program was developed according to the Michigan Job Crafting Exercise [37] and was operationalized on the basis of the JD-R theory principles [49]. The intervention aimed to train the participants in maximizing their job resources, optimizing the increased job demands, and adapting new job challenges, which may be useful in enhancing their harmonious work passion and career commitment.

Prior to the intervention program, potential participants and nursing managers with different levels were interviewed to understand the work context, which included the

following: what does good performance mean from their point of view, what hinders them from doing so, what helps them to provide high-quality care, what tasks represent challenges, and why they did not assume such challenges. This information was utilized to prepare a tailored intervention and customized examples in creating the intervention.

Five-expert committee included two nursing administration professors, one nursing manager, and two staff nurses with master's degrees were asked for suggestions on the content and structure of the intervention materials. The intervention materials were modified based on their suggestions and sent back to the committee for approval. Then the intervention materials were pilot tested to ensure their quality and clarity.

Thereafter, the intervention was conducted, consisting of a 2-day workshop, 3 weeks of job crafting implementation, and a reflection session. The workshop consisted of four 60–90-minute sessions with 2 sessions per day and 30 min rest between sessions over 2 days. In session 1, the researcher introduced the theoretical background. In session 2, the JD-R model was discussed in detail, and the participants were requested to share their personal job crafting experiences. In session 3, they were invited to participate in the Michigan Job Crafting Exercise [37], which included job analysis, personal analysis, and job-personal analysis. As a result of

completing the exercise, each participant was expected to be aware of the following: resources that could be increased, the idea that demands could be decreased without interrupting the work, and areas that represent a challenge to them. In the fourth session, the participants were invited to prepare their own "Personal Crafting Plan." Table 1 details the content of the workshop.

At the end of the workshop, each participant received a booklet of the teaching material, which was developed according to an intensive literature review [8, 10, 37, 49–51] and the nurses' needs that were identified through interviews.

Furthermore, a list of job crafting activities was distributed. This list was developed by the researchers according to a previous job crafting study [31, 32, 52] and input from interviews. This list contained four sections. The first section included a set of points to increase job resources, such as "Asking for help from your colleague or your leaders if you need it" and "Clean your desk to work more efficiently." The second section included a set of points to increase challenging job demands, such as "Offer to be responsible for making the nursing schedule in a certain month" and "Share your head nurse in writing certain documents e.g., lab-ray or sterilization." The third section includes a set of points to decrease hindering demands, such as "Checking emails only at certain times during the day" and "Encourage patient to perform daily morning care by himself." The fourth section included five potential nursing situations with suggested job crafting activities. Each situation was accompanied by activities that can increase resources, increase challenging demands, and decrease hindering demands. Giving a list of job crafting activities makes it easier for nurses to practice job crafting [32].

After finishing the workshop, the participants were asked to engage in job crafting activities for 3 weeks guided by the job crafting activity list and the plan developed by the researchers. The participants were then asked to target activities related to increasing resources, optimizing job demands, and seeking challenges in weeks 1, 2, and 3, respectively. During this 3-week intervention period, the participants were invited to a WhatsApp group, which was formed to encourage, guide, share experiences, and send reminders twice weekly to engage in the assigned behaviors.

After completing the 3-week intervention program, a reflection session was held. In this session, participants were asked to evaluate their success, obstacles, solutions, and future plans for how they can craft their job. At the end of the session, the researcher expressed appreciation to each group member.

3.6. Control Group.

In the control group, the participants received only the content provided in the first and second sessions. They neither participate in the Michigan Job Crafting Exercise nor prepare the Personal Crafting Plan. Unlike the intervention group, the control group was not required to participate in the 3-week job crafting intervention or the reflection session.

3.7. Measures.

The study measures included scales that measure job crafting behaviors, knowledge about job crafting, harmonious work passion, career commitment, and the demographic information form. The researchers translated the scales, which were initially developed in English, into Arabic using the committee approach to translation [53]. The committee included four members who translated the scales independently and in parallel. These four members included 2 Egyptian nursing academics, 1 nurse who was proficient in English and familiar with the healthcare environments, and 1 English educator who was an Arabic native and fluent in English. All committee members approved the final version of each scale. All these scales were self-reported and completed by both group participants across the three time points.

3.7.1. Primary Outcome

(1) Job Crafting Scale. The Job Crafting Scale [8], which has 13 items, was used to assess the level of nurses' job crafting behaviors. It includes three dimensions: seeking resources (6 items), seeking challenges (3 items), and reducing demands (4 items). A sample item includes "I make sure that my work is mentally less intense." The scale answers range from 1 (never) to 5 (always). Higher scores indicate higher levels of nurses' job crafting behaviors. In its original version, the Cronbach's alpha for scale dimensions is 0.69–0.76. In our study, its reliability across the three time points was acceptable ($\alpha = 0.799$–0.901).

3.7.2. Secondary Outcomes

(1) Job Crafting Knowledge Questionnaire. This questionnaire is a 26-item multiple-choice questionnaire that was used to assess the level of nurses' knowledge of job crafting. It was developed by the researchers according to previous studies [8, 10, 49, 51]. The 26 questions particularly assessed nurses' understanding of the job crafting concept (1 question), the importance of job crafting (1 question), characteristics of job crafting (2 questions), models (8 questions), and JD-R theory and its application strategy (14 questions). The score ranges from 0 to 26, with higher scores indicating greater knowledge.

(2) Harmonious Work Passion Scale. The Harmonious Work Passion Scale, which has 7 items, was created by Vallerand et al. to assess nurses' harmonious passion toward their work [18]. A sample item includes "This work allows me to live memorable experiences." Responses were based on a 7-point Likert scale, with 1 representing "Not agree at all" and 7 representing "Very strongly agree." Higher scores indicate greater harmonious work passion. The Cronbach's alpha in its original version was 0.79. In this study, the reliability across the three time points was acceptable ($\alpha = 0.711$–0.894).

(3) Career Commitment Scale. The Career Commitment Scale [24], which consists of 8 items, was specifically designed to assess career commitment among nurses. The

TABLE 1: Job crafting training sessions, goals, and activities.

Sessions	Goals	Program activities
First session (theoretical background)	(1) Establish a group (2) Introduce the program (3) Introduce the concepts of job crafting (4) Distinguish between job crafting and the traditional job design (5) Explore the importance of being a job crafter (6) Identify the job crafting characteristics (7) Discuss different job crafting models	(i) Warm-up game and acquaintances (ii) Establishment of a group contract (iii) Clarification of the program's aim, activities, and timeline (iv) Explanation of the concepts of job crafting by the researcher (v) Group discussion about the difference between job crafting and the traditional job design (vi) Description of the importance of being a job crafter (vii) Demonstration of job crafting characteristics (viii) Explanation of the different job crafting models by the researcher (ix) Sharing of real-life examples in practicing each model by the participants
Second session (JD-R model)	(1) Focus on the job demands-Resources (JD-R) model (2) Exchange concrete experiences	(i) Lecture on JD-R model (ii) Provision of examples of job resources, demands, and challenges related to nursing career (iii) Sharing of personal job crafting experiences in terms of maximizing resources, optimizing job demands, and seeking challenges with each other by the participants (iv) Review of the day (v) Provision of homework that aims to identify job resources, demands, and challenges other than those mentioned in the session
Third session (Michigan job crafting exercise)	(1) Complete the Michigan job crafting exercise in terms of the following: (2) Job analysis (3) Personal analysis (4) Job-personal analysis	(i) Sharing homework from the previous session (ii) Brain storming about job resources they have in their workplace (iii) The group listed their job demands (iv) Group discussion about tasks which represent job challenges (v) Participants summarize individually their own strengths, motive, weakness point and obstacles they experience in their work and matched it with the task they performed
Fourth session (personal crafting plan)	(1) Create the personal crafting plan (2) Clarify the next intervention	(i) Participants individually formulating their own job crafting goals and activities they could practice to maximize job resources, adapt new challenges and optimize job demands to carry out in the upcoming three weeks (ii) Discussion about the upcoming application (iii) Concluding all sessions

scale has three negatively worded items that are scored in reverse. A sample item includes "I definitely want a career for myself in nursing." A 5-point Likert scale, ranging from 1 (strongly disagree) to 5 (strongly agree), was used. Cronbach's alpha in its original version was 0.85. In this study, the reliability across the three time points was acceptable ($\alpha = 0.736$–0.753).

3.7.3. Demographic Information Form. This form consists of questions related to age, gender, marital status, education, nursing tenure, and status of receiving job crafting training before.

3.8. Data Collection and Procedure. Data were collected from the beginning of February 2022 to July 2022 in a longitudinal setup with a three-wave measurement (i.e., T0 = the baseline measurement collected 2 weeks before the intervention, T1 = the second measurement collected 2 weeks after the intervention, and T2 = the third measurement collected 3 months after the intervention (Figure 2)). Initially, permission to implement the study was obtained from the hospital administrators. Participants were recruited through announcements in their hospitals. The study purposes and procedures were thoroughly explained to all potential participants. Nurses who met the inclusion criteria and agreed to participate were asked to sign an informed consent form. After completion of the baseline measurement (T0), the nurses were randomly assigned to either the intervention or the control group. Three workshops were held with a maximum of 16 nurses per workshop. These workshops were conducted in the hospital education room.

To ensure consistent and effective implementation, a detailed implementation plan was developed, which outlined the specific activities, resources, and timelines for the intervention. Evidence-based teaching strategies were adhered to during program delivery, which was provided by the first author, who holds a PhD in Nursing Management and has extensive teaching experience. In addition, validated intervention materials, including booklets, brochures, and a list of job crafting activities, were developed and utilized.

To ensure participant retention, the program was scheduled at a convenient time for the study participants. In addition, multiple ways of maintaining contact with participants (i.e., personal phone contact, WhatsApp group, and email) were utilized to remind them to attend sessions and engage in the assigned job crafting behaviors.

3.9. Validity. The intervention program and data collection instruments used in this study were validated by 5 experts working in clinical and academic settings.

3.10. Pilot Study. A pilot study was conducted to assess the clarity, feasibility, validity, and reliability of the study measures, the amount of time taken for data collection, and the quality and clarity of the intervention materials. Ten nurses who were not included in the study sample but met the inclusion and exclusion criteria participated in the pilot study. Results revealed that the study measures and intervention materials were understandable and that no modifications were required.

3.11. Data Analysis. Data were analyzed using the Statistical Package for Social Sciences version 24.0 (IBM Corp, Armonk, NY, USA). Normally distributed data were evaluated using the Shapiro–Wilk test. The participants' characteristics were summarized using descriptive statistics. The homogeneity of the intervention and control groups' baseline characteristics was tested using the independent samples t-tests for the continuous data and the chi-squared (χ^2) test for the categorical data.

The study used intention-to-treat analyses [54] on participants who completed one data point (i.e., T0) at least ($n = 94$). The missing data ($n = 15$) were compensated by the "last observation carried forward" (LOCF) method [55]. Changes in the study outcomes within groups (over time: T0, T1, and T2) and between groups (intervention and control groups) were analyzed by a two-way repeated-measures ANOVA. Pairwise comparisons to further assess the significance between groups were conducted using Bonferroni correction to guard against type I errors.

The effect size for the intervention was calculated using the partial eta-squared (η_p^2) for differences indicated to be statistically significant and interpreted as small (0.01–0.06), medium (0.06–0.14), and large (≥ 0.14) effects [56]. All statistics were two-sided, and the significance level was set at <0.05.

3.11.1. Ethics Consideration. The Research Ethics Committee of the Faculty of Nursing in the Mansoura University, Egypt, approved the study protocol (NO: P.0231). The study conformed to the principles of the Declaration of Helsinki. The participants were explained the study objective and protocol, and only those who provided informed consent were included. Voluntary participation, autonomy, and confidentiality of the information gathered were confirmed.

4. Results

Most of the participants were female in both groups (intervention: 85.1%, control: 78.7%), with a mean age of 32.74 ± 6.18 and 34.29 ± 6.69 years in the intervention and control groups, respectively. Most of the participants in the intervention group were unmarried (55.3%) and held a diploma degree (31.9%), with a mean nursing tenure of 11.47 ± 5.86 years. In the control group, most of the participants were married (59.6%) and held an associate degree (44.7%), with a mean nursing tenure of 12.47 ± 6.93 years. Overall, the baseline characteristics were not significantly different between the two groups ($p > 0.05$), indicating that these characteristics were well balanced between these groups (Table 2).
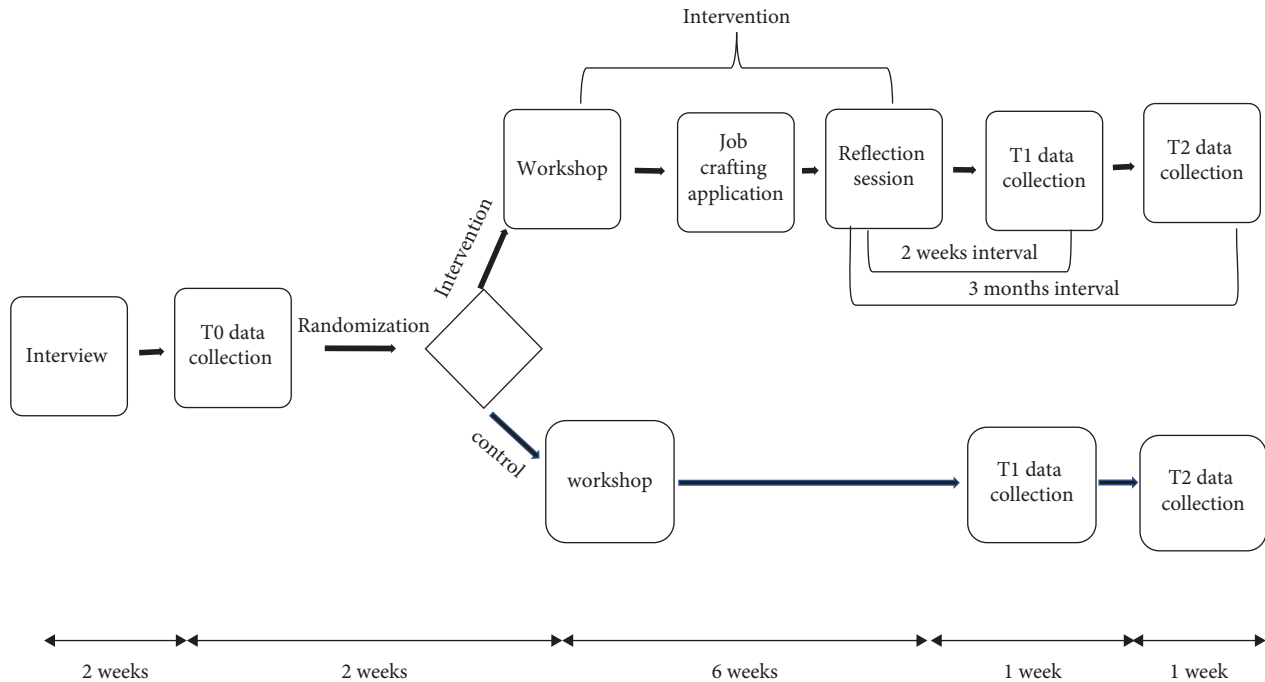
Figure 2: Graphical representation of the study design.

Table 2: Participant characteristics at baseline in the intervention and the control groups.

Characteristics		Total ($N = 94$) N (%)	Intervention group ($n = 47$) n (%)	Control group ($n = 47$) n (%)	P
Age (years)	Mean ± SD	33.52 ± 6.46	32.74 ± 6.18	34.29 ± 6.69	0.246[a]
Gender	Male	17 (18.1)	7 (14.9)	10 (21.3)	0.593
	Female	77 (81.9)	40 (85.1)	37 (78.7)	
Marital status	Married	49 (52.1)	21 (44.7)	28 (59.6)	0.215
	Unmarried	45 (47.9)	26 (55.3)	19 (40.4)	
Education	Diploma	26 (27.7)	15 (31.9)	11 (23.4)	0.748
	Associate	35 (37.2)	14 (29.8)	21 (44.7)	
	Bachelor	23 (24.5)	14 (29.8)	9 (19.1)	
	Postgraduate	10 (10.6)	4 (8.5)	6 (12.8)	
Nursing tenure (years)	Mean ± SD	11.97 ± 6.40	11.47 ± 5.86	12.47 ± 6.93	0.452[a]

SD, standard deviation. *Note.* All participants in both groups reported they ever received any training on job crafting before. [a]Analyzed by *t*-test while others by χ-square cross-tab analysis.

4.1. Primary Outcome

4.1.1. Job Crafting Behaviors. As shown in Figure 3 and Table 3, the total scores of job crafting behaviors and their dimensions (seeking resources, seeking challenges, and reducing demands) were not significantly different between the intervention and control groups at baseline ($p > 0.05$).

Regarding the total score of job crafting behaviors, the repeated measures ANOVA showed that the interaction effect of group × time was significant (F (2, 165) = 33.78, $p < 0.001$), with a large effect size ($\eta_p^2 = 0.27$). Furthermore, the pairwise comparison revealed that the intervention

group had shown higher job crafting behaviors than the control group at T1 (M ± SD = 45.79 ± 5.19 vs. 39.70 ± 5.59, $p < 0.001$) and T2 data points (42.85 ± 5.01 vs. 37.39 ± 5.38, $p < 0.001$). In terms of time, the mean of job crafting behaviors of the intervention group was increased by 6.22 in T1 compared with that in T0 data collection; meanwhile, the result was nearly similar in the control group (difference = 0.32). However, the total score of job crafting behaviors declined to −2.94 in T2 compared with that in T1 in the intervention group and to −2.25 in the control group, but in the intervention group, it was still higher than T0 (3.28) (Figure 3, Table 3).
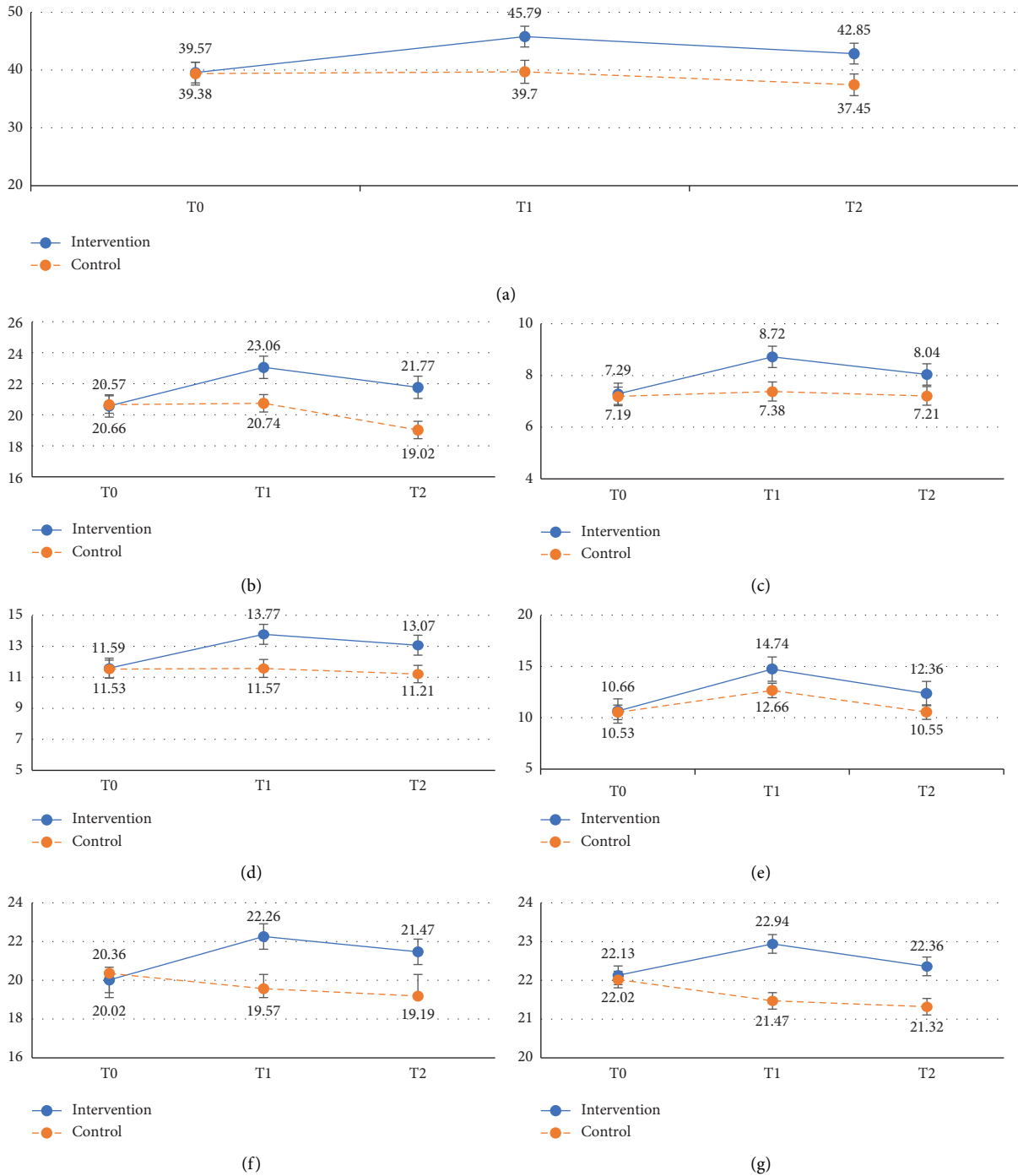
Figure 3: Mean changes of the primary and secondary outcomes. (a) Total job crafting, (b) seeking resources, (c) seeking challenges, (d) reducing demands, (e) job crafting knowledge, (f) harmonious work passion, and (g) career commitment.

Concerning job crafting dimensions, the results showed a significant group × time interaction effect for seeking resources (F (2, 184) = 15.45, $p < 0.001$), seeking challenges (F (2, 184) = 8.91, $p < 0.001$), and reducing demands (F (2, 144) = 14.17, $p < 0.001$). However, the main effect of groups on seeking challenges was not significant (F (1, 92) = 3.58, $p = 0.062$), revealing that after excluding the group effect, the level of seeking challenges was still significant over time. Moreover, the effect size was medium for seeking resources,

seeking challenges, and reducing demand ($\eta_p^2 = 0.14$, 0.09, and 0.13, respectively; Figure 3, Table 3). Thus, H1 was supported.

4.2. Secondary Outcomes

4.2.1. Job Crafting Knowledge. At baseline, job crafting knowledge was not significantly different between the two groups ($p = 0.837$). The results indicated a significant

Table 3: Change in study outcomes by the intervention and control groups overtime.

Outcomes	Time point	Intervention group ($n = 47$) Mean ± SD	Control group ($n = 47$) Mean ± SD	Pairwise comparison (p)	Group F (p)	Time F (p)	Group × time F (p)	η_p^2
Total job crafting behaviors	T0	39.57 ± 5.99	39.38 ± 5.14	0.868	14.67 (<0.001)	38.68 (<0.001)	33.78 (<0.001)	0.27
	T1	45.79 ± 5.19	39.70 ± 5.59	<0.001				
	T2	42.85 ± 5.01	37.45 ± 5.38	<0.001				
Seeking resources	T0	20.57 ± 3.33	20.66 ± 3.24	0.900	6.49 (0.012)	17.65 (<0.001)	15.45 (<0.001)	0.14
	T1	23.06 ± 3.99	20.74 ± 3.41	0.003				
	T2	21.77 ± 3.58	19.02 ± 3.46	<0.001				
Seeking challenges	T0	7.29 ± 2.21	7.19 ± 2.35	0.821	3.58 (0.062)	15.17 (<0.001)	8.91 (<0.001)	0.09
	T1	8.72 ± 1.99	7.38 ± 2.03	0.002				
	T2	8.04 ± 2.06	7.21 ± 1.99	0.051				
Reducing demands	T0	11.59 ± 2.79	11.53 ± 1.86	0.897	10.75 (0.001)	13.38 (<0.001)	14.17 (<0.001)	0.13
	T1	13.77 ± 2.42	11.57 ± 2.47	<0.001				
	T2	13.04 ± 2.44	11.21 ± 1.93	<0.001				
Job crafting knowledge	T0	10.66 ± 2.82	10.53 ± 3.17	0.837	4.07 (0.047)	94.29 (<0.001)	10.29 (<0.001)	0.10
	T1	14.74 ± 3.82	12.66 ± 3.96	0.011				
	T2	12.36 ± 3.29	10.55 ± 3.65	0.013				
Harmonious work passion	T0	20.02 ± 4.41	20.36 ± 3.00	0.663	4.87 (0.030)	3.28 (0.047)	14.95 (<0.001)	0.14
	T1	22.26 ± 4.68	19.57 ± 3.31	0.002				
	T2	21.47 ± 4.12	19.19 ± 2.68	0.002				
Career commitment	T0	22.13 ± 4.17	22.02 ± 3.37	0.892	1.76 (0.188)	0.80 (0.450)	2.89 (0.058)	—
	T1	22.94 ± 3.57	21.47 ± 3.62	0.051				
	T2	22.36 ± 3.37	21.32 ± 3.28	0.132				

SD, standard deviation; T0, baseline; T1, immediate postintervention; T2, 3-month follow-up.

interaction between the group and time factors (F (2, 167) = 10.29, $p < 0.001$), with a medium effect size ($\eta_p^2 = 0.10$). Both groups showed increased knowledge in the T1 data point compared with that in the T0 data point, but the intervention group gained more knowledge than the control group by a mean difference of 2.08 ($p = 0.011$). In the T2 data point, the knowledge of both groups decreased compared with that in the T1 data point, and it was similar to T0 in the control group, but in the intervention group, it was still higher than T0 by 1.7.

4.2.2. Harmonious Work Passion. At baseline, harmonious work passion showed no significant differences between the two groups ($p = 0.663$). The interaction effect of group × time was significant (F (2, 160) = 14.95, $p < 0.001$, $\eta_p^2 = 0.14$). The intervention group gained higher harmonious work passion than the control group at T1 (22.26 ± 4.68 vs. 19.57 ± 3.31, $p = 0.002$) and T2 data points (21.47 ± 4.12 vs. 19.19 ± 2.68, $p < 0.002$). In time comparison, the mean of harmonious work passion in the intervention group improved by 2.24 from baseline to T1 and by 1.45 from baseline to T2. Likewise, the harmonious work passion scores in the control group slightly declined over time (T0: 20.36 ± 3.00, T1: 19.57 ± 3.31, and T2: 19.19 ± 2.68; Figure 3, Table 3). Thus, H2 was supported.

4.2.3. Career Commitment. As shown in Figure 3 and Table 3, career commitment was not significantly different between the two groups at baseline ($p = 0.892$). The interaction effect of group × time was also not significant (F (2, 184) = 2.89, $p = 0.058$). Likewise, the main effects of group (F (1, 92) = 1.76, $p = 0.188$) and time (F (2, 184) = 0.803, $p = 0.450$) showed no significance. Consequently, H3 was rejected.

5. Discussion

Given that nurses constantly face high demands and few resources, which have negative outcomes on them [23], they must be trained on strategies that help them deal with such challenges, and the effectiveness of these strategies should be evaluated. Therefore, this study aimed at evaluating the effects of implementing a job crafting intervention program for nurses on their job crafting behaviors, harmonious work passion, and career commitment.

Results showed that nurses who underwent the program (the intervention group) reported significantly higher levels of job crafting behaviors than those who did not (the control group) immediately and 3 months after the intervention, with a large effect size. This finding is valuable because it indicates that job crafting is a trainable behavior. These results are in line with earlier studies showing that job crafting behavior could be fostered through intervention [57, 58]. However, these results are contradictory with a quasi-experimental study conducted among Dutch healthcare providers; in this previous study, the job crafting training did not improve job crafting behaviors [59]. The discrepancy in results may be caused by the difference in

work environment. Kuijpers et al. attributed their program's ineffectiveness to contextual factors such as poor leadership and organizational climate [59], whereas the present study was conducted in a universal health insurance hospital that has obtained accreditation and has a culture that reinforces such changes.

For job crafting dimensions, the intervention was effective in increasing seeking resources and decreasing job demands in the intervention group compared with the control group over time. However, for the dimension of seeking challenges, the intervention succeeded in enhancing seeking challenges in the intervention group compared with the control group immediately after the program, but during follow-up, the intervention group failed to maintain such behaviors. This result suggests that to maintain challenging behaviors among nurses, more reinforcement and ongoing support may be needed. Supporting this notion, Dubbelt et al. stated that seeking challenges is a less motivating behavior in an environment with high demands [36]. These results were partially supported by Gordon et al., who revealed that after offering job crafting training to nurses, the intervention group showed higher levels of seeking resources and decreasing job demands but not for seeking challenges [12].

Furthermore, job crafting knowledge increased in both groups, but the intervention group gained more knowledge than the control group. Despite the fact that nurses' knowledge in the control group was also increased, it was not enough to motivate them to adhere to job crafting activities. This result may be explained by the idea that the intervention activities performed by nurses in the intervention group after the workshop enhanced their intention and ability to practice job crafting. Interestingly, these results could help hospital managers design guidelines and programs to increase nurses' job crafting behaviors, considering that workshops and lectures are not sufficient for increasing such behaviors in nurses and should be accompanied with intervention activities.

Especially the job crafting intervention succeeded in improving nurses' harmonious passion toward their work. As anticipated, the intervention group gained a higher harmonious work passion than the control group over time. This result could be explained by the idea that job crafting behaviors enable nurses to create a more fitting and controllable working environment [60], which enhances nurses' feelings of self-efficacy and gets rid of a sense of powerlessness [61]. These positive outcomes may motivate nurses to invest their time and energy and experience more passion at work. Unfortunately, no study has examined yet the effect of job crafting interventions on harmonious work passion. Nonetheless, these findings are consistent with previous results obtained from an observational study that reported a positive relationship between job crafting and harmonious work passion [62].

Notably, the increased levels of job crafting behaviors, knowledge, and harmonious work passion among nurses in the intervention group began to decrease after 3 months of finishing the intervention. Therefore, nursing managers and hospital administrators should regularly organize job crafting training for nurses.

Contrary to our expectations, the intervention was not effective in enhancing nurses' career commitment. The reason may be that career commitment arises from the accumulation of perceived experiences [63]. Hence, the researchers suggest combining upcoming job crafting interventions with other activities, such as mindfulness, guided imagination, relaxation, and stress management activities. Another reason is the idea that the effect of the job crafting intervention on outcomes that go beyond one's job (i.e., career) is a sleeper effect, which needs more time to manifest. Thus, the intervention may work first by improving job engagement and satisfaction, and the effect on career commitment could be realized later in time. Despite being the first study to evaluate the effect of a job crafting intervention program on career commitment, the present findings are in line with those of Dubbelt et al., who implemented a job crafting program and reported that the effect of intervention on career satisfaction was not significant [36]. However, these results are contrary to the descriptive study of Chang et al., who showed that job crafting has a direct effect on career commitment [64].

5.1. Limitations. One of the limitations of this study is that the participants of the intervention and control groups were enrolled from the same hospital and potentially from the same units, possibly leading to cross-contamination. The study was conducted in one hospital to ensure that all study participants were subject to the same conditions, including working environment, serving the same patient populations, nursing practices, and workload. This approach aimed to increase the homogeneity of the study sample and reduce the potential for confounding factors that could affect the results of the study.

To avoid cross-contamination risk, the intervention group participants were asked not to share any information related to the intervention with others until study completion. To reinforce this message, regular reminders were sent to the participants via WhatsApp and e-mail. After completing the study, the control group participants were asked whether they had received any information about the job crafting activity during the study, and they confirmed that they had not. Another limitation is that the study lacked a guided website intervention. Nonetheless, a WhatsApp group was used to encourage, guide, and remind nurses; this application may be an alternative to the website. In addition, the study did not explore the mechanisms through which job crafting intervention works. Such mechanisms should be explored in future studies.

5.2. Implications. The study presents several meaningful practical implications for frontline nurses and nurse managers. The findings of this study provided evidence that nurse managers could promote nurses' job crafting behaviors by implementing tailored job crafting intervention programs. The study also highlighted the favorable outcomes that nurses and their managers can gain from the job crafting intervention. The job crafting intervention can be used as a promising method to help nurses cope with limited job resources and increased job demands and make them more harmoniously passionate about their work; thus, this study urges nursing managers to offer more opportunities for job crafting among nurses.

Moreover, the study findings guide nurse managers in designing job crafting interventions. This study suggests combining theoretical lectures with the intervention activity because workshops and lectures alone are insufficient to improve nurses' job crafting behaviors. In addition, to maximize the potential benefits, the study recommends adding other activities, such as mindfulness and stress management activities, to the job crafting activities. Nurses should also be trained on job crafting regularly.

Furthermore, the study yielded some theoretical implications. The current study contributes to job crafting literature and Job Demands-Resources (JD–R) theory in several ways. It provided evidence that job crafting is a trainable behavior within the nursing context. It also assured that job crafting interventions based on the Job Demands-Resources (JD–R) theory is effective in fostering harmonious work passion for nurses. However, the study results did not observe that the job crafting intervention has any effect on boosting nurses' career commitment. Further intervention studies are needed to confirm these results.

6. Conclusions

This RCT showed that in the context of the Job Demands-Resources (JD–R) theory, the job crafting intervention, which involves workshops and job crafting activities, proved to be effective in enhancing nurses' job crafting behaviors and harmonious work passion but not their career commitment. Further evidence is needed.

Data Availability

The datasets generated during and analyzed during the study are available upon reasonable request from the corresponding author.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Burnout among Junior Nurses: The Roles of Demographic and Workplace Relationship Factors, Psychological Flexibility, and Perceived Stress

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Background. Burnout is a common psychological syndrome among nurses, especially in the first few years of working. However, limited studies have evaluated the factors related to burnout among junior nurses. *Aims*. To investigate the levels of psychological flexibility, stress, and burnout among junior nurses and examine the role of demographic and workplace relationship factors, psychological flexibility, and perceived stress on burnout among junior nurses. *Materials and Methods*. A convenience sample of 481 junior nurses was recruited from three tertiary hospitals in China from July 2021 to August 2022. Data were collected, including demographic data, workplace relationships, psychological flexibility (measured by experiential avoidance and cognitive fusion), perceived stress, and burnout. The Independent *t*-test, one-way ANOVA, Wilcoxon–Mann–Whitney test, Kruskal–Wallis test, Spearman correlation, and hierarchical regression were used to analyze the data. *Results*. Junior nurses had a high level of burnout in different dimensions. Nurses with an undergraduate education, nurses working in the first year, and a lack of support from supervisors and poor colleague (nurse-nurse and nurse-doctor) relationships had the lowest level of psychological flexibility and the highest level of perceived stress and burnout. Spearman correlation indicated that experiential avoidance, cognitive fusion, perceived stress, and burnout were positively associated with each other. The regression model showed that psychological flexibility (especially cognitive fusion) and perceived stress influenced burnout in junior nurses. *Conclusions*. Higher psychological flexibility and lower perceived stress appear to improve burnout in junior nurses. Therefore, interventions targeting these two factors may provide a viable direction for the reduction of burnout among junior nurses. *Implications for Nursing Management*. Hospital authorities should create a harmonious working environment and provide some psychology training programs for junior nurses.

1. Introduction

Burnout, as an occupational hazard, has received considerable research attention in nursing over the past few years [1]. While there is no complete consensus on how to define burnout, the classic structure remains to be Maslach et al.'s description of burnout as a three-dimensional model characterized by emotional exhaustion, depersonalization, and decreased personal achievement [2]. In primary care nursing, a meta-analysis showed a prevalence of 28%, 15%, and 31% for high emotional exhaustion, high depersonalization, and low personal achievement [3]. The high prevalence of burnout among nursing professionals is unquestionable across different countries [4–7]. Lots of evidence have shown that burnout is often accompanied by anxiety, depression, and other negative emotions [8]. High

levels of burnout reduce the quality of care and patient satisfaction, increase the rate of medical errors, and affect clinical nursing outcomes [1, 5, 9]. Meanwhile, it prompts more nurses to abandon the medical field, which may further exacerbate the current global shortage of nurses [10].

Junior nurses make up a large percentage of nurses and are important human resource reserves. However, studies show that young and inexperienced nurses are more likely to suffer from burnout [11], and most nurses leave in the early stage of their careers [12]. Junior nurses in China usually refer to nurses who have worked in clinical settings for less than three years after graduating from nursing school or university [13]. Junior nurses need to undergo standardized training to complete the transition to qualified nurses. The standardized training process includes rotation among different departments, such as internal medicine, surgery, obstetrics and gynecology, pediatrics, and emergency and intensive care unit, as well as regular and irregular theoretical and operational examinations [14]. The transition is difficult owing to unfamiliar working environments, different professional skills, and interpersonal relationship adaptation, which are significant physical and psychological challenges for junior nurses [15]. Over time, these challenges unconsciously become catalysts for their burnout and even resignation [16].

Burnout is a complex multifactorial problem that is not easily addressed, even among nurses. Individual-specific factors (such as demographic variables, stress, psychological flexibility, personality, and coping strategies) and existing workplace factors (like job demands, job control, and organizational support) have been found to have varying degrees of relationships with burnout levels in numerous studies [17–21].

The relationship between stress and burnout is obvious, both from a psychological and biological perspective [22, 23]. Generally, burnout is believed to be an extreme reaction when individuals cannot smoothly cope with work stress, and it is a state of exhausted emotions, attitudes, and behaviors caused by individuals under long-term work pressure [24]. The effects of chronic stress on the functioning of biological processes in an organism can affect psychological processes and social behavior. Thus, according to clinical psychologists, burnout is not necessarily related to work but to stress [25]. Results from a cross-sectional study of 799 nurses showed that stress indirectly affected burnout through perceived social support and psychological capital [26]. In addition, a cross-sectional survey of new graduate nurses revealed that 76% of participants reported moderate-to-severe stress [27]. While some stress can be helpful, overwhelming stress can lead to poor performance at work and serious illnesses such as high blood pressure, depression, and sleep disorders [28].

Psychological flexibility was defined as "the ability to more fully engage with the present moment as a conscious person and to change or persist in behavior in the service of a valued goal" [28]. Psychological inflexibility is the opposite of that and mainly includes two important aspects: experiential avoidance and cognitive fusion [29]. In short, experiential avoidance is the tendency for individuals to avoid or escape from some unpleasant internal mood, which could lead to psychological distress and ineffective behaviors. A higher degree of experiential avoidance is associated with more emotional distress and lower life function, thus reducing work performance [30]. Cognitive fusion refers to the domination of thinking in behavioral regulation over other available processes [31]. Cognitive fusion can enhance an individual's believability of negative thoughts, leading to emotional discomfort [32]. Studies have shown that the lower the psychological flexibility was, the more the clinical nurses were tired of their job [20]. Meanwhile, the literature indicated a direct and predictive relationship between psychological inflexibility and burnout among nurses in the acute phase of the epidemic [33].

Besides, organizational factors have consistently been implicated among the complex determinants of burnout. In a recent report, burnout was considered as a result of an imbalance between job demands and resources [34]. The resources of clinicians include tangible and intangible resources in the work environment, such as meaning in work, job control, and social support from peers and supervisors. Multiple studies have shown that, in addition to increasing the number of nurses, changing the characteristics of the work environment, including training support, positive physician-nurse relationships, nurse autonomy, and support from supervisors, can also increase job satisfaction and reduce burnout in nurses [35–37].

The retention and successful transition of junior nurses is one of the guarantees for the future stable development of health care [38], while burnout is a stumbling block. It is urgent to find ways to retain them, but there are few studies on burnout among junior nurses. Therefore, we aimed to investigate the levels of psychological flexibility, stress, and burnout among junior nurses in different sociodemographic and workplace relationships. Furthermore, we sought to explore the influence of these individual and organizational factors on burnout among junior nurses.

2. Materials and Methods

2.1. Setting, Sample, and Data Collection. A cross-sectional design was used in this study. Participants were nurses recruited online from three tertiary hospitals in China from July 2021 to August 2022. The inclusion criteria for all participants were as follows: (1) aged 18 years or older; (2) with at most three years of work experience; and (3) provided informed consent. The exclusion criteria included nurses with psychological disease or who were taking a long leave of absence (e.g., maternity leave).

The sample size was calculated using G*Power 3.1.9.7. In the multiple linear regression, a fixed model and R^2 deviation from zero were selected as the statistical method. The statistical significance level was set at $\alpha = 0.05$, with an effect size of 0.1 and a statistical power $(1 - \beta)$ of 0.95, considering a total of 12 predictors. Theoretically, a minimum sample size of 270 was calculated.

With the assistance of the department of nursing, the call to participate was sent to 526 targeted nurses by link via the WeChat platform. The nurses decided whether to participate after reading the purpose and content of the study and had the right to withdraw at any time. Researchers checked the

platform daily and stopped data collection once it reached the target. Finally, we collected 481 valid questionnaires (response rate: 91.4%) through the Wenjuanxing platform (https://www.wjx.cn/). All questions were set as mandatory, so there were no missing data.

2.2. Measures

2.2.1. Demographic and Workplace Factors.
Demographic data were collected, including age, gender, education level, salary, and working experience. Workplace relationships included the relationship between nurses, the relationship between nurses and doctors, and the support received from supervisors.

2.2.2. Psychological Flexibility

(1) Experiential Avoidance. The Acceptance and Action Questionnaire II (AAQ-II), a 7-item instrument, was used to assess the level of experiential avoidance [30]. The AAQ-II is a 7-point Likert scale from 1 (never) to 7 (always). A higher score indicates a higher level of experiential avoidance. The minimum and maximum total score of the scale is 7 and 49, respectively. Cronbach's α coefficient of the Chinese version of AAQ-II was 0.88 [39]. Cronbach's α of the scale was 0.95 in this study.

(2) Cognitive Fusion. The Cognitive Fusion Questionnaire-Fusion (CFQ-F), a 9-item instrument assessing personal cognitive fusion, was developed by Gillanders et al. [40]. Items are rated on a 7-point Likert scale from 1 (never) to 7 (always). The possible score can range from 9 to 63, with higher scores denoting more serious cognitive fusion. Cronbach's α coefficient of the Chinese version of CFQ-F was 0.92 [41]. Cronbach's α of the scale was 0.96 in this study.

2.2.3. Perceived Stress.
The level of perceived stress was assessed with the Chinese Perceived Stress Scale (CPSS) [42], which was revised from the Perceived Stress Scale (PSS) [43]. The CPSS consists of a total of 14 items, with each item rated on a 5-point Likert scale from 0 (never) to 4 (very often). The total score of the CPSS scale ranges from 0 to 56, and a higher score indicates a greater level of perceived stress. Cronbach's α coefficient of the CPSS was 0.84 [26]. In this study, Cronbach's α of the scale was 0.70.

2.2.4. Burnout.
Burnout was measured using the Chinese version of the Maslach Burnout Inventory: Human Services Survey for Medical Personnel (MBI-HSS-MP) [44, 45]. It consists of a total of 22 items across three dimensions of emotional exhaustion, depersonalization, and personal accomplishment. Each item is scored on a 7-point Likert scale from 0 (never) to 6 (every day). Scores of 19–26 or ≥27 on emotional exhaustion, 6–9 or ≥10 on depersonalization, and 34–39 or ≤33 on personal accomplishment were indicative of moderate or high burnout for the respective dimensions. For the sake of consistency of interpretation, the items of personal accomplishment were reverse-scored and renamed as low personal accomplishment when calculating the total score. The total score of the MBI ranges from 0 to 132, and a higher score denotes more severe job burnout. Cronbach's α coefficient for the Chinese version of MBI was 0.62 [45]. Cronbach's α of the scale was 0.80 in this study.

2.3. Data Analysis.
Data analysis was performed using IBM SPSS Statistics, version 25 (IBM Corp., Armonk, NY, USA). Firstly, descriptive data were generated for participants' overall characteristics. Then, based on the normality test, we used the independent t-test or one-way analysis of variance (ANOVA) to compare levels of perceived stress and burnout, and the Wilcoxon–Mann–Whitney test or Kruskal–Wallis test was used to compare levels of experiential avoidance and cognitive fusion between nurses with different demographic and workplace relationship characteristics. The relationship between these psychological measurements was examined using the Spearman correlation. Finally, hierarchical regression analysis was used to construct models to assess the individual strength of different variables affecting burnout and how much the models explained burnout.

2.4. Ethical Considerations.
Ethical approval for this study was obtained from the Clinical Research Ethics Committee of Peking University First Hospital (approval no. 2021-415). Informed consent was obtained voluntarily from all participants, and all the data were recorded and analyzed anonymously.

3. Results

3.1. Descriptive Statistics.
Table 1 shows the descriptive statistics for participants' demographic, workplace, and psychological characteristics. Of the 481 nurses who completed the questionnaire, most were female (86.7%), with a mean age of 24.2 years. Approximately half of the participants held undergraduate education, while only 10.2% had postgraduate degrees. In total, 42% of the participants had only one year of work experience, and nearly 90% had a monthly salary of less than ¥5000. When asked about social relationships and support in the workplace, the vast majority of respondents reported being satisfied with coworker relationships and supervisor support, while about one-quarter of the respondents reported poor relationships between doctors and nurses. The participants' overall scores of experiential avoidance, cognitive fusion, perceived stress, and burnout are shown in Table 1. The scores for each of the three dimensions of burnout suggested high levels of emotional exhaustion (mean = 33.48, SD = 6.53) and depersonalization (mean = 16.07, SD = 5.23) and low level of personal achievement (mean = 20.75, SD = 4.51), indicating high burnout.

Table 1: Demographic, workplace, and psychological measurement characteristics of the participants ($N = 481$).

Variable	N	%
Gender		
Female	420	87.3
Male	61	12.7
Education		
Postgraduate	49	10.2
Undergraduate	248	51.6
Junior college	184	38.3
Salary (yuan/m)		
≤5000	281	58.4
5001~10000	156	32.4
≥10000	44	9.1
Work experience		
1 year	204	42.4
2 years	164	34.1
3 years	113	23.5
The relationship between nurses		
Good	462	96.0
Poor	19	4.0
The relationship between doctors and nurses		
Good	370	76.9
Poor	111	23.1
Supervisor support		
Good	442	91.9
Poor	39	8.1
	M	SD
Age (years)	24.21	1.88
Experiential avoidance	31.70	9.61
Cognitive fusion	43.19	12.19
Perceived stress	25.50	6.44
Burnout	76.80	11.56

M = mean; SD = standard deviation.

3.2. Comparisons of Junior Nurses' Psychological Flexibility, Perceived Stress, and Burnout between Groups. Significant differences in the score of several scales were found according to participants' demographic characteristics and workplace factors (Table 2). The preliminary analysis showed that female nurses had significantly higher levels of experiential avoidance. Nurses with a junior college education had significantly lower levels of experiential avoidance, cognitive fusion, and burnout than those with undergraduate education. There was little difference between undergraduate and postgraduate nurses, although undergraduate nurses scored slightly higher on perceived stress and burnout than the other two groups. Additionally, there was a decreasing trend in the scores of all four scales with longer work years in new nurses. Perceived stress decreased significantly across all years of work experience, while the improvement in the other three aspects did not reach statistical differences until the third year. Moreover, self-reported data showed that poor relationships and support from colleagues or supervisors were accompanied by significant psychological inflexibility, stress, and burnout.

3.3. Correlations between Psychological Flexibility, Perceived Stress, and Burnout. The results of the correlational analysis between four psychological measurements are presented in Table 3. Overall, experiential avoidance, cognitive fusion, perceived stress, and burnout were positively associated with each other. For each dimension of burnout, the largest correlations observed were between depersonalization and other measures. The correlation between accomplishment and cognitive fusion was relatively weak, while that between accomplishment and experiential avoidance failed to reach statistical significance.

3.4. The Roles of Demographics and Workplace Relationship Factors, Psychological Flexibility, and Perceived Stress in Burnout among Junior Nurses. Table 4 displays the results of the hierarchical regression analysis. As can be seen from the table, demographics and workplace relationship factors were entered in the first step, psychological flexibility in the second, and perceived stress in the third. Working experience, the relationship between nurses, the relationship between doctors and nurses, and supervisor support were significantly associated with burnout in the first step, while none of these remained statistically significant after psychological flexibility was added to the model. By comparing models 2 and 3, it can be seen that the standardized beta coefficients of experiential avoidance reduced to no statistical significance when considering perceived stress. Moreover, the adjusted R^2 of each regression indicated that the three sequential models explained 9.9%, 35.2%, and 43.9% of the variance in burnout, respectively.

4. Discussion

Although burnout has been noted in nurses for years, few studies have focused specifically on junior nurses. Our study examined the role of demographic and workplace relationships, psychological flexibility, and perceived stress on burnout and reported levels of these psychological indicators among junior nurses.

Our findings indicated a high level of burnout in different dimensions in our sample, which confirms that young nurses are at high risk of burnout. The COVID-19 pandemic had significant impacts on nurses' mental health [27, 46, 47]. China was at a lull between outbreaks during data collection for this study, and there were only a few COVID-19 cases in the sample hospitals. However, the workload associated with the "dynamic zero-COVID policy" and demands put on hospital staff (e.g., frequent nucleic acid testing, strict epidemic prevention and control measures, and restricted mobility) may have increased burnout. Xie et al.'s cross-sectional study of newly graduated nurses from 13 provinces in China before the pandemic focused on nurses with less than three years of experience and reported less severe burnout than our findings [48]. Province, hospital levels, and epidemic status may primarily explain the differences. Moreover, our study demonstrated that several demographic and workplace relationships are associated with these variables. We found that nurses with a junior college education had the lowest level of psychological inflexibility, perceived stress, and burnout, while nurses with an undergraduate education had the worst scores among the three educational

TABLE 2: Differences in nurses' experiential avoidance, cognitive fusion, perceived stress, and burnout by demographic characteristics and workplace relationship factors ($N = 481$).

Variable	N	Experiential avoidance		Cognitive fusion		Perceived stress		Burnout	
		M (IQR)	z/H (p)	M (IQR)	z/H (p)	M (SD)	t/F (p)	M (SD)	t/F (p)
Gender			−2.232 (0.026)*		−1.558 (0.119)		1.824 (0.069)		1.723 (0.086)
Female	420	33.00 (15.75)		45.00 (25.00)		25.70 (6.55)		77.15 (11.49)	
Male	61	28.00 (21.00)		42.00 (27.00)		24.10 (5.51)		74.43 (11.89)	
Education			18.872 (<0.001)***		17.842 (<0.001)***		2.709 (0.068)		4.859 (0.008)**
Postgraduate	49	35.00 (11.00)[c]		47.00 (17.50)		25.98 (6.64)		76.69 (11.40)	
Undergraduate	248	35.00 (14.00)[c]		47.50 (22.50)[c]		26.05 (5.95)		78.30 (11.54)[c]	
Junior college	184	28.00 (17.75)[a,b]		39.50 (24.00)[b]		24.64 (6.95)		74.82 (11.39)[b]	
Salary (yuan/m)			1.942 (0.379)		3.845 (0.146)		0.306 (0.737)		1.143 (0.320)
≤5000	281	31.00 (18.00)		44.00 (27.00)		25.32 (6.63)		77.08 (11.37)	
5001~10000	156	33.50 (14.00)		45.00 (23.00)		25.69 (6.15)		75.82 (11.54)	
≥10000	44	35.00 (12.00)		51.00 (12.75)		26.00 (6.33)		78.55 (12.78)	
Work experience			14.934 (0.001)**		10.659 (0.005)**		34.370 (<0.001)***		6.258 (0.002)**
One year	204	34.50 (13.75)[c]		47.00 (23.00)[c]		27.85 (6.79)[b,c]		78.57 (11.8)[c]	
Two years	164	34.50 (17.50)[c]		45.00 (22.50)[c]		24.95 (5.28)[a,c]		76.66 (11.65)	
Three years	113	28.00 (16.50)[a,b]		39.00 (24.00)[a,b]		22.07 (5.61)[a,b]		73.83 (10.41)[a]	
The relationship between nurses			−3.565 (<0.001)***		−3.048 (0.002)**		−3.851 (<0.001)***		−4.089 (<0.001)***
Good	462	32.00 (16.00)		45.00 (25.00)		25.27 (6.24)		76.37 (11.47)	
Poor	19	41.00 (10.00)		54.00 (20.00)		31.00 (8.60)		87.26 (8.70)	
The relationship between doctors and nurses			−5.447 (<0.001)***		−5.805 (<0.001)***		−5.199 (<0.001)***		−4.344 (<0.001)***
Good	370	31.50 (15.00)		42.50 (25.00)		24.69 (6.32)		75.57 (11.60)	
Poor	111	38.00 (12.00)		53.00 (12.00)		28.22 (6.13)		80.91 (10.49)	
Supervisor support			−5.160 (<0.001)***		−4.979 (<0.001)***		−5.573 (<0.001)***		−5.170 (<0.001)***
Good	442	31.00 (17.00)		44.00 (25.00)		25.03 (6.35)		76.02 (11.27)	
Poor	39	39.00 (8.00)		54.00 (14.00)		30.85 (4.96)		85.74 (11.22)	

M = mean/median; SD = standard deviation; IQR = interquartile range; * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. [a]Significant difference with those at postgraduate level or one-year work experience after Bonferroni adjustments. [b]Significant difference with those at undergraduate level or two-year work experience after Bonferroni adjustments. [c]Significant difference with those at junior college level or three-year work experience after Bonferroni adjustments.

Table 3: Spearman's correlations between burnout, perceived stress, experiential avoidance, and cognitive fusion ($N = 481$).

Variables	Burnout	Exhaustion	Depersonalization	Low personal accomplishment	Perceived stress	Experiential avoidance	Cognitive fusion
Burnout	1.000						
Exhaustion	0.834**	1.000					
Depersonalization	0.789**	0.576**	1.000				
Low personal accomplishment	0.411**	0.037	0.038	1.000			
Perceived stress	0.640**	0.551**	0.565**	0.228**	1.000		
Experiential avoidance	0.553**	0.490**	0.562**	0.066	0.634**	1.000	
Cognitive fusion	0.591**	0.515**	0.588**	0.097*	0.660**	0.840**	1.000

*$p < 0.05$; **$p < 0.01$.

TABLE 4: Hierarchical multiple regression models in explaining nurses' burnout ($N = 481$).

Variables	Model 1		Model 2		Model 3	
	B (SE)	β (p)	B (SE)	β (p)	B (SE)	β (p)
Independent variable						
Age	0.327 (0.390)	0.053 (0.402)	−0.043 (0.333)	−0.007 (0.897)	−0.142 (0.310)	−0.023 (0.646)
Gender (ref: female)	−2.297 (1.508)	−0.066 (0.128)	−0.999 (1.287)	−0.029 (0.438)	−0.658 (1.197)	−0.019 (0.583)
Postgraduate (ref: undergraduate)	−2.289 (2.146)	−0.060 (0.278)	−0.992 (1.831)	−0.026 (0.588)	−0.673 (1.703)	−0.018 (0.693)
Junior college (ref: undergraduate)	−1.946 (1.216)	−0.082 (0.110)	−0.593 (1.038)	−0.025 (0.568)	−1.366 (0.970)	−0.057 (0.159)
Salary (yuan/m)	−0.949 (0.812)	−0.054 (0.243)	−1.039 (0.690)	−0.059 (0.133)	−0.787 (0.642)	−0.045 (0.221)
Working experience	−1.986 (0.716)	**−0.136 (0.006)**	−0.946 (0.612)	−0.065 (0123)	0.754 (0.603)	0.052 (0.212)
The relationship between nurses (ref: poor)	−5.662 (2.766)	**−0.095 (0.041)**	−4.484 (2.351)	−0.076 (0.057)	−3.683 (2.188)	−0.062 (0.093)
The relationship between doctors and nurses (ref: poor)	−3.182 (1.255)	**−0.116 (0.012)**	−0.222 (1.087)	0.008 (0.838)	0.145 (1.012)	0.005 (0.886)
Supervisor support (ref: poor)	−6.681 (1.965)	**−0.158 (0.001)**	−3.088 (1.688)	−0.073 (0.068)	−1.725 (1.578)	−0.041 (0.275)
Experiential avoidance			0.206 (0.080)	**0.171 (0.011)**	0.082 (0.076)	0.068 (0.281)
Cognitive fusion			0.373 (0.063)	**0.393 (<0.001)**	0.224 (0.061)	**0.236 (<0.001)**
Perceived stress					0.755 (0.088)	**0.421 (<0.001)**
Model diagnosis and fit						
F value (p value)	6.873 (<0.001)		24.655 (<0.001)		32.334 (<0.001)	
Variance inflation factor	1.006–2.147		1.018–3.311		1.019–3.567	
R^2 (adjusted R^2)	0.116 (0.099)		0.366 (0.352)		0.453 (0.439)	
ΔR^2	0.116		0.250		0.087	

B = unstandardized regression coefficient; SE = standard error; β = standardized regression coefficient; significant values are reported in bold.

groups. This is partially inconsistent with previous studies, which showed that nurses with higher levels of education had lower levels of burnout [49, 50]. The reasons for the difference are unclear, given that education is confounded by other variables such as responsibilities, resources, and personal attributes [34]. For our findings, it is possible that junior college nurses have fewer responsibilities and encroachment on personal time. In addition, postgraduate nurses may have boosted their strategies to deal with adversity during education and may get more support and resource at work, while undergraduate nurses are more likely to experience a mismatch in job demands and resources, leading to stress and burnout. Future qualitative studies are needed to delineate the reasons behind this finding.

We also found that junior nurses with longer years of tenure had higher psychological flexibility and lower levels of stress and burnout, similar to the findings of earlier studies [21]. This finding can be explained by capacity and maturity gained from work or life experience, although it may also be due to survival bias. Longitudinal studies are needed to eliminate the bias caused by resignation and support the idea that experience can improve psychological flexibility in the absence of additional psychoeducation. Interestingly, perceived stress declined significantly across each additional year of work experience, while the improvement in burnout was not so rapid. The finding suggests that the accumulation of work experience can reduce stress caused by a lack of professional knowledge and skills, while the contributors of burnout may be more complex and require additional attention.

In the univariate analysis as well as the first model of hierarchical regression, our results showed a significant association between workplace relationships and nurse burnout. However, these effects were no longer statistically significant when psychological flexibility was entered into the model. This appears to be contrary to other studies and reports of burnout among health workers [34, 51]. One likely reason is that we used subjective questions rather than objective scales when assessing workplace relationships; thus, the responses obtained highly depend on subjective perceptions. In addition, some aspects of psychological flexibility, such as cognitive integration, may distort or reinforce the individual's perception of external evaluations to some extent. The relationship between workplace relationships and psychological flexibility in Table 2 supports this inference. Social support from coworkers and supervisors has been reported to reduce stress reactions and promote personal meaningfulness at work [52, 53]. The perception of relationships and support at work could increase nurses' confidence and alleviate adverse emotions by changing the process of cognitive appraisal [54]. The individual's psychological flexibility may have a similar effect in the process.

Our finding of a negative association between psychological flexibility and burnout corroborates with many other studies among nurses and nursing students [21, 33, 55, 56]. In addition, consistent with the concept of burnout as an outcome of chronic stress [57], the effect of perceived stress was reflected in the final model. Notably, psychological flexibility had an independent effect on burnout, suggesting that some aspects of psychological flexibility can directly affect burnout instead of indirectly through stress reduction. An imbalance between job demands and resources is considered to be the reason leading to stress and burnout [58, 59]. Psychological flexibility, as an intangible personal resource, helps individuals adhere to value-based actions in the presence of uncomfortable feelings [60]. The positive feedback that comes with effective work will guarantee that individuals are engaged in their work, realize their value in the workplace, and ultimately reduce burnout [61].

A strength of this study is that it was a multicenter study that focused exclusively on junior nurses. In addition, we considered both organizational and individual factors. However, the study has some limitations. Due to the cross-sectional design of the study, it is impossible to determine the causality between the variables. Furthermore, workplace relationships were evaluated using self-designed questions, which may reduce the objectivity of these factors. Nevertheless, this, in turn, suggests that stress and burnout resulting from perceived workplace relationships may be modifiable through specific processes of psychological flexibility.

Future researchers should carry out longitudinal and qualitative studies to clarify the different processes of burnout and how psychological flexibility regulates these processes. Path analysis would help assess the causal relationship and potential moderators. In addition, future studies should explore the possibility of providing extensive training for junior nurses to improve their psychological flexibility, such as mindfulness and acceptance commitment therapy.

4.1. Implications for Nursing Management. Junior nurses' job burnout will affect their professional identity, professional ability, and career development. In order to prevent early turnover and job change, it is necessary for hospital authorities to help junior nurses improve their burnout levels. We recommend that nurse managers prioritize improving organizational culture and enhancing the mental health of their employees, which may include creating a fair, non-blaming, supportive working environment; sharing tips for junior nurses to quickly acquire skills and deal with relationships in a new department; and providing some psychology training focused on psychological flexibility, stress, and burnout, such as mindfulness and acceptance and commitment therapy.

5. Conclusions

The results of this study corroborate that new nurses are at a high risk of burnout. Workplace relationships, psychological flexibility, and perceived stress impact burnout, while the latter two may be more fundamental.

Data Availability

Conflicts of Interest

Authors' Contributions

Yue Zhao and Xinyi Zhang contributed equally to this study.

Acknowledgments

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Research Article

Codesigning a Nursing Leadership Program to Transform Value and Delivery Systems for Fundamental Care

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Aim. The aim of this article is to report the process and outcomes of codesigning a nursing leadership program for fundamental care. The leadership program is designed to empower nursing leaders, across research, education, clinical practice, and policy, to challenge and change how fundamental care is valued, prioritised, and actioned within health and care systems. *Background*. Deficits in fundamental care represent an intractable problem adversely impacting care recipients, care providers, and health and care systems globally. These deficits stem from the minimal value placed on fundamental care and its subsequent invisibility across research, education, clinical practice, and policy. Sustainable systems change requires effective nursing leadership; however, existing nursing leadership programs tend to address only one area of health and care systems, typically clinical practice, and do not focus specifically on fundamental care. *Methods*. The Fundamentals of Care Leadership Program was codesigned with current and emerging nursing leaders using a participatory action research approach. The collaborative codesign process involved two stages: (1) idea generation and preliminary program development via Nominal Group Technique ($n = 60$ participants from 11 countries) and (2) refinement and trialling of program content and process via a three-day workshop ($n = 19$ participants from 9 countries). *Results*. Participants prioritised a program that provided clear understanding of the concept of fundamental care, enabled the development of influencing and negotiating skills to advocate for this care, and offered resources on knowledge translation, implementation, and measurement strategies. Participants also wanted allotted time to design research and quality improvement projects that would allow them to transfer the skills learned to the real-world issues occurring within their respective organisations. *Conclusions*. The codesign process, embedded within a participatory action approach, enabled the development of a Fundamentals of Care Leadership Program that is shaped by, and meets the needs of, current and emerging nursing leaders. The leadership program will enable nursing leaders to challenge value systems on fundamental care and to champion this care across research, education, clinical practice, and policy, working towards enhanced fundamental care outcomes and experiences.

1. Introduction

1.1. Background. Fundamental care is often considered the foundation of nursing practice [1], underpinning seminal nursing theories as well as frameworks and guidelines for care delivery [2–4]. Fundamental care is defined as nurse actions that respect and focus on a person's essential needs to ensure their physical and psychosocial wellbeing [5]. These needs are met through a trusting, therapeutic relationship between care providers and care recipients, whilst taking into consideration the context in which care is taking place [5]. Despite the centrality of fundamental care to nursing practice and care outcomes, internationally, care recipients report negative experiences of this care, including missed, infrequent, or poor-quality mouth care, toileting, bathing, mobility, information provision, education, and psychosocial support [6–11]. In turn, care recipients experience numerous adverse outcomes when fundamental care is poorly delivered, including pressure injuries, falls, new infections, readmissions, and death [8, 12–17].

There are several complex reasons for the global deficits in fundamental care. They include the predominance of biomedical approaches to care, the prioritisation of productivity and efficiency within health and care systems, and workforce issues (e.g., high workloads and inadequate nurse-to-patient ratios) [18–22]. As a result of these

pressures, fundamental care, particularly psychosocial and relational aspects, is afforded minimal priority, rendering it invisible and devalued across health and care systems [19]. For a decade, there have been calls to address the invisibility of fundamental care by empowering nursing leaders to champion change and affect a cultural shift in the way in which this care is valued and enacted at micro, meso, and macrolevels of health and care systems [23–26]. Commensurate with these calls is a growing body of research on leadership for fundamental care, albeit focused primarily on how this leadership relates to the delivery of fundamental care within clinical practice [26]. This research has shown that care recipients, nurses, and nurse managers all view appropriate and effective nursing leadership as central for facilitating high-quality fundamental care delivery [27, 28].

The importance of nursing leadership is not a new concept; more than 20 years ago, researchers argued that effective leadership was critical for positively influencing nursing practice and policy [29, 30]. In turn, there are numerous leadership programs designed to enhance nurses' leadership capabilities and to influence change [31, 32]. More recently, there is a growing body of work on how different leadership styles, particularly relational styles such as transformational leadership, can positively influence nursing practice, care-recipient outcomes, and nurses' job satisfaction [33–35]. Nursing leadership was emphasised once again during the global COVID-19 pandemic, with a focus on how effective leadership during times of crises can maintain quality standards and nurses' emotional and mental well-being, in both academic and clinical practice settings [36–38].

Despite these advances, knowledge and action around leadership specifically for fundamental care are lacking. Fundamental care remains a relatively under-researched area of nursing leadership [39], and there is limited guidance to support nursing leaders across all areas and at all levels of health and care systems to champion change in the way in which this care is valued, prioritised, and actioned [26]. Furthermore, the sustained deficits in fundamental care globally demonstrate that existing leadership programs, whilst undoubtedly successful in influencing change in some areas [40], are not necessarily supporting leaders to affect systems change in ways that translate to improved fundamental care outcomes and experiences. This is likely for two reasons. First, many existing leadership programs focus on only one aspect of health and care systems, most commonly clinical practice [41, 42], without an accompanying focus on leadership within research, education, or policy. Second, programs typically focus on general leadership capabilities rather than specifically on fundamental care and the individual system and policy level factors that influence its perceived value and subsequent prioritisation within health and care systems.

To achieve sustained system-level impact for fundamental care, leadership programs must influence all facets of healthcare: research, education, clinical practice, and policy. Continuing to operate in siloes will only perpetuate poorly integrated health and care systems, where nursing education does not readily translate to real-life clinical practice;

practising nurses find it difficult to see the relevance of research evidence, and policy initiatives do not reflect the realities of everyday clinical practice [43–45]. In addition to focusing on all areas of health and care systems, leadership programs must focus specifically on fundamental care rather than general leadership capabilities. The nursing education literature demonstrates that when fundamental care is not explicit nor reinforced within nursing curricula, it is rendered invisible and devalued [46, 47]. Implicitly embedding fundamental care within a general leadership program is similarly insufficient. Health and care systems already fail to value the role of fundamental care in enhancing care outcomes and experiences [19]; leadership programs that do not explicitly emphasise fundamental care only reinforce this devaluing. The need for targeted nursing leadership programs is also supported by existing literature, which has argued the importance of designing and implementing tailored programs that address the different facets of nursing leadership [48, 49].

To support nursing leaders in changing deeply entrenched organisational cultures and value systems on fundamental care, they must have the knowledge and skills to advocate for this care in a politically informed way and to foster sustainable change [50]. The International Learning Collaborative (ILC) is supporting nursing leaders to develop the skills required to affect real systems change for fundamental care. The ILC is a member-based international network aiming to transform how fundamental care is delivered, taught, and researched globally. It has been a long-held vision of the ILC to grow a critical mass of leaders globally who are courageous and skilled to champion and lead change. To achieve this vision, the ILC has engaged with current and emerging nursing leaders worldwide to codesign the Fundamentals of Care Leadership Program. The program aims to enhance the capacity of current and emerging nursing leaders within research, education, clinical practice, and policy to advocate for and affect systems change around fundamental care, thus ensuring the delivery of high-quality fundamental care within any health or care environment. This article outlines the collaborative codesign process undertaken to develop the leadership program and considers how this program might be sustained into the future.

2. Methods

2.1. Design. The development of the Fundamentals of Care Leadership Program was underpinned by participatory action research (PAR) [51, 52]. PAR requires active involvement of key stakeholders—those with a vested interest in or potential to benefit from the research findings—in the research process, with the aim of generating societal and system-level change [52, 53]. In the present study, the first step of the PAR process involved several discussions amongst the ILC's governing body (its steering committee) regarding how best to meet the challenge of shifting prevailing organisational cultures and value systems on fundamental care. At the time this study was conducted, the ILC's steering committee comprised of 13 nursing leaders from eight countries, all with relevant leadership expertise across research, education, clinical practice, and/or policy.

Through these discussions, and based on their own leadership experiences, the steering committee identified the need for a leadership program specifically for fundamental care that would equip nursing leaders with the knowledge and skills to effect change at a systems-level and which would meet the needs of a global nursing audience.

Aligning with the PAR principles of collaboration and participation [53], the proposed leadership program was then codesigned with an international cohort of nursing leaders via an iterative, two-stage process (see also Figure 1).

(i) Stage 1: Idea generation and preliminary program development via modified nominal group technique

(ii) Stage 2: Refinement and trialling of program content and process via a three-day workshop

The codesign process drew on the expertise and experience of both current and emerging nursing leaders within and across healthcare research, education, clinical practice, and policy. Current nursing leaders were defined as individuals who successfully influence others to achieve a common goal and who are often employed in managerial or executive positions within their organisations [54]. Emerging nursing leaders were defined as individuals who are developing the skills to influence others but who might not yet occupy designated leadership positions.

2.2. Stage 1: Idea Generation and Preliminary Program Development.

Aligning with the PAR approach, the first stage of the codesign process involved working with current and emerging nursing leaders to identify their priorities and preferences for a leadership program on fundamental care. This was achieved via nominal group technique (NGT) [55]. NGT is a structured consensus-generating approach that aims to develop ideas and solutions to a problem and facilitate agreement on the relative importance of the proposed ideas/solutions [55]. This study used a modified NGT approach [56, 57], involving online interactive workshops to enable idea generation, sharing, and clarification, follwed by an online ranking process to determine which ideas participants prioritised.

2.2.1. Online Interactive Workshops.

The workshops were conducted in June 2021 as part of the ILC's annual conference. The aim of the workshops was to identify the leadership program's goals, parameters, and deliverables.

(1) Setting and Participants. Workshops took place online via Zoom breakout rooms. Sixty participants from 11 countries (Australia, Canada, Denmark, Italy, Japan, New Zealand, Sweden, the Netherlands, Norway, the UK, and the US) took part. Participants self-selected to participate upon registration to the ILC conference.

(2) Data Collection. Four workshops were run simultaneously, each focusing on a different area: research, education, clinical practice, and policy. Participants nominated the workshop they preferred to participate in. Workshops were repeated a further two times, enabling participants to take part in workshops on different topics ($n = 12$ workshops total). Workshops were guided by a template with open-ended prompts (see Table 1). The template was developed by the first author with the expertise of the ILC's steering committee. Each workshop ran for 45 minutes and was managed by a facilitator, with a maximum of 15 participants. Workshops were audio and video recorded.

(3) Data Analysis. Following transcription of workshop recordings, the data were analysed using qualitative content analysis (QCA) [58, 59]. QCA allows for a focus on the frequency of patterns within the data [59], thus aligning with the NGT aim of consensus-generation. Following initial reading and familiarisation of the written transcripts, the data were coded inductively and deductively. The second author coded the data to the workshop questions and identified additional codes that did not align with these questions. Data from the different workshops, research, education, clinical practice, and policy, were considered as one dataset rather than separate as the initial familiarisation showed that there were no substantial differences in the content generated between the different workshops. Codes were refined via discussion with all authors, with the first and second authors then categorising the codes, based on similarity, into themes. The themes were further refined following discussion with all authors, nursing academics at Flinders University, and the ILC's steering committee.

2.2.2. Online Ranking Process.

The ranking process involved all workshop participants being invited to rate their preferences, from a list of options derived from the QCA, in relation to the leadership program content and outcomes.

(1) Setting and Participants. Participants were sent a link to an online Qualtrics survey in February 2022. Of the participants who took part in the workshops ($n = 60$), forty responded to the survey (response rate = 67%).

(2) Data Collection. The online survey consisted of four sections:

(1) Program content

(2) Program activities

(3) Program outcomes/outputs

(4) Draft program

Sections 1–3 each had predetermined responses, derived from the analysis of the workshop data. Participants were asked to rate their top five responses in order of preference, with 1 being the most preferred. The ranking of five priority ideas is common in NGT [55]. Section 4 provided a draft of the proposed leadership program, developed based on the ideas generated in the workshops. Participants were asked to provide feedback on this draft via a series of open-ended questions. The draft program comprised four parts:

(i) Part 1: An overview of the Fundamentals of Care Framework [25]. The Fundamentals of Care Framework is a conceptual framework,
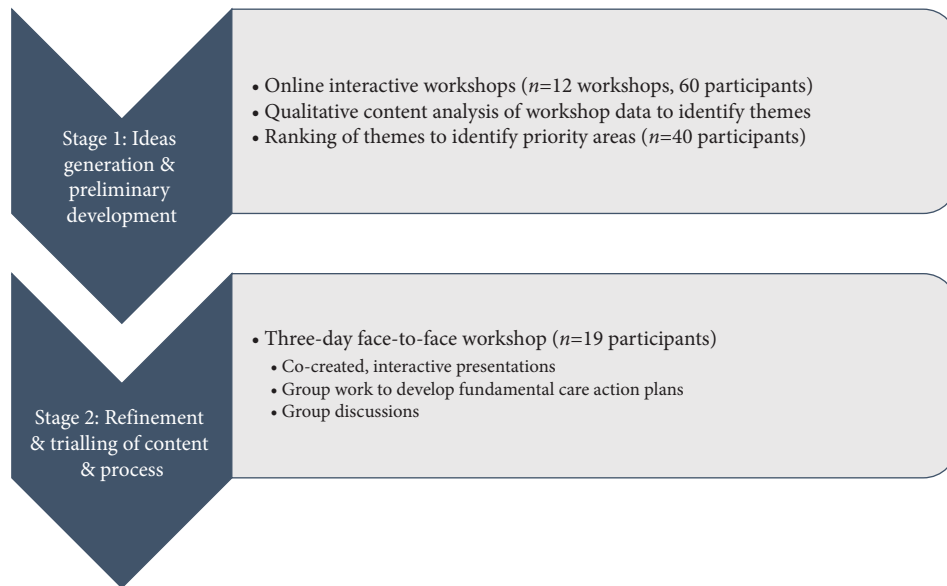
Figure 1: Fundamentals of care leadership program codesign development process.

Table 1: Workshop template.

Role of facilitators
Your role is to elicit the required information from workshop participants. Use the below prompts to encourage group discussion. If you are facilitating multiple groups on the same topic, feel free to summarise the results from the previous group and encourage participants to add their thoughts

Prompts
(1) What should the leadership program deliver in terms of attitudes, behaviours, skills, and competencies for nursing leaders?
(2) How would we know that a leadership program for nursing leaders had achieved its objectives? What could we observe or measure to determine this?
(3) Which nursing leaders should the leadership program be aimed at?
(4) What would be the unique selling point of a leadership program focused on fundamental care for nursing leaders?
(5) How can nursing leaders identify and tap into opportunities for enhancing and leading fundamental care research/education/ clinical practice/policy?
(6) What else do nursing leaders need to know to lead change around fundamental care research/education/clinical practice/ policy?

developed by the ILC, that outlines what high-quality fundamental care should look like in clinical practice. The Fundamentals of Care Framework outlines three core dimensions for high-quality fundamental care delivery: (1) developing trusting relationships with care recipients and carers; (2) integrating and addressing care recipients' physical, psychosocial, and relational needs; and (3) being aware of how the care context can influence care delivery (see Figure 2).

(ii) Part 2: Group discussion of self- and context-assessments, completed by participants in their own time prior to the Stage 1 workshops. These assessments determined participants' readiness for leading transformation as well as their organisations' readiness for change.

(iii) Part 3: Working with a mentor to develop a fundamental care action plan around an identified area of need and presenting the plan to all participants for feedback.

(iv) Part 4: A one-day debrief 12 months after program completion, enabling participants to provide an update on their action plans and share their experiences with the next cohort.

(3) Data Analysis. The top five responses for Sections 1–3 were collated. The open-ended responses in Section 4 were analysed via QCA.

2.2.3. Ethical Considerations. Ethical approval was received from Flinders University Human Research Ethics Committee (approval number: HEL1858). Participants were informed upon registration that the workshops would be video and audio recorded and that their participation in the workshop implied their consent for the recordings to be used in the research. The ranking survey was anonymous.

2.3. Stage 2: Refining and Trialling of Program Content and Process. The last stage of the codesign process used the ideas prioritised by the participants in Stage 1 to refine and trial the content, structure, and process of the leadership program. The result would be a structured leadership program for piloting in 2023. Stage 2 consisted
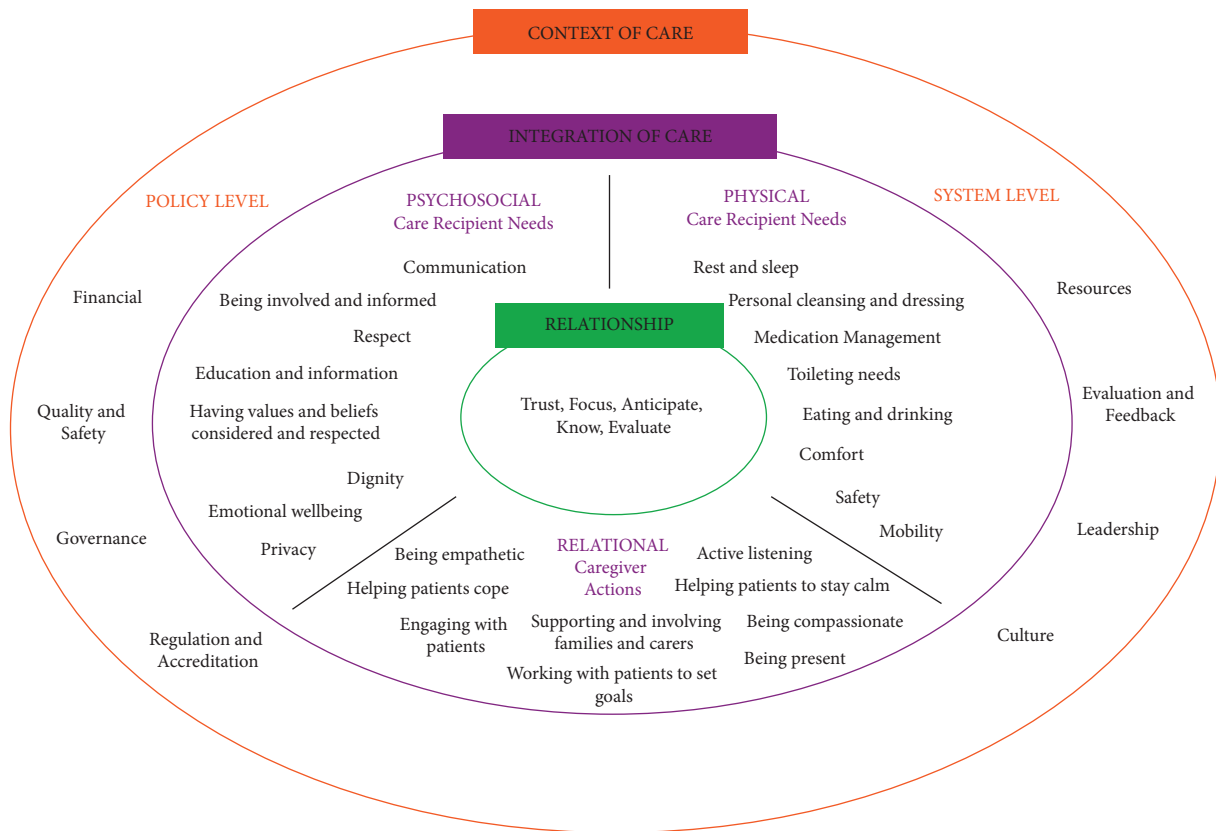
FIGURE 2: The Fundamentals of Care Framework. Image was obtained, with permission, from https://ilccare.org/the-framework/ and the content within the image was derived from [5].

of a three-day, face-to-face, codesign workshop led by the third and fourth authors.

2.3.1. Setting and Participants. The workshop took place in June 2022 at Saïd Business School, Oxford University, UK. Current and emerging nursing leaders were identified from the ILC's steering committee, organisational members, and international networks and were invited to take part. Participants were selected to ensure a breadth of experience and geographical representation. Nineteen participants from nine countries (Australia, Canada, Denmark, Iceland, New Zealand, Norway, Sweden, the UK, and the US) took part.

2.3.2. Data Collection. The workshop consisted of interactive presentations followed by the development of fundamental care action plans. These were interspersed with group discussion where participants provided real-time feedback on and subsequently refined the proposed program content.

(1) Cocreated Interactive Presentations. Prior to the workshop, participants were allocated to one of three groups and tasked with cocreating a presentation on a specified topic that could form a part of the 2023 pilot. The topics, derived from the prioritisation process in Stage 1, were as follows.

(i) Overview of fundamental care and the Fundamentals of Care Framework

(ii) Influencing change in fundamental care now and into the future

(iii) Knowledge translation and implementation strategies

Groups delivered their presentations to the wider group for refinement. This refinement took place during the presentations themselves, with participants offering suggestions for improvement.

(2) Fundamental Care Action Plans. Participants self-selected into groups to develop a fundamental care action plan, a tailored approach to addressing value systems and leading change at multiple levels within their respective organisations. The aim of including action plan development in the codesign process was to test how this development might work practically within the leadership program. Each group had a fellow participant who acted as a mentor to assist in plan development. Mentors were self-nominated or identified by groups based on relevant expertise. The groups were tasked with delivering a 10-minute presentation on their action plan to the wider group and reviewing the plan based on group feedback.

(3) Group Discussions. Time was allotted across the three days for group discussion on the evolving leadership

program content, including participants' recommendations for the 2023 pilot. The third and fourth authors made notes of these discussions.

2.3.3. Data Analysis. The notes from group discussions were consolidated by the third author to generate the next iteration of the leadership program.

2.3.4. Ethical Considerations. Ethical approval was granted by Flinders University Human Research Ethics Committee (approval number: HEL1858). Participants were informed that notes would be taken of group discussions, which would be used for program development and research.

3. Results

3.1. Stage 1: Idea Generation and Preliminary Program Development

3.1.1. Online Interactive Workshops. Four main themes were identified from the workshop data, as illustrated in Table 2. The first theme, "advocacy and lobbying," demonstrated that participants wanted a leadership program that provided them with the tools to advocate and speak up for fundamental care across health and care systems and with their interdisciplinary colleagues. The second theme, "understanding fundamental care," demonstrated that participants wanted a program that would strengthen their conceptual understanding of fundamental care, including the use of appropriate terminology. The third theme, "measurement and implementation," described participants' preference for a program that would equip them with the skills to identify and use appropriate implementation and measurement strategies, enabling them to effect real change within their respective organisations. In the fourth theme, "providing a supportive network," participants emphasised the importance of the leadership program providing a forum where program participants can motivate one another and build global connections, enabling collaborative problem-solving.

3.1.2. Online Ranking Process. The results from the ranking process are presented in Table 3. Participants prioritised program content and outputs that focused on understanding the concept of fundamental care, implementation strategies, advocating for fundamental care, designing quality improvement or research projects relevant to their organisation, self and organisational readiness assessments, and fundamental care measurement tools. The importance of the leadership program providing a supportive network was not prioritised.

Participants' responses to the draft leadership program were positive, describing it as well-structured, relevant, comprehensive, and innovative. Participants liked the 12-month follow-up, the use of mentors, and the practical focus, exemplified by the action plans. Participants also identified potential gaps in the program, offering the following solutions: (1) providing participants with a summary of fundamental care and the Fundamentals of Care Framework prior to the program to assist with self- and context-assessments, (2) including a stronger focus on knowledge translation and implementation in both the prereading and program content, and (3) incorporating a focus on sustainability into the action plan development.

3.2. Stage 2: Refinement and Trialling of Program Content and Process. Table 4 provides an outline of the revised Fundamentals of Care Leadership Program. Based on participants' real-time feedback, the leadership program was refined to include additional prereading and video resources on the Fundamentals of Care Framework and knowledge translation. To assist with action plan development, the program will also include additional resources and content on project planning, program logic, and mentoring. Seven fundamental care action plans were successfully developed during the three-day workshop, demonstrating the feasibility of including this process within the leadership program. The plans ranged in content from establishing regional ILC networks in America and Sweden to measuring the interrelated dimensions of the Fundamentals of Care Framework; generating an innovative, strategic approach to introducing fundamental care into preregistration curricula; and implementing the Fundamentals of Care Framework into clinical practice to guide care delivery. Each group is being provided structured, virtual mentoring over 12 months, with evaluation to occur thereafter.

4. Discussion

Improving fundamental care requires nursing leaders to challenge and change how this care is valued within health and care systems [19, 25]. The Fundamentals of Care Leadership Program aims to equip current and emerging nursing leaders with the skills and knowledge to make this change a reality. Codesigning the program through a participatory action research approach has generated considerable buy-in for fundamental care and its leadership globally, as illustrated by the number of participants across both stages and the number of action plans developed. The participatory action codesign approach also provided a platform for participants, who were at all levels and areas of health and care systems, to see the value in and advocate for fundamental care. The leadership program will be available to all current and emerging nursing leaders, regardless of whether they are ILC members, and will be hosted face-to-face in a different country each year, thus enhancing accessibility.

Whilst our leadership program is designed to challenge value systems, making sure the program gains traction and is sustained will be a system's challenge in itself. Numerous leadership programs have shown initial promise yet failed to sustain long-term impact. To avoid our program following the same path, we must ensure it achieves its vision and, in doing so, secures a place in the broader health and care landscape. In this discussion, we consider what we might learn from other healthcare movements, namely, quality and

TABLE 2: Main themes identified in Stage 1 with examples of illustrative quotes.

Theme	Examples of illustrative quotes from participants
Advocacy and lobbying	The [leadership program] needs to develop brave and courageous leaders who are not afraid to speak up, irrespective of the consequences [Fundamental care] is important at all levels of healthcare, not just nursing. Leaders need to have the ability to influence and gain support from other leaders outside of nursing Nurse leaders. . . they're not trained in or skilled in advocating for nursing. They are trained in leadership, they take masters' degrees in public administration and public leadership and so forth, [but] they're not equipped to advocate or speak up for nursing, so a leadership program would have to equip them [with] that
Understanding fundamental care	Leaders, irrespective of their health profession, need to understand what fundamental care means Creating a common, accessible, and consistent language about fundamental care
Measurement and implementation strategies	It is easy to believe that fundamental care is important but more difficult to implement into practice. The leadership program should assist people in how to implement changes in fundamental care in their setting Quality indicators in healthcare are often centred around process-type measures or misses and near misses, but they really don't address the core of the Fundamentals of Care Framework, which is that relationship. . . it would be nice to learn how to measure this
Providing a supportive network	Developing a network of fellow nurses, researchers, and leaders would be very motivating. It helps people to connect internationally and discuss challenges The program could provide a platform for worldwide fundamentals of care initiatives to inspire others, connect, and build stronger networks

TABLE 3: Results from the Stage 1 NGT ranking process, showing the top five rated responses.

	(%)
Section 1: Program content	
(1) Implementation strategies (in research, education, clinical practice, and policy)	16.36
(2) Understanding what fundamental care is and how to deliver it using the Fundamentals of Care Framework	14.49
(3) Influencing, lobbying, advocacy, empowering, and challenging value systems	11.21
(4) Measuring fundamental care	9.81
(5) Partnership building/collaboration (with care recipients, healthcare professionals, executives)	7.48
(6) Leadership styles, attributes, and skills	7.48
Section 2: Program activities	
(1) Participants choose a quality improvement or research project	24.19
(2) A self-assessment for fundamental care readiness (knowing what leader they are now and what they need to be a leader for fundamental care in the future)	22.58
(3) An organisational assessment for fundamental care readiness	16.94
(4) Development of a fundamental care measurement tool	12.90
(5) A quality improvement project that includes three phases: Phase 1: Diagnose (issue and evidence), Phase 2: Plan and prioritise (recommendations, policy impact, responsibility), and Phase 3: Implement and evaluate	11.29
Section 3: Program outcomes/outputs	
(1) Participants are better equipped to implement fundamental care in their workplace	18.09
(2) Participants have tools to advocate for fundamental care and are more confident to speak out for fundamental care	15.08
(3) Participants more strongly advocate for the nursing profession	14.57
(4) Participants have a better understanding of their own and the organisational barriers and enablers to fundamental care	12.56
(5) Participants and organisations have access to long-term support to implement and monitor fundamental care	10.55

TABLE 4: An outline of the Fundamentals of Care Leadership Program to be piloted in 2023.

Prereading	Key readings and video resources on: (i) Why we need to focus on fundamental care (ii) The development of the Fundamentals of Care Framework (iii) Mentoring (iv) Leadership and influencing (v) Knowledge Translation and implementation
Day 1	Presentations and group work: (i) Session 1: Making the case–Why fundamental care matters (ii) Session 2: What is fundamental care–The history of the Fundamentals of Care Framework (iii) Session 3: Knowledge translation–How to get fundamental care into research, education, clinical practice, and policy
Day 2	Presentations and group work: (i) Session 4: Project planning and program logic, including preliminary development of fundamental care action plans (ii) Session 5: Leadership and influencing (iii) Session 6: Mentoring–What it is, why it matters, and how you do it
Day 3	Receiving feedback on and finalising fundamental care action plans

safety and evidence-based practice, as well as the few larger-scale fundamental care initiatives that are gaining momentum, at least at national levels. Our aim is not to provide an exhaustive overview of these agendas; however, learning from their relative success will help to identify some of the policy and systems levers that we must consider in ensuring the Fundamentals of Care Leadership Program is successful in the long term.

The quality and safety movement, which focuses primarily on keeping care recipients safe from preventable harm [60], has gained considerable traction worldwide. It forms a part of the World Health Organisation's agenda [61] and has spawned several agencies, commissions, policies, and journals globally. The quality and safety movement has likely gained traction for three reasons: (1) it has primarily been medically driven [60]; (2) it aligns with the risk-averse culture of most health and care systems [19]; and (3) it has a strong economic driver (i.e., safety incidents cost money) [62, 63]. Like quality and safety, the evidence-based practice movement has gained traction in the last few decades. Although an evidence-practice gap still exists in healthcare [64], evidence-based practice is nonetheless seen to hold value. This is likely because it also relates to discourses around harm and risk, that is, failing to practise based on the latest evidence means possibly providing care that is ineffective, unnecessary, and unsafe. Fundamental care cannot necessarily or immediately leverage some of the drivers that have underpinned quality and safety and evidence-based practice; for instance, the economic case for relationship-based, integrated fundamental care, as espoused in the Fundamentals of Care Framework, remains unclear [65]. Nonetheless, there are lessons to be learnt from these agendas in terms of gaining traction for, and ensuring sustainability of, the Fundamentals of Care Leadership Program.

First, we must consider whether and how to align fundamental care initiatives, including the leadership program, with existing healthcare agendas. We know that failures in fundamental care compromise care quality and safety. Ensuring the safety of care recipients is also a key aspect of fundamental care delivery, as exemplified by the Fundamentals of Care Framework (see Figure 2 and [66]). Perhaps the goal for nursing leaders, then, is to incorporate fundamental care into quality and safety policies, agendas, and standards. Aligning with the quality and safety movement might also strengthen the economic case for fundamental care, demonstrating the monetary cost to health and care systems for failing to deliver this care to a consistently high standard. However, nursing leaders must navigate carefully; aligning with quality and safety can potentially reinforce, rather than challenge, prevailing value systems focused primarily on risk aversion [19]. Our leadership program must therefore empower nursing leaders to advocate for fundamental care as central rather than peripheral to existing care agendas [50]. The work of nursing leaders at Sinai Health System provides an example of how this can be achieved [67], that is, how we can leverage and even shape existing health and care drivers and values.

The Sinai Health System team, through collaborative partnership between leaders and clinicians in academia and clinical practice, has developed an evidence-informed Science of Care Framework. This framework situates fundamental care as the nexus point that intersects caring with safety, symptom, implementation, improvement, and innovation sciences, to provide holistic guidance for care delivery [67]. Efforts such as this align with but also expand current understandings of quality and safety, working to reframe what health and care systems value. By placing high-quality fundamental care as the goal of care delivery, the Science of Care Framework positions quality and safety as a mechanism to support fundamental care rather than as the driving force of care delivery itself. This also aligns with calls for the quality and safety agenda to evolve by shifting away from a focus on risk and harm, towards codesigned safety measures that encapsulate what matters most to those receiving care, including relational aspects [67]. Whilst the

Science of Care Framework is yet to be tested in clinical practice, it is an example of how we can work with, rather than against, existing healthcare agendas to challenge value systems and advance fundamental care. By equipping nursing leaders with the courage, knowledge, and skills to engage in partnership and advocate for the centrality of fundamental care, the Fundamentals of Care Leadership Program can meet its intended vision and ensure its continued presence in the health and care landscape.

A second lesson to be learnt from existing healthcare movements is that gaining traction is only one piece of the puzzle. Even the quality and safety agenda has more work to do in terms of ensuring long-term success and widespread adoption of safety interventions [60]. Hence, changing value systems around fundamental care, whilst a crucial first step, will not automatically and inevitably translate into improved care. Our leadership program must also equip nursing leaders with the requisite skills to implement and evaluate new ways of thinking, practising, and collaborating across research, education, clinical practice, and policy. There are local, small-scale efforts to improve fundamental care in these areas [23, 68]; however, large-scale efforts are rare [67, 69, 70]. The Fundamentals of Care Leadership Program must provide current and emerging nursing leaders with the skills to scale-up local initiatives, thus enabling change in the valuing, prioritisation, and actioning of fundamental care at micro, meso, and macrolevels. By becoming courageous and skilled leaders at all levels and areas of health and care systems, nurses will substantially shift organisational and system values for fundamental care, ultimately enhancing how this care is delivered.

5. Conclusions

Nurses are present in all areas and levels of health and care systems and make up the largest healthcare profession globally; their potential to influence culture, value systems, and care delivery must be fostered. A leadership program for fundamental care that, at its core, emphasises the value of this care will enable nursing leaders to positively influence how fundamental care is perceived and actioned within and across health and care systems. Using a participatory action approach to codesign, we were able to draw on the collective knowledge and active involvement of current and emerging nursing leaders globally, ensuring the development of a leadership program for fundamental care that is relevant and targeted to its intended audience and proposed aim. The resultant Fundamentals of Care Leadership Program can equip current and emerging nursing leaders across research, education, clinical practice, and policy with the requisite skills and knowledge to challenge value systems on fundamental care and to champion and sustain much-needed change, thus working towards improved care delivery and outcomes. Our goal moving forward is to assess the impact of the program and ensure its continued sustainability.

Data Availability

The workshop data from Stage 1 used to support the findings of this study have not been made available to protect participant confidentiality and anonymity (the workshops were video and audio recorded, which means the participants are easily identifiable). The transcripts of the workshops and the data from the Stage 1 ranking process are restricted by the Flinders University HREC to protect participant confidentiality. Data are available from the first author for researchers who meet the criteria for access to confidential data.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

The Correlation between Altmetric Attention Score and Traditional Bibliometrics in Top Nursing Journal Articles

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Background. Altmetric Attention Score (AAS) is a quantitative measurement of the online impact of research and has a potential correlation with traditional bibliometrics. However, the correlation for nursing journal articles is still unknown. The objective of the study was to analyze the correlation between AAS and traditional bibliometrics in the top nursing journal articles. *Materials and Methods.* Articles published in top nursing journals (the journals with the top 20 5-year impact factors) from 2010 to 2019 were included. The correlations between AAS and citations, AAS and Relative Citation Ratio (RCR) score, AAS and Category Normalized Citation Impact (CNCI) value, and AAS and impact factors were analyzed. Statistical analyses were performed using Stata 25.0 software. *Results.* A total of 15,212 journal articles were included in the study. Very weak correlations were found between AASs and citations [0.124 (95% CI, 0.108–0.14)], AASs and RCRs [0.26 (95% CI, 0.244–0.275)], and AASs and CNCIs [0.207 (95% CI, 0.192–0.223)]. The weak correlations were also found between AASs and impact factors in several journals. The weak correlations between AASs and citations, AASs and CNCIs, and AASs and RCRs were also found for most journals based on subgroup analysis. *Conclusions.* There is very weak correlations between AASs and traditional bibliometrics in top nursing journal articles. More studies should be conducted to assess how AAS influence bibliometrics, and how they can help manage nursing journal articles and research.

1. Introduction

Bibliometrics is the use of statistical methods to analyze publications, especially for scientific contents [1, 2]. It is used to justify the role of the researchers and the research team [3] and also to identify key partners [4] and the progress of a specific research field [5]. The most widely used bibliometrics method is based on citations [6], such as citation times, impact factors [7], *H* index [8], Eigenfactor score [9], and CiteScore [9]. However, these metrics have limitations. It would take time to accumulate citation times [10], and

different journal articles could not be compared directly even in the same research field [11, 12]. Absolute citation times favor older journal articles and have limited utility in comparing journal articles from different fields [12, 13]. Thus, new metrics have been developed. RCR [14], developed by NIH, is defined as the total number of citations that a paper received per year divided by the average field-specific citation rate for a peer companion group [14, 15]. It allows the comparison of articles in different fields. CNCI is another metrics to assess the paper's impact and has been analyzed in different studies [16, 17], which can also be used

to assess scientific articles from different research fields [16, 18].

In recent years, with the development of digital technology and the use of online platforms to discuss research, alternative-level metrics (altmetrics) have been introduced in research fields [12–14]. They were used to measure the journal articles with attention, dissemination, overall influence, and impacts [14]. The main altmetrics platform is Altmetric [19, 20], which compiles the number of mentions of a paper across the most used social media platforms such as Twitter, Facebook, and LinkedIn, and public policy documents, mainstream media, online reference managers, and other online platforms, to generate a weighted score, Altmetric Attention Score (AAS) [14]. AAS is a dynamic bibliometric which captures the online impact of a paper. It has been used to assess the online impact of journal articles across different fields [7, 14, 21] and provide potential evidence for research impact or journal strategy.

Nursing is an important discipline, and research helps the progress of the discipline by improving nursing practice and finally helping nursing management. Factors that influence the characteristics of nursing journal articles could further help journal articles to be quickly transformed into nursing practice and applied to nursing management. It has been reported that bibliometric analysis might help nursing management and nursing practice, and thus some studies have been performed in the field of nursing management [2, 16]. However, these studies did not analyze the important impact of online platforms on nursing management. It is still unclear whether the online impact would be associated with traditional bibliometrics and whether the online impact would help nursing paper citations. Furthermore, it is also unclear whether the nursing manager could use social media, public research platforms, or online platfroms to help nursing research impact. Although several articles have used bibliometrics methods to assess the top cited [2, 16] or the top impact nursing articles [2, 16], whether impact from social media, public research platforms, or online platforms will help higher citations is a mystery. Therefore, in the current study, we analyzed the Altmetric and bibliometric data of journal articles published in nursing journals, to assess the correlation between AASs and the citation metrics.

2. Methods

2.1. Inclusion and Exclusion Criteria for the Selection of Nursing Journal Articles. The inclusion criteria were as follows: (1) the journal articles should be published in top nursing journals. Five-year impact factors were used to identify the top nursing journals, and thus the top 20 5-year impact factor journals in the nursing category in the JCR report in 2021 were used in the current study. (2) The journals should be indexed by PubMed. Thus, the journals included in the study were as follows: Australian Critical Care, Birth-Issues in Perinatal Care, BMC Nursing, European Journal of Cardiovascular Nursing, Intensive And Critical Care Nursing, International Journal of Mental Health Nursing, International Journal of Nursing Studies, International Nursing Review, Journal of Advanced Nursing, Journal of Clinical Nursing,

Journal of Nursing Management, Journal of Nursing Scholarship, Nurse Education Today, Nursing Ethics, Nursing Outlook, Research in Nursing & Health, Seminars in Oncology Nursing, Women and Birth, Worldviews on Evidence-Based Nursing, and Asian Nursing Research. (3) The paper type should be an article or review. (4) The paper could be found in Incites, iCite, Altmetric, and PubMed. The following exclusion criteria were used: (1) duplicated journal articles; (2) mismatched journal articles; (3) editorial articles, corrections, and letters.

2.2. Paper Searching. The journal articles were searched by the selected journal names in the three databases (Incites [16], iCite [14], and Altmetric [12]). All search results were downloaded. If any data for an article was missing, the article was further searched in PubMed or the specific journal websites.

2.3. Paper Screening and Data Extraction. All articles were screened according to the inclusion and exclusion criteria. Only articles which had all the required data (RCR, citation time, AAS, and CNCI) were included. The following information was extracted from each article: journal, author, impact factor, RCR score, citation time, CNCI value, AAS, etc. The RCR scores were extracted from the downloaded file from the iCite database, the CNCI values were extracted from the downloaded file from the Incites database, and the AASs were extracted from the downloaded file from the Altmetric database. The journals' impact facotrs were downloaded from the Web of Science.

2.4. Statistical Analysis. The characteristics of the included studies were analyzed. The correlations between AASs and citations, AASs and RCRs, AASs and CNCIs, and AASs and impact factors, were analyzed using Spearman correlation coefficients [12]. Subgroup analyses were performed according to journals, and years. All analyses were performed by SPSS 25.0 software.

3. Results

3.1. The Main Characteristics of Included Journal Articles. The data were collected by September 9th, 2022. After screening all data of the journal articles according to the inclusion and exclusion criteria, a total of 15,212 journal articles were included. The impact factors for all the selected 20 journals from 2010 to 2019 are shown in Table 1, and the impact factors of most journals increased from 2010 to 2019. The average citation of all journal articles was 17.36 times, and the median citation was 11 times. A total of 318 journal articles were cited 0 times, 14,059 journal articles were cited 1 to 50 times, 660 were cited 51 to 100 times, and 175 journal articles were cited more than 100 times.

3.2. The Performance of Included Journal Articles. The average RCR score of included articles was 1.71, and the median RCR score was 1.14. The RCR scores of 258 articles

TABLE 1: The impact factors of the included 20 nursing journals from 2010 to 2019.

Journal	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Asian Nursing Research	0.133	0.071	0.44	0.418	1.000	0.849	0.768	0.918	1.256	0.988
Australian Critical Care	—	0.973	0.953	1.265	1.562	1.479	1.907	1.930	2.515	2.214
Birth-Issues in Perinatal Care	1.821	2.182	2.926	2.048	1.264	1.867	2.518	2.329	2.129	2.705
BMC Nursing	—	—	—	—	—	—	—	—	—	1.846
European Journal of Cardiovascular Nursing	1.348	1.711	2.042	1.828	1.876	2.491	2.763	2.651	2.497	2.296
Intensive and Critical Care Nursing	—	—	—	—	—	1.214	1.326	1.653	1.652	1.886
International Journal of Mental Health Nursing	1.427	1.071	1.287	2.009	1.950	1.943	1.869	2.033	2.433	2.383
International Journal of Nursing Studies	2.103	2.178	2.075	2.248	2.901	3.561	3.755	3.656	3.570	3.783
International Nursing Review	0.588	1.038	0.939	0.736	0.948	1.073	1.517	1.496	1.562	2.034
Journal of Advanced Nursing	1.540	1.477	1.527	1.685	1.741	1.917	1.998	2.267	2.376	2.561
Journal of Clinical Nursing	1.228	1.118	1.316	1.233	1.255	1.384	1.214	1.635	1.757	1.972
Journal of Nursing Management	1.452	1.181	1.454	1.142	1.500	1.721	1.905	1.912	2.386	2.243
Journal of Nursing Scholarship	1.392	1.490	1.612	1.772	1.636	2.128	2.396	2.662	2.540	2.655
Nurse Education Today	1.113	1.241	1.218	1.456	1.364	1.591	2.533	2.067	2.442	2.490
Nursing Ethics	1.085	0.815	1.210	1.093	1.247	1.469	1.755	1.876	1.957	2.597
Nursing Outlook	1.653	1.522	2.359	1.831	1.588	2.287	2.236	2.425	2.540	2.833
Research in Nursing & Health	1.736	1.708	2.181	1.163	1.267	1.638	1.693	1.762	1.678	2.163
Seminars in Oncology Nursing	—	—	—	—	—	—	—	1.667	1.412	1.330
Women and Birth	—	—	—	1.696	1.573	1.525	2.138	1.822	2.079	2.308
Worldviews on Evidence-Based Nursing	1.429	1.239	1.349	2.318	2.381	1.762	2.103	2.143	2.500	1.991

—: not available.

were 0; 6,576 articles had RCR scores between 0 and 1; 8,236 journal articles had RCR scores between 1 and 10; the RCR scores of 142 journal articles were higher than 10. The average CNCI value was 1.52, and the median CNCI value was 1.05. The CNCI values of 318 journal articles were 0; 7,017 journal articles had CNCI values between 0 and 1; 7,785 journal articles had CNCI values between 1 and 10; the CNCI values of 92 journal articles were higher than 10. The average AAS was 8.92, and the median AAS was 3. The AASs of 2264 journal articles were 0; 9,950 journal articles had AASs between 0 and 10; 2,866 journal articles had AASs between 10 and 100; the AASs of 132 journal articles were higher than 100. The citations, RCRs, CNCIs, and AASs of all journal articles in the 20 journals were summarized in listed in Table 2.

3.3. The Contribution of Different Sources to AAS. The sources that contributing to the AAS were individually analyzed from 2010 to 2019. For all years, Twitter was the most frequent contributor to AAS followed by news outlets and Policy (Table 3).

3.4. The Correlation of AASs with Citations, RCRs, CNCIs. The correlations of AASs with citations, CNCIs, and RCRs are shown in Figures 1–3. In summary, the correlation coefficient was 0.124 (95% CI, 0.108–0.14) between AASs and citations, 0.26 (95% CI, 0.244–0.275) between AASs and RCRs, and 0.207 (95% CI, 0.192–0.223) between AASs and CNCIs. The correlations for each journal are shown in Table 4.

For the International Journal of Nursing Studies, which ranked first in the JCR report (2021) with an impact factor of 6.612, a total of 1,437 journal articles were included. The total citation times was 43,729 (ranging from 0 to 582 by paper,

median 19), the total AAS was 12,975 (ranging from 0 to 703 by paper, median 3), and the total RCR score was 3,985.92 (ranging from 0 to 35.94 by paper, median 1.79). Very weak correlations were found: 0.207 (95% CI, 0.158–0.258) between AASs and citations, 0.371 (95% CI, 0.325–0.418) between AASs and RCRs, and 0.267 (95% CI, 0.219–0.317) between AASs and CNCIs.

The Journal of Clinical Nursing ranked fourth in the JCR report (2021) with an impact factor of 4.423, from which we collected the highest number of journal articles in the current study. The total number of citations was 48,236 (ranging from 0 to 262 by paper, median 10), the total AASs was 17,842 (ranging from 0 to 251 by paper, median 2), and the total RCR score was 4,709.72 (ranging from 0 to 21.32 by paper, median 0.98). Very weak correlations were found: 0.133 (95% CI, 0.097–0.166) between AASs and citations, 0.312 (95% CI, 0.28–0.346) between AASs and RCRs, and 0.23 (95% CI, 0.199–0.264) between AASs and CNCIs.

The Journal of Nursing Management was the only management journal in the field of nursing, from which a total of 783 journal articles were included. The total number of citations was 13,906 (ranging from 0 to 203 by paper, median 11), the total AASs was 3,007 (ranging from 0 to 228 by paper, median 1), and the total RCR score was 1,593.84 (ranging from 0 to 17.58 by paper, median 1.43). Very weak correlations were found: 0.158 (95% CI, 0.086–0.229) between AASs and citations, 0.239 (95% CI, 0.162–0.304) between AASs and RCRs, and 0.206 (95% CI, 0.137–0.274) between AASs and CNCIs.

Nurse Education Today was the only education journal in the field of nursing, from which a total of 1,566 journal articles were analyzed. The total citation was 26,555 (ranging from 0 to 770 by paper, median 11), the total AAS was 15,837 (ranging from 0 to 373, median 3), and the total RCR score

TABLE 2: The citations, RCRs, CNCIs, and AASs of the included 20 nursing journals [median (range)].

Journal	Citations	RCRs	Category normalized citation impact (CNCI)s	AASs
Asian Nursing Research	9 (0–677)	0.88 (0.08–34.29)	0.9267 (0–26.0303)	1 (0–151)
Australian Critical Care	8 (0–73)	0.83 (0–10.92)	0.6222 (0–8.4983)	3 (0–137)
Birth-Issues in Perinatal Care	12 (0–202)	1.23 (0–11.48)	1.0873 (0–10.717)	4 (0–773)
BMC Nursing	7 (0–78)	1.155 (0–11.67)	0.9076 (0–11.9965)	2 (0–215)
European Journal of Cardiovascular Nursing	11 (0–676)	0.93 (0–36.46)	0.7728 (0–36.5083)	1 (0–206)
Intensive and Critical Care Nursing	8 (0–66)	1.07 (0–7.69)	1.0534 (0–8.3769)	2 (0–76)
International Journal of Mental Health Nursing	10 (0–172)	1.09 (0–13.22)	0.82735 (0–11.0035)	7 (0–220)
International Journal of Nursing Studies	19 (0–582)	1.79 (0–35.94)	1.6983 (0–27.4897)	3 (0–703)
International Nursing Review	9 (0–253)	0.94 (0–23.61)	0.89685 (0–20.285)	2 (0–73)
Journal of Advanced Nursing	12 (0–415)	1.15 (0–25.58)	1.1492 (0–18.9222)	7 (0–1462)
Journal of Clinical Nursing	10 (0–262)	0.98 (0–21.32)	0.9812 (0–20.571)	2 (0–251)
Journal of Nursing Management	11 (0–203)	1.43 (0–17.58)	0.9246 (0–11.235)	1 (0–228)
Journal of Nursing Scholarship	12 (0–301)	1.19 (0–17.95)	1.3087 (0–23.6331)	2 (0–170)
Nurse Education Today	11 (0–770)	1.34 (0–81.92)	1.08825 (0–100.5749)	3 (0–373)
Nursing Ethics	9 (0–132)	1.15 (0–15.36)	1.1756 (0–16.0068)	1 (0–165)
Nursing Outlook	10 (0–184)	1.045 (0–15.45)	1.0906 (0–13.1287)	2 (0–670)
Research in Nursing & Health	11 (0–363)	0.915 (0–40.90)	1.1363 (0–22.0488)	1 (0–244)
Seminars in Oncology Nursing	6 (0–230)	0.51 (0–20.55)	0.4514 (0–17.3025)	1 (0–56)
Women and Birth	9 (0–234)	1.07 (0–17.53)	0.8593 (0–8.8129)	3 (0–231)
Worldviews on Evidence-Based Nursing	11 (0–234)	1.18 (0–21.91)	1.0154 (0–20.5276)	2 (0–245)

was 3,104.38 (ranging from 0 to 81.92, median 1.34). Very weak correlations were found: 0.086 (95% CI, 0.038–0.134) between AASs and citations, 0.269 (95% CI, 0.223–0.317) between AASs and RCRs, and 0.188 (95% CI, 0.139–0.234) between AASs and CNCIs.

3.5. The Correlation Analysis by Years. Spearman rank correlation coefficient was calculated between citations and the AASs by years (Table 5). The results showed very weak correlations between AASs and citations, AASs and CNCIs, and AASs and RCRs in all years.

3.6. The Correlation between AASs and Impact Factors. The correlations between AASs and impact factors were individually analyzed based on years. Weak correlations were found in most of the years (Table 6). Spearman rank correlation coefficient was calculated between the impact factors and AASs based on journals (Table 7). Weak correlations were found for the Australian Critical Care, International Journal of Mental Health Nursing, International Journal of Nursing Studies, Journal of Advanced Nursing, and Nurse Education Today.

4. Discussion

In the current study, the Altmetric and traditional bibliometric of journal articles published in 20 top nursing journals were analyzed. A very weak correlation between AASs and citations was found. AAS was also found to be correlated with RCR and CNCI, which were novel metrics of research influence based on citation times. The results suggest that traditional bibliometrics and AAS cannot be used interchangeably but rather complementarily when assessing the impact of journal articles in the nursing field.

Further analysis by journals and publication years found that the International Journal of Nursing Studies (IJNS) had more correlation between the AASs and citations, and no correlation was found in the Nursing Ethics. This difference might be due to the difference in the breadth of journal topics since one is a comprehensive nursing journal and the other is a subspecificity nursing journal. Articles from IJNS with high online attention might also impact the scientific community and thus increase citations. However, articles from Nursing Ethics, which are likely to be controversial articles for the public to garner public interest, thereby increasing AAS, while they might not impact the scientific community in the same manner [12].

With the COVID-19 pandemic [22], more training programs in the nursing practice field have been performed via the social media platforms and other online platforms. That should be of interest to nursing managers, nurses, and journals. It indicates that the social media and other online platforms would not only help the scientific community but also help the public community, especially during the COVID-19 pandemic period [23]. Implementing new research works on the online platforms will contribute to these results and further help the scientific community.

The study has several strengths. First, the current study was a study with large sample size analyzing alternative metrics and bibliometrics based on articles in top nursing journals. Second, it analyzed the AASs with 3 citation-based metrics and found weak correlations between these parameters. Third, we analyzed the correlation by journals, which was a unique contribution to the nursing field. The paper also has several limitations. First, to analyze the precision correlations, we excluded journal articles that missed any data of the four variables (AASs, citations, RCRs, and CNCIs). Second, the correlations might be different when analyzing at a different time. Third, the study only

Table 3: Attention received by papers from high-impact journals from 2010 to 2019 stratified by different resources.

Year	News mentions	Blog mentions	Policy mentions	Patent mentions	Twitter mentions	Peer review mentions	Weibo mentions	Facebook mentions	Wikipedia mentions	Google + mentions	LinkedIn mentions	Reddit mentions	Pinterest mentions	F1000 mentions	Q&A mentions	Video mentions	Syllabi mentions	Number of mendeley readers	Number of dimensions citations
2010	132	37	252	4	996	5	0	121	26	6	0	0	0	2	0	7	0	84885	36251
2011	153	48	277	26	1406	1	0	115	38	5	0	0	0	1	0	7	0	94199	35584
2012	137	40	286	21	3198	2	0	269	25	20	2	4	0	1	0	9	0	117410	39041
2013	198	46	351	6	5616	5	14	287	39	224	0	1	0	2	0	7	0	137176	41560
2014	294	61	298	1	8873	9	0	363	37	35	0	3	0	1	0	12	0	152609	42582
2015	268	76	246	4	13794	3	0	847	43	32	0	2	0	1	0	14	0	176717	45858
2016	873	85	248	4	29956	7	0	997	60	42	0	2	0	0	0	29	0	196983	43404
2017	660	63	258	0	31567	3	0	1010	29	123	0	3	0	1	1	5	0	189607	39207
2018	940	107	175	5	52475	5	0	952	54	73	0	5	0	3	0	28	0	206479	39251
2019	838	88	128	0	39928	139	0	517	33	9	0	7	0	4	0	13	0	162787	26578
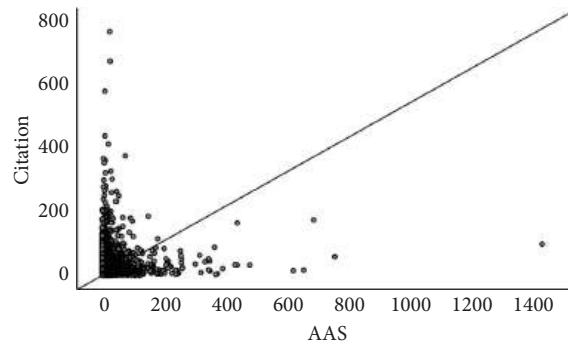
FIGURE 1: The correlation between AAS and citations.
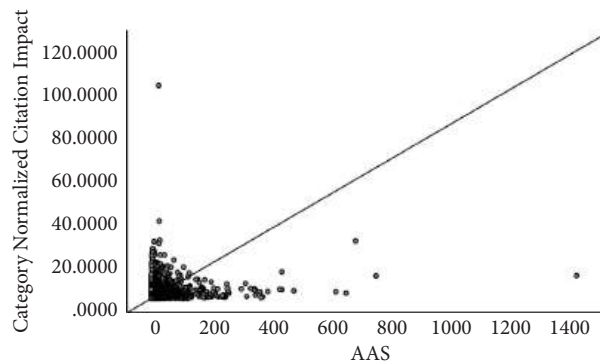
FIGURE 2: The correlation between AAS and CNCIs.
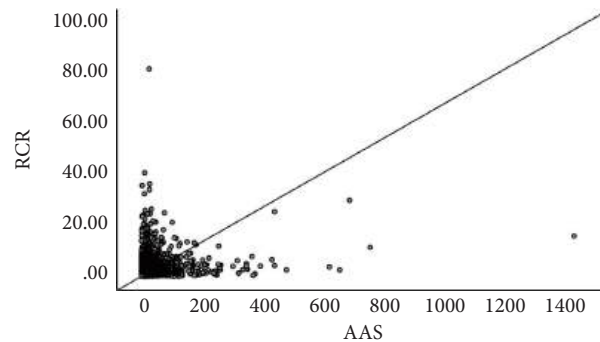
FIGURE 3: The correlation between AAS and RCRs.

TABLE 4: The correlations between citation and AAS, CNCI and AAS, RCR, and AAS based on journals.

Journal	Citation and AAS		CNCI and AAS		RCR and AAS	
	Rho	P value	Rho	P value	Rho	P value
Asian Nursing Research	0.284	0.002	0.240	0.011	0.234	0.014
Australian Critical Care	0.115	0.043	0.309	<0.001	0.342	<0.001
Birth-Issues in Perinatal Care	0.234	<0.001	0.311	<0.001	0.347	<0.001
BMC Nursing	0.286	<0.001	0.244	0.003	0.204	0.014
European Journal of Cardiovascular Nursing	0.107	0.023	0.225	<0.001	0.233	<0.001
Intensive and Critical Care Nursing	0.143	0.005	0.239	<0.001	0.234	<0.001
International Journal of Mental Health Nursing	0.012	0.756	0.233	<0.001	0.315	<0.001
International Journal of Nursing Studies	0.207	<0.001	0.267	<0.001	0.371	<0.001
International Nursing Review	0.207	<0.001	0.226	<0.001	0.268	<0.001
Journal of Advanced Nursing	−0.022	0.299	0.105	<0.001	0.209	<0.001
Journal of Clinical Nursing	0.133	<0.001	0.230	<0.001	0.312	<0.001

TABLE 4: Continued.

Journal	Citation and AAS		CNCI and AAS		RCR and AAS	
	Rho	P value	Rho	P value	Rho	P value
Journal of Nursing Management	0.158	<0.001	0.206	<0.001	0.239	<0.001
Journal of Nursing Scholarship	0.164	<0.001	0.246	<0.001	0.209	<0.001
Nurse Education Today	0.086	0.001	0.188	<0.001	0.269	<0.001
Nursing Ethics	0.025	0.600	0.055	0.247	0.008	0.860
Nursing Outlook	0.255	<0.001	0.327	<0.001	0.316	<0.001
Research in Nursing & Health	0.152	0.006	0.174	0.002	0.200	<0.001
Seminars in Oncology Nursing	0.246	0.001	0.238	0.001	0.295	<0.001
Women and Birth	0.111	0.005	0.248	<0.001	0.275	<0.001
Worldviews on Evidence-Based Nursing	0.245	<0.001	0.265	<0.001	0.295	<0.001

TABLE 5: Spearman rank correlation coefficient between citation, CNCI, RCR and AAS from 2010 to 2019.

Year	Citation and AAS		CNCI and AAS		RCR and AAS	
	Rho	P value	Rho	P value	Rho	P value
2010	0.293	<0.001	0.262	<0.001	0.275	<0.001
2011	0.327	<0.001	0.318	<0.001	0.306	<0.001
2012	0.238	<0.001	0.231	<0.001	0.219	<0.001
2013	0.278	<0.001	0.258	<0.001	0.262	<0.001
2014	0.301	<0.001	0.284	<0.001	0.277	<0.001
2015	0.285	<0.001	0.253	<0.001	0.271	<0.001
2016	0.259	<0.001	0.207	<0.001	0.241	<0.001
2017	0.280	<0.001	0.236	<0.001	0.268	<0.001
2018	0.275	<0.001	0.240	<0.001	0.269	<0.001
2019	0.242	<0.001	0.208	<0.001	0.246	<0.001

TABLE 6: The correlation between impact factors and AASs from 2010 to 2019.

Year	Rho	P value
2010	0.156	<0.001
2011	0.075	0.025
2012	0.125	<0.001
2013	0.186	<0.001
2014	0.165	<0.001
2015	0.190	<0.001
2016	0.078	0.001
2017	0.203	<0.001
2018	0.183	<0.001
2019	0.141	<0.001

TABLE 7: The correlation between impact factors and AASs based on journals.

Journal	Rho	P value
Asian Nursing Research	−0.086	0.371
Australian Critical Care	0.550	<0.001
Birth-Issues in Perinatal Care	−0.050	0.312
BMC Nursing	—	—
European Journal of Cardiovascular Nursing	0.208	<0.001
Intensive and Critical Care Nursing	0.166	0.003
International Journal of Mental Health Nursing	0.590	<0.001
International Journal of Nursing Studies	0.307	<0.001
International Nursing Review	0.121	0.023
Journal of Advanced Nursing	0.526	<0.001
Journal of Clinical Nursing	0.287	<0.001
Journal of Nursing Management	0.142	<0.001
Journal of Nursing Scholarship	0.153	0.001
Nurse Education Today	0.352	<0.001
Nursing Ethics	0.110	0.021

Journal	Rho	P value
Nursing Outlook	0.168	<0.001
Research in Nursing & Health	−0.058	0.299
Seminars in Oncology Nursing	−0.144	0.108
Women and Birth	0.214	<0.001
Worldviews on Evidence-Based Nursing	0.060	0.265

—: not available.

analyzed the journal articles from top nursing journals, and nursing-associated journal articles published in other journals could have different kinds of correlations, especially for those articles published in low-impact factor journals. Fourth, the study did not include other bibliometrics [24, 25], such as the Eigenfactor score and CiteScore; in the future, a new study should be performed to assess these correlations.

In conclusion, the study of articles published in high-impact nursing journals between 2010 to 2019, finds very weak correlations between AAS and citation-based metrics, which suggests promoting journal articles on online platforms may help research, journals, and nurses. Future studies are needed to assess the long-term correlations among these metrics for nursing journal articles.

5. Implication to Nursing Management

Understanding the correlation of online impact with traditional bibliometrics of research is critical to nursing practitioners, which in turn helps manage nursing journal articles and research. Nursing managers should develop targeted strategies to increase the online impact of research or nursing practice and increase research impact.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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Corrigendum

Corrigendum to "Nurses' Recovery Experiences during the COVID-19 Pandemic in Isfahan, Iran: A Qualitative Study"

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In the article titled "Nurses' Recovery Experiences during the COVID-19 Pandemic in Isfahan, Iran: A Qualitative Study" [1], there was an error in affiliations 1 and 2. In the corrected affiliations, the branch has been revised from "University of Isfahan (Khorasgan) Branch" to "Isfahan (Khorasgan) Branch." The corrected affiliation appears below:

(1) Department of Public and Media Management, Isfahan (Khorasgan) Branch, Islamic Azad University, Isfahan, Iran

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[1] A. Hosseinzadeh, A. E. Khorasgani, A. Gheitani, R. Ebrahimzadeh, and R. Torkashvand, "Nurses' Recovery Experiences during the COVID-19 Pandemic in Isfahan, Iran: A Qualitative Study," *Journal of Nursing Management*, vol. 30, no. 8, Article ID 13863, pp. 4090–4106, 2022.

Research Article

Environmental Risk Assessment of Low Back Pain in ICU Nurses: An Instrument Development Study

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Lihui Zhang and Yangyang Liu contributed equally to this work.

Aim. To develop a valid, reliable assessment tool to measure risk factors associated to low back pain (LBP) in intensive care unit (ICU) nurses. *Background*. LBP is defined as the pain extending from the 12th rib to the iliac crest and often coexists with buttock pain. Nursing has been identified among the top professions at risk of LBP. A mean of 70% prevalence per year in ICU nurses was reported, exceeding those employed in heavy industry. Environmental factors in workplace were also most important risks related to LBP in this population except factors including individual, physical, psychosocial, and lifestyle. However, there is lack of tools to assess environmental risk related to LBP for nurse managers currently. *Methods*. Focus group interviews, field research, and panel discussion were used to develop item pool. Two-round expert reviews and preinvestigation were carried out to form initial scale named Environmental Risk Assessing Instrument-Occupational Low Back Pain in Nurses (ERAI-N). A cross-sectional survey with 188 ICU participants in Hunan Province in China was implemented to collect data. Cronbach's alpha, split-half reliability, and test-retest reliability were used to test ERAI-N's reliability. Expert review was performed to test ERAI-N's content validity, and confirmatory factor analysis (CFA) was performed to assess its construct validity, being carried out in IBM SPSS Amos 26 Graphics. *Results*. Final version of ERAI-N scale had five dimensions with 18 items that were space, equipment, belief, guideline, and safe culture. ERAI-N scale's score of Cronbach's alpha, Guttman split-half, and intraclass correlation coefficient (ICC) was 0.958, 0.927, and 0.994, respectively. Item-level content validity scores ranged from 0.89 to 1.0, and scale-level content validity was 0.983. Standardized factor loadings ranged from 0.567 to 0.974. Model adjusted fit statistics were as follows: the chi-square statistic and degrees of freedom (χ^2/df) = 3.943, root mean square error of approximation (RMSEA) = 0.071, incremental fit index (IFI) = 0.905, comparative fit index (CFI) = 0.904, parsimony normed fit index (PNFI) = 0.641, and parsimonious comparative fit index (PCFI) = 0.661. *Conclusions*. ERAI-N scale had moderate reliability, content validity, and construct validity. *Implications for Nursing Management*. Designers may use ERAI-N scale to plan the interior layout when design a new ICU. Nurse managers might utilize this instrument as a managing tool to assess whether there is environmental risk factors related to LBP in ICU.

1. Introduction

Low back pain (LBP) is defined as the pain extending from the 12th rib to the iliac crest and often coexists with buttock pain [1]. LBP is one of the most common public health problems, especially in middle-aged to older women, with the prevalence [2] ranging [3] from 40% to 90% [4]. LBP has some other prominent features such as high annual

incidence leading to severe functional limitation [5] in addition to high prevalence. A study done in 195 countries found that LBP was the leading cause of worldwide productivity loss as measured in years and the top cause of years lived with disability [6].

Nursing has been identified among the top professions at risk of LBP [7], especially for those on duty in intensive care unit (ICU). A mean of 70% prevalence per year was reported,

exceeding those employed in [8] heavy industry [9]. It is also reported that being a nurse is independently related to spinal pain [10]. LBP can induce disrupted or reduced proprioceptive signaling which likely plays a pivotal role in driving long-term changes in the top-down control of the motor system via motor and sensory cortical reorganization [11]. There were lots of publications which revealed that LBP for ICU nurses may lead to work absenteeism, reduction of nursing workforce efficiency [12], and burnout [13] and may incur economic costs of personal or national finance.

In order to reduce the prevalence of LBP among ICU nurses, investigations have been focused on individual, physical, psychosocial, and lifestyle factors which might play an essential role on the [14] occurrence of LBP [15] in recent decades. Based on human factors theory [16], lots of publications revealed that environmental factors in workplace were the most important risk factors for LBP [17, 18] in ICU nurses [8]. Omura et al. [19] proved that the use of a sliding sheet can significantly lower levels of low back subjective fatigue for caregiver in clinic when performing patient repositioning [19]. Alamgir et al. [18] found that healthcare workers preferred to use ceiling lifts because of less physically demanding work [18]. It is also reported that high-level lift availability was half as likely to have work-related LBP [20]. However, less than half (46%) of respondents working in ICU reported that their employer provided lifts [20], and this means limited availability and adoption of lifting equipment have been a persistent problem [21].

On the other hand, spatial requirements for a bed space are also essential in a critical care setting [22]. It is reported that an average of $23.26\,m^2$ was needed for a bed-to-bed transfer followed by $22.87\,m^2$ for a resuscitation task [23]. Nevertheless, little investigations were made to make sure whether the bed space in ICU meets the requirements. In terms of culture of safe nursing activities for the prevention of LBP in ICU nurses, there is research indicating that it is urgent to make efforts to broadcast safety operations, to formulate nursing procedures for nurses such as manual handling task, and to carry out guidance for safe handling patients, so as to reduce the occurrence of occupational LBP [24] in ICU nurses [25].

In spite of this, there are currently less reports about these strategies and no established research instruments designed to measure them as well. The aim of the current study was to develop and validate the Environmental Risk Assessing Instrument-Occupational Low Back Pain in Nurses (ERAI-N), with the intent of providing a high-quality instrument with clinical practical value that may be utilized by nurse administrators or researchers.

2. Methods

2.1. Participating Units.
This was an instrument development and validation study. Sample and data collection was performed in the tertiary general hospitals in Hunan Province in China from March to May 2022, except those specialized hospitals like military hospital, child care hospital, maternal and child health care hospital, stomatological hospital, tumor hospital, reproductive hospital, and traditional Chinese medicine hospital. The final scale used in this investigation has 20 items. The sample size was calculated according to 5 to 10 times of the number of items, 100 to 200 ICUs would be selected for this assessment, and the final sample size was about 110 to 220 ICUs, considering a 10% sample failure rate. There were 2 ICUs being assessed in every tertiary general hospital with random sampling principle. A flowchart of the sampling method is shown in Figure 1.

2.2. Procedure

2.2.1. Item Generation.
A qualitative study was conducted from January to March 2022. The initial questionnaire was developed through focus group interviews and field research, which were instructed by human factors theory. A convenience sample of 5 head nurses and 3 registered nurses working in a single prestigious general health care center was selected for group interviews. The interview was carried out by 3 of our research team in one conference room in the hospital. Participants were asked to discuss about LBP and environmental risk and safe culture related to the pain. Interviews continued until data saturation was achieved. For further certainty in addition to the focus group interviews, a field research was performed, and descriptive observation and focal observation were used by 2 of our research team in two ICUs. Subsequently, based on the qualitative study and literature review, the preliminary questionnaire containing 27 items was developed.

2.2.2. Content Validity.
An expert reviews process based on Delphi [26] was used for this study. The number of experts to be consulted for the Delphi method ranged from 15 to 30, depending on the depth of the research content [27]. Because the instrument is intended to measure factors of working environment and safe culture related to LBP in the context of an inpatient department, 20 researchers in the field of nursing management, ergonomics, or occupational safety were identified as experts, who were from the provinces of Taiwan, Beijing, Hunan, Gansu, Shanghai, Jiangsu, Chongqing, Guangxi and Anhui in China, respectively. All experts were contacted by WeChat and consented to participate in the study.

Two rounds of expert reviews were conducted. Nineteen of these twenty reviewers (95.0%) completed the first round review and 18 of them (94.7%) completed the second round. All of nineteen experts have achieved the top class technique title in the research, and 11 of them had completed postgraduate degree education. For the two-round reviews, the authority coefficient of experts (Cr) was 0.76~1.00 (0.90 ± 0.08) and 0.75~1.00 (0.89 ± 0.08), respectively, greater than 0.7; Kendall's W values of the measurement items were 0.223 $(P < 0.001)$ and 0.107 $(P < 0.001)$; and coefficient of variation (CV) was 0.05~0.29 (0.11 ± 0.06) and 0.05~0.22 (0.09 ± 0.03), less than 0.25, indicating that the overall coordination degree of expert scores was at a relatively high level. Experts used Likert 5-score scale to rate each questionnaire item's relevance and its respective concept; a score of 5 means very important, and a score of 1

FIGURE 1: Flowchart of the cluster stratified sampling with random principle.

means not important. The screening criterion was the combination of an item importance score with a mean of ≥4 and CV ≤ 0.25. In the first round, 11 experts put forward suggestions for modification, accounting for more than 57.9%. In the second round, 5 experts put forward suggestions for revision, accounting for 26.3%. After synthesizing expert opinions and group discussions, 6 items were merged, 2 were deleted, 1 item was added, and 2 items were modified. The initial scale with 20 items was obtained.

2.2.3. Preliminary Investigation. To further screen the items of the initial scale that whether their descriptions were suitable for ICU nurse administrators, preinvestigation was performed in 31 ICUs of tertiary medical institutions in Changsha, which were half of nonprofit tertiary hospitals in Changsha. Critical ratio, correlation coefficient, and factor analysis method were used for the screening criteria for project analysis.

2.3. Instruments. The final ERAI-N instrument was used as the instrument to collect the data. Participants responded to each item of the scale using a Likert-type scale with five response options: very inconsistent = 1, not very consistent = 2, uncertain = 3, fairly consistent = 4, and very consistent = 5.

2.4. Statistical Analysis

2.4.1. Validity Test. After the initial scale was formed, 9 authoritative and highly motivated experts who participated in the first reviews were consulted to test its content validity, evaluating fit degree between the measured content of the

scale items and the expected measured content. Experts used the content validity index (CVI) to rate each questionnaire item's relevance and its respective concept. The item CVI (I-CVI) is determined by calculating the proportion of experts rating each item as "quite relevant" or "very relevant." The I-CVIs were averaged to calculate a scale CVI (S-CVI). I-CVI and S-CVI were used to evaluate item-level and scale-level content validity, respectively.

Construct validity was assessed using confirmatory factor analysis, being carried out in IBM SPSS Amos 26 Graphics. According to the literature, the chi-square statistic and degrees of freedom (χ^2/df) and the root mean square error of approximation (RMSEA) were used as absolute fit indices, comparative fit index (CFI), incremental fit index (IFI), and normed fit index (NFI) were used as incremental fit indices, and parsimony normed fit index (PNFI) and parsimonious comparative fit index (PCFI) were used as parsimonious fit indices [28]. The overall model fit was confirmed to be acceptable when χ^2/df was between 3 and 5 and excellent if it was between 1 and 3. Other acceptable fit criteria were RMSEA < 0.08, CFI > 0.9, IFI > 0.9, NFI > 0.9, PNFI > 0.5, and PCFI > 0.5. Guided by modification indices, residual correlations were specified for several items. Standardized factor loading was used for item-level content validity assessment. Factor loading greater than 0.40 was considered to be adequate. After confirming the model fit, individual standardized parameter estimates of paths (i.e., coefficients values) were assessed for magnitude, statistical significance ($p \leq 0.05$), and direction.

2.4.2. Reliability Test. Internal consistency reliability was assessed using coefficient alpha and split-half reliability, calculated in SPSS (IBM 26). McDonald's omega reliability

Figure 2: Distribution of the hospital locations.

coefficient was calculated using SPSSAU (https://spssau.com/). Nunnally and Bernstein [29] suggest that internal consistency reliability values greater than 0.7 are generally sufficient [29]. In this study, test-retest reliability was also performed to assess the instrument's reliability. Forty ICUs were reevaluated 2 weeks after the initial survey. Intraclass correlation coefficients (ICCs) were used to determine test-retest reliability. A series of two-way mixed-effects models with measures of absolute agreement were used. ICCs were determined as <0.40 (poor), 0.40~0.75 (fair to good), and >0.75 (excellent) [30].

2.5. Ethical Considerations.
The Medical Research Ethics Committee of Xiangya Hospital of Central South University approved the study protocol (#202109003). Prior to collecting the data, written informed consent was obtained from each participant. The study was conducted in accordance with the Declaration of the World Medical Association and the Helsinki Declaration on the testing of human subjects.

3. Results

3.1. Characteristics of the Participating Units.
Of the 94 third-level hospitals surveyed, 19 were in Changsha, accounting for 20.2%, followed by Shaoyang, Changde, and Zhuzhou, with 10 (10.6%), 9 (9.6%), and 9 (9.6%), respectively. The distribution is shown in Figure 2. Fifteen (16.0%) hospitals had <1000 available beds, 50 (53.2%) had 1000–1999 beds, 12 (12.8%) had 2000–2999 beds, and 17 (18.1%) had ≥3000 beds. 56.4% of ICUs were available with 10–19 beds, and 28.7% of ICUs were available with 20 and more beds. In 57.4% of ICUs, half or more of the nurses complained of low back pain due to nursing operations. In 27.7% of ICUs, half or more of the nurses suffered acute low back muscle injuries caused by nursing operations (Table 1).

3.2. The Final ERAI-N Instrument.
Our hypothetical model, the ERAI-N, theorized that five distinct mechanisms in hospital units contribute to LBP in nurses. These mechanisms are spatial requirement, equipment, belief, guideline, and atmosphere of safe culture. An initial set of items was developed based on human factors theory and was refined through focus group interviews and field research. The final ERAI-N instrument comprises 18 items, with each construct measured by a minimum of 3 and a maximum of 5 items. The total scale score was 18-90. The maximum value in this survey was 90, and the minimum value was 21, with a mean value of 54.7 ± 16.3.

3.2.1. Reliability

(1) Cronbach's Alpha Score. Cronbach's alpha scores ranged from 0.793 to 0.982 for the instrument's five factors. Guttman split-half scores ranged from 0.708 to 0.928. McDonald's omega reliability coefficient ranged from 0.866 to 0.986., The overall scale was 0.963 (Table 2). These scores all exceed the 0.7 standard proposed by Nunnally [29].

(2) Test-Retest Reliability. In this study, ICC was further analyzed to comprehensively examine the reliability level of the scale, ICC scores ranged from 0.616 to 0.924, and the scale's ICC was 0.994 (Table 3).

3.2.2. Validity

(1) Content Validity. In this study, 9 authoritative and highly motivated experts were consulted for the evaluation opinions on the correlation of scale items. The results show that item-level CVI ranged from 0.89 to 1.0, greater than 0.78 [31]. A total of 17 items in the scale were unanimously rated as "relevant" by all experts (3 or 4 points), the scale-level unanimity CVI was equal to 0.85, greater than 0.8 [32], and scale-level average CVI was 0.983, greater than 0.9 [32], which mean the content validity of both item level and scale level was good.

TABLE 1: General information of participating units ($n = 188$).

Characteristics	Number (n)	Percentage
Type of ICU you work in		
Comprehensive ICU (central ICU)	90	47.9
Specialty ICUs	98	52.1
Respiratory ICU	40	21.3
Emergency ICU	22	11.7
Neurology ICU	8	4.3
Neurosurgical ICU	16	8.5
Cardiac surgical ICU	2	1.1
PICU	4	2.1
Cardiovascular ICU	6	3.2
Number of beds available in your ICU		
<10	28	14.9
10–19	106	56.4
≥20	54	28.7
Have any nurses from your ICU complained of low back pain as a result of nursing operations?		
75–100%	48	25.5
50–74%	60	31.9
26–49%	68	36.2
1–25%	8	4.3
0%	4	2.1
Have nurses from your ICU suffered acute low back muscle injuries as a result of nursing operations?		
75–100%	24	12.8
50–74%	28	14.9
26–49%	82	43.6
1–25%	36	19.1
0%	18	9.6

TABLE 2: Coefficient reliability estimates.

Scale	Coefficient alpha	Split-half reliability	McDonald's omega
Space	0.793	0.708	0.866
Equipment	0.808	0.759	0.875
Belief	0.982	0.938	0.986
Guideline	0.946	0.855	0.965
Atmosphere	0.823	0.806	0.884
The overall scale	0.958	0.927	0.963

TABLE 3: Test-retest reliability.

Dimensionality	The first	The second	ICC
Space	13.55 ± 3.43	13.3 ± 3.96	0.819**
Equipment	13.60 ± 3.49	13.03 ± 3.93	0.772**
Belief	14.33 ± 5.82	12.98 ± 5.98	0.924**
Guideline	8.83 ± 3.36	8.10 ± 3.52	0.834**
Atmosphere of safe culture	15.43 ± 2.92	14.80 ± 3.07	0.616**
The overall scale	65.73 ± 16.76	62.20 ± 18.50	0.994**

ICC, intraclass correlation coefficient. ** $p < 0.001$.

(2) Construct Validity. Construct validity was assessed by confirmatory factor analysis. The maximum likelihood method was used to estimate the factor loadings. In the initial model, χ^2/df was approximately 5, and neither IFI nor CFI was equal to or greater than 0.9. After several times adjusting of model and group discussion, 2 items were deleted. The final model fit indices showed acceptable model fit (Table 4). All parameters in the model were significant at $p < 0.001$ (Figure 3).

The five-factor hypothesized adjusted model resulted in the following goodness-of-fit indices. The standardized factor loadings ranged from 0.567 to 0.974 and exceeded the recommended 0.40 threshold (Table 5).

3.2.3. Minimum Detectable Change. Nurses' complaints of low back pain due to nursing operations were negatively correlated with scale scores, with a Spearman correlation

TABLE 4: Modified model fit test.

Index classification	Indices	Evaluation criterion	Fitted value	Meet the standard
Absolute fit indices	$\chi^2/\mathrm{d}f$	<3 good 3~5 (fail to good)	3.943	Yes
	RMSEA	<0.08	0.071	Yes
Incremental fit indices	IFI	>0.9	0.905	Yes
	CFI	>0.9	0.904	Yes
Parsimonious fit indices	PNFI	>0.5	0.641	Yes
	PCFI	>0.5	0.661	Yes

$\chi^2/\mathrm{d}f$, the chi-square statistic and degrees of freedom; RMSEA, root mean square error of approximation; IFI, incremental fit index; CFI, comparative fit index; PNFI, parsimony normed fit index; PCFI, parsimonious comparative fit index.

FIGURE 3: CFA model diagram of Environmental Risk Assessing Instrument-Occupational Low Back Pain in Nurses (ERAI-N).

coefficient of −0.434. Using receiver operating characteristic (ROC) curve analysis, ICUs in which ≥50% of nurses had complained of low back pain due to nursing operations were considered high risk. The AUC was 0.745, $p = 0.001$, the maximum Yordon index was 0.414, and the cutoff value was 62.5 (Figure 4).

4. Discussion

Environmental factors in the work place have been found to be an important risk related to LBP in ICU nurses [8, 33]. HealthWISE published by the World Health Organization and International Labour Organization indicated top ten

Table 5: Scale items and standardized factor loadings.

Scale items	Standardized factor loadings
Space	
Spatial requirements for a bed space meets the standard of 15 to 18 square meters	0.567
The height of the sickbed is adjustable	0.630
The height of the work surfaces (desks, trolleys, and shelves) is adjustable for nurses working with the natural posture	0.771
The height of the seat and the height of the lumbar support pillow are adjustable, and the structure of the lumbar support pillow is elastic and rigid enough, so it is comfortable and stable	0.798
Equipment	
Auxiliary equipment such as slip and bed easy is available at any time	0.610
Patient lifting system is available at any time	0.772
The height of the interface of common devices is suitable. Nurses do not need to bend or bend excessively when operating the interface (such as monitoring devices and ventilators).	0.709
Belief	
An organizational policy system of working safely has been established	0.917
Promote the concept of "safe patient handling, no manual lift" in the work place	0.952
Training nurses about the knowledge of ergonomics related to the prevention of lumbar and back musculoskeletal injury	0.974
Training nurses on the skill of biomechanics of lumbar spine related to the prevention of lumbar and back musculoskeletal injury	0.973
Evaluate nurses' knowledge and skills in the prevention of lumbar and back musculoskeletal injury	0.965
Guideline	
There were safe work procedures for nurses to prevent low back musculoskeletal injury	0.985
There was risk assessment checklist of safe patient handling	0.856
There were emergency plans to deal with lumbar and dorsal musculoskeletal injuries for nursing staff	0.929
Atmosphere of safe culture	
Nurses have the vision of "I want to work safely"	0.636
Nurses have the initiative to carry out the risk assessment of safe patient handling	0.877
There was a culture of safety named "team work, safe patient handling" in the work environment	0.646

ergonomic principles including working in neutral positions, keeping everything within easy reach, and maintaining a comfortable environment [34]. However, these were instructive principles, and a tool with the capacity of accurately identifying risks in clinic would be more popular than those theoretical principles for clinical administrators. Therefore, we sought to develop such a simple instrument to help clinical administrators complete the identification of environmental risk factors related to LBP in nurses.

4.1. Scale Content Analysis. ERAI-N scale had five dimensions with 18 items that were space, equipment, belief, guideline, and safe culture. Jafari et al. [35] developed a scale for predicting LBP occurrence among nurses, including three dimensions with 40 items, which were occupational, psychosocial, and individual [35]. Kazemi [36] developed an instrument to assess occupational low back pain prevention behaviours among nurses, including six aspects that are knowledge, attitude, behaviour, self-efficacy, reinforcing factors, and enabling factors. But the knowledge subscale was with low reliability [36]. However, previous scales related to the low back pain risk assessment in nurses have focused less on the direct and controllable factors that produce these risk behaviours. In addition to safe working procedures [37] and improving nurses' work posture, a safe working environment is also essential. A study showed that providing ceiling lifts was associated with reduced LBP in nurses [21]. Therefore, the instrument is intended to measure factors of working environment and safe culture related to LBP in the context of an inpatient department.

4.2. The Results from the Expert Consultation Are Reliable. The experts participating in this review were involved in the fields of nursing management, ergonomics, or occupational safety. The authority coefficient of experts for two reviews was higher than the standard, and it indicated that the experts in this study were highly authoritative. More than half experts put forward suggestions for modification and participated in the consultation for the evaluation of model fit degree, and they fully expressed their concern and support for this study. Furthermore, CV scores were less than 0.25 in two-round reviews indicating that the overall coordination degree of expert scores was at a relatively high level.
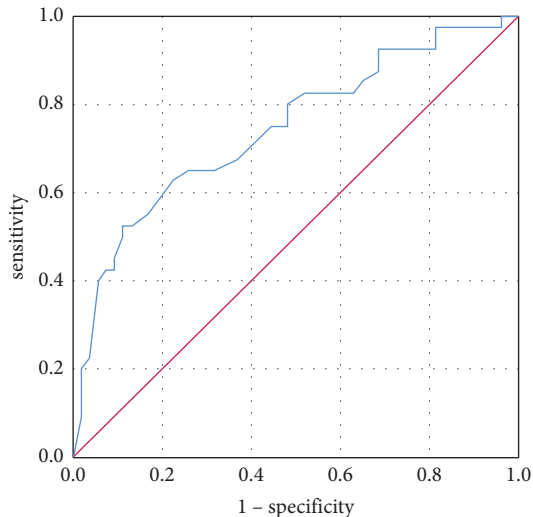
Figure 4: ROC curve.

4.3. ERAI-N Had Moderate Reliability. In terms of the internal reliability, this scale only had a moderate internal consistency.

Reliability analysis is to test the reliability of measuring tools, which is an index reflecting the consistency degree of the result measured from the tool. In this study, coefficient alpha, split-half reliability, and test-retest reliability were used to test ERAI-N's reliability. Coefficient alpha reliability coefficient is the most commonly used reliability coefficient, and it is often used to test scale's intrinsic consistency. The method of split-half reliability means to divide the survey item into two halves and then calculate the correlation coefficient of the scores of the two halves, and it is also used to test scale's intrinsic consistency. For the data analyzed in this study, both coefficient alpha reliability and split-half reliability surpassed generally accepted standards, and this means ERAI-N had moderate reliability. In order to test the results' stability, 40 ICUs were reevaluated 2 weeks later. The scale's ICC was 0.994, greater than the standard of 0.75, indicating that the stability of ERAI-N was excellent [36].

4.4. ERAI-N Had Moderate Validity. In this study, in order to ensure the accuracy of phrasing and the importance of entry item, two-round expert consultation was carried out. In the consultation letter, open information collecting columns of "Indicators to be added" and "Opinions and suggestions" was set to obtain experts' advice as more as possible. The evaluation from authoritative experts showed that the CV of both item level and scale level exceeded the standard, this indicated that ERAI-N had excellent content validity, and its items had a good correlation with the corresponding dimension and content.

In order to ensure the scientific research, it is necessary to test the suitability of the questionnaire model. The indices of the initial model including absolute fit indices, incremental fit indices, and parsimonious fit indices basically meet the relevant parameter requirements. Based on it, the initial model was modified in this paper so as to pursue better fitting results. The fitness test results of the modified model showed that χ^2/df was not at the range of excellent, but at the range of fair to good. Meanwhile, CFI, IFI, PNFI, and PCFI reached up to the level of excellent. These findings indicated adequate internal consistency of the items within each factor and a close alignment with the ERAI-N's theoretical factor structure. Therefore, it can be illustrated that ERAI-N had a moderate goodness of fit.

4.5. Implications for Nursing Management. There are several clinical and research implications that follow this study. When a new ICU is built, ERAI-N may help the designer to decide the number of sickbed for an area so that a bed space meets ICU spatial requirement standard. It also can help them to determine the location of special equipment such as invasive ventilators that are frequently operated by the nurse so as to keep operators in a natural posture while operating the equipment's interface. Nurse managers can utilize ERAI-N as a managing tool to assess whether there are environmental risk factors related to LBP in their own unit and then form an improvement report and put forward it to supplementary departments. Researchers may tentatively utilize the tool to assess the status quo of environmental risks leading to LBP in ICU.

4.6. Limitations of ERAI-N and Future Directions. ERAI-N was developed and tested on a sample from one province; therefore, there is a need for future research focusing on further evaluating the ERAI-N's reliability and validity. For example, it would be national and cross-cultural study with variation in the ERAI-N structure and distribution. The individual factors related to LBP in ICU nurse population can be summarized and set up a connection with the ERAI-N scale. Otherwise, it is urgent to develop practical intervention strategies according to specific conditions for ICU. Of course, it is important for researchers in the future to focus on the study of putting into effect interventions to reduce or eliminate these risk factors, so as to realize its real value of research and development.

5. Conclusion

This study introduces a reliable and valid instrument (ERAI-N) for clinical administrators to measure risk factors of low back pain in ICU nurses. The ERAI-N scale had five dimensions with 18 items that were space, equipment, belief, guideline, and safe culture. It demonstrates good levels of reliability, content validity, and construct validity in the process of initial testing and appears promising. Clinical administrators or researchers may tentatively utilize the tool to assess the status quo of environmental risks leading to LBP in ICU. There is a need for future research focusing on further evaluating the ERAI-N's reliability and validity, developing and putting into effect interventions to reduce or eliminate these risk factors, so as to realize its real value of research and development.

Data Availability

Data are available on request from the authors.

Ethical Approval

The Medical Research Ethics Committee of Xiangya Hospital of Central South University approved the study protocol (no. 202109003).

Disclosure

Lihui Zhang and Yangyang Liu are co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Lihui Zhang and Yangyang Liu collected and analyzed the data and prepared the first version of the manuscript. Su'e Yuan helped develop ideas for the study, designed the study, and prepared the manuscript for publication. Lihui Zhang and Yangyang Liu contributed equally to this work.

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Research Article

Current Status of Core Competencies of Chinese Nurses in Burn Departments: A Latent Profile Analysis

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Aim. To investigate the current status of NBDs' core competencies through latent profile analysis, identify potential subgroups and their population characteristics, and analyze the influencing factors of different categories. *Background*. NBDs are essential in the treatment and rehabilitation of burn patients. However, the core competencies of Chinese NBDs are seldom reported. *Methods*. Our analyses were based on a cross-sectional and multicenter study of 267 Chinese NBDs. Latent profile analysis was employed to identify NBDs' core competence profiles using the NBD Core Competencies Self-rating Scale (NBD-CCSS). We then explored the characteristics among different profiles and determined socio-demographic variables associated with profile membership by conducting ANOVA, Chi-square test, and multinominal logistic regression analyses. *Results*. A 3-profile model provided the best fit. The three profiles were titled "skillful competencies" (Class 1, $n = 77$, 28.8%), "moderate competencies" (Class 2, $n = 140$, 52.4%), and "poor competencies" (Class 3, $n = 50$, 18.7%). Regression analysis suggested that professional title, years of employment, and BICU experience were influencing factors of NBDs' profile membership of core competencies. NBDs who were supervisor nurses or above (OR = 0.802, 95% CI: 0.009, 0.759), with more than 7 years of employment (OR = 0.091, 95% CI: 0.009, 0.906) and BICU experience (OR = 3.564, 95% CI: 1.423, 8.925) were more likely to fall into Class 1. *Conclusions*. Our findings could provide evidence for nursing administrators to develop training programs to enhance NBDs' core competencies. In particular, variables associated with profile membership determined in the study may facilitate more tailored training strategies.

1. Background

Burns can be caused by various factors such as fire, chemicals, or electricity, and they can lead to a significant financial burden on families and society [1]. Severe burns in China have an overall mortality rate ranging from 9.79% to 14.21% [2], highlighting the severity of this public health problem, particularly in developing countries where access to medical care is often limited [1]. Burn injuries can result in high rates of morbidity and disability, severely impacting the quality of life

and psychological well-being of burn victims [3]. Treatment of burns can be costly and often requires long-term care [4]. Given that nurses are the primary healthcare providers who interact with patients frequently during their hospital stay, it is imperative for nurses in burn departments (NBDs) to be equipped with advanced professional knowledge and specialized skills to provide high-quality care.

As is known, the definitions, mechanisms, and development of nurses' competencies have been explored in-depth in western countries [5–7]. Similarly, studies on specialized nurses in intensive care, operating rooms, emergency medicine, oncology, wound care, and intravenous therapy have been conducted frequently in China [8]. Relevant studies have also expanded to address vulnerable populations (elderly, infants, children, and pregnant women), chronic diseases (e.g., diabetes, chronic cardiovascular, and cerebrovascular diseases), and the improvement of quality of life (e.g., nutrition and rehabilitation) [9–12]. Moreover, previous literature suggests that practical assessments of nurses' critical thinking and clinical reasoning competencies in real-world contexts could improve the quality of nurses' work [13]. Despite the progress made in these areas, there is still a lack of research on the current status and training of NBDs' core competencies in China. Furthermore, the scope and standards of NBDs' core competencies have not been standardized yet.

To date, registered nurses are expected to possess core competencies that encompass knowledge, skills, and attitudes to provide high-quality and safe care to patients. The Burn Nurse Competency Initiative (BNCI) developed 45 burn nurse practice competency statements through a multistaged consensus-building method by the American Burn Association (ABA) [14]. In light of their contributions, Chinese researchers have also developed instruments to assess NBDs' competencies [15], while the "National Expert Consensus on Professional Standards for Chinese Nurses of Burn Department" was constructed with definitions, operating contexts, occupational/skill requirements, training, assessment, and certification. The Chinese Expert Consensus categorizes NBDs into junior, intermediate, and senior groups based on their professional level [16]. However, it is important to note that the Chinese expert consensus was not specifically for burn-specific principles but established for job qualifications.

As noted earlier, NBDs are crucial in burn prevention, emergency care, and continuity of care in developing countries [17–19]. Despite their importance, newly hired NBDs are often placed directly in burn wards or BICUs without specialized training. Instead, their training focuses on fundamental knowledge, leaving them lacking in the specific competencies necessary for burn care. Developing specialized skills in clinical settings requires repeated practice, which many novice NBDs are not receiving. At present, the competency profile of NBDs is inconsistent across China, as this field of work is still in its early stages. Thus, a comprehensive assessment of NBD competencies is necessary to ensure they are fully equipped for their vital roles.

To better understand NBDs' core competencies, we have previously reported their overall competencies and factors

affecting them [20]. In this research, we tried to utilize latent profile analysis (LPA) to help nursing administrators and policymakers tailor training programs. LPA allows researchers to identify subgroups of individuals based on shared attributes, enabling them to determine potentially diverse patterns of NBDs' competencies [21]. This person-centered approach has been used in previous nursing studies to identify subgroups related to workload, mental health, healthcare beliefs, or behavior, revealing associations with demographic characteristic [22–24]. By leveraging LPA findings, targeted actions can be taken to achieve favorable outcomes.

1.1. Study Aims. The purpose of this study was to investigate the current status of NBDs' core competencies through latent profile analysis, identify potential subgroups and their population characteristics, analyze the influencing factors of different categories, and provide a basis for developing targeted training programs.

2. Materials and Methods

2.1. Study Design. A cross-sectional study utilizing purposive sampling was carried out in 12 tertiary hospitals in China from March to June 2020. All study procedures followed the Karolinska Institute's ethical standards and the 1964 Helsinki Declaration and its later amendments. In addition, this study was reviewed and approved by the Ethics Committee of Changhai Hospital affiliated to Naval Medical University (No. 2020-54), and participants gave consent to complete the online survey.

2.2. Participants. The study was conducted amongst Chinese NBDs who delivered burn care from March to June 2020. Eligible participants were nurses who: (a) were registered nurses; (b) had work experience in burn departments (burn wards or BICUs) over one year; (c) gave informed consent and voluntary participation in this study. NBDs absent from work or taking time off for illness throughout the survey period were excluded.

2.3. Data Collection. We calculated the sample size of this study using the following formula: $N = Z^2 * S^2/d^2$, with Z (95% confidence level) = 1.96, S (overall standard deviation) = 0.8, and d (permissible error) = 10%. The minimum sample size N was obtained as 246, and we decided to deliver 296, considering a nonresponse rate of 20%. Through Wen Juanxing (https://www.wjx.cn, an online data collection website), we distributed an anonymous online survey (https://www.wjx.cn). We trained the administrators in charge of the participants over the phone and with WeChat to help survey before the questionnaires were distributed. Sampling was separated for each institution. All the participants responded to the online Wen Juanxing survey independently by scanning the QR Code via WeChat without the presence of researchers or nursing administrators. With a response rate of 98.6%, a total of 292 NBDs

working in burn departments at 12 tertiary institutions were recruited. There were no missing items in the 292 completed surveys because of the restriction of the answer system settings, but 25 of them were invalid and were removed from the dataset because of the detected all-the-same options. As a result, we received 267 valid questionnaires, and the effective response rate was 90.2%.

2.4. Measures. We collected data via online questionnaires, which included a socio-demographic questionnaire and the NBD Core Competencies Self-rating Scale (NBD-CCSS). The socio-demographic questionnaire collected general information such as age, professional title, length of employment, whether the participant had work experience in BICUs, and educational level. Based on a systematic literature review, we previously used the core competencies in the ICN framework for nurse specialists as a theoretical framework to develop NBD-CCSS [15]. The ICN framework was chosen due to its recommended competencies of a specialist nurse, which include knowledge, skills, judgment, and attributes, all under the premise of ethical and legal compliance. Health promotion, nursing process, therapeutic communication, and interpersonal relationships are among the fundamental care principles. However, the NBD-CCSS lacked dimensions on psychosocial help, aftercare guidance, end-of-life care, and team collaboration compared to the ABA's Burn Nurse Competencies. In China, we have not yet constructed tertiary hospitals radiating to community rehabilitation and postrehabilitation psychosocial support.

The NBD-CCSS includes nine dimensions and 100 items (see supplement 1). The nine dimensions are basic specialized knowledge, related specialized knowledge, basic specialized skills, related specialized skills, condition assessment, adverse nursing events, mass casualty care, critical thinking, and teaching skill. The items were rated using a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Sixteen experts assessed the content validity of the measure. The NBD-CCSS items' content validity index (I-CVI) was 0.8–1, while the scale's overall content validity index (S-CVI) was 0.976. The internal consistency test revealed that the NBD-alpha CCSS's Cronbach's coefficient was 0.984 and that each dimension's Cronbach's coefficient ranged from 0.824 to 0.958. The scale underwent exploratory factor analysis, and the entire scale's KMO coefficient was 0.951.

2.5. Statistical Analysis. SPSS (version 25.0) and Mplus (version 8.4) were used for data analysis. All the missing data were not included in the statistical analysis because 4 questionnaires were not submitted and 25 questionnaires had identical answers. After the data were cleaned, descriptive statistics were conducted for all variables. Continuous variables are displayed in mean ± standard deviation, and categorical variables were displayed in frequency and percentage. To accomplish the study aims, we identified latent profiles (subgroups) of NBDs' core competencies based on the nine dimensions of NBD-CCSS. Based on a specific set of factors, LPA enables the identification of latent subgroups within the population. To start, we determined the number of subgroups using the Bayesian information criterion (BIC), entropy, and bootstrapped likelihood ratio test (BLRT). Lower values of the BIC indicate higher fitness as it takes into account model fit and parsimony. Individual classification accuracy is referred to as entropy (values close to 1 are preferred). Significant p values indicate that the k-class model has more excellent fitness when BLRT compares it to the $k - 1$ class model.

Meanwhile, the one-way analysis of variance (ANOVA) and Chi-square analysis were used to analyze the distribution of the identified classes and their relationships with socio-demographic variables. Furthermore, we performed multinomial logistic regression to investigate the variables influencing profile membership. A statistically significant difference was accepted at a two-sided p-value <0.05.

3. Results

3.1. Fit Statistics for Latent Profiles. In this study, LPA was performed on NBDs' core competencies. We assumed equal variance between but zero covariance profiles while estimating for 2–5 profile models. The results of LPA are shown in Table 1. When comparing models, if the AIC and BIC are smaller, the entropy is higher, and the BLRT-p is less than 0.05, and the better the model fit is. As can be seen in Table 1, the 3-profile model has the highest entropy. The 4-profile model was not significantly better than the 3-profile model (p-value close to the critical value of 0.05) and had the lowest entropy. The 5-profile model had the lowest ABIC and AIC, but the proportion for the most minor class was only 0.022. Therefore, combining all indicators and model simplicity, the 3-profile model was found to be the optimal model for interpretation and additional analysis.

3.2. Distribution of Core Competencies in the 3-Profile Model. The distribution of core competencies in the 3-profile model is described in Table 2 and Figure 1. The mean scores of the NBD-CCSS's dimensions significantly differed among the 3 profiles (all $p < 0.001$). Class 1, the second largest profile ($n = 77$, 28.8%), had the highest levels of core competencies. Class 2 was the largest group ($n = 140$, 52.4%), while class 3 formed the smallest group ($n = 50$, 18.7%) and was characterized by the lowest levels of core competencies. Based on the results, class 1 was labeled as "skillful competencies," class 2 was labeled as "moderate competencies," and class 3 was labeled as "poor competencies."

3.3. Interprofile Characteristic Differences. The differences among the profiles concerning socio-demographic variables were examined (Table 3). Among the socio-demographic variables, significant differences were noted across profiles in age, professional title, education, length of employment, and experience in BICU (all $p < 0.05$). In

Table 1: Fit statistics for 2–5 latent profile models ($n = 267$).

Model	AIC	BIC	ABIC	Entropy	LMR-p	BLRT-p	Proportion
2-Profile	3896.117	3996.559	3907.783	0.909	0.0002	0.0000	0.438/0.562
3-Profile	3443.528	3579.844	3459.361	0.937	0.0006	0.0000	0.187/0.524/0.288
4-Profile	3273.952	3446.140	3293.952	0.900	0.0471	0.0495	0.131/0.288/0.213/0.367
5-Profile	3181.985	3390.046	3206.151	0.905	0.0136	0.0000	0.022/0.139/0.281/0.210/0.348

Note. AIC, akaike information criteria; BIC, bayesian information criteria; ABIC, adjusted bayesian information criteria; LMR-p, lo-mendell-rubin; BLRT-p, bootstrapped likelihood ratio test.

Table 2: Distribution of core competencies in the 3-profile model ($N = 267$), mean (SD).

	Dimensions	Total sample ($n = 267$)	Class 1 ($n = 77$)	Class 2 ($n = 140$)	Class 3 ($n = 50$)	F	p
A1	Basic specialized knowledge	3.94 (0.57)	4.51 (0.35)	3.89 (0.33)	3.20 (0.45)	204.88	<0.001
A2	Related specialized knowledge	3.55 (0.55)	4.10 (0.32)	3.48 (0.35)	2.91 (0.37)	157.36	<0.001
A3	Basic specialized skills	4.03 (0.64)	4.63 (0.32)	4.03 (0.42)	3.12 (0.43)	223.59	<0.001
A4	Related specialized skills	3.87 (0.60)	4.46 (0.35)	3.84 (0.37)	3.05 (0.34)	233.45	<0.001
A5	Condition assessment	4.02 (0.61)	4.70 (0.24)	3.95(0.35)	3.17 (0.37)	338.68	<0.001
A6	Adverse nursing events	3.99 (0.72)	4.74 (0.36)	3.90 (0.47)	3.07 (0.44)	227.62	<0.001
A7	Mass casualty care	3.60(0.78)	4.40 (0.47)	3.47 (0.51)	2.72 (0.62)	165.23	<0.001
A8	Critical thinking	2.78 (0.88)	3.55 (0.74)	2.60 (0.69)	2.06 (0.70)	76.09	<0.001
A9	Teaching skills	3.47 (0.76)	4.11 (0.59)	3.36 (0.64)	2.83 (0.54)	72.12	<0.001
Total		3.69 (0.79)	4.36 (0.58)	3.65 (0.64)	2.90 (0.59)		
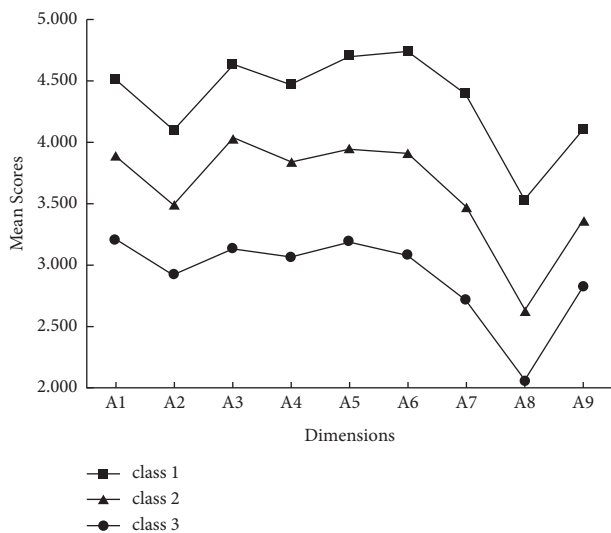
Figure 1: Distribution of core competencies in the 3-profile model.

particular, Class 3 included the largest proportion of NBDs who were ≤25 years old, junior nurses, had junior college degrees, had less than three years of employment, and had no BICU experience.

3.4. Variables Associated with the Latent Profile Membership. In order to analyze whether different socio-demographic variables lead to different profiles of core competencies in NBDs, a multinomial logistic regression analysis was conducted. In this study, profile membership (Class 1–Class 3) was used as the outcome variable, and the predictor variables were age, professional title, length of employment, experience in BICU, and education. During the analysis, Class 3 was set as the reference group. The final results are shown in Table 4.

It can be seen that professional title, length of employment, and experience in BICU impacted profile membership, while age and education had no significant impact. In the comparison between Class 1 and Class 3, senior nurses were more likely to be grouped in Class 3 compared to supervisor (or above) nurses. However, in the comparison between Class 2 and Class 3, there was no significant tendency to profile membership for NBDs with different professional titles. Secondly, NBDs with 4-5 years of work experience were more likely to be assigned to Class 3 than those with more than 7 years. However, there was no tendency to profile membership when comparing Class 2 and Class 3 concerning the length of employment. In terms of experience in BICU, NBDs with BICU experience tended to be more likely to fall into Class 1 and Class 2, with a 2.564-fold and 1.304-fold increase in the probability of profile membership, respectively.

4. Discussion

This study identified three potential profiles of core competencies for NBDs: "skillful competency" at 28.8% ($n = 77$), "moderate competency" at 52.4% ($n = 140$), and "poor competency" with a percentage of 18.7% ($n = 50$). With an overall mean score of (3.69 ± 0.79), the mean core competencies of the 267 NBDs were at a medium level. Professional titles, years of employment, and BICU experience were determined as influencing factors of NBDs' profile membership of core competencies. Moreover, NBDs who were senior nurses with 4-5 years of employment were more likely to be grouped in Class 3, while those who were supervisor nurses or above, with more than 7 years of employment and BICU experience, tended to fall into Class 1.

Among the nine dimensions, the critical thinking (2.78 ± 0.88) and teaching skills (3.47 ± 0.76) dimensions were of the lowest scores—the same cases in the NBDs' three

Table 3: Interprofile characteristic differences ($N = 267$), N (%).

Variables	Total sample ($n = 267$)	Class 1 ($n = 77$)	Class 2 ($n = 140$)	Class 3 ($n = 50$)	χ^2	p
Age					31.81	<0.001
≤25 y	63 (23.60)	7 (9.09)	32 (22.86)	24 (48.00)		
26~30 y	86 (32.21)	23 (29.87)	47 (33.57)	16 (32.00)		
31~35 y	57 (21.35)	21 (27.27)	31 (22.14)	5 (10.00)		
≥36 y	61 (22.84)	26 (33.77)	30 (21.43)	5 (10.00)		
Professional title					32.20	<0.001
Junior nurse	85 (31.84)	15 (19.48)	44 (31.43)	26 (52.00)		
Senior nurse	129 (48.31)	33 (42.86)	73 (52.14)	23 (46.00)		
Supervisor nurse or above	53 (19.85)	29 (37.66)	23 (16.43)	1 (2.00)		
Education					15.65	<0.001
Junior college	97 (36.70)	18 (23.38)	51 (36.43)	29 (58.00)		
Bachelor's degree or above	169 (63.30)	59 (76.62)	89 (63.57)	21 (42.00)		
Length of employment					37.88	<0.001
≤3 y	62 (23.22)	7 (9.09)	33 (23.57)	22 (44.00)		
4~5 y	47 (17.60)	7 (9.09)	26 (18.57)	14 (28.00)		
6~7 y	39 (14.61)	14 (18.18)	20 (14.29)	5 (10.00)		
>7 y	119 (44.57)	49 (63.64)	61 (43.57)	9 (18.00)		
Experience in BICU					7.96	0.019**
Yes	99 (37.08)	36 (46.75)	52 (37.14)	11 (22.00)		
No	168 (62.92)	41 (53.25)	88 (62.86)	39 (78.00)		

Table 4: Multinomial logistic regression analysis of variables associated with the latent profile membership ($N = 267$).

Variables	Class 1		Class 2	
	b	OR (95% CI)	b	OR (95% CI)
Age (ref: ≥36 y)				
≤25 y	0.217	1.242 (0.063, 24.685)	−0.164	0.848 (0.068, 10.552)
26–30 y	1.014	2.756 (0.236, 32.223)	0.459	1.582 (0.172, 14.580)
31–35 y	0.142	1.152 (0.240, 5.529)	0.195	1.216 (0.275, 5.381)
Professional title (ref: supervisor nurse or above)				
Junior nurse	−2.464	0.085 (0.006, 1.143)	−1.595	0.203 (0.017, 2.368)
Senior nurse	−2.497*	0.082 (0.009, 0.759)	−1.561	0.210 (0.024, 1.868)
Education				
Junior college (ref: bachelor's degree or above)	−0.213	0.808 (0.272, 2.404)	−0.239	0.787 (0.322, 1.928)
Length of employment (ref: >7 y)				
≤3 y	−2.154	0.116 (0.008, 1.741)	−0.807	0.446 (0.046, 4.308)
4-5 y	−2.402*	0.091 (0.009, 0.906)	−1.170	0.310 (0.042, 2.270)
6-7 y	−0.591	0.554 (0.057, 5.372)	−0.411	0.663 (0.085, 5.163)
Experience in BICU				
Yes (ref: no)	1.271**	3.564 (1.423, 8.925)	0.834*	2.304 (1.024, 5.181)

Note. * means $p < 0.05$; ** means $p < 0.01$.

potential profiles. Yue et al's team [25] also identified low evidence-based competencies in their previous study on burn specialist nurses in Hunan Province. Additionally, for the training of specialist nurses in China, there are training programs organized by nursing associations, such as the training of intensive care specialist nurses and operating room specialist nurses. Nevertheless, such programs are desired to be more systematic and standardized since 62.7% of them do not carry out recertification (Ding et al. [26]). Most Chinese specialist nurses gain progress through experience in relevant departments instead of systematic training [27, 28, 29]; Wang et al. This could explain our findings why NBDs lack the competencies necessary to recognize clinical issues, use scientific approaches to solve problems, raise awareness of research and teaching, and integrate theory with

practice. In the United States, colleges, boards, or organizations administer specialty certification programs that evaluate whether a nurse meets the criteria they have established in a specialty field of practice. Previous studies have widely reported correlations between specialty nurse certification and better patient outcomes and care quality [30]. Therefore, it should be a key concern for nursing administrators to develop a training and certification system for NBDs underlining critical thinking and teaching skills.

In addition, we also found that NBDs' sociodemographic characteristics differed across the potential profiles. NBDs' professional titles, length of employment, and BICU work experience influenced their profile membership of core competencies. NBDs who were supervisor nurses or above, had over seven years of employment and

BICU experience, had more probability of being grouped into the "skillful competencies" class than those who were senior nurses, and had 3–5 years of employment and no BICU experience. However, these factors did not impact the profile membership of the "moderate competencies" class. We are inclined to propose the following reasons: Firstly, there is a significant difference in the severity of burn patients, especially those with severe burns who are in critical condition and require a high level of competence in specialist burn care [31]. Therefore, their burn care requires more skilled nurses. Moreover, nurses with more seniority and BICU experience have more opportunities to care for severe burn patients. As a result, they are more likely to possess expertise in burn care, such as monitoring circulatory, respiratory, urinary, and other systems. Secondly, experienced nurses might realize their value in the care process, especially after solving complex clinical problems. This serves as their intrinsic driving force, coupled with support and empowerment from nursing administrators, which also enhances their extrinsic drive. All these drives could be facilitators for the self-transcendence of specialist nurses, as formerly reported by Wang et al. [32].

Furthermore, NBDs in the "poor competencies" profile were featured as having the largest proportion of those who were ≤25 years old ($n = 24$, 48.00%), junior nurses ($n = 26$, 52.00%), with a junior college education background ($n = 29$, 58.00%), with less than three years of employment ($n = 22$, 44.00%), and no BICU experience ($n = 39$, 78.00%). In accordance with Rizany et al's study [6], our findings gave more evidence to highlight the systematic training of novice nurses with lower educational levels. Through literature review, nursing associations have developed the concept of continuing competence, which has drawn attention worldwide [33]. Prior studies revealed that NBDs should possess emergency response capabilities due to burns' abrupt and batch nature Feng et al. [34]. Similarly, the literature on emergency nurses has also highlighted the need to understand their lack of knowledge and capability for a long-term career [35]. Hence, in addition to entry-level competencies, NBDs need to be continuously assessed regarding their core competencies. However, administrators are challenged with a lack of unified standards, practices, and frameworks for continuously assessing NBDs' competencies. This, therefore, makes our research more meaningful.

4.1. Recommendations for Future Research. Based on our study, we offer the following recommendations for cultivating NBDs' core competencies. It is important to provide enhanced training and support for both nursing managers and staff, as proposed by Avery and Cleaver [36]. Further research is needed to fully understand the impact of competence management methods on nurses. For example, previous studies have explored how contextualized simulation, such as burns suite [37] or Advanced Burn Life Support (ABLS) course [38], affects effective learning. Additionally, it is crucial to examine how nurses who fulfill their responsibilities can support clinical leaders. A noteworthy study conducted in Canada by Kandakoglu's team developed a system to assist administrators of nephrology departments by creating daily visit schedules and routes for nurses providing home dialysis treatment [39]. These recommendations can guide future research and help inform the development of targeted training programs to promote NBDs' core competencies.

4.2. Clinical Implications for Nursing Managers and Policymakers. The results of this study hold significant implications for nursing managers and policymakers who are responsible for designing and implementing training programs to recruit competent NBDs. The findings demonstrate that the professional titles, length of employment, and BICU experience of NBDs are closely linked to their core competencies. Hence, it is crucial for nurse managers to consider these subgroup characteristics when tailoring advanced practice programs for NBDs. This will enable them to match subgroups to appropriate training courses, thereby enhancing the overall quality of care provided by NBDs in hospitals. Policymakers can also utilize these study results to formulate evidence-based policy decisions related to the recruitment and retention of qualified NBDs in healthcare facilities. Overall, this study underscores the need for nursing managers and policymakers to be cognizant of the importance of targeted training programs that align with NBDs' specific core competencies.

4.3. Limitations of the Study. Although we made great efforts to ensure the accuracy of our data, this study still has several limitations. First, because the participants in this study were not randomly selected and primarily recruited from tertiary hospitals, the sample may not be sufficiently representative. Therefore, we advise broadening the study's scope to include more institutions. In addition, the competency assessment used self-reports, which might have led to possible bias. Several of the LPA's weaknesses should also be taken into account. On the one hand, while grouping based on LPA makes data presentation and interpretation easier, participants do not actually belong to a single group. Every participant's profile is assigned in light of the highest likelihood of belonging to a latent profile. On the other hand, although LPA makes it easier to identify associations between sociodemographic variables that may vary between profiles, it does not accurately reveal the specific factors driving these associations.

5. Conclusions

Based on potential profile analysis, this cross-sectional study explored the subgroup characteristics and influencing factors of NBDs' core competencies. We identified three profiles of NBDs' core competencies across the nine dimensions of NBD-CCSS, consisting of skillful competencies (Class 1, 28.8%), moderate competencies" (Class 2, 52.4%), and poor competencies (Class 3, 18.7%). NBDs in Class 1 had the best performance across all dimensions, while those in Class 3 had the reverse performance. Moreover, we found that potential influencing factors of profile membership

included professional titles, length of employment, and BICU experience. Nursing administrators and educators can form alternative professional training and career development plans depending on the subgroup characteristics of NBDs' core competencies. Meanwhile, it is advised that more research be done in order to create specific training programs geared to those subgroups.

Data Availability

Data presented in this study are available on request from the corresponding author.

Additional Points

Implications for Nursing Management. Our results indicate a critical need to improve Chinese NBDs' core competencies and optimize the training system. Interventions at the departmental and organizational levels are desired to support specialized training for NBDs.

Ethical Approval

All study protocols adhered to the Karolinska Institute's ethical guidelines as well as the Helsinki Declaration of 1964 and its subsequent amendments. In addition, this study was reviewed and approved by the Ethics Committee of Changhai Hospital affiliated to Naval Medical University (No. 2020-54), and participants gave consent to complete the online survey.

Disclosure

All authors have approved the manuscript for publication, and it is an original study that has never been published previously and is not being considered for publication elsewhere. Ping Feng, Ping Feng, Jianling Hao and Yuan Wang are cofirst authors.

Conflicts of Interest

All authors declare that they have no conflicts of interest.

Authors' Contributions

Zhang Lingjuan, Liyan Gu, and Ping Feng designed the study. Yuan Wang, Xiaoying Lu, Yuanyuan Zha, Xinyu Li, Lin Zhou, Ning Li, Jianfang Zhang, Qin Zhou, and Shujun Wang collected the data. Jianling Hao and Yuan Wang designed and developed a database for the study. Liyan Gu and Ping Feng carried out data analysis and produced the initial draft of the manuscript. Lingjuan Zhang and Jianling Hao contributed to revising the manuscript. All authors have read and approved the final submitted manuscript.

Acknowledgments

Supplementary Materials

Nurses of burn department (NBDs) competences. (*Supplementary Materials*)

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Research Article

Development of a Core Outcome Set for Randomised Controlled Trials of Nursing Education: A Methodological Framework

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Background. Nursing educational research is very important for the development of the nursing discipline. There have been many randomised controlled trials (RCTs) of nursing education, and the outcomes are highly heterogeneous and waste resources. The study aims to report the methodological framework to establish a core outcome set (COS) for RCTs of nursing education. *Methods.* The study will be conducted in the following five steps: (a) establish nursing education COS working groups; (b) develop an initial list of outcomes of nursing education by systematic review and semistructured interview; (c) Delphi survey with different stakeholders to reach a preliminary consensus on the core outcome of nursing education; (d) expert consultation to form the outcome pool; (e) expert consensus meeting to form the nursing education COS. *Results.* The goal is to develop a COS that includes stakeholders' interest in nursing education to determine which outcomes should be reported and how they should be measured. *Conclusions.* By performing the study, the nursing education COS will be established, which will help to reduce reporting bias and resource waste, and provide enough results for nursing education systematic reviews.

1. Introduction

With the increasing aggravation of the ageing population, the nursing discipline's development is increasingly important [1, 2]. Nursing discipline depend on the development of nursing education [3–5]. New nursing teaching theories [6], teaching methods [7], and teaching models have been applied more and more in nursing education, such as the problem-based learning teaching model [8], integrated teaching model [9], core ability teaching model, massive open online course teaching model, and flipped classroom teaching model [10]. They have promoted the development of nursing education. In addition, new technologies such as artificial intelligence and virtual reality [11] have been increasingly applied to nursing education. With the introduction of new theories, methods, and models in nursing education, evaluating the effect of these methods is very important and designing randomised controlled trials (RCTs) is very important [12, 13].

In the nursing education field, an RCT is always performed to compare the different effects of the intervention and control methods and to identify the importance of the

teaching method [14–17]. It aims to find the importance of improving outcomes and strategies for promoting nursing education [18–23]. There have been many RCTs on nursing education; however, the reported outcomes were heterogeneous [18–23]. Some used test scores [19], some used satisfaction [14], some used success rate [21], and some used 'nursing students" knowledge and confidence [23]. Inconsistencies of outcomes will lead to the low use of studies in the systematic review [24]. It also makes the results inaccurate and unlikely to meet the needs of stakeholders. Therefore, outcomes must be standardised to reduce heterogeneity and waste resources for nursing education.

Developing a core outcome set (COS) will address these issues [25, 26]. The COS is a collection of the smallest and most important outcomes that should be measured and reported in a trial in the same health problem or social care area [27, 28]. It aims to improve research utility by involving stakeholders' perspectives and reducing inconsistency, reporting bias, and research waste [29–32]. In recent years, with the continuous application of new technologies in nursing education, implementing new RCTs requires the standardisation of outcomes. However, there was no COS for nursing education. Therefore, developing nursing education COS is needed. The development of COS will not only help to demonstrate different perspectives in this important area but also provide, for the first time, a standardised set of outcomes to be used in nursing education research and practice to assess the effect of nursing education and help to design research of nursing education.

2. Methods

2.1. Ethical Consideration and Registration.
The current study is a methodological framework for producing a COS but not for patients. When it is needed, ethical approval will be obtained from West China Hospital of Sichuan University. To be transparent, the methodological framework will be submitted to the peer-reviewed journal, and the methodological framework has also been submitted to register in the Core Outcome Measures in Effectiveness Trials (COMET) database. The methodological framework of the COS was reported according to the core outcome set standards for protocol items [33]. The main steps of the nursing education COS study are showed in Figure 1 and as follows.

2.2. Step 1: Establish Nursing Education COS Working Groups.
According to the handbook, a steering group will be established [33]. The COS steering group will be composed of 3 multidisciplinary experts, including a nursing education manager with at least 20 years of work experience, an evidence-based medicine methodologist with at least ten years of research experience, and one nursing expert with at least 20 years of work experience. The primary responsibilities of the committee are: to determine the scope of COS, to approve COS methodological framework, to oversee the COS development process, and to provide advice and guidance for COS development as necessary. In addition, the

research group will also be established. The research team will invite experts from universities in China, such as Sichuan University, Peking University, Fudan University, and so on.

2.3. Step 2: Develop an Initial Outcome List Covering All Relevant Outcomes.
There will be three parts of the work, namely, [1] systematic review, [2] semistructured interview [24, 30, 34, 35], and merge and group outcomes.

2.3.1. Systematic Review of the Outcomes in the RCTs for Nursing Education

(1) Search Strategy. The research group will search the following databases to identify outcomes reported in RCTs for nursing education published in 2021 and 2022: PubMed, Embase, The Cochrane Library, CNKI, CBM, and WanFang Data. The search strategies of PubMed are as follows: (nursing education OR nurse education OR nursing students OR nurse students OR nursing student OR nurse student) and (trial OR RCT OR randomised clinical trial OR systematic review OR meta-analysis). The language will be limited to English and Chinese.

(2) Eligibility Criteria. The inclusion criteria are as follows: the study should be RCT, the study should be for nursing education, the language should be Chinese or English, and the outcomes should be involved with the effectiveness of nursing education. The exclusion criteria are as follows: the page number of the study is only 1 page, the single author's publication, the study is for the patients, the study is for evaluating disease mechanism or pharmacokinetics of drugs, and the full text of the study could not be obtained.

(3) Study Selection and Data Extraction. Two authors will independently screen the titles and abstracts according to the inclusion and exclusion criteria to find the RCTs of nursing education. Any disagreement will be resolved by discussion [24, 30, 34, 35]. Two authors will independently extract the following items: the characteristics of the study, journal, author, and year; the characteristics of the intervention; and the outcomes. Any disagreements will be resolved by discussion. All outcomes will be included.

2.3.2. Semistructured Interviews of Stakeholders

(1) Participant Selection. The outcomes generated by systematic reviews only reflect outcomes from research; the opinion of the nurse students, nursing teachers, and nursing education managers should also be considered. Thus, nurse students, nursing teachers, and nursing education managers will be invited to participate in the semistructured interviews. The inclusion criteria are as follows: (a) nursing students: undergraduate nursing students in school for at least one year, willing to participate in the study; (b) nursing

FIGURE 1: The development process for nursing education-COS.

teacher: at least five years of nursing education or clinical nursing work, had ever participated in nursing education research, bachelor's degree or above, willing to participate in the study; (c) nursing education manager: at least five years of nursing education managing work, had ever participated in nursing education research, bachelor's degree or above, willing to participate in the study.

(2) Recruitment and Data Collection. The authors will invite nurse students, nursing teachers, and nursing education managers from the West China Hospital of Sichuan University. The author will also invite nurse students, nursing teachers, and nursing education managers from other nursing schools to participate. As shown in previous studies [24, 30, 34, 35], when the sample size is 30, it will achieve data saturation; therefore, the author will include 30 nurse students, 30 nursing teachers, and 30 nursing education managers. If new information is generated in the interview,

the sample size will be expanded as previously suggested [24, 30, 34, 35].

The authors, who have been trained in qualitative research methods, will conduct the interview and introduce the purpose and content of the interview to the participants. All participants will receive and read separate written information. The participants who agree to participate in the interview will provide their signed informed consent. After obtaining the participants' consent, the interview's content will be recorded in audio. The information on demographic characteristics will also be recorded. The interview will be mainly performed in China. Face-to-face interviews or online interviews will be used when it is possible.

The outline of the semistructured interviews for nursing teachers and nursing education managers: How long have you been a nursing teacher or a nursing education manager? What intervention will you give to nursing education? Which outcome do you think is the best intervention to

improve nursing education? Please write down at most five outcomes that you think are important for nursing education.

The outline of the semistructured interviews for nursing students is as follows: What is your grade? What intervention have you received because of nursing education from your nursing teacher? Which outcome of intervention do you want to improve after education? Which outcome do you want the intervention to improve most?.

(3) Data Analysis. Two authors will independently analyse the results of semistructured interviews to identify the important outcomes for RCTs of nursing education. The authors will conduct all interview transcriptions using the qualitative analysis software NVivo 12 plus. Two researchers will first read all transcripts to familiarise themselves with the data and develop a structured coding tree that starts with an inductive open coding. The transcripts and open coding will be initially coded individually by the two researchers. To ensure consistency and reliability of the process, themes will be sought, reviewed, defined, and named. Inconsistency will be discussed until reaching a consensus. After review by the steering committee, the new outcomes will be added to the list of outcomes.

2.3.3. Merging Outcomes and Grouping Outcomes into Different Domains. Based on previous COS studies [24, 30, 34, 35], the outcomes from the systematic review and the semistructured interviews will be merged and grouped into different domains. Nursing student-reported, teacher-reported, and nursing education manager-reported outcomes will be categorised [24, 30, 34, 35]. Two researchers will independently conduct this process. Any discrepancies will be resolved through discussion or by consulting the steering group.

2.4. Step 3: Delphi Survey with Different Stakeholder Groups to Prioritise the Outcomes. Delphi survey will be performed as previously reported [24, 30, 34, 35]. The Delphi manager is based on a web system to build and administer the Delphi surveys [24, 30, 34, 35].

2.4.1. Stakeholder Selection. The researchers will invite nursing teachers, nursing students, nursing educational managers, and nursing education researchers to participate in the three rounds of the Delphi survey [24, 30, 34, 35]. Representatives of the stakeholder groups are as follows: (a) nursing students: undergraduate nursing students in school for at least one year who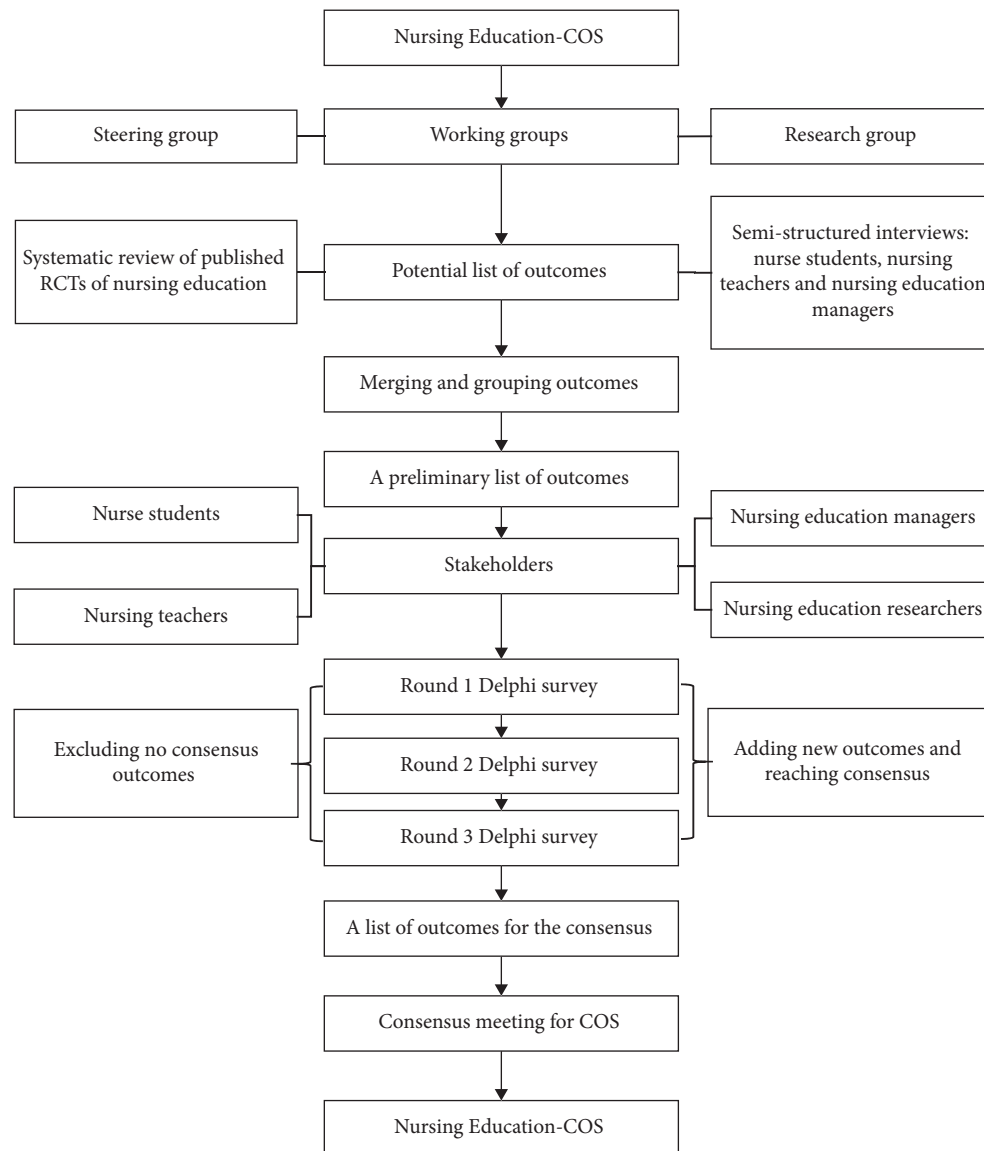 are willing to participate in the study; (b) nursing teacher: at least five years of nursing education or clinical nursing work, had ever participated in nursing education research, bachelor's degree or above, and willing to participate in the study; (c) nursing education manager: at least five years of nursing education managing work, had ever participated in nursing education research, bachelor's degree or above, and willing to participate in the study; and (d) nursing education researcher: first author or

contact author of publication of nursing education, at least five years of nursing education or nursing clinical research work, bachelor's degree or above, and willing to participate in the study. There is no restriction on the geographical area of participants. As there has been no standard sample size calculation method in the Delphi survey in the development of the COS study [24, 30, 34, 35], referring to the previous COS studies, the researchers plan to select 30 participants for each stakeholder group.

2.4.2. Consensus Standards. The consensus standards will be defined as previously reported: (a) ≥70% of participants scored the outcomes as 7 to 9, and <15% of the participants scored the outcomes as 1 to 3, and the outcomes will be included; (b) ≤50% participants scored the outcome as 7–9, and the outcomes will be excluded [24, 30, 34, 35].

2.4.3. Three Rounds of Delphi Survey and Data Analysis. All candidate outcomes of nursing education will be included in the questionnaire [24, 30, 34, 35]. The questionnaire will be in two versions: for nursing teachers, nursing education managers, and researchers, and for nursing students. All participants will register in the Delphi manager and sign the informed consent [24, 30, 34, 35]. All participants will score the candidate items via the online survey and can add new outcomes that are not included in the outcome list [24, 30, 34, 35]. Additional materials will also be sent to them for reference. They can also contact the authors for further details if they have any questions. Each round of the Delphi survey will be planned in three weeks, and the author will send two emails at the end of the first and second weeks to remind the participants. If the response rate is <80% at the end of the third week, the time will be prolonged.

Descriptive analysis will be applied to analyse the results of the Delphi survey of different stakeholders. An outcome is scored as ≥4 by ≥70% of the participants in any stakeholder group who complete the questionnaire in round 1 will be included in round 2. In round 2, the participants will need to re-score the outcomes, the outcomes that agree with the consensus standards will be directly included in the consensus meeting, and the rest of the outcomes will be surveyed in round 3.

2.5. Step 4: Expert Consultation and form the Outcome Pool for the Expert Consensus Meeting. Expert consultation will be performed after analysing the results of the Delphi survey. The research team will invite one nursing teacher, one nursing education manager, one nursing education researcher to work with the steering committee to discuss the results of Delphi and determine the outcome pool for an expert consensus meeting.

2.6. Step 5: Consensus Meeting. After the development of the outcome pool, a face-to-face consensus meeting will be held with key stakeholders to finalise the COS. The consensus meeting will be held in Chengdu in China.

2.6.1. Participants of the Consensus Meeting. As reported in previous studies, there is no standard method to calculate the sample size for the consensus meeting in the development of COS studies [30]. Therefore, the researchers will invite 20 to 25 stakeholders to participate in the consensus meeting, including (a) nursing teachers who have more than ten years of teaching experience; (b) nursing education managers who have more than ten years of nursing education managing work; (c) evidence-based medicine methodologists; (d) nursing education researchers with a master's degree or above; (e) journal editors; and (f) nursing students.

2.6.2. Process of the Consensus Meeting. First, the potential outcomes from the survey will be reported to the stakeholders, and the stakeholders will decide whether the outcomes meet the consensus criteria [24, 30, 34, 35]. In addition, the less consistent outcomes will be discussed [24, 30, 34, 35]. Finally, the stakeholders will vote for each outcome. The detailed information of the consensus definition will be based on the previously mentioned [24, 30, 34, 35]. The nursing education COS will finally be formed.

3. Discussion

Nursing education research is important for developing nursing discipline and has significance for nursing management [4, 5]. However, the results have been very heterogeneous due to the heterogeneous outcomes of previous RCTs in nursing education. Many results cannot be included in a systematic review to produce evidence. Therefore, it is necessary to carry out the study of COS for nursing education.

At present, COS studies have been published in several disciplines, promoting the standardisation of outcomes in trials and reducing research waste [24, 30, 34, 35]. However, there is a need for COS in nursing education. Due to the wide range of nursing disciplines, the COS in nursing education will promote nursing education to a certain extent and improve the results of nursing education.

The current study reports a comprehensive methodological framework for COS of RCTs of nursing education by conducting a systematic review, semistructured interview, Delphi survey, expert consultation, and consensus meeting [24], which can ensure the feasibility and promotion of COS in future RCTs for nursing education. The development of COS will help the consistency of reporting study outcomes of RCTs for nursing education and reduce reporting bias [30]; then, the results of different RCTs can be compared and merged to improve the value of interventions and reduce waste resources for nursing education.

4. Implications for Nursing Management

Standardisation of the outcomes and establishing a COS will be helpful to reduce reporting bias, reduce resource waste, and help the management of nursing education research. The current methodological framework will be helpful to develop a COS for RCTs in nursing education; thus, it will help the management of nursing research and nursing education.

Data Availability

No underlying data was collected or produced in this study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Research Article

Development and Validation of the Portuguese Transcultural Nursing Leadership Questionnaire (QLTE-PT)

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Introduction. This study introduces the Portuguese Transcultural Nursing Leadership Questionnaire (QLTE-PT), a pioneering instrument designed to assess leadership behaviours in multicultural nursing work environments, addressing gaps in current leadership assessment tools. *Aim.* This study aimed to develop and validate the Portuguese Transcultural Nursing Leadership Questionnaire (QLTE-PT). *Methods.* It was conducted as a sequential exploratory mixed-method study, integrating DeVellis's steps for instrument development. Items were formulated based on a literature review and a focus group study, and the content validity was evaluated by a panel of experts. A methodological approach involving nurses registered in the Portuguese Order of Nurses with leadership experience in multicultural nursing work environments was employed to further conduct an exploratory and a confirmatory factor analysis to assess the instrument's structure and psychometric properties. *Results.* One hundred forty-five items were initially generated, of which 39 were included in the QLTE-PT following content validity assessment by a panel of experts. EFA revealed a factor structure of 25 items loading on six factors, explaining 64% of the total variance. The overall Cronbach's α coefficient of the questionnaire was 0.90. This six-factor structure was tested by CFA, revealing a final model of 23 items and six factors, with a good quality of adjustment (CFI = 0.980, TLI = 0.976, SRMR = 0.078, and RMSEA = 0.070). Both convergent and discriminant validity were confirmed. *Conclusions.* The QLTE-PT demonstrates good psychometric properties and is suitable for assessing transcultural leadership behaviours of nurse managers and leaders in multicultural nursing work environments. *Implications for Nursing Management.* The QLTE-PT can assist nurse managers to improve their leadership behaviours, promote supportive working environments for their multicultural nursing staff, and improve the quality of care provided to patients from different cultural backgrounds.

1. Introduction

The interconnectedness and interdependence between nations, along with the exchange of people, goods, services, and information, have contributed to cultural diversity in workplaces, communities, and globally. This requires leaders who can guide multinational projects and lead people or groups from different cultural backgrounds in organizations, producing appropriate responses to their customers' needs with different cultures and expectations [1, 2]. Against this backdrop, the concept of transcultural leadership has gained prominence, advocating for the development of people and organizations equipped to address the challenges that arise from globalization, increased competition, and power asymmetries [3].

Defined as the process of articulating, implementing, and nurturing a global cultural vision and creating multicultural synergy [4], transcultural leadership is pivotal in various sectors, including healthcare. Within the nursing discipline, transcultural nursing leadership focuses on the culturally sensitive transformation journey. This involves tailoring behaviours, processes, and products to meet the cultural needs of both nurses and patients, challenging traditional paradigms, and guiding the delivery of culturally congruent care [5]. Such leadership is essential not only for delivering culturally congruent care to patients and achieving optimal health outcomes for all populations [6, 7] but also for effectively managing the challenges of culturally diverse nursing teams [5].

Cultural diversity among patients and healthcare professionals is a current scenario in Portuguese healthcare organizations [8]. Portugal hosts more than half a million of immigrants [9], who face several difficulties when accessing health services, such as discrimination, lack of information and knowledge on how the Portuguese healthcare system works, administrative barriers, and cultural and linguistic barriers that hinder communication with the employees and healthcare professionals of the National Health Service [10]. According to a study developed by Dias et al. [11], a majority of immigrants consider that having been in Portugal for a short time (85.1%), lacking knowledge about legal rights to health access (78.9%), being alone in Portugal (76.9%), having insufficient financial resources (75.6%), existence of complex bureaucratic procedures for health services access (75.2%), language differences (59.8%), absence of interpreters (49.5%), challenges in expressing symptoms and recognizing illness (46.9%), distrust towards health professionals (45.7%), and beliefs, religious, and cultural traditions (27.7%) are factors that condition their access and utilization of health services in Portugal.

In addition, recent data from the Portuguese Order of Nurses Ordem dos Enfermeiros [12] reveal that 1348 nurses registered in 2022 were from foreign countries. According to Silva and Fernandes [13], despite the reports of a good welcome, immigrant nurses report challenges and difficulties during their integration in Portugal. These difficulties and challenges are related to the recognition of academic degrees and the differences in roles, skills, autonomy, and hierarchy in professional relationships, working conditions/resources, and language, particularly differences in technical nursing terms between Portugal and their home countries. Foreign nurses in Portugal also identify experiences of discrimination from patients and colleagues and unequal treatment by their managers, such as discrediting their knowledge, exclusion from training, unbalanced work distribution, abuse of power, and no opportunities for professional development, specifically being a team leader or mentoring nursing students [13]. According to Primeau et al. [14], it is important that organizations ensure healthy work environments free of discrimination and with opportunities for this particular group of nurses to achieve their career goals.

The diversity and related challenges in Portuguese healthcare settings highlight the need for a nuanced understanding and effective management of cross-cultural dynamics, accentuating the importance of transcultural nursing leadership. Nurse managers are pivotal in this context, as they are responsible for promoting culturally congruent care to patients from different cultural backgrounds and developing favorable work environments for multicultural nursing teams [15]. The challenges they face in providing better support to their teams and developing effective leadership styles [16], especially when managing nurses from different cultures, are significant. This complexity is a growing concern in Portugal [17–21] and the complexity that cultural diversity adds to these environments must be recognized.

There are no studies or instruments to assess transcultural nursing leadership. The most commonly used tools to assess nursing leadership competencies are the Ambulance Nurse Competence scale, Leadership Practices Inventory, Clinical Leadership Needs Analysis Instrument, Cotter Preceptor Selection Instrument, Performance Evaluation Tool, Leadership and Management Inventory, Advanced Practice Nursing Competency Assessment Instrument, and Kuopio University Hospital Transformational Leadership Scale [22]. Given the absence of instruments assessing transcultural nursing leadership in multicultural settings, i.e., in healthcare settings where nurses from different cultural backgrounds work and where care is provided to culturally and linguistically diverse patients, this study aimed to do the following:

(1) Develop the Portuguese Transcultural Nursing Leadership Questionnaire (QLTE-PT) specifically tailored to assess nurse leaders and managers' leadership behaviours in multicultural nursing environments in Portugal

(2) Validate the QLTE-PT by assessing its internal consistency, confirming its construct validity through exploratory and confirmatory factor analyses, and establishing both its convergent and discriminant validity

2. Materials and Methods

A sequential exploratory mixed-method study was conducted in two stages [23]. The first stage aimed to develop the questionnaire. The second stage followed a quantitative study to analyze its psychometric properties.

The questionnaire development and validation process were based on DeVellis's [24] steps for instrument development which are as follows: (a) determine what is intended to be measured; (b) generate a set of items; (c) determine the measurement format of the instrument; (d) review the set of items formulated from a panel of experts; (e) consider the inclusion of validation items; (f) apply the items to a sample; (g) evaluate the items; and (h) optimize the dimensionality of the instrument.

2.1. Generate a Set of Items. Items were generated based on a scoping review and a focus group, which are both strategies to generate a pool of items for new instruments [25, 26].

2.1.1. Scoping Review. The scoping review was conducted in accordance with JBI guidelines [27], aiming to map the personality traits, competencies, behaviours, and leadership styles of nurse leaders and managers impacting the outcomes of multicultural nursing teams. Papers published in English, Portuguese, and Spanish languages were searched through electronic databases, such as CINAHL, MEDLINE, Nursing & Allied Health Collection, MedicLatina, Psychology and Behavioural Sciences Collection, Wiley Online Library, and Scopus. We did not restrict the publication dates in our scoping review due to the lack of previous literature reviews on this topic. This approach enabled us to

comprehensively access the best available evidence without temporal constraints. The search strategy comprised the following keywords: nursing leadership, leadership traits, competencies, behaviours, skills, and styles; multicultural nursing teams, and nurses' outcomes.

2.1.2. Focus Group.

A qualitative, exploratory focus group study was conducted to explore the strategies used by nurse managers in creating favorable work environments for multicultural teams and delivering culturally congruent care to diverse patients [28]. A convenience sample of five Portuguese nurses with experience leading multicultural nursing teams was recruited to participate in the study. A semistructured interview was performed with questions aimed at eliciting participants' insights on transcultural nursing leadership, effective management interventions for multicultural nursing teams, and strategies to improve culturally congruent care. Qualitative data were recorded and transcribed for content analysis.

Based on the results of both studies, a list of the most relevant nurse leaders and managers' behaviours in multicultural nursing work environments was produced. The items were revised to ensure appropriate wording and to remove duplicates. A first draft of the questionnaire was prepared.

2.2. Determine the Measurement Format of the Instrument.

All items of the questionnaire were scored based on a 5-point Likert scale ((1) "never," (2) "rarely," (3) "sometimes," (4) "frequently," and (5) "always"), representing a continuum of the frequency of nurse leaders or managers' behaviours in multicultural nursing work environments. This choice is based on Boateng et al.'s [25] guidelines, which advocate that response scales with five to seven points have higher reliability than Likert-type response scales with less than five points.

2.3. Reviewing the Set of Items Formulated from a Panel of Experts.

Once the items had been formulated, an assessment of the questionnaire's psychometric properties was conducted to analyze whether it was adequate and accurate in assessing transcultural nursing leadership, as well as to evaluate its validity and reliability [29]. This stage comprised two phases: content validity and construct validity.

Content validity is invaluable for the quality of a newly developed instrument [29]. Since there is no specific statistical test for this purpose, it is common to use a panel of experts to assess the set of items formulated and validate whether they accurately represent the construct measured by the new instrument [30].

The experts were recruited by convenience in a Portuguese association of nurse managers and leadership. Following the recommendations of Polit and Beck [26], it was defined that at least two rounds would be performed to determine the content validity of the items and the questionnaire as a whole. In the first round, each item was assessed regarding its degree of relevance, clarity, simplicity

and ambiguity, on a scale of 1 (not relevant) to 4 (very relevant), according to the criteria described by Yaghmale [31]. Once assessed in each criterion, the content validity index of each item (I-CVI) was calculated based on the ratings assigned by the experts regarding its degree of relevance [26, 29].

Following the authors' recommendations, it was determined that items with a I-CVI of <0.78 would be excluded from the questionnaire [26, 29]. The items with a I-CVI of ≥0.78 but with values of <1 in the criteria of clarity, simplicity, and ambiguity, estimated according to the previous formula were reformulated. After this process of item deletion and reformulation, a second round of relevance assessment of the remaining and reformulated items was carried out. The I-CVI of each item was calculated and the overall content validity index of the questionnaire (Ave-CVI) was estimated from the average of the I-CVIs [29]. It was considered that a I-CVI ≥0.78 on each item and an Ave-CVI of ≥0.90 would be indicative of an excellent content validity [26]. The estimated value of Ave-CVI in the second round would determine the need for questionnaire reformulation and additional rounds.

2.4. Consider the Inclusion of Validation Items.

Although it is possible to include additional scales that may provide information about the validity of the final questionnaire [24], it is recommended that researchers limit these efforts at this stage of developing a new instrument. According to Worthington and Whittaker [32], it is advisable to keep the overall length of the questionnaire as short as possible and directly related to the central aim of the study. Worthington and Whittaker [32] also argue that there is a potential risk that items from other scales may interact with the items designed for the new instrument, interfering with its development process. Therefore, it is important to avoid influencing the items' responses during the initial phase of instrument development, thus limiting the use of additional measures [32]. Understanding the risks highlighted by Worthington and Whittaker [32], it was decided to not include validation items as recommended by DeVellis [24].

2.5. Evaluating and Refining the Instrument.

Following the establishment of content validity, a quantitative and cross-sectional study was conducted to identify the core dimensions of transcultural nursing leadership and to confirm the reliability of the instrument. For this purpose, an exploratory factor analysis (EFA) was performed followed by a confirmatory factor analysis (CFA).

Nurses registered in the Portuguese Order of Nurses in the categories of nurse manager, nurse specialist, or nurse, with current or past leadership experience in multicultural nursing work environments were invited to participate in this study. Nurses without leadership experience in multicultural nursing work environments were excluded. The sample size was based on guidelines recommending five to ten participants for each questionnaire item to ensure a robust analysis in EFA and CFA [33].

During EFA, the correlations between items were assessed using the Kaiser–Meyer–Olkin (KMO) measure to ensure that they were suitable for factor analysis. The analysis was then performed using an appropriate estimator for ordinal data (WLSMV), robust to deviations from normal distribution [34]. For the extraction of factors in our EFA, we employed the principal component as the method to identify the initial structure of latent factors, followed by an oblique rotation to explore the relationships between these factors. The number of latent factors identified considered both the eigenvalues greater than 1 and the scree plot. We then retained factors explaining a significant portion of the total variance and removed individual items with factor loadings below 0.50.

The instrument was refined by repeating EFA, ensuring that each factor was reliable and represented by at least two items. The quality of the factor structure was assessed using the root mean square residual (RMSR) index.

Confirmatory factor analysis was performed to assess the validity of the factor structure identified in EFA. It analyzed the existence of outliers by analyzing the square distance of Mahalanobis (D^2). The normality of the variables was assessed by the uni- and multivariate asymmetry ($|Sk| < 3$) and kurtosis ($|Ku| < 10$) coefficients [35]. The quality of the model was assessed through the indices proposed by Brown [36] and Marôco [35]: CFI (<0.8: bad fit), TLI ((0.9; 0.95): good fit), SRMR (≤0.08: good fit), and RMSEA (>0.08–0.10: unacceptable; (0.05; 0.08): acceptable; and ≤0.05: very good). Necessary adjustments were made based on modification indices greater than 11 and theoretical justification, as recommended by Marôco [35].

Finally, item reliability was assessed based on the proportion of variance accounted for by the latent factor, with a target value of 0.25 or higher [35]. The overall instrument's reliability, as well as that of individual factors, was determined using Cronbach's alpha, setting a minimum acceptable level of 0.70 [37]. Construct validity was established through analyses of convergent and discriminant validity [30, 35]. Missing values were handled with the pairwise method in both EFA and CFA.

All statistical analyses were conducted in RStudio (© 2009–2022 RStudio, PBC) using packages "polycor," "psych," "lavaan," and "lavaanPlot."

2.6. Ethical Considerations. This study was first approved by the Ethics Committee of the Nursing School of Lisbon (approval no. 216/2022/CE), as part of the doctoral research project. Authorization and support were requested from a Portuguese association of nurse managers and leadership to recruit nurses to integrate the panel of experts to perform the content validity of the questionnaire. Once the content validity phase was completed, authorization and support were also requested from the Portuguese Order of Nurses to disseminate the study to its members and invite those with the experience of leadership in multicultural nursing work environments to complete the questionnaire online. All participants approved their participation through an electronic consent form, without which they could not proceed to data collection. All participants were informed that they could withdraw from the study at any moment. Anonymity and data confidentiality were guaranteed.

3. Results

3.1. Generation of Items. A total of 115 and 63 items were formulated from the scoping review and the focus group study, respectively. After removing duplicates and similar items, 145 items composed the initial version of the QLTE-PT.

3.2. Content Validity. A total of six members of the Portuguese association of nurse leaders and managers participated in the panel of experts, meeting the minimum number of experts recommended to assess the content validity of an instrument [29]. Half of the participants were female, with a mean age of 53.8 years (SD = 7.7) and 31.7 years of professional experience (SD = 7.4). More than 50% held a master's degree or PhD degree, 16.7% were nurse specialists, and 16.7% had a bachelor's degree. About 67% were nurse managers. All experts of the panel stated that they worked or had worked with professionals from different cultural backgrounds, but none of them were or had been emigrants. None of the participants had education in multiculturalism.

Of the 145 items rated by the experts regarding their degree of relevance, 98.6% ($n = 143$) had a I-CVI ≥ of 0.78. Two items were excluded from the questionnaire due to I-CVI = 0.67. Only two participants wrote comments/suggestions for improvement, which were "simplify some items." In some cases, it may even be necessary to "split one item into two" and "some questions were too long, which makes it difficult to answer them." However, these two participants did not specify items for these actions. Due to the lack of specific guidance on which items to modify, a conservative approach proceeded in the revision process. The original structure of the items was maintained, focusing instead on improving items' clarity, simplicity, and reducing ambiguity. Fifty-one items, which had clarity, simplicity, or ambiguity indices below 1, were rephrased. These revised items, along with the others, constituted a set of 143 items that underwent a second round of evaluation. Five of the six experts from the previous round participated in the second round. Of the 143 items, 94.4% ($n = 135$) obtained a I-CVI of ≥0.78 and eight were eliminated due to a I-CVI of <0.78. No comments or suggestions for improvement were made in the second round. The questionnaire showed an Ave-CVI of 0.96. As a strategy to obtain a more parsimonious set of items, it was decided to consider the items' Content Validity Ratios (CVRs).

Twenty-nine items were identified as essential/very relevant with CVR = 1. It was decided to retain 10 additional items, despite having a CVR of <1, given their relevance highlighted in the literature. For instance, item "I adapt my leadership style according to the expectations, values, habits, beliefs, and cultures of the members of the nursing team member" was aligned with established theoretical

frameworks [3, 38] and empirical studies [5, 28] within the field that underscore their significance in assessing transcultural leadership. These decisions resulted in a total of 39 items included in the QLTE-PT, categorized into seven hypothetical dimensions: impartiality and nurse manager's ability to adapt, understand, accept, and respond to cultural differences; professional and sociocultural integration of immigrant nurses; standardization of nursing practice; supporting professional development; managing problems in multicultural teams; intercultural communication; and culturally congruent services and care. Figure 1 summarizes the process of item generation, inclusion, and exclusion from the QLTE-PT.

3.3. Reliability of QLTE-PT

3.3.1. Sample Characteristics. Four hundred and sixty-three nurses answered the questionnaire between November 2022 and March 2023, among whom 79.3% were female and 21.7% were male. The average age of the participants was 41.3 years (SD = 10.6), and the mean length of professional nursing experience was 18.2 years (SD = 10.6). More than 20% reported working or having worked abroad, namely, in Belgium, Brazil, Cape Verde, France, Germany, Guinea-Bissau, Indonesia, Oman, São Tomé and Príncipe, Saudi Arabia, Switzerland, Timor-Leste, and the United Kingdom. Data about education level, professional category, work unit, exposure to other cultures and in which context, training in multiculturalism, and international professional experience are comprehensively presented in Table 1.

3.3.2. Exploratory Factor Analysis. EFA was performed to identify the relational structure among the 39 items of the QLTE-PT. The findings of the preliminary factor analysis showed a KMO value of 0.85, which indicates the adequacy of the instrument's items for factor analysis. The factorability was confirmed for the 39 items by Bartlett's test of sphericity ($X^2 = 1370.5$; $p < 0.001$).

According to the criterion of eigenvalue greater than 1 and in line with the scree plot, the relational structure of the QLTE-PT would be explained by the nine latent factors explaining 73.2% of the variance. This initial factor structure of the questionnaire resulted in a problematic factor with only one item (item A32). Subsequent attempts to refine the structure by extracting eight factors still yielded another one-item factor (item A17). Even when reducing the factors to seven, the internal consistency of the two factors fell below the recommended threshold of 0.70 ($\alpha = 0.62$ and $\alpha = 0.66$). To improve the questionnaire's psychometric properties, we conducted further analyses, ultimately settling on a factor structure with six factors, which provided a more coherent and interpretable model. The factor structure comprising six factors was successfully derived, explaining a total variance of 64%. Fourteen items were removed due to factor loadings below 0.50. The six retained factors were found to aptly describe the correlational structure between the items, and the factor structure exhibited a good quality of adjustment

(RMSR = 0.059). The overall internal consistency of the questionnaire was demonstrated to be robust ($\alpha = 0.90$). In addition, each of the six factors retained in the factor analysis also showed a good internal consistency ($\alpha \geq 0.69$). These results affirm the reliability of the instrument both as a whole and in its individual factors. Table 2 provides a comprehensive summary of the factor loadings, communalities, percentage of explained variance, overall internal consistency, and individual factors' internal consistency.

3.3.3. Confirmatory Factor Analysis. The first CFA revealed an initial poor quality of adjustment (CFI = 0.961, TLI = 0.955, SRMR = 0.089, and RMSEA = 0.091). To enhance the model, outlier observations were removed. Items A24 and A25, which exhibited modification indices suggesting saturation in at least two other factors, were also removed from the model. Furthermore, we correlated the measurement errors of items with higher modification indices (A34-A35, A3-A4, A35-A6, A5-A6, A35-A31, and A15-A8) to improve the model quality. Following these refinements, the model demonstrated good fit indices (CFI = 0.980, TLI = 0.976, SRMR = 0.078, and RMSEA = 0.070) and good internal consistency, providing robust support for the factor validity of the QLTE-PT.

All items had standardized factor loadings greater than 0.50 and individual reliability ($\lambda_{ij} \geq 0.25$). It was observed that the average variance extracted (AVE) supported all factors' convergent validity. The discriminant validity of the factors was evaluated by comparing the AVE with the squared correlations between the factors (Table 3). It was found that each of the factors had an AVE greater than the square of its correlation with the other factors, which supported that all factors had a discriminant validity.

The first factor was designated as "supporting culturally congruent care" (CCC), the second as "managing intercultural issues" (MII), the third as "inclusive and unbiased management" (IUM), the fourth as "cultural sensitivity and adaptation" (CSA), the fifth factor as "integration in the nursing work environment" (INWE), and the last factor was designated as "adjusting care to cultural expectations" (ACCE). Figure 2 provides a visual representation of the final six-factor model of QLTE-PT.

4. Discussion

The development and validation of the Portuguese Transcultural Nursing Leadership Questionnaire (QLTE-PT) fills the gap in assessment tools for transcultural nursing leadership. It revealed a six-factor structure and 23 items that robustly encapsulate essential aspects of transcultural nursing leadership. These factors include supporting culturally congruent care, managing intercultural issues, inclusive and unbiased management, cultural sensitivity and adaptation, integration in the nursing work environment, and adjusting care to cultural expectations. The instrument demonstrates strong internal consistency, with an overall Cronbach's alpha value of 0.90, which is higher than the expected α and equal or higher than 0.70 for new instruments [37]. It explains a total
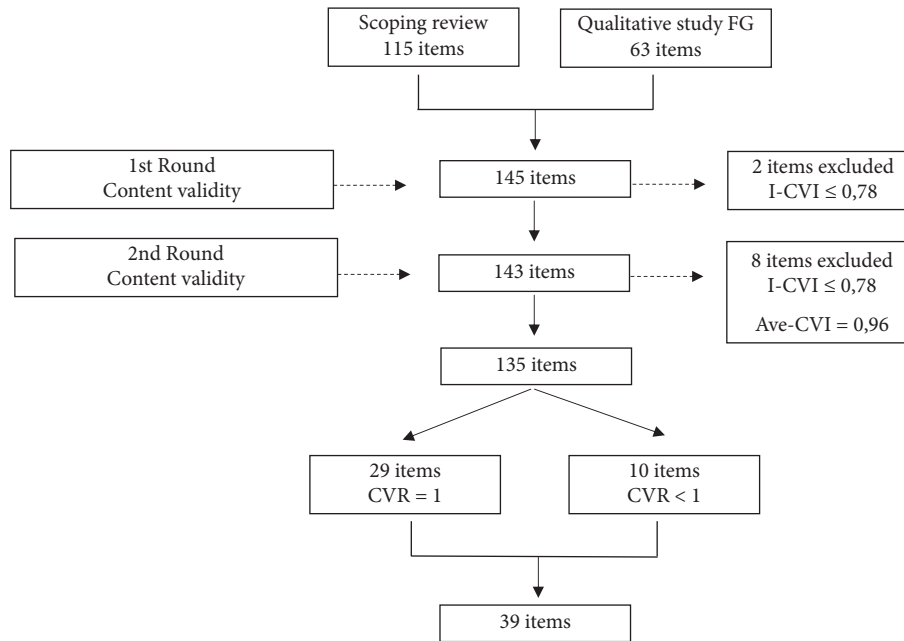
Figure 1: Process of items' generation, inclusion, and exclusion from the QLTE-PT.

Table 1: Sociodemographic and professional characteristics ($n = 463$).

Sociodemographic and professional data		Frequency	Percentage
Education level	Bachelor	224	48.4
	Master degree	181	39.1
	Specialty	52	11.2
	Doctorate	6	1.3
Professional category	Nurse	172	37.1
	Nurse specialist	98	21.2
	Nurse manager	110	23.8
	Team leader	83	17.9
Work unit	Surgery	67	14.5
	Medicine	63	13.6
	Emergency room	56	12.1
	Paediatrics	47	10.2
	Community	38	8.2
	Outpatient clinics	22	4.8
	Psychiatry	13	2.8
	Obstetrics	8	1.7
	Others	149	32.2
Exposure to other cultures	Usually	220	47.5
	Sometimes	114	24.6
	Always	98	21.2
	Rarely	31	6.7
Cultural exposure context	Professional	182	39.3
	Personal	15	3.2
	Both	266	57.5
Training in multiculturalism	Yes	33	7.1
	No	430	92.9
International experience	Yes	99	21.4
	No	364	78.6

variance of 64%, which is also higher than the minimum expected for social sciences [33], indicating its effectiveness in capturing the complexity of transcultural nursing leadership in multicultural nursing work environments.

During the stage of the questionnaire's development, 135 items obtained a I-CVI of ≥0.78 and the questionnaire showed an Ave-CVI of 0.96, meeting the required criterion of Ave-CVI of ≥0.90 [26, 29]. Although the criteria for an

TABLE 2: Exploratory factor analysis of the QLTE-PT.

Items	Factors						Communalities
	1	2	3	4	5	6	
A35	0.784	—	—	—	—	—	0.698
A34	0.717	—	—	—	—	—	0.704
A32	0.711	—	—	—	—	—	0.638
A30	0.549	—	—	—	—	—	0.496
A31	0.533	—	—	—	—	—	0.596
A26	—	0.836	—	—	—	—	0.834
A27	—	0.765	—	—	—	—	0.727
A15	—	0.715	—	—	—	—	0.665
A28	—	0.566	—	—	—	—	0.641
A2	—	—	0.838	—	—	—	0.722
A3	—	—	0.730	—	—	—	0.787
A7	—	—	0.622	—	—	—	0.681
A24	—	—	0.532	—	—	—	0.608
A1	—	—	0.513	—	—	—	0.449
A5	—	—	—	0.833	—	—	0.781
A6	—	—	—	0.814	—	—	0.800
A8	—	—	—	0.635	—	—	0.738
A4	—	—	—	0.606	—	—	0.583
A25	—	—	—	0.521	—	—	0.519
A17	—	—	—	—	0.808	—	0.717
A13	—	—	—	—	0.561	—	0.602
A19	—	—	—	—	0.524	—	0.524
A38	—	—	—	—	—	0.791	0.791
A36	—	—	—	—	—	0.733	0.733
A37	—	—	—	—	—	0.564	0.564
Variance	13.9%	13.6%	11.3%	9.3%	8.8%	7.1%	
			64%				
Cronbach's alpha	0.81	0.79	0.76	0.76	0.76	0.69	
			0.90				

TABLE 3: Correlations and squared correlations between the factors.

	1	r_{ij}^2	2	r_{ij}^2	3	r_{ij}^2	4	r_{ij}^2	5	r_{ij}^2	6	r_{ij}^2
1												
2	0.620	0.384										
3	0.570	0.325	0.480	0.230								
4	0.453	0.205	0.641	0.411	0.587	0.345						
5	0.648	0.420	0.502	0.252	0.693	0.480	0.405	0.164				
6	0.509	0.259	0.539	0.291	0.210	0.044	0.456	0.208	0.309	0.095		
AVE	0.477		0.726		0.555		0.541		0.598		0.492	

excellent content validity were assured, the high dimensionality of the questionnaire in its initial development phase raised concerns. In the early stages of questionnaire design, it should not be so long that it reduces the likelihood of potential participants answering or completing all the items, nor too short that it fails to cover all aspects of the construct it is intended to measure [32]. Such imbalances pose risks to the internal consistency of the construct and can affect the relationships and correlations among items within specific factors or domains [29]. As a strategy to obtain a more parsimonious set of items, it was decided to consider also the items' CVR as proposed by Lawshe, cited

by Almanasreh et al. [29], which reduced the number of items from 135 to 29.

The inclusion of 10 additional items with a CVR of <1 proved to be a significant step in the development of the QLTE-PT. Only two of these items were dropped during the EFA due to factor loadings below 0.50, which underscores the importance and relevance of the remaining eight items, as they contribute meaningful dimensions to the overall construct despite their initial lower CVR scores.

The first factor, "supporting culturally congruent care," showed good internal consistency, as evidenced by a high Cronbach's alpha value ($\alpha = 0.81$). This indicates that the
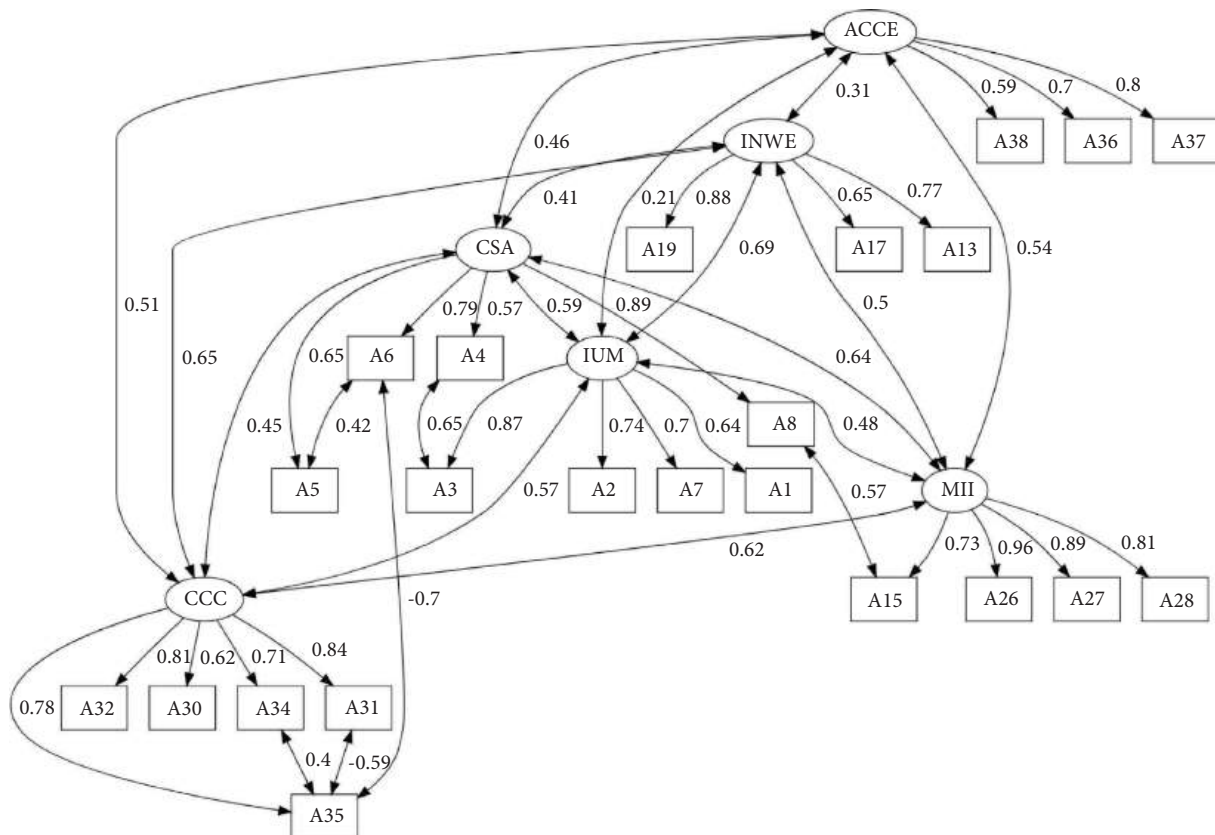
FIGURE 2: Six-factor model of QLTE-PT (CFI = 0.980, TLI = 0.976, SRMR = 0.078, and RMSEA = 0.070). Standardized loads and covariances.

items within this factor reliably measure the intended construct. The factor accounted for a significant portion of the total variance (13.9%), demonstrating its substantial contribution to the overall model. This factor comprises five items that encapsulate the actions taken by nurse leaders and managers to assist nurses in enhancing the quality of care they provide to patients from different cultural backgrounds. Examples of such actions include "I encourage immigrant nurses to take a course on the local language and facilitate their schedules to be able to attend it," "I conduct trainings that enable nurses to provide culturally congruent nursing care," and "I provide nurses with pamphlets and handbooks related to the delivery of culturally congruent nursing care." These items align closely with the established strategies to improve culturally congruent care in nursing literature, which supports the convergent validity of this factor. According to Russell [7], a transcultural nurse leader engages nurses, nursing students, and other healthcare professionals in a learning process of what it means to deliver culturally congruent care to culturally diverse populations. Providing written documentation on culturally congruent care [39], introducing transcultural education in services [40] and encouraging nurses to attend culture-related training sessions and activities, and ensuring their coverage during their absence from the shift [41] are a few examples of how this learning process may be conducted that support this factor. This factor includes also an item related to the nurse leader or manager's improvement to

communicate effectively with nurses of different nationalities and cultures, which is supported by the literature about the importance of engaging in ongoing training that enhances the skills related to culture and diversity in the workplace [41]. The discriminant validity of this factor is supported by its distinctiveness from other factors in the model. The relatively low correlations with other factors indicate that it measures a unique aspect of transcultural nursing leadership, separate from other leadership dimensions captured in the QLTE-PT.

The second factor "managing intercultural issues" contains four items, for instance, "I investigate events related to verbal or physical abuse, discriminatory behaviour, and harassment, and implement measures that reduce the risk of occurrence." It comprises nurse leaders and managers' attitudes and actions to prevent, resolve, and mitigate problems arising from cultural differences between nurses. This factor demonstrated a good internal consistency ($\alpha = 0.79$), reflecting the coherence of its four items in assessing leadership approaches to intercultural challenges. The factor's significant contribution to the total variance (13.6%) underscores its importance in the overall construct of transcultural nursing leadership. Convergent validity for this factor is supported by literature emphasizing the critical role of nurse leaders in addressing and resolving cultural conflicts and fostering a harmonious work environment. For instance, Munkejord [42] argues that healthcare managers can contribute to challenging the ethnic pyramid often

identified in culturally diverse institutions by implementing diversity-sensitive measures. Encouraging and arranging dialogue and collaboration among staff are one of those measures that lead to better relationships and reduce ethically based discrimination [42]. Nurses from ethnic minorities need to feel supported in the nonthreatening work environment. They also need to know that corrective actions will be implemented if the behaviour of an employee or group of employees is considered harmful [43]. The distinctiveness of this factor from others in the questionnaire, as shown by its discriminant validity, highlights its unique role in transcultural nursing leadership.

Factor 3 was labelled as "inclusive and unbiased management" as it concerns the degree to which the decision-making process of the nurse leader or manager deviates from favoring some nurses. It demonstrated a significant internal consistency ($\alpha = 0.76$), which suggests that the item effectively captures the essence of unbiased and inclusive decision-making in transcultural nursing leadership. Factor 3 is composed offour items, including "I have a transparent policy in the unit regarding the method of organizing nursing care, schedules, holidays, annual appraisal, and promotions." Convergent validity for this factor is evident in its alignment with existing literature on the importance of equity and impartiality in leadership, particularly within culturally diverse healthcare settings. Studies have highlighted that nurse managers who show favoritism, plan schedules, and vacations unequally among nurses of different cultural backgrounds, and promote nurses based on cultural criteria over merit, impact negatively on migrant nurses' job satisfaction, retention, and professional development [44, 45]. Discriminant validity is also well-established, with this factor distinctly measuring characteristics of leadership that are separate from others, as suggested by its low correlations with other factors in the QLTE-PT. This uniqueness is crucial in a transcultural context where unbiased and inclusive management is key to harmonizing a diverse workforce.

The fourth factor "cultural sensitivity and adaptation" is composed of four items aiming to describe nurse leaders and managers' sensitivity to cultural differences and how this sensitivity is reflected in their attitudes and behaviours towards nurses. The internal consistency of this factor ($\alpha = 0.76$) confirms the reliability of the items in measuring cultural sensitivity and adaptation in nursing leadership. This factor's convergent validity is supported by the existing research, such as studies by Sharifi et al. [46], which emphasize cultural sensitivity as an attribute of cultural competence in nursing, translating into valuing, respecting, and admiring cultural diversity and helping nurses to understand how people's attitudes and views affect their behaviours and care-seeking patterns. Examples of such nurse manager's sensitivity and adaptation included in the QLTE-PT are "I am open to realities that are different from mine" and "I adapt my leadership style according to the expectations, values, habits, beliefs, and cultures of the nursing team members." The distinctiveness of this factor from other factors in the QLTE-PT is evident in its unique focus on leaders' ability to respect, understand, and adapt to

cultural differences, as outlined by Matveev [47]. Transcultural leaders must demonstrate the ability to adapt to the distinct expectations of their organization, community, competitors, and clients [3]. This supports the factor's discriminant validity, as it captures unique aspects of transcultural leadership not covered by other factors.

Factor 5 "integration in the nursing work environment" comprises three items which highlight interventions targeted at the professional integration of immigrant nurses into the specificities of the nursing practice in the host unit, for example, "I implement a clinical orientation program specific to my unit to develop competencies of immigrant nurses with different levels of knowledge and professional experience" and "I recourse to international protocols to guide and standardise nursing practice in the team." This factor demonstrated a good internal consistency ($\alpha = 0.76$), indicating that the items are cohesively capturing the essence of immigrant nurses' integration in the work environment. Convergent validity is reinforced through literature emphasizing the need for supportive nursing work environments for diverse nursing staff. Integration in multicultural nursing work environments is a bidirectional process that involves efforts not only by the immigrant nurses but also by the host organization [48]. Rovito et al. [49] warn that sometimes nurses need to "unlearn" practices of nursing care that were common in their home country, since they are not a part of the nursing practice in the culture of the host country. According to Safari et al. [50], several strategies are needed to guide immigrant healthcare professionals in the culture of the host country before starting their clinical practice. A clinical orientation program is an example of a strategy that minimizes the impact of the challenges and difficulties migrant nurses experience, improves their well-being, the quality of care, and mitigates the risks to patient safety [51]. It is the nurse manager's responsibility to provide guidance, invest in multicultural education and mentoring for these nurses, guide their practice to provide safe and culturally congruent care, and ensure competence development and efficient use of their expertise [52]. Discriminant validity is evident, as this factor uniquely addresses the integration of immigrant nurses in the work environment, distinct from other transcultural nursing leadership characteristics evidenced in the other factors.

The last factor was labelled as "adjusting care to cultural expectations." It demonstrated an acceptable internal consistency ($\alpha = 0.69$), indicating that the items are able to capture nurse managers and leaders' interventions to meet patients' cultural expectations regarding nursing care. This factor is composed of three items such as "I request religious support congruent with patients' beliefs (e.g., Chaplain, Imam, Brahmin, Lama, and other spiritual leaders)." According to Leininger and McFarland [38], if patients receive nursing care that is not compatible and respectful with patients' ways of life, beliefs, and values, they will demonstrate signs of stress, nonadherence, cultural conflict, and ethical or moral concerns. This factor is in line with the guidelines for the implementation of culturally congruent nursing care in organizations, namely, the provision of structures and resources needed to meet patients' cultural

needs [53]. It is also supported by existing literature on the responsibility of nurse managers to provide culturally and linguistically appropriate services to diverse populations [28, 54]. This literature supports the convergent validity of this factor. Furthermore, the distinctiveness of the factor, evident through discriminant validity, confirms its unique role in the QLTE-PT, differentiating it from other factors.

Although there is an overall agreement about the scenario of cultural diversity among patients and healthcare workers in Portugal, no studies have attempted to describe the leadership behaviours of nurse leaders and managers in multicultural nursing work environments in this country. Therefore, this paper is innovative and grants a questionnaire that addresses nurse leaders and managers' leadership behaviours in multicultural nursing work environments with applicability in Portugal.

4.1. Study Limitations. The findings of this study contribute to the field by providing a reliable and valid instrument for assessing transcultural nursing leadership. However, it is important to consider the limitations of this study and the implications they have for the generalizability and interpretation of the results.

First, self-report measures were utilized in this study, which are subject to potential biases. Participants may have provided socially desirable responses regarding their leadership behaviours in multicultural nursing work environments, leading to response bias. Efforts were made to minimize these biases through clear instructions to participants and ensuring data anonymity. However, it is important to acknowledge this limitation probability.

In addition, despite QLTE-PT having good internal consistency and construct validity, further validation in different cultural contexts is necessary. The current study focused on nurses registered with the Portuguese Order of Nurses and with experience of leadership in multicultural nursing work environments. Future research should aim to conduct cross-cultural validation to ensure the questionnaire's robustness across diverse cultural contexts. Future research should also include a criterion measure to provide a more comprehensive assessment of the questionnaire's validity.

5. Conclusions

This study successfully developed and validated the Portuguese Transcultural Nursing Leadership Questionnaire (QLTE-PT). The final instrument, comprising 23 items across six factors, demonstrates robust psychometric properties, including good internal consistency and construct validity. The QLTE-PT captures essential aspects of transcultural nursing leadership, making it a valuable tool for evaluating nurse managers and leaders' behaviours in multicultural nursing work environments. While acknowledging the study's limitations, the QLTE-PT represents a significant contribution to nursing management, offering insights into leadership behaviours in diverse healthcare settings. Due to its potential interest of use in other countries with multicultural healthcare settings, we recommend the

development of guidelines with comprehensive information about different methodological approaches to support the decision-making and the quality of the cross-cultural adaptation process [55].

6. Implications for Nursing Management

The development and validation of the QLTE-PT hold important implications for nursing management and leadership. By providing a reliable and valid instrument to assess transcultural nursing leadership, the QLTE-PT offers nurse managers a valuable tool to gain insights into their own leadership behaviours in their multicultural units or organizations and acknowledges the needs of their nursing staff and patients from different cultural backgrounds. The questionnaire can assist nurse managers in identifying areas for improvement in their leadership and promotes a supportive work environment for their multicultural nursing staff, conducive to the well-being and engagement of nurses. It can also contribute to improving the quality of care provided to patients from different cultural backgrounds, ensuring patients' safety, satisfaction with nursing care, and higher levels of adherence to treatments.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Development of Infectious Disease Emergency Response Competencies for Nurses in China: A Delphi Study and an Analytic Hierarchy Process

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Aim. To develop a set of infectious disease emergency response competencies specific to frontline nurses in China. *Background*. Nurses play an important role in the infectious disease emergency response. Competency-based training is the cornerstone of the professionalization of disaster rescue, including the infectious disease emergency response. Accordingly, reaching a consensus on a set of core competencies is essential. However, information regarding the competencies needed for nurses in the infectious disease emergency response is limited. *Methods*. A literature review and in-depth expert interviews were conducted to establish a draft of competencies, which consisted of 53 items, including 3 first-level index items, 12 second-level index items, and 38 third-level index items. Eighteen experts with the knowledge of infectious disease management and experience with infectious disease emergency rescue from different regions in China were recruited for Delphi consultation. A two-round Delphi survey was conducted via email. Consensus was defined as a mean importance value >4.5 and the coefficient of variation <0.25 among the experts. Finally, the analytic hierarchy process was used to determine the weight of each index on which consensus had been reached. *Results*. An index system of infectious disease emergency response competencies for nurses was constructed, including 3 first-level indices (knowledge, attitudes, and skills), 10 second-level indices, and 32 third-level indices. The response rates of the two rounds of the Delphi survey were both 100%, and the authority coefficient of the 18 experts was 0.903. The weighted value of each index was established with a consistency ratio <0.1, demonstrating that skill (0.5396) ranked first among the three first-level indices, followed by knowledge (0.2970) and attitudes (0.1634). *Conclusion*. The study developed a consensus on infectious disease emergency response competencies required for nurses in China, which provides guidance for the assessment and training of nurses on infectious disease emergency response. *Implications for Nursing Management*. According to the competency index system, nursing managers could develop effective training programs of infectious disease emergency response competency for nurses and select competent nurses for emergency response to infectious diseases.

1. Introduction

In recent decades, emerging infectious diseases have increased due to socioeconomic, environmental, and ecological factors [1, 2]. In general, humans lack natural immunity to emerging infectious diseases; therefore, they may spread rapidly and cause devastating consequences [3]. Correspondingly, the risk of unpredictable infectious disease

pandemics is increasing and has become a potential threat to global security. Currently, the entire world is encountering the largest infectious disease emergency, the coronavirus disease 2019 (COVID-19) pandemic. As of November 27, 2022, 637 million cases of COVID-19 and 6.6 million deaths have been reported worldwide [4]. Global health, economies, and social development have been significantly affected.

Although a clear definition of an infectious disease emergency is lacking, it involves two characteristics: infectious disease-related and public health events [5]. Therefore, in this study, we regarded infectious disease emergencies as public health emergencies caused by epidemics or pandemics of infectious diseases, such as severe acute respiratory syndrome (SARS), H1N1, Middle East respiratory syndrome (MERS), Ebola virus disease, and COVID-19. Medical rescue is an essential part of the infectious disease emergency response. Nurses have always played an important role in the response to infectious disease emergencies, including infection prevention, infection control, isolation, containment, and public health [6]. Especially in the absence of effective medical interventions for an emerging infectious disease, nurses play a vital role in caring for patients with fatal infectious diseases [7–9]. For example, during the COVID-19 pandemic in China, approximately 42,000 health care workers nationwide, more than 68% of whom were nurses, were sent to support Hubei Province [10].

Nurses' knowledge and experience are the key to controlling infectious disease pandemics [11]. A group of skilled and competent nurses is essential to adapt to a rapidly changing work environment and provide high-quality care, especially in response to infectious disease emergencies [12]. However, due to the shortage of specialty nurses for infectious disease, most nurses who participate in infectious disease emergency rescue are from noninfectious departments with no prior experience caring for patients with infectious diseases [13]. For example, Labrague and Santos [14] found that 91.4% of the frontline nurses reported that they were not completely prepared to care for COVID-19 patients and highlighted the need to improve nurses' core competencies to better handle infectious disease emergencies. Moreover, frontline nurses are repeatedly exposed to the virus, and providing sufficient training and equipment to protect them is consequently essential [15].

Competence-based emergency nursing staff deployment and training are the cornerstones of the professionalization of disaster rescue, including the infectious disease emergency response [16–18]. Accordingly, reaching a consensus on a set of core competencies is essential. Competence is a complex concept and has been defined as the ability to perform a task with desirable outcomes [19], "functional adequacy and the capacity to integrate knowledge and skills with attitudes and values into the specific contexts of practice" [20], or "the effective application of a combination of knowledge, skill, and judgment demonstrated by an individual in daily practice or job performance" [21]. In this study, the framework of the Chinese registered nurse's competency [22] is adopted for the term nursing competence. According to this framework, nursing competence

refers to the integration of knowledge, skills, and attitudes in clinical nursing practice [22]. Therefore, in this study, we define infectious disease emergency response competencies as the integration of knowledge, skills, and attitudes in effective response to an infectious disease emergency for nurses.

To our knowledge, very few studies have demonstrated the specific competencies that are required for nurses in the infectious disease emergency response. Kan et al. [5] developed a competency index system for medical staff in response to infectious disease emergencies. In the index system, only the competencies shared by physicians and nurses were included. However, in the actual situation of infectious disease emergency response, the specific tasks and abilities required for physicians and nurses are quite different. Physicians are mainly responsible for diagnosis and treatment decisions, whereas nurses need to provide specific care activities. Medical diagnosis and treatments are lifesaving but temporary. In contrast, nurses remain at the patient's bedside for long periods and provide the necessary labor-intensive and time-consuming care for the patient's recovery and rehabilitation [23]. Therefore, a scientific and comprehensive competency index system of infectious disease emergency responses for the nurses needs to be developed to guide high-quality training and effective nursing staff deployment during an epidemic. Thus, this study presents the following guiding question: what knowledge, skills, and attitudes are needed by frontline nurses in response to infectious disease emergencies? This study aims to develop a set of infectious disease emergency response competencies specific to frontline nurses in China.

2. Methods

This study took place from July 2020 to January 2021. We conducted a modified Delphi consultation to construct the index system and then used the analytic hierarchy process to determine the weight of each index.

2.1. Establishment of the Research Team. We established a research team that included 2 nursing education experts, 1 nursing management expert, 1 clinical nursing expert, and 1 nursing graduate student. The responsibility of the research team included developing expert consultation questionnaires, recruiting and contacting experts, and summarizing and analyzing expert opinions.

2.2. Construction of the Index System

2.2.1. Construction of the Index Draft and Consultation Questionnaire. In this modified Delphi consultation, we used an initial draft of the index system to replace the traditional first-round Delphi survey. The index draft was constructed through theory analysis, literature review, and a face-to-face in-depth expert interview. First, we adopted the framework of the Chinese registered nurse's competency [22] as the theoretical framework and divided "competencies" into three first-level elements: knowledge, attitudes,

and skills. Second, a literature review and expert interviews were conducted, and the data were classified into any dimension of knowledge, attitude, and skills. Eight experts with infectious disease rescue experience participated in 30–60 minutes of one-on-one interviews. In the interviews, the participants were asked approximately 6 questions as follows: According to your experiences and opinions, (1) What roles are played by frontline nurses in response to infectious disease emergencies? (2) What tasks should be undertaken by frontline nurses in response to infectious disease emergencies? (3) What knowledge is needed for frontline nurses in response to infectious disease emergencies? why? (4) What skills are needed for frontline nurses in response to infectious disease emergencies? why? (5) What attitudes and personal attributes are needed for frontline nurses in response to infectious disease emergencies? why? and (6) Is there anything else you would like to share with me? Subsequently, based on the literature [5, 22, 24, 25] and the results of expert interviews, we listed the second-level index and the third-level index related to knowledge, attitudes, and skills. Furthermore, each item was discussed by the research team, and modifications were made where necessary. Finally, an initial draft of 53 indices, including 3 first-level indices, 12 second-level indices, and 38 third-level index items, was developed. The consultation questionnaire consisted of four parts: (1) questionnaire introduction, including the research background, consultation purpose, completion instructions, and contact information for the research team; (2) main body of the questionnaire, including a five-point Likert scale with 53 items with scores ranging from 1 (completely unimportant) to 5 (very important) to represent the importance of each index (each item had an open-ended question to collect the expert's free-text comments); (3) basic characteristics of the experts, including their sex, age, education level, work experience, mentor status, professional title, academic qualifications, and current professional area; and (4) experts' familiarity level and judgment basis relating to the consultation questions.

2.2.2. Recruitment of the Expert Panel. Purposive sampling was used for expert recruitment. Additionally, expert heterogeneity was also considered to obtain a variety of perspectives and achieve more accurate judgments [26], such as different professions (nursing, public health, and hospital infection management), regions, and positions (frontline staff, managers). The selection criteria were as follows: (1) previously participated in the rescue of infectious disease emergencies; (2) ≥10 years of experience in clinical nursing, nursing management, nursing education, public health, or hospital infection management; (3) a bachelor's or higher degree; and (4) willingness to participate in this study. There is no consensus on the necessary number of experts. Belton et al. [26] recommended that 5–20 experts were sufficient; therefore, 18 experts were selected in this study.

2.2.3. Consultation Procedure. The members of the research team contacted the experts, explained the purpose of the research to them, and obtained their consent. The questionnaires were sent to the experts via email. The experts were required to fill out the questionnaires independently and send them back in two weeks. A brief reminder was sent to the nonresponders one day after the deadline.

2.2.4. Data Analysis and Selection of the Index. We used Microsoft Excel 2010 and IBM SPSS Statistics 21.0 to analyze all quantitative data. Frequencies, proportions, and means were used for data descriptions. The authority coefficient of experts was calculated to represent the reliability of the consultation results [27]. The coefficient of variation (CV) was used to judge the coordination and concentration of expert opinions. Kendall's W was used to test the consistency of experts' opinions [28]. The qualitative data of experts' free-text comments were analyzed by content analysis [29]. The research team carefully reviewed and discussed the comments from the experts and then modified, excluded, or added items based on the study aims and literature.

After round 1 consultation, the items with a mean importance value <4.5 were deleted. Additionally, the researchers carefully reviewed the experts' comments, categorized the content, integrated similar opinions, and then discussed the research team to modify, exclude, or add items based on the study aims, literature, and theoretical framework of this study. For example, three experts suggested adding items that reflect the "overall view," "obedient organization arrangements," and "team spirit" of nurses. Therefore, a related third-level item was added. Two experts suggested changing the second-level index of "communication and management abilities" into "communication abilities." Through discussion and a literature review, the research team agreed that the comment was reasonable and thus modified the item according to the expert opinion. Finally, several items were modified, and new items were added following analysis of the experts' comments. All the retained items and the new items were entered into the second-round questionnaire. After round 2 of consultation, the items with a mean importance value >4.5 and CV < 0.25 were considered to have reached a consensus [30].

2.3. Weight of the Index. We used the analytic hierarchy process to determine the weight of each index. The analytic hierarchy process was completed by Yaahp V10.3 (Meta Decision Software Technology Co., Ltd., Nanjing, China).

2.3.1. Build the Hierarchical Structure Model. In this study, the hierarchical structure model of the index was established according to the result of round 2 of the Delphi consultation, which consisted of four layers: the target layer, the criteria layer, the subcriteria layer, and the scheme layer. In this study, the target layer was the competency assessment index system for nurses responding to infectious disease emergencies, the criteria layer included the 3 first-level indices, the subcriteria layer included the 10 second-level indices, and the scheme layer included the 32 third-level indices.

2.3.2. Construction of the Judgment Matrix. The mean importance value of each index determined by the experts in

the round 2 consultation was used to calculate the difference between pairwise indices. Then, the importance degree between pairwise indices was compared, and the pairwise comparison judgment matrix was constructed based on Saaty's fundamental 9-point scale [31]. In this study, we formed a total of 14 judgment matrices.

2.3.3. Test Consistency and Weight Calculation.

For consistency testing, a consistency ratio (CR) of the judgment matrix <0.10 indicates that the judgment matrix has satisfactory consistency; in contrast, CR > 0.10 indicates that the judgment matrix needs to be adjusted [30]. In Yaahp V10.3 software, the power method was used to calculate weights.

2.4. Ethical Considerations.

This study was approved by the Biomedical Research Ethical Committee of West China Hospital, Sichuan University (No. 2020312), and was conducted in accordance with the principles of the Declaration of Helsinki. The study objectives and participant rights were explained to the experts via an electronic document. Consent was implied after the participant completed the survey.

3. Results

3.1. Characteristics of the Experts.

In this study, we conducted two rounds of expert consultation. A total of 18 experts were enrolled from 11 hospitals and universities, covering 7 provinces, autonomous regions, or municipalities, including Hubei, Beijing, Sichuan, Anhui, Gansu, Yunnan, and Xinjiang. The experts' characteristics are shown in Table 1. The response rates of the two rounds of consultations were both 100%. Fifteen (83.33%) and five (27.78%) experts also provided free-text comments in the two rounds. The authority coefficient of the 18 experts was 0.903, indicating that the experts were highly authoritative, and the consultation results were reliable. The concentration and coordination of expert opinions are listed in Table 2. The CVs were 0–0.23 (median 0.13) and 0–0.17 (median 0.09) in the first and second rounds, respectively. Kendall's W was 0.170 and 0.139 in the two rounds, with statistically significant differences, indicating a high level of synergy among experts.

3.2. Nursing Response Competency Index System of Infectious Disease Emergency.

The process of index construction is shown in Figure 1. In the first round, the importance value was 4.11–5.00, with an average of 4.69, and 9 items scored <4.5. In the first round, 62 comments were provided by 15 experts regarding adjusting the wording, merging or splitting some items, and deleting or adding new items. Two second-level indices and 7 third-level indices were deleted, 3 new third-level indices were added, 2 second-level indices, and 17 third-level index statements were revised, and 1 third-level index was reclassified through data analysis. Therefore, a five-point Likert scale with 47 items (3 first-level indices, 10 second-level indices, and 34 third-level indices) was sent to 18 experts for the second round of consultation.

In the second round, the importance value was 4.28–5.00, with an average of 4.78; 2 items scored <4.5, and all CVs were <0.25. The second round also included 13 comments from 5 experts. Two third-level indices were deleted, and 3 third-level index statements were revised. After the second round, the experts' opinions tended to be consistent, and the nursing response competency index system of infectious disease emergencies was confirmed, including 3 first-level indices, 10 second-level indices, and 32 third-level indices (Table 3).

3.3. Weight of the Competency Assessment Index.

The results showed that the first-level CR was 0.0088, the second-level CR was 0.0825, 0.0000, and 0.0314, and the third-level CR was 0.0266, 0.0000, 0.0000, 0.0000, 0.0000, 0.0192, 0.0172, 0.0000, 0.0000, and 0.0707. All the CRs were <0.1, indicating that each judgment matrix had satisfactory consistency. The weight coefficients of each index are listed in Table 4.

4. Discussion

In this study, we developed a competence index system of infectious disease emergency response for nurses in China through a Delphi survey and determined the weight of each index with an analytic hierarchy process. The consensus-based competence index system represents the general expectations of the Chinese health care team for the nurses in response to infectious disease emergencies.

The competence index system established in this study is scientific, reliable, and representative with the following characteristics. First, the response rate of experts indicates their concern for the research, and a response rate >70% is necessary to ensure the rigor of the Delphi technique [32]. The response rate of the two rounds of consultation in this study was 100%, indicating that the experts had high enthusiasm for consultation. Second, a higher degree of expert authority generally indicates better accuracy of prediction, and an authority coefficient ≥0.7 specifies that the consultation results are reliable [27]. In this study, the authority coefficient exceeds 0.9, showing excellent reliability of the experts' opinions. Third, Kendall's W in the two rounds was significantly different, indicating good coordination among experts and acceptability of the study results. Additionally, the items' CVs decreased from round 1 to round 2, showing that the experts' opinions tended to be stable and that the consensus was meaningful. Furthermore, the selection of experts is crucial for success in a Delphi study [33]. Purposive sampling was used to improve representativeness, rather than random sampling. In this study, 18 experts were well-known experts in infectious disease nursing, education, or management, and all of them had frontline work experience in infectious disease emergency rescue, such as SARS or COVID-19. They originated from 11 institutions, covering 7 geographic regions, which decreased the regional distribution bias. In summary, the Delphi technique and qualified experts ensure the reliability of this competence

TABLE 1: Characteristics of the experts ($n = 18$).

Variables	n	(%)
Gender		
Men	2	11.1
Women	16	88.9
Age (years)		
≤40	4	22.2
41–50	9	50.0
≥51	5	27.8
Education level		
Bachelor degree	4	22.2
Master degree	10	55.6
Doctor degree	4	22.2
Mentor status		
Postgraduate tutor	8	44.4
Doctoral supervisor	3	16.7
None	7	38.9
Working experience(years)		
10–20	6	33.3
21–30	6	33.3
≥31	6	33.3
Professional title		
Nurse supervisor	3	16.7
Associate professor	7	38.9
Professor	8	44.4
Current professional area		
Nursing management	5	27.8
Nursing education	2	11.1
Clinical nursing	5	27.8
Public health	1	5.6
Hospital infection management	1	5.6
Two and above	4	22.2

TABLE 2: The level of concentration and coordination of expert's opinion.

Rounds	Importance values	Full-score rates (%)	Coefficients of variation	Kendall's W	Chi-square	P value
Round1	4.11–5.00	44.00–100	0.00–0.23	0.170	147.565	<0.001
Round2	4.28–5.00	39.00–100	0.00–0.17	0.139	114.780	<0.001

index system. Moreover, the combination of the Delphi technique and the analytic hierarchy process method in this study integrates the wisdom of experts and the science of quantitative measurement.

Competency is a complex and holistic concept. Although consensus on the definition and domains of competency is lacking, it contains the integration of knowledge, skills, and attitudes required to accomplish a task effectively and efficiently [18, 20]. Therefore, in this study, the nursing competencies of the infectious disease emergency response initially consisted of 3 first-level indicators—knowledge, attitudes, and skills—and the experts also reached a high consensus. The weights of knowledge, attitudes, and skills were 0.2970, 0.1634, and 0.5396, respectively, reflecting the priority of nursing skills in responding to infectious disease emergencies. Nursing practice is highly technical; therefore, excellent skills are essential for completing basic nursing tasks. In the context of infectious disease emergencies, nurses usually must address many clinical nursing tasks [34]. In this circumstance, nursing skills should be prioritized both in nurse training and in staff deployment. The weight of knowledge ranked second, and most abilities can reasonably be acquired based on knowledge. Finally, although the weight was relatively low, the experts still highly agreed that attitude was indispensable (mean importance value 4.83, CV 0.10). In general, attitude can predict behavior to some extent. The professional attitudes of nurses are essential to enhancing the quality of health care [35]. Professional attitudes are particularly important in response to an infectious disease emergency. Because nurses may be at risk of being infected, stigmatized, isolated, and even sacrificing their lives [36, 37], only nurses with a firm professional attitude and good mental health are suited for frontline nursing work in an infectious disease emergency.

Finally, we confirmed 32 third-level indicators and identified their weight coefficients. These third-level
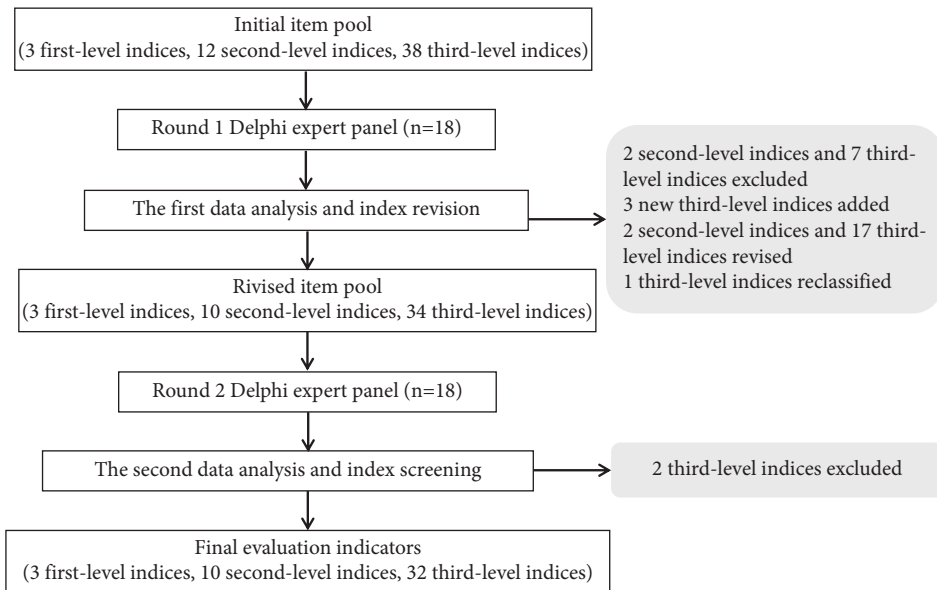
FIGURE 1: Flowchart of the index construction process. Two rounds of expert consultation were conducted to construct the index system. Through the first round data analysis, 2 second-level indices and 7 third-level indices were deleted, 3 new third-level indices were added, 2 second-level index and 17 third-level index statements were revised, and 1 third-level index was reclassified. Through the second round data analysis, 2 third-level indices were deleted, and 3 third-level indices statements were revised. Finally, the nursing response competency index system of infectious disease emergencies was confirmed, including 3 first-level indices, 10 second-level indices, and 32 third-level indices.

indicators provide evidence for developing training curricula and identifying prioritized training topics in future education. For example, "understand the disinfection and isolation of infectious diseases" (portfolio weight 0.1241) and "correctly perform specimen collection for infectious disease patients" (portfolio weight 0.1245) are the most important knowledge and skills and need to be trained preferentially. Notably, two third-level indicators were also very important. The first indicator was "effectively adjust one's own psychology and behavior to quickly meet the work requirements under the pressure caused by the infectious disease emergency." The outbreak of an infectious disease and subsequent pandemic exert considerable psychological pressure on health care workers who directly provide care to patients [38]. Studies have demonstrated that nurses who can recover quickly from a stressful event may cope effectively and overcome the pressure imposed by an infectious disease emergency [14]. The second indicator was "follow organization arrangements and collaborate effectively with other team members in an infectious disease emergency." Good cooperation within a health care team is crucial for providing high-quality care to patients and ensuring the safety and health of staff [34, 39]. In the rescue of an infectious disease emergency, health care workers from various

departments, multiple professions, and even different hospitals or institutions may be integrated as a temporary medical aid team to participate in the frontline care work [40]. Team members may not be familiar with each other or with the workflow and the environment in a new workplace; therefore, cooperation on the team is full of challenges. Accordingly, the nurse's team spirit and effective collaboration should be emphasized in this context.

5. Limitations

This study was also subjected to limitations. Although the 18 experts recruited nationwide in this study are sufficient for a Delphi study, they may not fully represent all stakeholders. Although purposive sampling was essential to reach the target experts, it may also have introduced bias in the sampling process [30]. Furthermore, the infectious disease emergency response competencies constructed in this study have not yet been tested in a clinical setting. Therefore, the study results should be generalized with caution and limited to a similar context. Future studies need to collect more opinions from various stakeholders to improve the competency index system and test the index system in a real clinical context.

TABLE 3: Consensus of the competency index system after two rounds of the Delphi study.

First-level indicators	IV†	CV‡	Second-level indicators	IV†	CV‡	Third-level indicators	IV†	CV‡
(A) Knowledge	4.89	0.06	(A1) General knowledge of infectious disease	4.89	0.06	(A1.1) Understand the epidemic process of common infectious diseases and previous major infectious diseases (source of infection, route of transmission, and susceptible population)	4.89	0.06
						(A1.2) Understand the typical signs and symptoms of common infectious diseases and previous major infectious diseases	4.78	0.11
						(A1.3) Understand the prevention and containment rules of infectious diseases	4.94	0.05
						(A1.4) Understand the treatment and nursing of common and previous major infectious diseases	4.83	0.10
			(A2) Infectious disease management	5.00	0.00	(A2.1) Understand the laws and regulations about infectious disease management	4.72	0.12
						(A2.2) Understand the emergency management procedures related to infectious diseases	4.72	0.12
						(A2.3) Understand the disinfection and isolation of infectious diseases	5.00	0.00
			(A3) Occupational protection	4.61	0.15	(A3.1) Understand the standard precaution	4.89	0.06
						(A3.2) Understand the personal protective requirements of infectious diseases with different transmission routes	5.00	0.00
						(A3.3) Understand the emergency procedures after occupational exposure and medical protective products damage	4.89	0.06
(B) Attitudes	4.83	0.10	(B1) Psychological traits	4.89	0.06	(B1.1) Effectively adjust one's own psychology and behavior to quickly meet the work requirements under the pressure caused by the infectious disease emergency	4.89	0.06
						(B1.2) Have a strong sense of responsibility and dedication in the infectious disease emergency and actively participate in frontline nursing	4.72	0.12
			(B2) Professional attitude	4.83	0.10	(B2.1) Follow organization arrangements and collaborate effectively with other team members in an infectious disease emergency	4.89	0.06
						(B2.2) Provide care for infectious disease patients in accordance with ethics and laws, without stigmatization, fear, or disclosure of patients' privacy	4.78	0.09

TABLE 3: Continued.

First-level indicators	IV[†]	CV[‡]	Second-level indicators	IV[†]	CV[‡]	Third-level indicators	IV[†]	CV[‡]
(C) Skills	4.94	0.05	(C1) Specialty nursing practice	5.00	0.00	(C1.1) Properly perform respiratory care techniques for patients with infectious disease, e.g., oxygen therapy, atomization inhalation, sputum suction care, endotracheal intubation care, tracheostomy care, and ventilator care	4.61	0.15
						(C1.2) Properly perform circulatory care techniques for patients with infectious disease, e.g., electrocardiographic monitoring and cardiopulmonary resuscitation	4.72	0.12
						(C1.3) Identify anticipated condition changes and provide effective care for patients with infectious disease	4.67	0.12
						(C1.4) Identify the psychological needs of infectious disease patients and their families and give appropriate support	4.67	0.10
						(C1.5) Correctly perform specimens collection for infectious disease patients	4.83	0.08
			(C2) Hospital infection management	4.67	0.12	(C2.1) Comply with the quarantine requirements of different areas (clean, potential contamination, and/or contamination area) and channels	5.00	0.00
						(C2.2) Correctly classify and provide quarantine measures for infectious disease patients, e.g., placement of patients, selection of medical protective products, and management of visiting and accompanying	4.89	0.06
						(C2.3) Correctly perform disinfection and dispose of the environment, belongings, cadavers, medical waste, and medical reusable materials of infectious disease patients	4.89	0.06
						(C2.4) Put on and take off personal protective equipment according to the quarantine type and the protection level (level 1 protection, level 2 protection, and level 3 protection)	4.89	0.06
						(C2.5) Properly perform hand hygiene	4.83	0.08
						(C2.6) Manage the personnel and environment in the ward to reduce the risk of infectious diseases spread	4.72	0.09
			(C3) Education and consulting	4.50	0.13	(C3.1) Effectively teach the prevention, containment, and rehabilitation measures about infectious disease to patients and their families	4.72	0.09
						(C3.2) Guide other health team members in caring for patients with infectious diseases	4.72	0.09
			(C4) Communication abilities	4.72	0.09	(C4.1) Effectively communicate with infectious disease patients and their families	4.67	0.12
						(C4.2) Effectively communicate and coordinate with health team members during infectious disease emergencies	4.83	0.08
			(C5) Thinking and learning abilities	4.67	0.10	(C5.1) Under the pressure of infectious disease emergency, remain critical thinking and make correct decisions to solve difficulties in work	4.56	0.13
						(C5.2) Identify and deal with potential risks related to infectious disease emergency response	4.67	0.10
						(C5.3) Actively and effectively learn new knowledge and skills to improve the required abilities for infectious diseases patient care	4.83	0.10

Note. [†]IV: importance value; [‡]CV: coefficient of variation.

TABLE 4: The weights coefficient of each indicator.

First-level indicators	Weights	Second-level indicators	Weights	Third-level indicators	Weights	Portfolio weights
(A) Knowledge	0.2970	(A1) General knowledge of infectious disease	0.2797	(A1.1) Understand the epidemic process of common infectious diseases and previous major infectious diseases (source of infection, route of transmission, and susceptible population)	0.2829	0.0235
				(A1.2) Understand the typical signs and symptoms of common infectious diseases and previous major infectious diseases	0.1059	0.0094
				(A1.3) Understand the prevention and containment rules of infectious diseases	0.4476	0.0396
				(A1.4) Understand the treatment and nursing of common and previous major infectious diseases	0.1636	0.0145
		(A2) Infectious disease management	0.6267	(A2.1) Understand the laws and regulations about infectious disease management	0.1667	0.0310
				(A2.2) Understand the emergency management procedures related to infectious diseases	0.1667	0.0310
				(A2.3) Understand the disinfection and isolation of infectious diseases	0.6667	0.1241
		(A3) Occupational protection	0.0936	(A3.1) Understand the standard precaution	0.2500	0.0069
				(A3.2) Understand the personal protective requirements of infectious diseases with different transmission routes	0.5000	0.0139
				(A3.3) Understand the emergency procedures after occupational exposure and medical protective products damage	0.2500	0.0069
(B) Attitudes	0.1634	(B1) Psychological traits	0.6667	(B1.1) Effectively adjust one's own psychology and behavior to quickly meet the work requirements under the pressure caused by the infectious disease emergency	0.7500	0.0817
				(B1.2) Have a strong sense of responsibility and dedication in the infectious disease emergency and actively participate in frontline nursing	0.2500	0.0274
		(B2) Professional attitude	0.3333	(B2.1) Follow organization arrangements and collaborate effectively with other team members in an infectious disease emergency	0.7500	0.0822
				(B2.2) Provide care for infectious disease patients in accordance with ethics and laws, without stigmatization, fear, or disclosure of patients' privacy	0.2500	0.0274

TABLE 4: Continued.

First-level indicators	Weights	Second-level indicators	Weights	Third-level indicators	Weights	Portfolio weights
(C) Skills	0.5396	(C1) Specialty in nursing practice	0.5352	(C1.1) Properly perform respiratory care techniques for patients with infectious disease, e.g., oxygen therapy, atomization inhalation, sputum suction care, endotracheal intubation care, tracheostomy care, and ventilator care	0.0773	0.0223
				(C1.2) Properly perform circulatory care techniques for patients with infectious disease, e.g., electrocardiographic monitoring and cardiopulmonary resuscitation	0.2224	0.0642
				(C1.3) Identify anticipated condition changes and provide effective care for patients with infectious disease	0.1330	0.0384
				(C1.4) Identify the psychological needs of infectious disease patients and their families and give appropriate support	0.1330	0.0384
				(C1.5) Correctly perform specimens collection for infectious disease patients	0.4343	0.1254
		(C2) Hospital infection management	0.1163	(C2.1) Comply with the quarantine requirements of different areas (clean, potential contamination, and/or contamination area) and channels	0.3772	0.0237
				(C2.2) Correctly classify and provide quarantine measures for infectious disease patients, e.g., placement of patients, selection of medical protective products, and management of visiting and accompanying	0.1570	0.0099
				(C2.3) Correctly perform disinfection and dispose of the environment, belongings, cadavers, medical waste, and medical reusable materials of infectious disease patients	0.1570	0.0099
				(C2.4) Put on and take off personal protective equipment according to the quarantine type and the protection level (level 1 protection, level 2 protection, and level 3 protection)	0.1570	0.0099
				(C2.5) Properly perform hand hygiene	0.0936	0.0059
				(C2.6) Manage the personnel and environment in the ward to reduce the risk of infectious diseases spread	0.0583	0.0037
		(C3) Education and consulting	0.0547	(C3.1) Effectively teach the prevention, containment, and rehabilitation measures about infectious disease to patients and their families	0.5000	0.0148
				(C3.2) Guide other health team members in caring for patients with infectious diseases	0.5000	0.0148
		(C4) Communication abilities	0.1697	(C4.1) Effectively communicate with infectious disease patients and their families	0.2500	0.0229
				(C4.2) Effectively communicate and coordinate with health team members during infectious disease emergencies	0.7500	0.0687
		(C5) Thinking and learning abilities	0.1240	(C5.1) Under the pressure of infectious disease emergency, remain critical thinking and make correct decisions to solve difficulties in work	0.1172	0.0078
				(C5.2) Identify and deal with potential risks related to infectious disease emergency response	0.2684	0.0180
				(C5.3) Actively and effectively learn new knowledge and skills to improve the required abilities for infectious diseases patient care	0.6144	0.0411

Note. The first-level consistency ratio (CR) was 0.0088; the second-level CR was 0.0825, 0.0000, and 0.0314, respectively; and the third-level CR was 0.0266, 0.0000, 0.0000, 0.0000, 0.0000, 0.0192, 0.0172, 0.0000, 0.0000, and 0.0707, respectively.

6. Conclusion

This study is the first to develop a consensus on infectious disease emergency response competencies needed for nurses in China. A Delphi survey based on a literature review and in-depth expert interviews were used to establish the competency index system, and eventually, 3 first-level indices, 10 second-level indices, and 32 third-level indices were agreed upon. Additionally, the weighted coefficients of each index were determined using the analytic hierarchy process. The competency index system is scientific and reliable, revealing clear expectations and performance standards for nurses in response to an infectious disease emergency and providing guidance for nursing educators to develop effective infectious disease emergency response competency training programs.

7. Implications for Nursing Management

The competency index system reveals clear expectations and performance standards for nurses in response to an infectious disease emergency. The findings specifically apply to situations where emergency rescue is required in an infectious disease epidemic or pandemic and the frontline nurses who are deployed to undertake rescue tasks in such an infectious disease emergency. Nursing managers could develop effective training programs for infectious disease emergency response competency for the nurses based on the competency index system and select competent nurses for medical rescue in infectious disease emergencies.

Data Availability

The data analyzed during the current study are not publicly available due to privacy restrictions but are available from the corresponding authors on reasonable request.

Disclosure

Fengjiao Chen and Li Li are the co-first authors. Shu Gong, Hongxia Guo, and Xiaoyi Cao are the co-corresponding authors to this work.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Fengjiao Chen and Li Li equally contributed to this work.

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Research Article

Effect of 3D Animation Combined with Teach-Back Health Education on Pelvic Floor Muscle Training in LARS Patients: A Randomized Controlled Trial

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Aim. The present study aimed to evaluate the effect of 3D animation combined with teach-back health education on the recovery of low anterior resection syndrome (LARS) patients. *Background*. LARS is the most common problem after anus-preserving surgery in rectal cancer. Pelvic floor muscle training can promote the recovery of recto-anal function. *Methods*. Ninety-nine patients with LARS were randomly divided into control group, experiment group I, and experiment group II. The control group was guided by one-to-one verbal pelvic floor muscle training. The experiment group I was given self-made 3D animation along with one-to-one pelvic floor muscle guidance. The 3D animation and teach-back methods were used for training and guidance in the experiment group II. The outcome measures were scores of low anterior resection syndrome scale items, as well as the completion of training content. *Results*. The degree of completion of training content in the experiment group II was higher than that of the control group and experiment group I. The total score of LARSS in the experiment group II was significantly lower than in the control group and experiment group I. In particular, scores of loose stool incontinence, defecation frequency level, tenesmus, and defecation urgency in experiment group II were better than those in the control group. *Conclusion*. 3D animation combined with teach-back health education improved the mastery of pelvic floor muscle training theory and practice in LARS patients, and effectively reduced the symptoms. *Implications for Nursing Management*. This intervention promoted the recovery of pelvic floor muscle function in LARS patients and can be regarded as an effective measure to improve quality of life and provide better clinical care for patients.

1. Background

According to pertinent statistical reports, the incidence and mortality of colorectal cancer rank third and second in the world, respectively, and it has become the most prevalent malignant tumor of the digestive system in China, among which rectal cancer accounts for about 60%–75% [1, 2]. At present, the treatment methods for rectal cancer mainly include combined abdominoperineal resection (Miles) and transabdominal resection and anastomosis (Dixon), also known as anal preserving surgery, accounting for 70% of the surgical methods [3]. Following anus-preserving surgery,

90% of patients show a series of defecation-related bowel function changes such as increased defecation frequency, difficulty in excretion, and incontinence, a phenomenon referred to as low anterior resection syndrome (LARS) [4, 5].

At present, the treatment for LARS consists of drug therapy (tryptamine agonists and antagonists), anal lavage and anterograde enema, sacral nerve stimulation and percutaneous tibial nerve stimulation, pelvic floor rehabilitation training (pelvic floor muscle exercise, rectal balloon training, and biofeedback training), and other methods [6, 7]. Pelvic floor muscle training refers to the voluntary contraction of pelvic floor muscles, dominated by the levator ani muscle, in

a conscious and rhythmic way to strengthen defecation control ability, and is simple and easy to learn, while not being restricted by external objective conditions [8]. At present, pelvic floor muscle training is widely used in the treatment of stress urinary incontinence, postpartum urinary retention, postpartum pelvic floor function, and sexual dysfunction [9, 10], and the effects are significant.

The vivid image characteristics of 3D animation creates a rich color saturation viewing experience, increasing and improving learners' perceptual understanding [11]. Teachback is a communication method that allows information recipients to repeat or demonstrate the information provided to them using their own language and actions to confirm their understanding. The technique comprises four steps: explanation, evaluation, clarification, and understanding [12]. Studies have shown that this feedback method has significant effects in reducing the readmission rate of patients, improving diet compliance, and reducing surgical complications and medication error rates [13]. At present, the study of feedback methods in Chinese health education focuses only on chronic diseases, and there are no reports of its impact on intestinal function and quality of life in patients with rectal cancer LARS.

Therefore, this study proposes a training program for LARS patients to quickly recover pelvic floor muscle function, which can improve their quality of life, and also provide a reference for medical staff to provide them with appropriate care.

2. Methods

2.1. Program Development. This study used a randomized controlled trial to evaluate the effectiveness of the developed program. In the control group, the responsible nurse selected a one-to-one verbal health education method to provide patients with pelvic floor muscle knowledge and guidance on training the muscles. Group I conducted one-to-one education with the vivid, three-dimensional 3D animation, and training measures the same as those in the control group. In group II, the patients were trained with 3D animation and teach-back (pelvic floor muscle training method guidance, assessment of mastery, repeat of guidance deficits, confirmation of mastery, and continuous exercise).

2.2. Design and Study Protocol. Patients enrolled in the study were randomly divided into three groups using SPSS Statistics for Windows, version 18.0 random number generator program. The results of randomization were 33 cases in the control group, 33 cases in the experiment group I, and 33 cases in the experiment group II. To ensure validity, this study was designed as a single-blind trial.

2.3. Outcome Measures. All the patients in the three groups started training on the 7th day after surgery which lasted till 3 months after. Training took place daily at 8 AM, 2 PM, and 6 PM. The baseline data recorded comprised the low anterior resection syndrome score (LARSS) and the training content completion evaluation.

2.4. Participants and Setting. Participants were LARS patients from the gastrointestinal surgery department of Guizhou Provincial Class A Hospital. The age range included in this study was 45 to 75 years. They were diagnosed with rectal cancer and first treated with anus-preserving surgery. The LARSS scale at baseline was scored at ≥21, with the rating level indicating above mild severity of LARS [14]. Participants chosen had constant access to their mobile phone during hospitalization and discharge and had a long-term primary caregiver (care time of no less than 4 h/d; if there were many caregivers, the longest care time was considered; caregivers included family members who were ≥18 years of age and were fluent in the language) [15].

2.5. Procedures

2.5.1. The Control Group. The responsible nurse engaged the patient in one-to-one verbal health education to provide them with relevant, pelvic floor muscle knowledge and guidance on training the muscles before surgery, after surgery, on the day of discharge, and when returning to the hospital for chemotherapy [16]. The muscles of pelvic floor muscle training mainly include the levator anal muscle, the internal and external anal sphincter, the transverse and transverse anal canal muscle, and the coccygeal muscle.

2.5.2. Experiment Group I. 3D animation was used to enhance their knowledge of pelvic floor muscles and guide them in performing pelvic floor muscle training. The content and duration of the training were the same as in the control group.

A 3D motion capture camera was used to capture and save videos of the standardized patients. In the first part of the animation, Autodesk-Maya modeling software was used to recreate the pelvic floor muscle and bone model on the computer. In the second part, the muscle and bone model was superimposed on the corresponding anatomical position in the human body captured on video and presented with perspective three-dimensional effects. Finally, a complete 3D animation was made using the post-effect editing function of Adobe After Effects.

2.5.3. Experiment Group II. The patients were trained using the 3D animation combined with teach-back. The training content and duration were the same as the control group. The intervention involved the following steps:

(1) The teach-back health education team was established. The head nurse of the department coordinated and managed the team, 2 responsible nurses were mentors of the education team, 1 subject researcher, and 1 gastrointestinal surgeon and 1 rehabilitation training instructor in the department served as health consultants.

(2) The 3D animation was played for the patients and their families to enhance the guidance and explanation.

(3) On a postoperative day 7: the teach-back procedures were used to continue the pelvic floor muscle training

    (a) Guidance on pelvic floor muscle training methods: the researchers watched the 3D animation again with the patients and reviewed the information and functional training methods shared before surgery.

    (b) Assessment of mastery: The patient was asked to repeat the procedure for pelvic floor muscle training in their own words and demonstrate it. The method explanation and the completion degree of the exercises by the patient was evaluated by the trainer, who maintained detailed records.

    (c) Repeated guidance for deficiencies: further guidance for deficiencies of the patient was given according to the records.

    (d) Mastery and continued use of the exercise are confirmed: mastery of the exercises was evaluated, and video playback and one-on-one education applied until the patient fully grasped the entire information and procedure.

(4) After discharge: every Monday, Wednesday, and Friday, mobile phone communication was used to remind patients to train, to understand their training situation, and give guidance.

(5) Returning to hospital for chemotherapy: patient's understanding and accuracy of practice was recorded and guidance was provided if necessary.

2.6. Ethical Considerations. This study was approved by the Medical Ethics Committee of the Affiliated Hospital of Guizhou Zunyi Medical University (review approval document no.KLLY-2020-143). During the intervention, the researcher strictly followed the bioethical principles of benefit and no harm, informed consent, confidentiality, ethics, and fairness.

2.7. Statistical Analysis. SPSS Statistics for Windows, version 18.0 was used to sort and analyze the data, and the level of significance was set at 5%. Unpaired F tests and the χ^2 test were used to compare the participants' baseline data. The measurement data were presented by $\overline{x} \pm s$, and the three groups of data, with normal distribution and homogeneity of variance, were tested by repeated measurement ANOVA. Before the analysis of variance, the sphericity test was performed for all of them, and if the results were not satisfactory, multivariate tests were conducted. After repeated measures of ANOVA, if there was an overall interaction, comparisons between groups and within groups were carried out. One-way ANOVA test was used for comparison, and the least significant difference (LSD) method was used for post-hoc multiple comparisons when significant differences were found. The Kruskal–Wallis H rank sum test was used in non-normal

measurement data, and in the nonparametric test was used for rank data.

3. Results

3.1. Patients Baseline Data. A total of 99 patients with LARS were enrolled in this study, assigned as 33 patients each were to the control group, experimental group I, and experimental group II. In the course of the study, one case in the control group was discharged automatically in advance and one case could not be contacted after discharge. One case in experimental group I had poor compliance, one case in experimental group II had poor compliance, as well and one other case was transferred to another department for treatment. Finally, a total of 94 patients completed the program and data collection phase of the study. There were no significant differences in baseline data such as gender, age, height, weight, and BMI among the three groups ($P > 0.05$), indicating comparability. Specific comparison results are shown in Table 1.

3.2. Pelvic Floor Muscle Training Content Completion. When comparing the degree of completion of the training content, experiment group I and experiment group II were better than the control group before the surgery, and 7 days, 14 days, 1 month, and 3 months post-operation ($P < 0.05$). The details are shown in Table 2.

3.3. LARSS Total Score. The total score of LARSS for the three groups was analyzed and that of the experiment group II was significantly lower than that of the control group one month after the operation ($P < 0.05$). The total score of LARSS in the experiment II group was lower than that in the experiment I group and the control group at 3 months after the operation. There were statistically significant differences in the total score of LARSS between the control group and the experiment II group before and after intervention ($P < 0.05$). Specific comparison results are shown in Table 3.

3.4. Comparison of Scoring on Individual LARSS Items. The time effect of LARSS items was statistically significant ($P < 0.05$). The treatment effects of loose stool incontinence, frequency of defecation, and urgency of defecation were also statistically significant ($P < 0.05$). The interaction effects of loose stool incontinence, frequency of defecation, tenesmus-related weight loss, and urgency of defecation scores were statistically significant ($P < 0.05$). One-way analysis of variance was used to compare the three groups at different time points. The results showed that the defecation urgency score of group II was better than that of the control group on the 14th day after the operation; defecation frequency, 1 month after operation; loose stool incontinence, 3 months after operation; defecation frequency level, tenesmus, defecation urgency score in the experiment group II were consistently better than those in the experiment group I and control group. The scores of loose stool incontinence in experiment

TABLE 1: Comparison of baseline data among the three groups (n (%)/$\overline{x} \pm s$).

Variable		The control group ($n = 31$)	Experiment group I ($n = 32$)	Experiment group II ($n = 31$)	χ^2/F	P
Gender	Male	18 (58.10)	20 (62.50)	19 (61.30)	0.138*	0.933
	Female	13 (41.90)	12 (37.50)	12 (38.70)		
Age (years)		57.61 ± 7.36	57.03 ± 7.51	56.68 ± 6.89	0.131#	0.877
Height (cm)		161.77 ± 5.41	161.25 ± 6.18	162.77 ± 5.10	0.602#	0.550
Weight (kg)		55.68 ± 5.93	54.91 ± 5.96	56.81 ± 5.41	0.861#	0.426
BMI		21.23 ± 1.56	21.11 ± 1.88	21.43 ± 1.77	0.284#	0.753
Level of education	Primary school and below	20 (64.50)	17 (53.10)	19 (61.30)	2.824*	0.831
	Junior high school	6 (19.40)	7 (21.90)	6 (19.40)		
	High school	1 (3.20)	2 (6.30)	0		
	College degree or above	4 (12.90)	6 (18.80)	6 (19.40)		
Medical payment method	New type farmers and residents health care	16 (51.60)	15 (46.90)	13 (41.90)	3.334*	0.766
	Residents health	13 (41.90)	14 (43.80)	14 (45.20)		
	Worker health	2 (6.50)	1 (3.10)	3 (9.70)		
	At his own expense	0	2 (6.30)	1 (3.20)		
Past medical history	Hypertension	9 (29.00)	10 (31.30)	8 (25.80)	0.634*	0.959
	Diabetes	1 (3.20)	2 (6.30)	2 (6.50)		
	No	21 (67.70)	20 (62.50)	21 (67.70)		
Type of pathology	Adenocarcinoma	23 (74.20)	25 (78.10)	25 (80.60)	0.378*	0.828
	Other	8 (25.80)	7 (21.90)	6 (19.40)		
TNM staging	Phase I	6 (19.40)	6 (18.80)	7 (22.60)	5.863*	0.439
	Phase II	14 (45.20)	12 (37.50)	7 (22.60)		
	Phase III	9 (29.00)	8 (25.00)	13 (41.90)		
	Phase IV	2 (6.50)	6 (18.80)	4 (12.90)		
Surgical method	Laparoscopic assisted surgery	28 (90.30)	27 (84.40)	27 (87.10)	0.501*	0.778
	Open operation	3 (9.70)	5 (15.60)	4 (12.90)		

1: * for the χ^2; # for the F. 2: TNM staging: T (Tumor) represents the size and extent of the primary tumor, N (Node) represents regional lymph nodes, reflecting the lymph node metastasis associated with the tumor, and M (Metastasis) represents distant metastasis.

TABLE 2: Comparison of training content completion among the three groups (n).

Group	Number	Preoperative			On the 7th day after surgery			On the 14th day after surgery			1 month after surgery			3 months after surgery		
		Optimal	Good	Poor	Optimal	Good	Poor	Optimal	Good	Poor	Optimal	good	Poor	Optimal	Good	Poor
The control group	31	3	16	12	4	15	12	6	15	10	5	15	11	4	12	15
Experiment group I	32	12▲	14▲	6▲	13▲	13▲	6▲	15▲	13▲	4▲	14▲	14▲	4▲	11▲	13▲	8▲
Experiment group II	31	14▲	11▲	6▲	15▲	11▲	5▲	18▲	11▲	2▲	15▲	13▲	3▲	12▲	13▲	6▲
H	—		9.907			10.405			12.892			11.536			8.824	
P	—		0.007*			0.006*			0.002*			0.003*			0.012*	

1: comparison between groups: ▲compared with the control group, all $P < 0.05$. 2: *indicates that there were statistically significant differences between the experiment group I and experiment group II and the control group ($P < 0.05$).

Table 3: Comparison of total LARSS scores among the three groups at different time points ($\overline{x} \pm s$).

Group	Number	Preoperative	On the 14th day after surgery	1 month after surgery	3 months after surgery	Time effect	Treatment effect	Interaction effect
The control group	31	33.03 ± 3.52	32.42 ± 3.77$^\Delta$	31.58 ± 4.00$^\Delta$	30.87 ± 3.77$^\Delta$			
Experiment group I	32	32.88 ± 4.23	32.22 ± 3.95$^\Delta$	30.03 ± 3.41	27.50 ± 3.60$^{\blacktriangle\Delta}$	60.732*	3.185*	10.358*
Experiment group II	31	32.71 ± 4.23	31.74 ± 4.07$^\Delta$	29.65 ± 3.59$^{\blacktriangle\Delta}$	25.48 ± 2.16$^{\blacklozenge\blacktriangle\Delta}$			
F		0.050	0.243	2.167	26.516			
P		0.951	0.784	0.047*	<0.000*			

1: intra-group comparison: $^\Delta$ was compared with that before the intervention, all $P < 0.05$. 2: Comparison between groups: $^\blacktriangle$compared with the control group, $^\blacklozenge$compared with the experiment group I, $P < 0.05$. 3: *indicates that there were statistically significant differences between the experiment group I and experiment group II and the control group ($P < 0.05$).

group II were better than those in the control group. Detailed results comparison are shown in Table 4.

4. Discussion

4.1. Effectiveness of Training. Pelvic floor muscle training has been proven to be effective in improving LARS symptoms. The results indicated that the degree of completion of training in experiment groups I and II at each time point was higher than that in the control group. Experiment group II combined the stereo-realistic characteristics of 3D animation with the four steps of teach-back (pelvic floor muscle training, method guidance, assessment of mastery, repeated guidance of deficits, confirmation of mastery, and continued exercise), and fully mobilized patients' vision, hearing, and motion perception. Regular health education gives priority to the verbal method of information transmission, usually one way [17, 18]. Teach-back adopts a two-way information transmission mode, to help medical staff to assess patients' understanding of the health education content, through real-time testing of mastery, receiving feedback from the patient, correcting errors, and providing missing information to strengthen and consolidate repeatedly. Its effect was found to be significantly higher than that of conventional health education, and its connotation of health education was quite consistent with the concept of "knowledge-belief-behavior" [19, 20].

LARSS is the most commonly used assessment tool for LARS patients that can evaluate the symptoms of anal exhaust, defecation, tenesmus, and so on. If the score of LARSS is lower, the recovery of anal exhaust and defecation function is better. At 1 month and 3 months after the operation, the total score of LARSS in experiment group II was lower than that in the control group and experiment group I, and the effect at 3 months was better than that at 1 month, indicating that the intervention method in experiment group II obtained stronger results than that in the control group. Realistic 3D animation of the characteristics of pelvic floor muscles provided a visual impact that was memorable and patients could view it in privacy. In combination with the teach-back method, the aim was to emphasis the training content and deepen, preoperative knowledge about pelvic floor muscles, and strengthen this during the postoperative review. It can effectively promote patients to form a deep

memory and develop the habit of persistent exercise [21]. Related studies had reported that patients may have temporary uncontrolled defecation in the early stage due to the disorder of normal functioning after anal preservation surgery. However, long-term uninterrupted pelvic floor muscle training of patients was not only conducive to the recovery of normal anal defecation function but also the success rate of treatment of short-term or long-term treatment can reach 50%–92% [22].

The normal rectal and anal sphincter, intact rectal nerve reflex arc, and sound fecal storage mechanism together maintain the normal function of the anus, and the failure of any one of these links leads to various problems [23]. After training, the level of loose stool incontinence and defecation frequency at 1 and 3 months after surgery in group II was better than that of the control group and group I. The reason was that the combination of 3D animation and teach-back on pelvic floor muscle functional exercise made a deep impression in the memory of the patients motivating them to continue exercising for a long time. Abdominal breathing can regulate gastrointestinal peristalsis and intra-abdominal pressure, and the up- and down-training of the muscle can also effectively drive the operation of the levator ani muscle [24]. Kegel exercise can improve the muscle contraction ability of the levator ani muscle and promote the recovery of its innervated nerve function [25]. Fork leg anal levator exercises can further strengthen the intensity of anal levator exercises with the help of hip muscles and thigh strength, inducing effective training of the levator ANI muscle, improving the patient's ability to control stool, and reducing the frequency of defecation [16]. Through perineal four-dimensional pelvic floor ultrasound examination, Yao found that pelvic floor muscle exercise could strengthen the thickness of the levator ani muscle itself and reduce its hiatus, thereby providing strong objective evidence for pelvic floor muscle training to improve the ability of defecation control [26]. In the LARSS items, tenesmus and defecation urgency items in the experiment group II were better than those in the control group and the experiment group I on the 14th day, 1 month, and 3 months after the surgery, and with the increase of time, there were more and more differences between items, indicating that the intervention of the experiment group II was effective. With training through repeated pelvic

Table 4: Comparison of LARSS items scores among the three groups at different time points after the operation ($\overline{x} \pm s$).

Variable	Group	Number	Preoperative	On the 14th day after surgery	1 month after surgery	3 months after surgery	Time effect	Treatment effect	Interaction effect
Exhaust incontinence	The control group	31	4.87 ± 2.17	4.35 ± 2.17	3.97 ± 1.91	2.77 ± 2.22			
	Experiment group I	32	4.84 ± 2.14	4.47 ± 1.98^Δ	4.38 ± 1.93^O	2.66 ± 2.39			
	Experiment group II	31	4.77 ± 2.14	4.39 ± 1.96	3.9 ± 1.58	2.32 ± 2.01			
	F		0.107	0.026	0.63	0.384	42.158*	0.138	0.704
	P		0.983	0.974	0.535	0.707			
Loose stools incontinence	The control group	31	2.81 ± 0.75	2.61 ± 1.02^Δ	2.52 ± 1.12^OΔ	2.42 ± 1.20^◇ΔO			
	Experiment group I	32	2.81 ± 0.74	2.53 ± 1.11^Δ	2.25 ± 1.32^O	2.16 ± 1.37^O			
	Experiment group II	31	2.81 ± 0.75	2.42 ± 1.20	1.84 ± 1.49	0.97 ± 1.43^◆◆			
	F		0.001	0.236	2.081	10.404	17.682*	3.112*	4.070*
	P		0.999	0.790	0.131	<0.000*			
Defecation frequency	The control group	31	3.61 ± 1.54	3.19 ± 1.35	2.58 ± 1.29	2.45 ± 1.43			
	Experiment group I	32	3.56 ± 1.56	3.00 ± 1.59	2.38 ± 1.56	1.88 ± 1.24			
	Experiment group II	31	3.58 ± 1.52	2.65 ± 1.31	1.55 ± 1.23^◆◆	0.97 ± 1.02^◆◆			
	F		0.009	1.187	4.944	11.268	72.448*	3.192*	3.627*
	P		0.991	0.310	0.009*	<0.000*			
Tenesmus	The control group	31	14.39 ± 2.38	13.71 ± 3.50^Δ	13.39 ± 3.51^O	12.71 ± 4.19^◇O			
	Experiment group I	32	14.28 ± 2.41	13.47 ± 3.48^Δ	12.97 ± 4.19^O	10.94 ± 6.28			
	Experiment group II	31	14.23 ± 2.43	13.19 ± 4.25	11.06 ± 6.87	8.65 ± 7.64^◆			
	F		0.036	0.146	1.850	3.349	18.160*	1.549	2.271*
	P		0.965	0.864	0.165	0.040*			
A sense of urgency to defecate	The control group	31	10.55 ± 0.85	10.48 ± 0.89^Δ	10.13 ± 2.08^OΔ	9.42 ± 3.25^◇ΔO			
	Experiment group I	32	10.56 ± 0.84	10.13 ± 1.01^Δ	9.16 ± 3.14	8.13 ± 4.07^◇			
	Experiment group II	31	10.55 ± 0.85	9.32 ± 2.68^◆	7.68 ± 4.31^◆	5.52 ± 5.14^◆			
	F		0.003	3.658	4.326	6.860	20.238*	5.740*	3.507*
	P		0.997	0.034*	0.017*	0.002*			

1: comparison between groups: ▲compared with the control group, ◆compared with the experiment group I, ◇compared with before intervention, ○compared with 14 days after the operation, and ◇compared with 1 month after the operation, all $P > 0.05$. 2: intra-group comparison: ^Δcompared with before intervention: ^△compared with 14 days after the operation, all $P < 0.05$. 3: *indicates that there were statistically significant differences between the experiment group I and experiment group II and the control group ($P < 0.05$).

floor muscle exercises, muscle strength and tension in the region are enhanced along with functioning, promoting the recovery of the sensory nerve endings on the intestinal wall, stimulating and strengthening the excitability of the cerebral cortex which controls defecation, and adding elasticity to the rectum, thereby increasing the storage capacity for excrement and urine and alleviating rectum edema and fibrosis in the surrounding tissue. Thus, the symptoms of tenesmus and urgency of defecation can be improved [27], so as to improve the life comfort of patients.

4.2. Limitations and Future Challenges. This study has some limitations. First, limited research time and manpower led to the restriction of the sample to only 94 patients. Furthermore, as it was mainly a hospital intervention, and the follow-up duration was only up to 3 months after the surgery, and there was a lack of continuous nursing guidance for the patients. Moreover, the limitation of research funds, equipment, and other conditions meant that this study did not use an anorectal manometer to measure rectal contraction force and lacked objective evaluation indicators. In the future, we will expand the sample size and the intervention time, study the deficits in patients' home exercise from the perspective of quantitative research, analyze the causes, and add objective indicators involving continuous detection of pelvic floor muscle function.

5. Conclusion

This study demonstrated that 3D animation combined with teach-back health education improved the mastery of pelvic floor muscle training and exercise in LARS patients, thereby effectively reducing their symptoms of loose stool incontinence, defecation frequency, tenesmus, and urgency of defecation.

6. Implications for Nursing Management

In this study, the combination of 3D animation and teach-back with real-time feedback advantages were applied to the pelvic floor muscle training of LARS patients, which not only promoted the early and rapid recovery of patients but also significantly improved their quality of life, and symptoms of loose stool incontinence, defecation frequency, tenesmus, and urgency of defecation. The results prove that it is worth adopting as a regular course of treatment.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval

This study was conducted after obtaining the approval of the Medical Ethics Committee of the Affiliated Hospital of Guizhou Zunyi Medical University (approval: KLLY-2020-143).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Disruptive Behavior and Factors Associated with Patient Safety Climate: A Cross-Sectional Study of Nurses' and Physicians' Perceptions

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Background. Few studies have analyzed the negative outcomes of disruptive behaviors in the nurse-physician relationship in patient care and their impact on patient safety. These multicausal studies significantly relate to organizational, institutional, and professional attitudinal risk factors. *Aim.* Analyze healthcare professionals' perceptions of disruptive behavior and factors associated with patient safety climate in the nurse-physician relationship at the hospital level. *Methods.* A multicenter cross-sectional study was conducted with a sample of 370 nurses and physicians assigned to different public hospitals in the Murcia/Spain region, applying the adapted and validated Spanish version of the Nurse-Physician Relationship Scale: Impact of Disruptive Behavior on Patient Care. The analysis used proportions or means (standard deviation (SD)), univariate and multivariate linear regression models, and the chi-square test. *Results.* Disruptive behavior was more prevalent in the ICU (81.6%) and the emergency department (67.8%). Professionals indicate that fear of reprisals is the main barrier to the reporting system. Likewise, stress and frustration are more associated with disruptive behavior and influence the safety climate. *Conclusion.* Professionals indicate that disruptive behaviors can have a negative impact on clinical outcomes. Age and type of service were identified as the most relevant socio-occupational factors. Stress, frustration, and communication problems are the factors that most influence the safety climate.

1. Introduction

The healthcare industry is considered one of the most complex sectors in the world, alongside aviation and nuclear energy. Labor relations within healthcare systems are especially noteworthy, as they contribute to an environment that is more susceptible to risks and failures. Furthermore, the likelihood of failures increases with the complexity of a system [1]. Interprofessional relationships between healthcare professionals are crucial in developing strategies to reduce disruptive behaviors and improve patient safety. Before this investigation, we conducted a systematic review to identify disruptive behaviors in nurse-physician

relationships and their impact on patient care [2]. However, we found limited international studies and none conducted within Spain's healthcare domain. This indicates a significant gap in the literature on disruptive behaviors in nurse-physician dynamics. Therefore, further research is necessary to understand healthcare personnel's perceptions of the factors contributing to disruptive behavior and areas that require improvement to prevent such behavior.

There is no consensus on the definition of disruptive behavior and safety climate. Nevertheless, this study aims to contribute to resolving this issue or advancing current knowledge. Concerning disruptive behaviors, we define them as actions that impede interpersonal communication,

strain work relationships, and hinder the sharing of crucial information among professionals, thereby directly impacting the quality of the care process [3, 4]. According to the patient safety culture [5], disruptive behaviors can lead to errors in the care process. Our study defines safety climate as how organizational factors influence the safety culture perceived by professionals and institutions [6, 7]. Specifically, patient safety culture is a strategic focal point to encourage healthcare professionals to adopt attitudes and behaviors that encourage patient safety [8]. Moreover, it fosters a nonpunitive environment in which individuals at all levels of an institution or organization (including caregivers, managers, and administrators) pledge to improve patient safety by promoting error reporting as a source of learning rather than blame [9, 10]. Cooper et al. stress the significance of fostering an organizational culture that esteems professionals, caregivers, managers, and administrators who adeptly navigate ethical conflicts impacting the quality of the care process. This culture encompasses effective communication (encompassing behavior management, staff safety status, and attitudes) and procedures (encompassing participation in decision-making, adherence to protocols, and task allocation) [11]. The perception of an unfavorable environment can lead to behaviors associated with horizontal violence, which negatively impacts patient safety [5]. On the other hand, creating a safe environment that promotes an improved safety climate can positively influence professionals' perceptions of workplace safety, leading to more favorable attitudes and behaviors toward patient safety. Research indicates a notable reduction (76%) in adverse event rates associated with such improvements [9, 12].

Many factors that cause disruptive behaviors are closely related to patient safety culture, particularly communication and teamwork. These factors significantly influence compliance with safe work practices [13] and healthcare professionals' perception of a safe environment [14]. Disruptive behaviors may be linked to low job satisfaction due to poor work relationships and co-worker communication [15]. Organizational risk factors at work [16], which include various aspects such as strategies, behavior, and attitudes adopted by healthcare centers to improve the safety environment, can influence professionals' perceptions. The attitudes and approaches of institutional managers and professional burnout can significantly affect emergency nurses' satisfaction and quality of work life.

For a long time, healthcare professionals and institutions did not openly acknowledge disruptive behaviors or measure their impact. In 2001 and 2002, the American Association of Critical Care Nurses (AACN) recognized the need to address the working relationships between nurses and management physicians. They emphasized the importance of establishing a reporting system for disruptive behaviors in healthcare facilities. They stated that such behaviors could not be ignored because they disrupt the workplace and can lead to unpleasant incidents and possible workplace accidents [17, 18]. In 2005, disruptive behaviors were observed to affect patient care and attention [19, 20]. In 2004, the Institute for Safe Medication Practices highlighted potential risks to patient safety due to the approach to medications. They stated that the disruptive behavior of some physicians inhibits nurses from asking questions or providing information about the use of drugs. This behavior is labeled "dangerous silence" and can be interpreted as abusive behavior by some physicians that prevents nurses from answering questions or seeking clarification [21]. In 2008, Rosenstein et al. [22] found that healthcare professionals identified disruptive behaviors as a cause of adverse events that disrupt the chain of patient safety. In 2012, the same author emphasized the connection between disruptive behavior and patient safety. The study revealed that nearly 33% of physicians and nurses believed that these behaviors could lead to adverse events, and, more alarmingly, 12.3% of them were associated with an increased risk of patient mortality [23].

Disruptive behaviors generate vertical workplace violence and are considered a public health problem with global repercussions, affecting the entire healthcare system in its multiple spheres and levels [24]. As part of its healthcare quality accreditation process for healthcare institutions, the Joint Commission has made it mandatory for institutions to implement policies that address disruptive behavior. These policies should be based on human capital prepared to handle the complexity of the healthcare environment. The aim is to prevent and control factors associated with disruptive behavior while ensuring patients' safety and protecting healthcare professionals' occupational health (physical, mental, and emotional) [25]. This study aims to analyze healthcare professionals' perceptions of disruptive behavior and factors associated with patient safety climate in the nurse-physician relationship at the hospital level.

2. Materials and Methods

2.1. Study Design. A multicenter cross-sectional study was conducted to assess the perceptions of healthcare professionals at the hospital level about disruptive behaviors and factors associated with the patient's safety environment. The research was conducted at the hospital level within the network of public hospitals in the Murcia region. This region encompasses nine referral hospitals, each corresponding to one of the nine Health Area Managements of the Murcian Health Service. Specifically, this study was conducted in five of the nine referral hospitals.

2.2. Participants. The sample consisted of nurses (direct care), administrative nurses (indirect care/management), physicians (direct care/management), and administrative physicians (indirect care/management) assigned to different clinical and surgical services.

The study included all physicians and nurses working in public hospitals in the Murcia region, Spain, who met the following criteria: (a) had a contractual relationship (permanent/interim) with any of the hospital services, (b) had worked for more than a year in the service/unit and job position, (c) were Spanish or naturalized citizens and belonged to different work shifts, and (d) agreed to

participate in the study. We excluded professionals with temporary contracts or on standby (holidays or temporary leave) because these contracts were subject to short periods in the same department/unit/plant and high staff turnover, which could bias the perception of the safety climate and work relationships.

The professionals were identified based on the hospital's human resources lists.

2.3. Procedure. During the study period, from January to July 20, 2022, a researcher was responsible for providing and collecting evaluation instruments. The researcher personally delivered each instrument to participants and explained the importance of their participation in the study. No personal data were included in the instrument to ensure anonymity and confidentiality. Participants were instructed to complete the scales and group them by units/services. The completed scales were collected and sealed in an envelope. In April 2022, a reminder intervention was conducted to increase the response rate.

2.4. Measurements. The instrument used was the Spanish version of the original "Survey on the nurse-physician relationship: The impact of disruptive behavior on patient care" [25]. This scale was cross-culturally adapted and validated for use at the hospital care level in Spain. [26]. In this study, the scale obtained a Relevance Index (RI) of 0.89 and a Pertinence Index (PI) of 0.94. The RI and PI values were both below 8, which was considered acceptable for each item and for the scale as a whole. Most of the items in the scale showed a moderate to almost perfect level of concordance between responses (16 items). The Intraclass Correlation Coefficient (ICC) values for these items were equal to or greater than 0.75, indicating excellent reproducibility. Additionally, all items in the scale showed a general agreement index of 100%. The scale is made up of 21 items. In the first part of the scale, the socio-occupational variables are presented: age, sex, service, and position (nurse and clinician or administrative physician). The latter was identified as nurse and clinician, which defines professionals who spend 50% or more of their working day in clinical tasks/direct patient care, and nurse and administrative/managerial physician, which represents professionals who spend 50% or more of their working day in administrative tasks/indirect management. Items 1 to 9 assess the perception of the environment, specifically the safety climate, in the relationship between nurses and physicians, addressing the presence and frequency of disruptive behaviors in different services and specialties. However, items 10 to 17 focuses on assessing the perception of the impact of disruptive behaviors on patient safety, considering various psychosocial aspects, adverse events, and dimensions such as communication and information. Items 18 to 21 focus on assessing the reporting system for disruptive behaviors and barriers that may hinder its effectiveness (Supplementary Table S1). This scale provides a comprehensive measure of the perception of disruptive behaviors in the relationship between physicians and nurses and their impact on patient care.

2.5. Data Analysis. Each item on the scale was used as a variable to assess healthcare professionals' experiences of disruptive behavior in the physician-nurse relationship and its impact on patient care. No missing data was present as we discarded incomplete questionnaires. This upheld data integrity for accurate analysis.

Proportions or means (standard deviation (SD)) were used to describe the participants' characteristics and the questionnaire's items. Univariate and multivariate linear regression models were used to analyze the perception of the environment of the physician-nurse relationship and the severity of problems caused by disruptive behavior. The chi-square test was used to compare the proportion of physicians and nurses who had witnessed disruptive behavior. We also used this test to examine the frequency with which physicians and nurses believe disruptive behavior negatively affects the team and patients. P values <0.05 were considered significant. All analyses were performed using SPSS software version 22.0 (IBM, Armonk, NY, USA).

2.6. Ethical Considerations. Approval was obtained from the Ethics Committee of the Catholic University of Murcia (Code No. CE041825) and from all participating hospitals to conduct the study. Furthermore, confidentiality and data protection are guaranteed by Organic Law 3/2018, of 5 December, on the Protection of Personal Data and the Guarantee of Digital Rights [27].

The Materials and Methods section should contain sufficient detail to repeat all procedures. It may be divided into headings if several methods are described.

3. Results

Of the 500 nursing and medical professionals from public hospitals in the Murcia region invited to participate in this study, 370 responded to the scale/instrument (74%). Most of the sample consisted of men (53%) between 20 and 29 years old (42.7%). 41.1% belonged to the emergency department. Regarding position/category, there were few differences in the frequency of participation, except for the low participation of administrative physicians (indirect assistance/management) (18.4%) in the other categories (Table 1).

The average perception of the nurse-physician relationship environment among the 370 participants was 8.05 (SD = 1.59).

Table 2 details the mean values for each variable studied and the results of the univariate and multivariate linear regression analyzes that identify the sociodemographic and occupational determinants of the environment of the nurse-physician relationship. The findings revealed a statistically significant association between the variable age range 30–49 years, both in the univariate (0.487, $p < 0.05$) and multivariate (0.566, $p < 0.05$) models, compared to the reference group (20–29 years). A significant association was also found with the administrative group (indirect care/management) of physicians in the univariate (0.975, $p < 0.05$) and multivariate (0.625, $p < 0.05$) models compared to physicians (direct care). The intensive care unit

Table 1: Characteristics of the participants.

Variables	n (%)
Sex	
Woman	174 (47.0)
Men	196 (53.0)
Age	
20–29 years	158 (42.7)
30–49 years	121 (32.7)
>50 years	91 (24.6)
Job position	
Physician (clinical)	97 (26.2)
Physician (administrative)	68 (18.4)
Nurse (clinical)	101 (27.3)
Nurse (administrative)	104 (28.1)
Unit	
Emergency department	152 (41.1)
Intensive care unit (ICU)	137 (37.0)
Surgery	81 (21.9)

(ICU) (univariate −0.453, $p < 0.05$; multivariate −0.505, $p < 0.05$) and surgery (univariate −1.090, $p < 0.001$; multivariate −1.078, $p < 0.001$) also showed significant associations compared to the emergency department. Nagelkerke's square R indicated that the independent variables used in the multivariate linear regression model explained 11.5% of the variance of the dependent variable.

According to the perception of nurses and physicians ($n = 370$), a higher prevalence of disruptive behaviors was observed in specific areas, the most affected being the intensive care unit (ICU) with 81.6% ($n = 302$), followed by the emergency department with 67.8% ($n = 251$) and general medicine with 58.6% ($n = 217$). Regarding the frequency of such behaviors according to specialty, respondents reported a higher incidence in general surgery with 83.0% ($n = 307$), followed by obstetric/gynecology with 45.9% ($n = 170$), and cardiology with 40.8% ($n = 151$). On the other hand, the specialty with the lowest frequency of disruptive behavior was anesthesia, with 13.2% ($n = 49$) of affirmative responses.

Table 3 shows that physicians (clinical) (87.6%) and administration/management nurses (81.2%) were the most frequent witnesses of disruptive behavior by a physician. When asked, have you ever witnessed disruptive behavior by a nurse at your hospital? A positive response from clinicians was observed (96.6%). Furthermore, compared to nurses, a significant difference was found and nurse clinicians (76.9%, $p < 0.001$) reporting more disruptive behavior from another nurse clinician.

In the multivariate model, the perception of the severity of disruptive behavior problems was primarily influenced by age and the care service. Table 4 shows that physicians and nurses in the age range between 30 and 49 years and those older than 50 years have a more marked perception compared to other age groups. Furthermore, the surgical service showed a significant influence on this perception in both professional categories, with coefficients of 0.911 ($p < 0.001$) for physicians and 0.674 ($p < 0.001$) for nurses.

When analyzing the impact of the results of disruptive behaviors in the nurse-physician relationship on the patient safety climate, the following factors were identified: stress and frustration (219, 59.2%), loss of concentration (207, 55.9%), reduced teamwork (161, 43.5%), reduced information sharing (214, 57.8%), reduced communication (269, 80.0%), and problems in the nurse-physician relationship (256, 69.2%). When analyzing the differences between physicians and nurses in these factors, it was found that loss of concentration, reduction in transmitted information, and problems in the nurse-physician relationship have a significant implication ($p < 0.001$) on the patient's safety environment according to nurses compared to physicians (see Table 5).

When asked about the relationship of disruptive behavior with aspects or indicators related to patient safety, the following percentages were identified: adverse events (25.4%), patient safety errors (13.0%), quality of care (20.8%), patient mortality (14.9%), nurse satisfaction (33.2%), physician satisfaction (43.2%), and patient satisfaction (39.2%). When analyzing the differences between physicians and nurses, it was found that physicians have a significantly more negative perception of quality of care ($p < 0.001$) and patient mortality ($p < 0.001$) than nurses.

Most professionals, 83.8% ($n = 310$), indicated that they were aware of a possible adverse event that could have occurred as a result of disruptive behavior. Furthermore, 29.0% ($n = 90$) stated that such events could be severe. Some 47.3% ($n = 175$) indicated that they were aware of the following adverse events that had occurred as a result of disruptive behavior: lack of information (8.6%), delays in care (28.0%), misunderstandings between staff (26.9%), and misinformation provided to relatives (36.6%).

Four questions were asked about the system to prevent and report patient safety incidents. When asked whether incidents could have been prevented, 94.9% ($n = 166$) answered yes. Regarding the conduct procedure, 99.7% ($n = 369$) indicated that a code of conduct or protocol is in place to address disruptive behavior in their hospital. Of these, 27.8% ($n = 103$) stated that a protocol was followed, while 71.9% ($n = 266$) mentioned a code of conduct. Virtually all professionals (99.7%) stated that a nonpunitive recording system was in place for those who witnessed or experienced disruptive behavior. In terms of barriers or obstacles to reporting disruptive behavior, practitioners noted fear of reprisals (82.4%), lack of confidentiality (19.7%), feeling that nothing would change (31.6%), and no response or outcome (10.0%).

4. Discussion

Overall, professionals assessed the nurse-physician relationship environment positively, though disruptive behaviors were noted in clinical practice, potentially impacting safety climate and clinical outcomes. Age and service type emerged as key variables affecting perceptions of disruptive behavior impact. Stress, communication barriers, and nurse-physician relationship issues were linked to disruptive behavior. Nurses reported more negatively affected concentration and information transmission. Due to disruptive behavior, physicians perceived lower care quality, safety, and

TABLE 2: Univariate and multivariate analysis of the perception of the environment of the nurse-physician relationship.

Variables	Mean (SD)	Univariate B coefficient (SE)	Multivariate B coefficient (SE)
Sex			
Woman	7.91 (1.56)	Reference	
Men	8.18 (1.61)	0.265 (0.166)	
Age			
20–29 years	7.84 (2.03)	Reference	
30–49 years	8.32 (1.29)	0.487 (0.191)*	0.566 (0.171)*
>50 years	8.08 (1.00)	0.241 (0.208)	
Job position			
Physician (clinical)	7.70 (1.67)	Reference	
Physician (administrative)	8.68 (1.55)	0.975 (0.248)*	0.625 (0.206)*
Nurse (clinical)	8.03 (1.49)	0.329 (0.223)	
Nurse (administrative)	8.00 (1.53)	0.299 (0.221)	
Unit			
Emergency department	8.46 (1.71)	Reference	
Intensive care unit (ICU)	8.01 (1.08)	−0.453 (0.182)*	−0.505 (0.183)*
Surgery	7.37 (1.82)	−1.090 (0.212)**	−1.078 (0.212)**

Nagelkerke R Square: 0.115. $^*p < 0.05$; $^{**}p < 0.001$.

TABLE 3: Frequency of witnessing disruptive behavior.

Job position	Have you ever witnessed disruptive behavior from a physician in your hospital?	
	Yes	No
Physician (clinical)	85 (87.6)	12 (12.4)
Physician (administrative)	53 (77.9)	15 (22.1)
p value		0.098
Nurse (administrative)	82 (81.2)	19 (18.8)
Nurse (clinical)	77 (74.0)	27 (26.0)
p value		0.220
	Have you ever witnessed disruptive behavior from a nurse in your hospital?	
Physician (clinical)	94 (96.9)	3 (3.1)
Physician (administrative)	63 (92.6)	5 (7.4)
p value		0.210
Nurse (administrative)	55 (54.5)	46 (45.5)
Nurse (clinical)	80 (76.9)	24 (23.1)
p value		<0.001

higher mortality rates. Such behaviors also diminished satisfaction among patients, physicians, and nurses. Professionals recognized patient safety incidents associated with disruptive behaviors but did not understand safety incident taxonomy. A cultural perception hindered trust in reporting systems for learning and improvement, indicating a need for cultural change as a priority in improvement strategies.

Although disruptive behaviors are not uncommon [28, 29] and should be of concern for healthcare institutions to improve patient safety and foster a working environment conducive to positive outcomes [7, 30], few studies have been published on this problem in the healthcare setting. This is the first study in Spain, to our knowledge, that explicitly addresses disruptive behaviors in the healthcare setting. The first published studies correspond to Rosenstein

et al., the authors of the instrument used in our research. In 2002, they analyzed 1,200 questionnaires on the United States West Coast [25]; in 2005, there were 244 participants [31].

In recent years, studies like ours have obtained a lower response rate than ours (74%). For example, a study in Singapore had a response rate of almost 40% (39.9%), and most of the respondents were physicians (64.2%) [32]. This contrasts with our results. In the context of Iranian healthcare care, we found two relevant studies. One of them, carried out in health centers affiliated with the University of Isfahan, involved 248 professionals, most of them nurses [33]. The other study was carried out in four emergency departments, with 45 physicians and 110 nurses responding [34]. Considering cultural and social differences, the professionals participating in our study may have a greater postpandemic awareness, leading them to participate in studies to improve the psychosocial aspects associated with the care process.

According to our 10-point maximum rating scale, our professionals reveal a moderate-high degree (with an average of 8.05 points). Being between 30 and 49 years old and working in the surgery and ICU departments are the sociodemographic and occupational factors most influencing this perception. Regarding age, these results were expected, as it is likely that, with increasing age, professionals acquire more experience and a more critical view of their working environment, identifying aspects that may go unnoticed by their younger colleagues.

Regarding the type of service, several studies have found that emergency and operating room areas are the most significant in the manifestation of disruptive behavior [22, 23, 25, 33, 35]. These two environments are high-stress environments characterized by high communication flow and remarkable concentration. Surprisingly, our findings, in agreement with those of Rosenstein and O'Daniel [35], indicate that the emergency department is not significant in

Table 4: Perception of the severity of problems caused by disruptive behavior.

Variables	Physicians	Model 1	Model 2	Nurses	Model 3	Model 4
Sex						
M	2.83 (1.77)	Reference		2.37 (1.27)	Reference	
W	2.47 (1.44)	−0.353 (0.168)*	−0.377 (0.156)*	2.13 (1.10)	−0.246 (0.124)*	
Age (years)						
20–29	3.02 (1.90)	Reference		2.28 (1.24)	Reference	
30–49	1.97 (1.26)	−1.052 (0.187)**	−1.073 (0.166)**	1.93 (1.17)	−0.359 (0.141)*	−0.343 (0.138)*
>50	2.88 (1.14)	−0.140 (0.204)		2.59 (1.02)	0.309 (0.154)*	0.433 (0.152)*
Job position						
Phys. (C)	3.22 (1.99)	Reference		2.37 (1.35)	Reference	
Phys. (A)	2.75 (1.77)	−0.466 (0.249)		2.32 (1.20)	−0.048 (0.187)	
Nurse (A)	2.35 (1.15)	−0.870 (0.224)**		2.38 (1.07)	0.005 (0.168)	
Nurse (C)	2.32 (1.33)	−0.899 (0.223)**		1.94 (1.09)	−0.429 (0.167)*	
Servicio						
ED	2.28 (0.97)	Reference		2.13 (1.01)	Reference	
ICU	2.63 (1.64)	0.345 (0.185)		2.11 (1.21)	−0.016 (0.138)	
Surgery	3.33 (2.22)	1.050 (0.216)**	0.911 (0.188)**	2.69 (1.36)	0.566 (0.161)**	0.674 (0.146)**

Data are presented as the coefficient b (standard error). Model 1: Univariate model of disruptive behavior of physicians; Model 2: Multivariate model of disruptive behavior of physicians; Model 3: Univariate model of disruptive behavior of nurses; Model 4: Multivariate model of disruptive behavior of nurses. Nagelkerke R square: Model 2 = 0.157; Model 4 = 0.098. * $p < 0.05$; ** $p < 0.001$.

Table 5: How often do you think disruptive behavior results in the following? Difference between physicians and nurses.

Impacts	Physicians	Nurses	p value
Stress and frustration			
No	77 (52.3)	72 (47.7)	0.013
Yes	86 (39.3)	133 (60.7)	
Loss of concentration			
No	89 (54.6)	74 (45.4)	<0.001
Yes	76 (36.7)	131 (63.3)	
Reduced teamwork			
No	82 (39.2)	127 (60.8)	0.018
Yes	83 (51.6)	78 (48.4)	
Reduced information transmission			
No	107 (69.0)	48 (31)	<0.001
Yes	58 (27.1)	156 (72.9)	
Reduced communication			
No	36 (48.6)	38 (51.4)	0.433
Yes	129 (43.6)	167 (56.4)	
Nurse-physician relationship problems			
No	66 (57.9)	48 (42.1)	<0.001
Yes	99 (38.7)	157 (61.3)	

overall perception; on the contrary, the intensive care unit (ICU) and the operating theatre are. The Nagelkerke R square coefficient of determination value of 11.5% highlights the importance of interpreting this result with caution and assessing the linear relationship with other socio-occupational variables in future research.

In terms of the type of department and specialty, there are different perceptions. When asked about the prevalence of disruptive behaviors by department type, the emergency department and the ICU are the most relevant in our study. However, in terms of specialty, they are more frequent in general surgery, which coincides with the study by Saghaei et al. [33]. This reflects that these services have a context characterized by high demand and a high level of technology where life and death are separated by an instant or an error in care. It is understood that these characteristics can contribute to the perception of disruptive behaviors in these environments.

Our results reveal a significant discrepancy with the existing literature on the observation of disruptive behaviors. Previous research has indicated that clinicians and nurse clinicians frequently witness such behaviors in their work environments, primarily by clinicians. However, in our study, clinicians reported seeing disruptive behavior from other physicians and nurses with greater frequency than that reported by nurses, in line with the results of Lim et al. This finding is remarkable and contradicts the prevailing conception, suggesting that direct care nurses, who work in

contexts characterized by hierarchies, manifestations of authority, and negotiation of responsibilities, especially in emergency and operating rooms, are more susceptible to abusive behaviors from physicians.

Both older physicians and nurses show a higher perception of the severity associated with disruptive behaviors, with significant negative implications in the context of the surgical service. This phenomenon suggests that these factors are relevant in the professional assessment of the seriousness of disruptive behaviors. This finding indicates that more experienced practitioners may be more willing to express their views on disruptive behaviors' possible complications and effects.

According to the perspective of professionals and according to the existing literature, the main factors linked to disruptive behaviors that impact the safety climate include stress and frustration [32–39], poor communication [32], and problems in the nurse-physician relationship [33]. However, nurses report a more negative perception of lost concentration and reduced information transmission than their medical colleagues. This insight underscores the importance of communication and information for safer care [40, 41]. Professionals recognize the relevance of all aspects of communication for continuity of care and to promote a positive working relationship between nurses and physicians [42]. Both healthcare bodies and international organizations recognize that deficiencies in patient information transmission can cause substantial safety problems [42, 43]. Effective communication is a global goal to improve patient safety [44], as reflected in Strategic Objective 6: Information, research, and risk management of the World Patient Safety Action Plan 2021–2030 [45]. According to Astier-Peña et al. [46], this goal aims to ensure a better flow of information and knowledge to promote risk management and ensure more respectful care at all levels of care.

Regarding the undesirable clinical outcomes associated with disruptive behaviors, professionals point out that these directly impact the satisfaction levels of patients and professionals themselves, according to previous research [32–34, 47]. There is also evidence of their relationship with adverse events in clinical practice. Given the consequences and impact of disruptive behaviors, these results were predictable. The degree of satisfaction is not always determined solely by the structure or level of knowledge; it can be related to a culture of attitudes and behaviors that have a negative impact on working relationships [48, 49], compromising the safety climate, weakening teamwork, and affecting job satisfaction. Furthermore, our findings highlight that physicians are the ones who most strongly perceive the relationship between disruptive behaviors and poor quality of care and patient mortality, in agreement with another research [32, 34]. However, these cause-effect results must be assessed with caution, as other factors that have not been studied or may be intrinsically or hidden in negative behaviors and attitudes can be involved, which can be detrimental to the care process.

Although unwanted events due to disruptive behavior were not unexpected, as identified in other studies [20, 22, 25, 32, 34, 41, 45], we were surprised by the high percentage observed in the investigated context. Professionals reported adverse events such as "misinformation to relatives," "delay in care," and "misunderstandings between staff." We recognize that disruptive behaviors affect the safety climate and can have severe consequences on the job, compromising the nurse-physician relationship and creating obstacles to improving the quality of care. However, when examined from the perspective of the taxonomy of safety incidents proposed by the Heinrich Pyramid, we observe that, rather than events, they constitute patient safety incidents with the potential to cause patient harm [50]. These incidents are classified as near misses, indicating the possibility of having caused harm to the patient [50], and physicians indicated that these risk circumstances for patient safety could have been avoided. Furthermore, they noted clear guidelines in their centers on addressing disruptive behaviors, through protocols or codes of conduct. We believe that this aspect is relevant and should be integrated into the healthcare management strategies of each center and institution.

In examining the question related to the reporting system for disruptive behaviors witnessed or experienced, almost all practitioners indicated that it was a nonpunitive system. However, a significant proportion of them expressed that fear of reprisals was a major concern, acting as a substantial barrier to reporting such behavior. Furthermore, they reported a perceived lack of feedback or positive response as a consequence of the report. They noted that there was no change in practice, findings that are consistent with previous research [31, 33, 34, 47]. Against this backdrop, several questions arise. Is there truly a nonpunitive system, or does fear persist among professionals to speak openly and honestly about the reporting system? Do professionals understand the inherent meaning and function of a reporting system? Have health institutions succeeded in effectively implementing a reporting system? These questions raise fundamental questions about the culture of patient safety. Despite more than two decades since the publication of the report To Err Is Human [51], it remains imperative to address these issues to drive continuous improvement in quality and safety in healthcare. The foundation of all healthcare systems is an awakening towards improving patient safety, evidenced by joint efforts and focused attention on this crucial aspect. Despite two decades since the National Quality Forum's recommendation to implement safety culture as the first of its "30 safe practices," there is still a way to go towards fully realizing this goal [52]. From our perspective, the "tip of the iceberg" represents only a visible fraction of a broader set of factors influencing or determining safe practice. We recognize that visible and invisible aspects intrinsically relate to patient safety culture. This culture, characterized by its nonpunitive nature and its focus on learning from mistakes, is a fundamental element in promoting safety and improving the quality of care [8].

This study is not without limitations. First, the sample used. Our study focused on five hospitals of the 9 Health Departments of Murcia Healthcare, Spain. This selection can restrict the interpretation of the results, as it is described as a global perception of professionals only in hospitals in

a specific region of Spain. Although it was not our main objective, it is important to note that including other professional categories could enrich the understanding of the general importance of disruptive behaviors. This aspect should be addressed in future studies. It is essential to remember that the subjects in our study represent only a sample of the total population, which also implies certain limitations regarding the generalizability of the findings.

The second aspect refers to the "Nurse Physician Relationship Survey: Impact of Disruptive Behavior on Patient Care." Although the results of the previous study of adaptation and validation [24] in Spanish were satisfactory, certain important aspects must be considered. Not many questionnaires or scales have been found that specifically address disruptive behavior in the hospital setting. Although this scale covers all the issues relevant to our research objectives, few studies are available to compare the results obtained. In the Spanish context, none have been identified to date. More research is needed to assess the perception of disruptive behaviors in the hospital setting and their impact on patient safety using this national and international instrument to establish meaningful comparisons between different countries.

Finally, another study limitation is the lack of consideration for potential confounding variables. While efforts were made to control for known factors, variables beyond the scope of this research could influence outcomes. Future studies should address these variables to provide a more comprehensive understanding of the phenomena under investigation.

5. Conclusions

Professionals have assessed that the nurse-physician relationship environment is relatively good overall. However, disruptive behaviors have been observed in clinical practice, which can have a negative impact on the safety climate and clinical outcomes.

Age and type of service were the most relevant socio-occupational variables for the perception of the impact of disruptive behavior in the nurse-physician relationship. The factors most associated with disruptive behavior and influencing the safety environment included stress and frustration, reduced communication, and problems in the nurse-physician relationship. Nurses expressed significantly more negative perceptions of losing concentration and reducing information transmission.

Regarding the impact of disruptive behaviors on the nurse-physician relationship and clinical outcomes, physicians have a more unfavorable perception of quality of care, patient safety, and even mortality rate. In addition, disruptive behaviors negatively influence patient, physician, and nurse satisfaction.

We have observed that professionals do not yet understand the taxonomy of patient safety incidents, but they have a relatively high perception of incidents associated with disruptive behaviors. In addition, a cultural perception persists that generates fear and "low credibility" with respect to the reporting system as a tool for learning and improvement. Changing culture is not an easy challenge, but it significantly impacts other countries and remains a priority in improvement strategies.

Data Availability

The data used to support the study are available from the corresponding author upon request.

Conflicts of Interest

The authors declared that there are no conflicts of interest with respect to the publication of this paper.

Acknowledgments

Supplementary Materials

Table S1: original and cross-culturally adapted and validated in a Spanish context of the instrument "Survey on the nurse-physician relationship: The impact of disruptive behavior on patient care." (*Supplementary Materials*)

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Research Article

The Effect of Ethical Leadership on Nurse Bullying, Burnout, and Turnover Intentions

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The bullying of nurses by patients, doctors, and employees is common in the healthcare industry. Nurses who are bullied are more likely to experience burnout, and nurses who experience burnout are more likely to intend to quit. However, few studies investigate how leadership can mitigate workplace incivility and nurse bullying as a way to improve nurse retention. A cross-sectional study was conducted using a sample of 216 nurses recruited from various regions across the United States from different specialties. A moderated mediation model using path analysis was used to examine the relationships between bullying, burnout, and ethical leadership in predicting intentions to stay. Bullying significantly and positively related to burnout ($\beta = 0.22$, $p = 0.02$), and burnout significantly and negatively related to intent to stay ($\beta = -0.18, p = 0.01$). Perceived ethical leadership predicted intentions to stay ($\beta = 0.62$, $p = 0.00$), and ethical leadership moderated the effect of bullying on burnout ($\beta = 0.20$, $p = 0.03$). The results of our study also suggest that nurses are less likely to quit when ethical leadership is present, and ethical leadership weakens the effect of bullying on burnout.

1. Introduction

Nurses are a key part of the healthcare system; they have the majority of direct interactions with patients, and it is estimated that by the next decade over 13 million nurses will be needed worldwide [1]. In the United States, there will be a national shortage of 63,720 full-time registered nurses for nursing roles by the year 2030 [2]. Additionally, the health systems of all 63 countries of the World Health Organization European Region have been adversely affected [3], and a shortage of more than 100,000 nurses is expected in Australia by the year 2025 [4]. This shortage is, in part, due to a variety of factors including a decline in nursing faculty, an aging population, an aging nursing workforce, burnout, staffing ratios, and verbal abuse in healthcare settings [4]. Many new nurses graduating and beginning their careers are not staying in the profession as a whole for long [5]; in

addition, fewer nurses are becoming certified [6–8]. Additional factors contributing to this shortage include workplace environment, team dynamics, leadership style, organizational commitment, and turnover [7]. As this historical shortage persists in the United States [9, 10], patient care suffers, and the remaining nurses tend to be overworked, which leads to more negative experiences for those remaining.

In recent years, events such as the introduction of the Affordable Health Care Act in the U.S. have resulted in a substantial increase in potential patients testing the capacity of healthcare providers [11]. Coupled with global health pandemics such as SARS, Ebola, and Covid-19 over the past few decades, first responders in healthcare have encountered additional strain that leads to burnout [12] and lower job engagement worldwide [13, 14]. For example, during the time of the COVID-19 pandemic, nurses in

Australia and New Zealand experienced more stress and greater workloads [15, 16]. More than half of the 351 nurses in a study conducted in Oman during the pandemic reported high levels of job burnout [13]. This resulting burnout among nurses is high [17, 18], and it is an important variable that affects employee turnover intentions [19]. Therefore, it is critically important to assess the level of burnout among nurses and identify factors that can reduce it.

Turnover can be costly for organizations monetarily [20], but turnover among nurses has even greater implications for healthcare organizations because it negatively impacts patient outcomes [21] and healthcare resources [22]. Nursing shortages lead to negative outcomes including an increase in mortality, staff violence, accidents, and injuries [8], rates of nosocomial infections, patient mortality, patient falls, pressure ulcers, prolonged average hospital stay lengths, and additional healthcare costs [23], further validating the need for solutions to ameliorate it.

Prior research has shown that some main psychological predictors of turnover include job satisfaction [24, 25], organizational commitment, and intent to stay [24, 26], value attainment, and mood [25]. Being bullied at work [27], burnout [19, 28], and leadership style [29] have also been shown to influence employees' turnover intentions. In the context of nursing, inadequate staffing is another important predictor of turnover because it leads to greater physical exhaustion by nurses managing heavy workloads [28].

Bullying is one way in which experienced nurses control new nurses to meet objectives, but verbal abuse can be traumatic for new nurses [30] and lead to outcomes that are psychologically, physically, and emotionally harmful [31]. In prior research, bullying is "considered as the most chronic issue in the health-care sector" [32]: 2, and being placed in stressful and unethical situations such as this can lead to job burnout [33]. Moreover, nurses who experience bullying at work may leave the nursing profession altogether [34–36]. Although bullying and burnout can negatively affect outcomes for nurses and their patients, scant research addresses strategies to reduce bullying incidents, especially related to nursing [37].

Some research results suggest that leadership styles of nursing managers can impact nurse behavior [29]. Unfavorable leadership styles, such as toxic leadership, are positively related to turnover intentions [29] while favorable leadership styles, such as transformational leadership, are negatively related to turnover intentions [38]. Despite the call from scholars to redirect attention to ethical leadership to improve nursing and patient outcomes [39], empirical investigations on how it can impact a culture of workplace incivility and burnout are limited. Because ethical leadership can model ethical performance [37], we propose that ethical leadership will ameliorate workplace incivility, and possess a buffering effect on burnout that stems from bullying behavior.

In this study, we examined perceived ethical leadership among nurses working for various types of healthcare provider institutions, and the consequences of bullying and burnout on intentions to stay. Our aim is to understand some understudied causes of turnover intentions in nursing.

Our study makes a significant contribution to the literature in the following ways. First, given the turnover crisis in the nursing profession [4, 8], we fill a void in the turnover intentions literature by investigating how an ethical leadership style can mitigate the effect of bullying on burnout. Furthermore, because ethical leadership is understudied in the nursing literature [32, 37], and bullying is prevalent among new nurses [40], we examine its effect on intentions to stay among nurses who experience burnout as a result of experiencing or observing bullying in the workplace. In line with prior research, we contend that bullying and burnout have negative effects on intentions to stay, and further the literature by proposing that perceptions of ethical leadership influence this relationship.

As shown in Figure 1, we hypothesize that bullying is directly related to job burnout of nurses. Further, we propose that job burnout is negatively related to intentions to stay. Also depicted by our model, we contend that leadership perceived to be ethical by nurses ameliorates the effect that bullying has on job burnout. Lastly, we propose the interaction effect between perceived ethical leadership and bullying on job burnout is indirectly related to intentions to stay resulting in a moderated mediation model.

1.1. Predictors of Turnover Intentions. Turnover intention refers to when an employee's motive is to leave a specific organization [41] and is a predictor of the actual act of turnover [42]. Job turnover among nurses has been an ongoing concern for many years [43] with the national average total hospital turnover rate being 19.5% as of 2022 [44]. In general, four types of variables have been studied extensively as predictors of turnover which include job training, job involvement, positive affectivity, and negative affectivity [45]. Positive and negative affectivity refer to dispositional states of pleasurable or unpleasurable engagement, respectively [46]. Justice, stress, and social support are variables associated with positive and negative affectivity used to research determinants of turnover [45], which include, but are not limited to, dimensions of supervisory support, role overload, role conflict, and perceptions of fairness [45]. Specific to the field of nursing, job turnover is exacerbated when nurses' have negative experiences in their work environment [47]. For example, other factors contributing to turnover include pandemic-related pressures [48], inadequate nurse staffing [49, 50], dealing with toxic leadership [29], and workplace violence [51]. In line with research on perceptions of fairness, bullying in the workplace is associated with high turnover intentions [52–54]. Viewed as a form of stress, burnout is also linked to intentions to quit and actual turnover [33]. As of recent, nurses specifically are leaving the nursing field due to emotional exhaustion brought on by high job demands, low job control, and role overload due to caring for COVID-19 patients [55], that also contributes to lower overall psychological well-being among nurses [48]. Besides dispositional effects on turnover intentions, perceptions regarding the nursing profession and the negative public image of their organization also affects nurses' job satisfaction which in
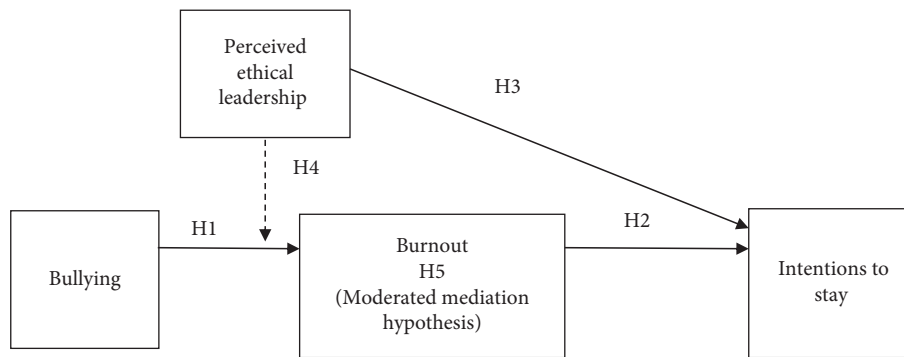
FIGURE 1: Conceptual model.

turn influences their decision to quit their job or the profession entirely [51, 56].

1.2. Nursing Context. For our study, we focus on bullying and how it leads to both burnout and nurse intentions to stay because healthcare organizations are especially susceptible to bullying behaviors [30, 57]. There is evidence to suggest this may be because nurses are taught to bully others as an organizational cultural norm [58], and that healthcare systems traditionally operate using paternalistic styles of leadership that can lead to the oppression of nurses [58], exacerbated by authoritarian management practices [59]. Bullying is the act of aggressive behavior toward an individual repeatedly over time [60] which may also violate employees' civil rights [61]. Due to both the nature of their work environments and hospital group dynamics, nurses work under unique conditions that can be tied to turnover, including the experience of both physical and psychological effects. Physical conditions experienced by nurses from doctors, patients, and co-workers include "invasion of personal space, shoving and blocking the way, threat of violence, physical abuse, or actual abuse" [57]: 140. Patients in facilities where nurses are bullied can also receive poor nursing care or experience adverse events [62, 63]. We suggest that the nurse manager can play a key role in mitigating these bullying behaviors as a way to increase nurse retention and improve patient outcomes. Specifically, we study the effect that the ethical leadership of the nurse manager has on these scenarios.

1.3. Bullying and Job Burnout. Job burnout occurs when employees experience chronic stress resulting from their job [64] and is caused by various stressors which may include a number of physical or psychological issues nurses experience in their workplaces [65]. A key dimension of burnout is exhaustion [33], which is defined in the nursing literature as a common feeling of physical and emotional overload experienced by nurses stemming from interactions with co-workers and patients [66]. A work environment where bullying occurs is a stressful environment where employees feel intimidated, abused, or insulted, resulting in a stressful work experience [32]. Workplace bullying among nurses can lead to a number of psychological and mental health

outcomes and work behaviors such as quiet quitting [67], depression, suicidal ideation, post-traumatic stress disorder, deterioration in the quality of their work life [68], job dissatisfaction [51], and burnout [69]. Physical health symptoms experienced by bullied nurses include headaches, eating disorders, onset of chronic diseases, and sleep disturbances [40].

Emotional exhaustion, a dimension of burnout [33], can be exacerbated by bullying, which could have a greater effect on intent to leave than any other factor [35]. Bullying can manifest itself in unfair treatment or any sort of verbal or physical harassment and may greatly influence whether or not nurses stay with an organization [61]. Examples of bullying include, but are not limited to, verbal attacks, intimidations, and withholding support [70] and its effect on employees shares similar characteristics to symptoms of burnout including anxiety and depression symptoms [33, 71, 72]. Further, prior research has shown that nurses experience burnout in climates where workplace bullying occurs [73]. In line with prior research, we contend that bullying is another prevalent factor that explains intentions to quit as it influences feelings of burnout.

Hypothesis 1. Bullying is positively related to burnout.

1.4. The Effect of Burnout on Intentions to Stay. Some of the global nursing shortage can be attributed to burnout, as increasingly more countries report how it has directly impacted turnover across their health systems [50]. Since nurses are likely to experience job burnout [74], the relationship between burnout and turnover must be further explored, especially since nurses have ongoing interaction with patients and their visitors, and frequent encounters with work stressors [75]. Burnout is considered a stress phenomenon, linked to lower job performance and poor health outcomes [33, 76], physical and mental health outcomes including psychological and physiological fatigue [75], impaired short-term memory and cognitive decline [77], alcohol and drug use [76], and disintegration of family and social relationships [74, 78, 79]. Under stressful circumstances associated with burnout, employees are less committed to the organization [80], become exhausted, and struggle to continue working. Some recent examples of stressful circumstances that relate to burnout and turnover

among nurses include, but are not limited to, inadequate staffing [50], anxiety, and fear stemming from caring for patients during the COVID-19 pandemic [81]. Consequently, nurses experiencing burnout seek other jobs [82] and are more inclined to quit [75]. Not only is nurse burnout related to greater turnover [51, 83], burned-out nurses may no longer communicate effectively with others, engage in behaviors of workplace incivility [83], and experience physical and mental health challenges. Burned-out nurses will also express indifference toward patients [84] which can jeopardize their safety [21].

Hypothesis 2. Burnout is negatively related to intentions to stay.

1.5. The Effect of Ethical Leadership on Employees and Organizations. The type of leadership employees receive can greatly influence performance, especially in an environment like that of nursing. Ethical leadership is an observable expression from leaders of support for behavior deemed appropriate for followers that may be enacted through relationship building [85], communication, decision-making, and reinforcement [86]. Various studies have shown that ethical leadership creates an ethical environment conducive for reducing moral distress, thereby improving job satisfaction and absenteeism [87]. However, among the few studies on ethical leadership in the nursing literature that do exist, the number of quantitative studies is lacking [88].

Leaders in an organization set the tone for employees in terms of establishing a support system, the work environment, and acceptable behaviors. In fact, one of the most powerful methods to promote ethics in healthcare and the nursing practice is to role model ethical performance on the managerial level [37]. Leaders, through displaying and modeling ethical leadership, foment an ethical environment for nurses. Working in an ethical environment is especially important in a healthcare environment; especially at the nurse level, given that they interact the most frequently with patients.

1.6. Ethical Leadership and Turnover Intentions. In environments where nurses are "faced with obstacles that force them to act against their ethical beliefs, they feel discomfort, dissatisfaction, and frustration" [89]: 5, which can increase intentions to quit. An ethical environment allows nurses to feel supported and operate in an environment that is conducive to a higher quality of patient care. Moreover, ethical leadership influences the behavior of employees through its influence on the work climate [90]. However, many nurses report that they feel unsupported by their leaders [37] and some nurse leaders admit that ethical practice should be emphasized more as a part of organizational support [39]. However, the literature regarding the role of ethical leadership in nursing has recently been sparse [37]. For these reasons, we expect ethical leadership to be immensely important in the nursing field, which can prove beneficial for healthcare systems via increased job satisfaction for nurses and better patient outcomes [39]. Medical practices may

receive outsized gains for attracting and developing ethical leaders throughout their organization due to the difficult work climate that nurses face on a day-to-day basis [91]. Furthermore, results from prior research suggest that a climate perceived as ethical helps prevent burnout [92] and strengthens organizational commitment [92–94], and job satisfaction [95–97], both predictors of turnover intentions [56]. For this reason, we expect to find that strong ethical leadership has a direct relationship with intention to stay.

Hypothesis 3. Perceived ethical leadership is positively related to intentions to stay.

1.7. The Interaction Between Perceived Ethical Leadership and Bullying. While we suggest that bullying [27] and burnout [98] will increase employees' intentions to leave an organization, we propose that the employment and development of ethical leaders in the organization can mitigate those intentions. Ethical leadership in place decreases employee anxiety about their job and increases employee behavior aligned with ethical principles [99]. Ethical leaders are both moral persons and moral managers [100]. Not only do they need to be moral individuals, but also they must apply that morality in the workplace. Brown and colleagues [86] define ethical leadership as "the demonstration of normatively appropriate behavior through personal actions and interpersonal relationships, and the promotion of such conduct to followers through two-way communication, reinforcement, and decision-making (p. 120)." Prior research has utilized social learning theory to explain how ethical leadership can mitigate negative workplace environments [101, 102]. This is welcome news for healthcare providers and nurses in particular because work environments in healthcare organizations have been shown to create a climate that leads to burnout [103].

Ethical leaders set a standard for what moral behavior is like in the workplace [104]. Employees with ethical leaders learn what is and what is not appropriate behavior in the organization through their leaders. In addition to the likelihood that bullying would decrease under ethical leaders due to an increased ethical climate [105], employees reporting to ethical leaders will be much less likely to assume bullying behavior is normal and appropriate workplace behavior. Evidence suggests that employees with ethical leaders will develop the ability and willingness to confront and address the conflict behavior [106] rather than assuming that exiting the organization is their only way out. For example, Islam and colleagues [32] found that the presence of ethical leadership positively influenced employee voice behavior and negatively affected bullying. In addition to the ethical role modeling and increased psychological safety that employees feel when working for ethical leaders, these ethical leaders have also been found to increase employees ability to deal with relationship conflict situations in the workplace by increasing employees' ability to create resolution [101]. In addition to social learning, the way that leaders design the work environment has been found to be a key mechanism for ethical leaders to decrease workplace

bullying [107]. Prior research indicates that ethical leaders influence both the work climate that an employee works in and influences the behaviors and abilities of employees directly. For these reasons, we expect ethical leadership to moderate the effect that bullying has on employee burnout.

Hypothesis 4. Perceived ethical leadership moderates the effect of bullying on burnout such that nurses will experience less burnout from bullying when ethical leadership is high compared to when it is low.

Thus far we have proposed that bullying is positively related job burnout (i.e., Hypothesis 1 above), and that this relationship is moderated by perceived ethical leadership (i.e., Hypothesis 4 above). We also proposed that perceived ethical leadership is positively related to intentions to stay (i.e., Hypothesis 3 above). As prior research suggests that job burnout predicts turnover intentions, we contend that perceived ethical leadership signals to nurses messages of support regarding bullying prevention which, in turn, improve their feelings of job burnout, and ultimately intentions to stay. Thus not only do we propose that job burnout is related to intentions to stay (i.e., Hypothesis 2 above), we also propose that a conditional indirect effect exists for bullying and perceived ethical leadership on intentions to stay through job burnout. Based on prior research regarding the mediating role of burnout [79], this type of model is a moderated-mediation model [108, 109] resulting in our final hypothesis (full model shown in Figure 1).

Hypothesis 5. Bullying is related to intentions to stay via conditional indirect effects, such that its relationship with intentions to stay is moderated by perceived ethical leadership and mediated by job burnout.

2. Materials and Methods

2.1. Participants. A total of 216 nurses from various regions across the Unites States were recruited from different specialties to participate in the current research study in exchange for modest compensation. One hundred were identified through an email listserv managed by the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN) and followed by nurses in obstetrics and women's health as their primary field. The remaining 116 were recruited using an online surveying agency (Turk-Prime's Prime Panels platform: https://www.turkprime.com/LaunchedSurvey/PrimePanels) that commissions large-scale stratified samples. By recruiting participants from a wide array of online sources, this service allows researchers to set a priori demographic quotas for sampling. The panel was set to ensure the recruitment of participants from the nursing field.

2.2. Measures. All of the scales of measurement used for the current study were adapted from those published in peer-reviewed journals and have a reliability Cronbach's alpha coefficient greater than 0.80.

2.2.1. Intentions to Stay. The dependent variable intentions to stay were measured using a four-item five-point Likert scale [110] used to measure intent to stay. For the current study $\alpha = 0.89$. Sample items include "I would like to leave my present employer" and, "I plan to stay with my present employer as long as possible."

2.2.2. Bullying. The workplace incivility/bullying culture scale [111] was adapted to measure the independent variable bullying. It includes 12 items and uses a five-point Likert scale. The scale yielded a coefficient $\alpha = 0.96$ for the current study. The survey begins with the following incomplete question to be completed by the 12 listed items to total 12 questions: "During the past year were you ever in a situation in which any of your supervisors or coworkers..." Sample items used to complete the question asked of participants include "Gave you hostile looks, stares, or sneers" and, "Made jokes at your expense."

2.2.3. Burnout. Malach-Pines' [112] short version of burnout measure was used to measure the mediating variable job burnout of participants in the current study. It includes 10 items using a seven-point Likert scale and yielded a coefficient $\alpha = 0.92$. Participants are asked an introductory question "When you think about your work overall, how often do you feel the following?" Sample items that follow the introductory question for participants to answer include "Hopeless", and "Difficulties sleeping."

2.2.4. Perceived Ethical Leadership. We measured perceptions of ethical leadership using the 10 item five-point Ethical Leadership Scale that Brown and colleagues [86] developed. For the current study $\alpha = 0.96$. Sample items include, "Conducts his/her personal life in an ethical manner," and "Sets an example of how to do things the right way in terms of ethics."

2.2.5. Controls. Age, race and organizational tenure were originally entered as control variables, and because they significantly did not have an effect on the primary variables of interest we removed them from the main statistical analysis.

2.3. Procedures. Online surveys were used to collect the data for this study. Participants replied to a link sent to their email address after having signed up to be a part of the research study either through their listserv announcement or as part of the Prime Panels platform. Upon clicking on the link, participants were redirected to an introductory web page where they provided consent before completing a battery of questions including surveys that measured the primary variables of interest in the current study dispersed among other surveys that measured various work attitudes, perceptions, beliefs, and basic demographic information.

2.4. Statistical Analysis. A moderated mediation model using path analysis in Mplus v.8 was conducted to examine proposed relationships [113] as seen in Figure 2. A moderated mediation path model is a statistical technique used to
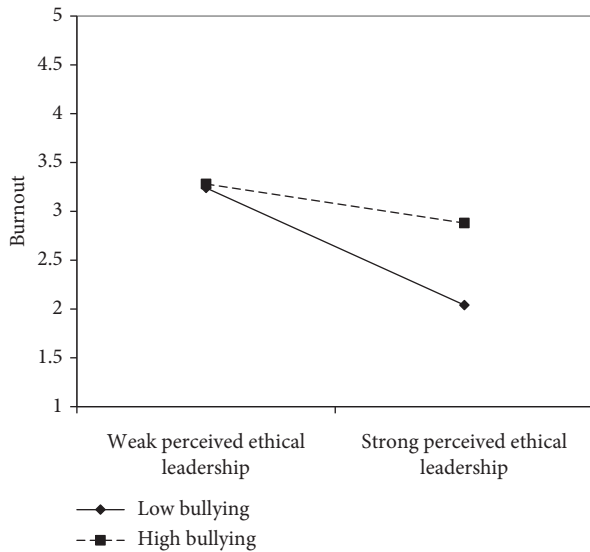
FIGURE 2: Graphed interaction effect between bullying and perceived ethical leadership on burnout.

TABLE 1: Descriptive statistics and bivariate correlations.

	Variable	Mean	SD	1	2	3
1	Bullying	1.58	0.79			
2	Burnout	3.10	1.17	0.30**		
3	Ethical leadership	0.13	1.10	−0.39**	−0.42**	
4	Intentions to stay	3.60	1.10	−0.36**	−0.46**	−0.61**

Note: $N = 184$.

Abbreviation: SD, standard deviation.

**$p < 0.01$.

Hypothesis 3 which proposed that perceived ethical leadership predicts intentions to stay was also supported with significance ($\beta = 0.62$, $p = 0.00$), and our fourth hypothesis proposing that ethical leadership moderates the effect of bullying on burnout was supported ($\beta = 0.20$, $p = 0.03$). The graph of the interaction in Figure 2 indicates the direction hypothesized with perceived ethical leadership mollifying the effect of bullying on burnout. Our fifth and final hypothesis proposed a moderated mediation model. Although there were significant paths from bullying to burnout and from burnout to intent to stay, and the interaction term was significant, the indirect effect of bullying on intentions to stay was not significant; hence Hypothesis 5 was not supported ($\beta = -0.04$, $p = 0.08$). Table 2 presents the results and coefficients for the observed variables.

examine how the relationship between two variables (independent and dependent variable) is influenced by a third variable (moderator) through a mediating variable [114, 115]. In this model, the mediator (burnout) lies between the independent and dependent variables and explains part of the effect of the independent variable on the dependent variable. The moderating variable (ethical leadership) influences the strength or direction of the relationship between the independent variable and the mediator, ultimately affecting the indirect effect on the dependent variable. The current model examined the interaction between bullying, burnout, and ethical leadership in predicting intentions to stay. The primary purpose of the model was to examine how job burnout mediated the relationship between bullying and intentions to stay. In addition, the interaction effect between bullying and perceived ethical leadership on job burnout was tested to examine the mediation effect further.

3. Results and Discussion

3.1. Results. Participants with missing data related to the variables being investigated were removed resulting in 184 valid responses ($N = 184$); a response rate of 85.2%. Respondents were 92% female with an average age of 40.2 years (SD = 11.95), and most were White (84%), followed by Black (7.4%), Hispanic/Latinx (6.8%), and American Indian (1.9%).

Table 1 shows the means, standard deviations and bivariate correlations for all study variables. It should be noted that the path model was just-identified, thus, model fit indices were not useful (i.e., RMSEA = 0.00, CFI and TLI = 1.00). Our first and second hypotheses were supported as expected indicating that bullying significantly and positively relates to burnout ($\beta = 0.22$, $p = 0.02$), and burnout significantly and negatively relates to intent to stay (i.e., intentions to quit) ($\beta = -0.18$, $p = 0.01$), respectively.

3.2. Discussion. There is an ongoing shortage of skilled nurses across many high income countries. The key components of nursing work of providing care are challenging and emotionally trying, which have an impact on the shortage and the ability of the industry to attract and retain nurses [116], and the resulting quality of patient care [28]. Prior research has established that bullying relates to burnout [23, 69, 116–118], yet there is limited research that examines solutions to mitigate this relationship, and how nurse leaders, specifically, can address this cultural phenomenon. There is limited research that investigates the effect of ethical leadership on nursing outcomes [37], and scant research in the nursing literature addresses how various styles of leadership can mitigate the effect of bullying on burnout and turnover intentions, specifically. The results of the current study contribute to the literature and to solutions for mitigating burnout and turnover among nurses in a number of ways.

The results of the current study align with prior research suggesting that bullying relates to burnout, and that burnout relates to turnover intentions [23, 118]. The results also suggest that bullying has a main effect on turnover intentions. However, we found no indirect effect for bullying on turnover intentions through burnout in the present study, compared to prior studies with nurses working in Taiwan [23] or Korea [118]. This could be due to cultural differences and how workplace culture is perceived differently by nurses in the United States compared to nurses from other countries. For example, based on Hofstede's dimension of national cultures [119], the United States ranks lower than Taiwan and Korea on the dimensions of power distance and higher on the dimension of individualism. Power distance is defined as the

TABLE 2: Summary of path analysis predicting intentions to stay.

Path	R^2	β	SE
Burnout on	0.23*		
Perceived ethical leadership		0.39***	0.09
Bullying		0.22*	0.09
Perceived ethical leadership X			
Bullying		0.20*	0.09
Intentions to stay on	0.52***		
Perceived ethical leadership		0.62***	0.06
Burnout		−0.18*	0.07

Note: $N = 184$.
Abbreviation: SE, standard error.
* $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

degree to which employees prefer a consultative or participative style of leadership (i.e., low ranking) versus an autocratic style of leadership (i.e., high ranking) [119]. Individualism refers to the degree in which a person views their connection to their society on a spectrum of either having loose ties to others and looking after one's self (i.e., high ranking), or valuing strong bonds with their community and having a great sense of loyalty to their society (i.e., low ranking) [119]. Employees in the U.S. who prefer a consultative style of leadership (i.e., low power distance) may be less apprehensive about expressing their opinions, attitudes, and beliefs with leadership compared to employees in other countries where a more autocratic style of leadership is preferred (i.e., high power distance). Also, employees in the U.S. who are more likely to hold individualistic ideals (i.e., high individualism) may be more likely to challenge the "status quo" compared to employees from countries where collectivism ideals (i.e., low individualism) are the norm. We posit that this perspective may weaken or eliminate the indirect effect that bullying has on turnover intentions. This is because their perceived ability to express concern about bullying may serve as a coping mechanism for reducing burnout, thereby weakening the relationship. More research about the relationship between bullying, burnout, and turnover intentions among nurses in the U.S., and its comparison across multiple countries may offer a more comprehensive understanding of this phenomenon.

Suggestions for mitigating the effects of bullying and burnout on turnover have been proposed in prior research [23, 118], but there is limited empirical evidence that these solutions work. Although prior research has investigated the relationship between leadership, bullying, burnout, and turnover intentions, not all leadership styles have been empirically examined as a means to mitigate the negative effects of this relationship. Laschinger and colleagues [120] conducted a study with results to suggest that authentic leadership negatively affects workplace bullying. Another study, qualitative in nature, suggested that transformational leadership attributes are important for establishing a positive hospital work environment [121]. We responded to the call for a greater examination of ethical leadership as an effective tool to manage nursing outcomes in healthcare [37, 118], and specifically the call to propose interventions to mitigate the effect of bullying on burnout [69]. Not only did the current study results suggest that ethical leadership has

a positive main effect on intentions to stay, the results also show that ethical leadership ameliorates the effect of bullying on burnout. Providing ethical leadership training and employing nurses who demonstrate ethical leadership may be a useful strategy for mitigating the effect of bullying on burnout, two important predictors of turnover.

4. Limitations and Future Research

It is important to note a few limitations of this study. The current study used self-report measures where social desirability may have affected the results of the data in addition to mono-method bias as a result of common method variance [122]. Cross-sectional designs such as the kind used for our study also poses limitations on causal inferences regarding the relationships between the observed variables. Online data collection also can pose limitations for controlling environmental factors. However, prior research has established there is equivalence between the results of online survey methods and results produced using paper-and-pencil formats [123].

Although our study yielded significant findings, qualitative studies may offer additional explanations to why ethical leadership mitigates the effect of bullying on burnout and increases intentions to stay in the nursing field. The current study used the survey method to measure participants' perception about the ethical leadership of their nurse manager, which can limit the richness of the data collected. Research questions that address how followers identify ethical leadership in healthcare settings are warranted. For example, does it matter if perceived ethical leadership communication is verbal instead of written? Are there any effects for gender based on the identity of leaders or nurse managers? Building on prior research [124], should we investigate whether any effects exist for race based on the identity of leaders or nurse managers perceived as ethical? Future researchers should address these questions to explain the effect of different circumstances under which ethical leadership influences the behavior and attitudes of nurses.

5. Conclusions

The aim of the current study was to investigate the relationships between perceived bullying, burnout, perceived ethical leadership, and turnover intentions. In line with prior research, the results suggest that nurses who get bullied are more likely to experience burnout, and nurses who experience burnout are more likely to intend to quit. Furthering this line of research, the results of our study also suggest that ethical leadership weakens the effect of bullying on burnout, and nurses are less likely to quit when ethical leadership is present [125–130].

5.1. Implications for Nursing Management Research. Our path analysis findings align with and extend previous research on workplace mental health outcomes in nursing. The significant relationship we found between bullying and burnout ($\beta = 0.22$, $p = 0.02$) supports prior studies showing that workplace incivility and bullying contribute to emotional exhaustion and burnout among nurses [73, 116]. The moderating effect of

ethical leadership on this relationship ($\beta = 0.20$, $p = 0.03$) builds on work by Laschinger et al. [130] on authentic leadership, suggesting that multiple positive leadership styles may help buffer against the negative effects of bullying.

Furthermore, our results highlighting the importance of ethical leadership in predicting intentions to stay ($\beta = 0.62$, $p = 0.00$) complement research on the nursing work environment. Studies have shown that supportive practice environments and ethical climates are associated with lower turnover intentions among nurses [96, 131]. Our findings suggest that ethical leadership may be a key factor in creating such positive work environments.

5.2. Implications for Nursing Management Practice. Developing a better understanding of ethical leadership's role in nursing has major implications for strategies to increase retention. There are instances when organizations go through periods of rough transitions when trying to improve their climate or culture. As leaders remove bully employees from their organization, ensuring there is ethical leadership in place may mitigate the degree of burnout experienced by nurses who are bullied. The first implication of our study is for healthcare administrators to recognize the importance of training nurse managers about ethical leadership principles and strategies. The study results suggest that this will help improve nurses' intentions to stay, and thereby reduce turnover in the field of nursing. Second, nurse managers who are perceived as ethical leaders have the effect of weakening the impact of workplace incivility on burnout. This should translate into better work outcomes for nurses and, in turn, improve health outcomes for patients. In line with prior recommendations for improving the nursing work environment [132], our results suggest that healthcare organizations should prioritize developing ethical leadership skills among nurse managers. This aligns with calls for creating positive practice environments to enhance nurse retention [133].

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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Research Article

Effectiveness of a Haemorrhage-Control Task Simulator for Training Nursing Students: A Quasi-Experimental before-after Study

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Aim. To assess the efficacy of a low-cost haemorrhage-control task simulator integrated in a high-fidelity simulation scenario to facilitate knowledge and practical skills acquisition, as well as self-efficacy in haemorrhage control among nursing students. *Design*. A quasiexperimental before-after design was conducted at the University of Almeria. *Methods*. A one-group preintervention, immediate postintervention, and a third assessment at three months were performed, with the Stop the Bleed Education Assessment Tool used to evaluate knowledge of haemorrhage control, as well as a 5-point Likert scale used to evaluate perceived self-efficacy. The success of controlling exsanguinating bleeding was determined by quantifying the millilitres lost during the intervention and calculating the time required to control the haemorrhaging. The data were reported using the TREND guidelines. *Results*. One hundred and three final-year nursing students participated in this study. Significant improvements ($p < 0.001$) were observed in pre- and posttest total scores on knowledge of bleeding control, self-efficacy, as well as time is taken and volume loss to control the haemorrhage. Similar results were observed between preassessment and three months postassessment with significant improvements ($p < 0.001$) in all measures. *Conclusions*. The use of a haemorrhage-control task simulator within a high-fidelity simulation scenario resulted in noteworthy improvements in nursing students' practical skills, knowledge retention, and self-efficacy. After three months, performance decreased but remained greater than pretraining levels. Thus, broadening the use of this task-training simulator would be of great value to further develop a first responder training approach with healthcare professionals and other laypersons, allowing for greater knowledge distribution and reaching a larger audience. *Implications for Nursing Management*. The findings underscore the potential efficacy of this simulator as a valuable resource for nursing educators and supervisors to train nursing students and professionals in terms of practical skills, knowledge retention, and self-efficacy in haemorrhage control, fostering a train-the-trainer cascade approach to reach a wider audience and enhance bleeding control proficiency among professionals.

1. Introduction

Haemorrhagic shock is a severe form of hypovolemic shock that occurs when significant blood loss leads to insufficient oxygen delivery at the cellular level and, if ignored, may culminate in death within minutes [1]. Indeed, only haemorrhage is the cause of death in 55.1% of patients aged 1 to 46 [2], thereby being the primary cause of intrahospital mortality within 48 hours after admission and the second highest cause of prehospital death in both military and

civilian trauma patients, accounting for 40–45% of all fatalities [3–6]. In this context, managing patients with haemorrhagic shock remains difficult and complex, with a high mortality rate [7–9]; hence, early recognition and prompt action to halt bleeding are critical, as the condition is time-dependent [4, 10].

Moreover, 34.5% of traumatic accident patients die from preventable bleeding-related causes, either in the prehospital setting or within an hour of being admitted to the hospital [11, 12]. While strengthening hospital and prehospital care seems to be essential for reducing trauma-related mortality, further bleeding control training needs to be provided to ensure such successful interventions [13–15]. The World Health Organisation and numerous consensus groups recommend first responder training programmes, for instance, as the first step in formalising emergency medical services in areas where no prehospital services have yet been created [16–18]. In this vein, one of the most effective and well-established training programmes for adequate bleeding control worldwide is the Stop the Bleed (STB) campaign, a basic short educational programme for both laypeople and healthcare professionals, that aims to provide education on wound compression, wound packing, and the use of emergency tourniquets [19]. According to certain research, even a single 2-hour STB training course could significantly increase self-confidence and competence among healthcare students instructed in bleeding control measures [20, 21].

Aside from the STB programme, there are a number of additional training programmes available that have similar objectives, which include Haemorrhage Control Course [22], Tactical Combat Casualty Care, and Advanced Trauma Life Support [23]. These programmes all share an agreed-upon aim of providing individuals with the knowledge and skills to effectively manage haemorrhage, with tourniquets standing as the primary device used to control time in exsanguinating haemorrhage in extremities [24, 25]. Although different methods can be employed for this training, simulation-based education, ranging from low-fidelity simulation (LFS) to high-fidelity simulation (HFS), has been shown as one of the most successful teaching-learning approaches for these scenarios [26–28]. In this manner, high-fidelity simulation (HFS) stands as the most popular and effective approach for incorporating realism and authenticity into the educational experience for demanding scenarios [29]. Notably, nursing students demonstrate superior outcomes in both technical and nontechnical skills when employing HFS during their emergency environment training [30]. This may not only foster self-confidence but also help in lowering anxiety levels among students [29, 31]. However, recent evidence suggests that its use in haemorrhage control training programmes such as STB appears to be currently limited and costly due to the nature of the specialist simulators and personnel skillset required [32].

Notwithstanding self-efficacy in bleeding control is paramount in successfully performing the intervention, and specialised training for first responders and healthcare professionals has shown improvement in confidence across all domains, thereby increasing the ability to manage severe active bleeding and pack a bleeding wound, and there is still

scant evidence regarding the use of cost-effective HFS for haemorrhage education. For these reasons, the aim of this study was to assess the efficacy of a low-cost haemorrhage-control task simulator, recently patented by our research team (ES-1294309_U [33]) and integrated into an HFS scenario to facilitate knowledge and practical skills acquisition, as well as self-efficacy in haemorrhage control among nursing students.

2. Material and Methods

2.1. Design and Participants. A quasiexperimental one-group before-after design was conducted at the University of Almeria from February to July 2022, following the recommendations of the Transparent Reporting of Evaluations with Nonrandomized Designs statement (TREND) guidelines [34]. The study participants were selected through purposive sampling from final-year nursing students who met the following inclusion criteria: (1) were enrolled in clinical placement 6 and 7 modules, (2) attended the bleeding control training, and (3) signed the required informed consent forms prior to participation.

2.2. Clinical Simulation. An HFS scenario was designed using a low-cost haemorrhage-control task simulator developed by our research team (ES-1294309_U) and based on the INACSL of Best Practise Standards: SM Simulation Design framework [35]. This simulator comprises a first container, means for pressurizing the infusing liquid, a venepuncture member with a flexible conduit leading to a second collecting container, and pressure control means for the user to regulate the pressure on the venepuncture member. The simulator is calibrated to measure the millilitres exsanguinated and includes a timer to record the time taken to control the haemorrhage. Specifically, the device replicates a haemorrhage in a limb within a closed circuit, using a fluid simulating blood, pressurized at a constant pressure chosen by the user-trainer, optionally through a manual or automatic sphygmomanometer. Proper and effective tourniquet placement is essential for haemorrhage control, requiring the application of the appropriate pressure.

The clinical setting was intended to simulate an exsanguinating haemorrhage scenario in which the participant was only able to control the condition using a tourniquet, without prior training (PRE). The exsanguinating haemorrhage was caused by a 6-millimetre incised wound on the anterior surface of the simulator's forearm. Table 1 summarises the required elements used to lead the simulation-based experience.

Following the collection of PRE data, the clinical simulation started with an initial 90-minute briefing in which participants were presented with the purpose of the intervention and the scenario they were facing. The nursing students received training on the proper management of exsanguinating haemorrhages using a tourniquet. This training was provided by experienced military nurses in the field and was based on the first-care provider model. After

TABLE 1: Simulation training session of bleeding control.

PRE	Simulation				POST	
	Prebriefing	HFS components	Simulated scenario	Debriefing	IPA	3M
Knowledge questionnaire (SBEAT) Self-efficacy questionnaire (5-point Likert scale) Practical skills (time, exsanguinated volume)	Military nurses provide 90-minute specialised training based on the first-care provider model	Modality (exsanguinating haemorrhage simulator) Fidelity (realism through simulation equipment, setting, and scenario)	Haemorrhage-control task simulator integrated into a traumatic multiple-incident scenario (including an exsanguinating haemorrhage) Standardised emergency equipment (including tourniquet) Practical skills (time, exsanguinated volume)	Plus-delta approach using double-barrelled questioning (problem-solving and critical thinking through informed learner self-assessment, and managing perception mismatches)	Knowledge questionnaire (SBEAT) Self-efficacy questionnaire (5-point Likert scale)	Knowledge questionnaire (SBEAT) Self-efficacy questionnaire (5-point Likert scale) Practical skills (time, exsanguinated volume)

3M: 3-month assessment; HFS: high-fidelity simulation; IPA: postassessment; PRE: preassessment; POST: postassessment; SBEAT: Bleed Education Assessment Tool.

the initial briefing, the simulation stage began, in which the students attempted to control the haemorrhage with the tourniquet (POST), applying the training received during the clinical simulation by the military. This was followed by a 30-minute debriefing stage in which critical thinking and perceptions were shared collectively. Additionally, three months (3M) later, a third assessment of each study parameter was performed to assess the short- to medium-term retention of knowledge and practical skills for bleeding control.

2.3. Instruments.

The sociodemographic data were collected using an ad hoc questionnaire created expressly for this purpose. The gender, age, and total amount of previous training in bleeding control were all questions on this questionnaire. The level of knowledge in bleeding control, success in haemorrhage control with tourniquet application, and students' training self-efficacy were measured as outcome variables pre- and postintervention.

Pre- and postintervention student knowledge was assessed using a nonvalidated modified version of the Stop the Bleed Education Assessment Tool (SBEAT) [36], a standardised assessment instrument for evaluating cognitive components of first aid for potentially life-threatening haemorrhages. The tool used incorporates 34 items into 20 survey questions. The questionnaire score ranged from 0 to 100, with a higher score indicating more knowledge in the field. In a Rasch model, the mean infit statistics were 1.00 and the outfit was 0.99, showing a reasonable level of fit [37].

Conversely, student self-efficacy was measured using a 5-point Likert scale, which was applied to 23 questions in the developed questionnaire. The responses to each of the questions were totalled up at the end of the questionnaire and shifted so that the maximum score was 100 points; a higher score on the questionnaire was interpreted as a greater perceived self-efficacy by the student. Cronbach's alpha reliability levels for this instrument were 0.99 (PRE), 0.99 (POST), and 0.98 (3M).

Lastly, the success of controlling exsanguinating bleeding was determined by quantifying the millilitres lost during the intervention and calculating the time required to control the haemorrhaging. The blood lost quantification was carried out by instructors directly observing the simulator's collection bag, which was graduated in 20-millilitre increments. When the amount of exsanguinated blood did not exceed 800 millilitres and the time did not exceed 120 seconds, the intervention was deemed successful.

2.4. Data Analysis.

All statistical analyses of the data were conducted using the IBM SPSS Statistics v.27.0 software. A significant value of $p < 0.05$ was considered for all statistical tests performed. First, a descriptive analysis was performed on sociodemographic variables. The frequencies and percentages of qualitative variables, and the mean and standard deviation of quantitative variables were calculated. The Kolmogorov–Smirnov test was used to determine the normal distribution of the data. The chi-square test was then used to analyse the differences between qualitative variables. The Student's t-test or Mann–Whitney U test, ANOVA, or Kruskal–Wallis test were used for quantitative variables, depending on whether the variables matched normality conditions or not. Depending on the distribution, Pearson's or Spearman's correlation was used to relate quantitative variables.

2.5. Ethical Considerations.

The study proposal was approved and authorised by the Ethics Committee of the Department of Nursing, Physiotherapy andMedicine at the University of Almería (EFM 99/2021) and in accordance with all of the ethical aspects of the Declaration of Helsinki. All participants were informed and signed informed consent forms prior to participating in the study, as well as had the option to withdraw at any time. Added to that, participants were advised that their participation in the clinical simulation training would have no influence on their grades.

3. Results

One hundred and three final-year nursing students participated in the study, with women accounting for 78.64% ($n = 81$) and men for 21.36% ($n = 22$). In terms of age, the mean age was 23.34 years (5.81), with a range of 21 to 56 years. Baseline characteristics are summarised in Table 2.

Table 3 and Figure 1 provide a comparison of the variables knowledge, self-efficacy, time, and volume pre- and postintervention. These phases correspond to the initial evaluation (PRE), the immediate evaluation after the intervention (POST), and the three-month (3M) late evaluation.

In terms of participant knowledge, statistically significant differences were found between the PRE and POST findings ($Z = -5.84$; $p < 0.01$), as well as at 3M when compared to the PRE phase ($Z = -4.82$; $p < 0.01$). The mean questionnaire score in the PRE phase was 70.58 (10.24), increasing to 79.51 (8.53) in the POST phase and 76.70 (8.95) at 3M (Figure 1(a)).

PRE-intervention self-efficacy was significantly different from POST self-efficacy ($Z = -8.53$; $p < 0.01$) and self-efficacy findings at 3M ($Z = -8.23$; $p < 0.01$). The mean score in the PRE phase was 45.83 (21.69), 77.50 (15.24) in the POST phase, and 68.50 (15.19) at 3M (Figure 1(b)).

The time required for controlling bleeding differed statistically between the three phases: PRE-POST ($Z = -6.65$; $p < 0.01$), PRE-3M ($Z = -5$; $p < 0.01$), and POST-3M ($Z = -2.48$; $p < 0.05$). Prior to training, the mean time (s) to stop simulated haemorrhaging was 76.38 (41.28), which was reduced to an average of 41.69 (27.13) following the intervention and 47.13 (28.88) after three months (Figure 1(c)).

The difference in the amount of exsanguination (mL) in the simulator between the PRE and POST phases was statistically significant ($Z = -6.98$; $p < 0.01$) as was the difference between the PRE and 3M ($Z = -5.23$; $p < 0.01$) and between the POST and 3M ($Z = -2.84$; $p < 0.01$). The mean loss was 573.30 (246.01) in the PRE phase, 325.15 (179.83) in the POST phase, and 387.38 (199.10) at 3M (Figure 1(d)).

TABLE 2: Baseline demographic characteristics of participants.

Variable	N/M	%/SD
Gender		
Male	22	21.36
Female	81	78.64
Age (years)	23.34	5.83
Knowledge (0–100)	70.58	10.24
Self-efficacy (0–100)	45.83	21.69
Time (s)	76.38	41.28
Volume (mL)	573.30	246.10

TABLE 3: Comparison of the variables knowledge, self-efficacy, time, and volume pre- and postintervention.

Variable	PRE (M (SD))	POST (M (SD))	3M (M (SD))	PRE-POST sig. (Z)	PRE-3M sig. (Z)	POST-3M sig. (Z)
Knowledge (%)	70.58 (10.24)	79.51 (8.53)	76.70 (8.95)	0.000 (−5.84)	0.000 (−4.82)	0.011 (−2.55)
Self-efficacy (%)	45.83 (21.69)	77.37 (15.36)	68.50 (15.19)	0.000 (−8.53)	0.000 (−8.23)	0.000 (−5.92)
Time (s)	76.38 (41.28)	41.69 (27.13)	47.12 (28.88)	0.000 (−6.65)	0.000 (−5.00)	0.013 (−2.48)
Volume (mL)	573.30 (246.10)	325.15 (179.83)	387.38 (199.10)	0.000 (−6.98)	0.000 (−5.23)	0.005 (−2.84)

3M: 3-month assessment; PRE: preassessment; POST: postassessment.
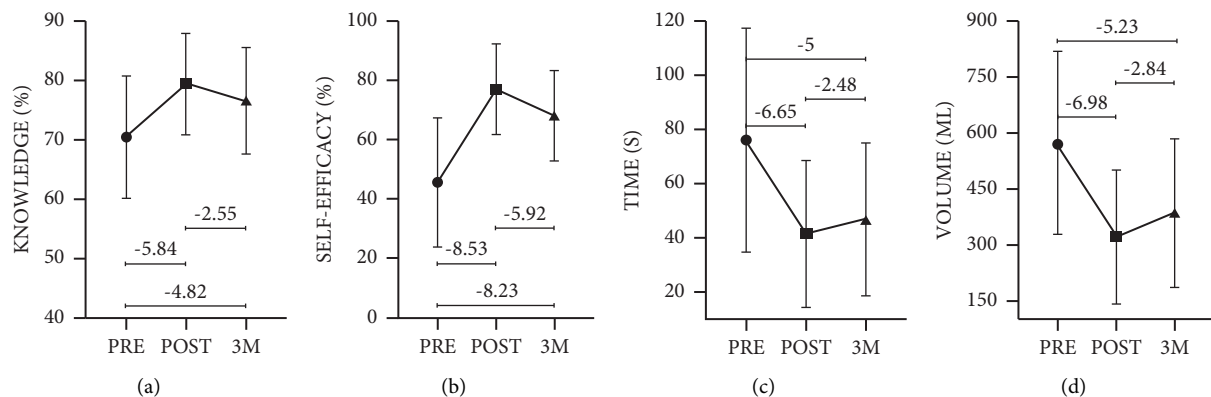
FIGURE 1: Comparison of the variables knowledge, self-efficacy, time, and volume pre- and postintervention.

4. Discussion

The aim of our study was to assess the efficacy of a low-cost haemorrhage-control task simulator integrated into an HFS scenario to facilitate knowledge and practical skills acquisition, as well as self-efficacy in haemorrhage control among nursing students. While there have been a few studies in this field to date, the current study emphasises training utilising a low-cost simulator to improve clinical skills and knowledge retention in the nursing student training process, which is created from generally available materials, requiring a minimal economic investment.

According to the findings of our study, final-year nursing students had a very poor success rate in haemorrhage management. At baseline, only half of the study participants demonstrated effective control prior to the intervention using a tourniquet. Likewise, the time required and the number of millilitres of blood lost during the pre-intervention phase were inadequate. This supports previous findings employing certified training manikins as simulators [38, 39]. They found that the success rate in haemorrhage control among healthcare students was less than 66% and less than 24%, respectively, and the mean time taken was more than 75 seconds, and the amount of blood lost was more than 500 mL. Following the educational intervention, however, significant improvements in the level of knowledge, self-efficacy, and bleeding control skills among nursing students were observed, suggesting that the intervention was effective in improving the students' abilities to manage haemorrhages using a tourniquet. The present findings seem to be consistent with other research. Goralnick et al. [40] found that laypersons can successfully apply tourniquets following a one-hour course. Their study utilised various training methods, including an audio kit with visual aids on the device (audio kit) and instructional flashcards. Similarly, Stadeli et al. [41] reported improvements in knowledge and self-efficacy after participants received theoretical exposure with English slides followed by practical interpretation

without an apparent simulator. Furthermore, Muret-Wagstaff et al. [42] observed that participants achieved a proficiency level in controlling bleeding after four sessions. Their training consisted of in-person instruction following the Peyton 4-stage model and simulation-based mastery learning with deliberate practice on certified simulators of amputated limbs [42]. While earlier research has noted the importance of educational interventions in the domain of self-efficacy in bleeding control training [43, 44], our findings have important implications for developing similar results in self-confidence and self-efficacy among nursing students utilising a low-cost simulator. In this vein and as mentioned in the literature, participants are able to attain nearly flawless competency scores and appropriately assist a bleeding victim by applying direct pressure [45], particularly when HFS or more realistic models are being used, with no major financial expenditure [46]. The study by Orlas et al. [45] was conducted through a master class followed by a practical component, employing Z-Medica's training kits, which include certified manikins. Additionally, the study by Villegas et al. [46] also employed manikins as simulators.

Regarding the limitations of the study, it should be noted that the intervention was a pre-post design with expected improvements after the training and a late assessment at three months. Nonetheless, this is the first study to incorporate a low-cost simulator with regular nursing faculty materials in an HFS scenario, which demonstrated reliability and validity in evaluating advancement in knowledge level, self-efficacy, and haemorrhage control. Although our results demonstrate reliability and validity, it is important to note that the study design has several limitations and is not adequate for establishing causality. Therefore, in future studies, it would be desirable to perform a randomised trial that measures the retention of this training for a longer period than three months and expand the sample to other populations such as medical students, other healthcare professionals, civilian populations, or laypeople. Finally, another limitation of this study to consider was the use of tourniquets solely as haemorrhage control methods; hence, it might be worthwhile paying attention to other approaches such as pressure, wound packing, and others.

5. Implications for Nursing Management

In general, it seems that educating and training healthcare professionals and students is effective in promoting self-efficacy, knowledge retention, and ensuring patient survival while controlling and managing haemorrhages [47–51]. However, both laypeople and healthcare professionals continue to lack the necessary knowledge and expertise to utilise tourniquets properly [52], and thus, our findings may help healthcare educators and supervisors to find a suitable approach to foster training among their professionals and students in effective bleeding control. As previously stated in the literature, it may be worth noting that this basic training could serve as the initial step in a train-the-trainer cascade, allowing for more knowledge distribution and reaching a broader audience [20, 53].

6. Conclusion

The effectiveness of a low-cost task simulator within an HFS scenario for haemorrhage control training in nursing students was evaluated in this study, which revealed a significant improvement in the practical skills and knowledge retention of the students who used the simulator. This was evidenced by a reduction in the time required to apply a tourniquet and the millilitres of blood lost in the simulator, whereas knowledge and perceived self-efficacy were increased. Although a decrease in the performance of the students was observed after three months, they still maintained higher results than those obtained before the training and close to those obtained immediately after the high-fidelity clinical simulator training. Overall, these findings indicate that using a low-cost task simulator within an HFS can be a valuable resource for training nursing students in haemorrhage control, with effects that are comparable to additional simulators and persist over time, though reinforcement of its application may be required in the future.

Data Availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Effectiveness of a Patient-Family Carer Partnership Intervention on Blood Pressure Control for People with Hypertension in Rural Communities: A Randomised Controlled Trial

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Objectives. To examine the effectiveness of a patient-family (carer) partnership intervention on the BP control, self-care and self-efficacy for hypertensive people, and dyadic-relationship quality, depressive and anxiety symptoms, and health-related quality of life for the family dyads (hypertensive people and family carers) in rural communities of mainland China. *Design.* A randomised controlled trial. *Methods.* A total of 110 family dyads were randomly recruited from village clinics and randomly allocated to the intervention group ($n = 55$) or control group ($n = 55$). Family dyads in the control group received usual care. In addition to the usual care, family dyads in the intervention group received the individual-based, five-session patient-family (carer) partnership intervention. The primary outcomes included SBP, DBP, and the proportion of people with normal controlled BP. EuroQol five-dimensional-five-level (EQ-5D-5L) was adopted to evaluate participants' health-related quality of life. Data were collected at the baseline (T0), one-month (T1), and three-month postintervention (T2). Generalised estimating equation model was adopted to test the study hypotheses on all study outcomes. *Results.* Compared with the control group, hypertensive people in the intervention group had a greater reduction in SBP by 10.10 mmHg and DBP by 4.66 mmHg and a larger proportion of people with normal BP at T2, as well as statistically significant improvements at T1 and T2 in dyadic relationship, self-care, antihypertensive drug-titration rate, anxiety symptoms, and health-related quality of life. The intervention also had statistically significant positive effects on family carer's dyadic relationship and health-related quality of life at T1 and T2. *Conclusion.* The patient-family (carer) partnership intervention has the potential to improve hypertensive people's BP control and family dyad's dyadic-relationship quality and mental health at short-to-medium term follow-ups. *Implications for the Profession and/or Patient Care.* This study provided evidence and direction to support healthcare providers in developing and implementing patient-family (carer) partnership intervention for hypertension care in rural areas. This trial is registered with ChiCTR1900027087.

1. Background

Cardio-cerebrovascular disease is the leading cause of death and disability-adjusted life-year worldwide [1]. Hypertension is a major risk factor for cardio-cerebrovascular disease, and it is a major challenge for chronic illness management, with high prevalence and poorly controlled blood pressure

(BP) [2]. Hypertension prevalence in rural and urban areas could be similar, but the control rates were statistically significant lower in rural areas in China and worldwide, that was, about 9.8% versus 14.5% worldwide [3] and 9.5% versus 14.0% in China [4].

The health disparities in rural areas can contribute to the lower treatment and control rates of hypertension [5]. In

rural areas, the health disparities are considerably related to the healthcare system, socioeconomic condition, geographical distance of seeking healthcare services, strength and competence of healthcare providers, and individual characteristics such as education level and physical activity pattern, as well as the differences in cultural practices and living habits [6]. One of the largest health disparities presented in China is the inequality of resources and accessibility to healthcare services between rural and urban areas [7]. The percentages of hypertensive people receiving treatment provided by physicians in the recent two weeks are 11.29% in urban areas and 6.77% in rural areas [8].

Hypertension management interventions for populations in rural areas should consider specific sets of important sociodemographic characteristics of hypertensive people, the healthcare service/system, and their living districts/areas as needed. Families serving as an important source of social support for people with hypertension in rural areas can facilitate their compliance with the recommended treatment regimen [9]. Notably, Chinese family culture and values place high emphasis on the responsibilities and obligations of family members in caring for sick family members, considering them to be moral obligations and norms of Chinese societies [10]. These cultural specificities can influence family members' and carers' responses to the needs of their patients, the self-efficacy of an ill relative, and the relationship of the family dyad in daily care [11, 12].

Establishing a positive family-dyad (patient and the family carer) partnership is essential in family-oriented care at home [13]. Family care intrinsically involves the patients and their family carers (i.e., the family dyad) in close interactions and relationships. Family-dyad partnership is the supportive and collaborative relationship in illness management. A review of systematic reviews demonstrated that involving family members in chronic illness care can benefit patients and families [14]. However, there were research results showed that family care can be stressful for the patients and family carers during the caregiving process because of criticisms [15], family conflicts [16, 17], and overcontrolling or protective behaviours [18, 19], which can negatively affect the relationship between family dyad, as well as their physical and psychological health. Most family carers especially those living in rural areas often have lower levels of education and health literacy and may not be equipped or prepared for engagement and facilitated hypertension management. Interventions directed at improving family carers' ability and confidence and family-dyad partnership in providing care for hypertensive people are needed [20, 21]. Therefore, this study aimed to test a family-dyad partnership programme on BP control for people with hypertension in rural communities of mainland China.

1.1. Intervention Development. The development of the patient-family (carer) partnership intervention (PFPI) for people with hypertension and their family carers living in the rural areas of mainland China was (1) based on the findings of a systematic review and (2) guided by a theoretical framework-shared care model (SCM).

We conducted a systematic review to evaluate the effects of different approaches to psychoeducational intervention for family dyads in hypertension care and to examine the optimal structure, format, and components of effective interventions [22]. Synthesised evidence of the 15 (RCTs and quasiexperimental) studies demonstrated a small to medium effect of family dyad-oriented psychoeducational intervention on BP control. Several main intervention components among the effective psychoeducational interventions were identified, including education for lifestyle modification and medication adherence, home BP monitoring, and group education for family carers. In addition, interventions using a mixed-teaching approach (a combination of didactic and participatory learning) can be more effective for these family dyads than other methods. Also, several research gaps have been identified. First, very few interventions were developed to improve patient-family (carer) communication and cooperation in daily hypertension care. In addition, only two of the 15 studies adopted a theoretical framework to guide the intervention. Second, none of the included studies reported the effects of psychoeducational interventions for family dyads/family carers focused on health outcomes of family carers. Third, RCTs with high-quality methodology on psychosocial intervention for hypertension care are lacking. Well-designed RCTs of family-oriented psychoeducational intervention with commonly accepted health outcomes for the Chinese hypertension population are recommended. Finally, only two studies on hypertension care were conducted in rural areas; thus, the effects of psychoeducational intervention for hypertensive patients residing in rural areas are uncertain and inconclusive. Considering the low percentage of well-controlled hypertension and health disparities (e.g., lack of healthcare providers) in rural communities such as remote districts or villages in mainland China, there is a strong need or demand for a well-prepared family carer to facilitate and support daily care, lifestyle change, and health management for their hypertensive relatives. Therefore, a family-dyad psychoeducational intervention with didactic and participatory learning strategies (e.g., family dyadic communication, decision-making, and action planning) for hypertension care in rural communities can be designed for further testing among the population of family dyads of people with hypertension.

SCM was adopted to guide the intervention used in this study. SCM provides a structure on how to involve a family carer in caring for a patient with chronic illness. Figure 1 presents the theoretical framework of the current study. In the SCM, shared care is defined as an interpersonal process used by patients and family carers (family dyad) in home care to exchange support and manage a chronic illness [23]. Shared care is a dyadic process in which each participant affects and is affected by the other(s) [24]. The SCM hypothesises and anticipates that shared care can improve the effects of providing and receiving a family member's (carer's) assistance on improving the quality of the dyad's relationship and therefore positively affects the self-care and promotes the physical and mental health of the family dyads [23, 25]. Shared care elements (communication, decision-
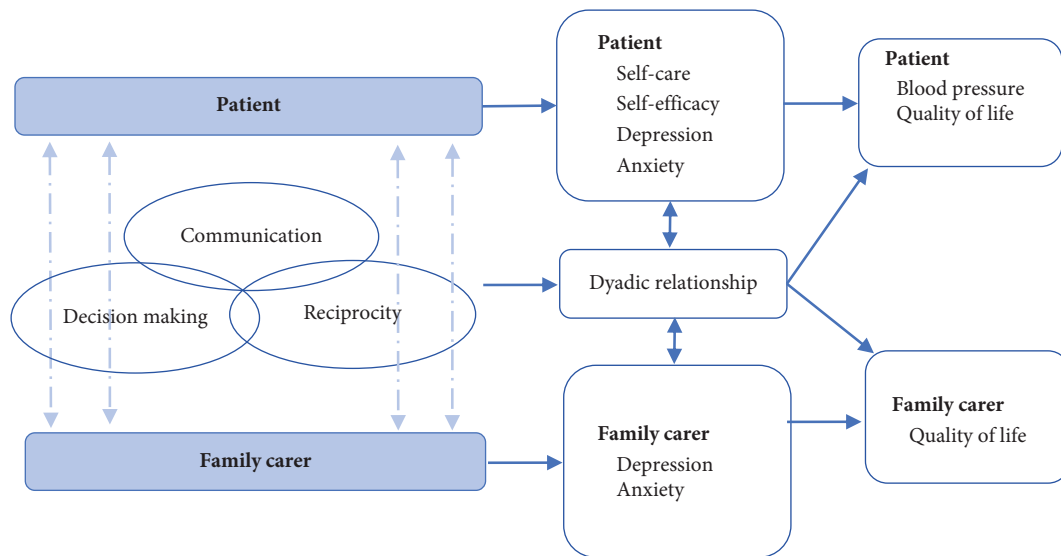
FIGURE 1: Theoretical framework of this study.

making, and reciprocity) have substantial positive associations with the self-care, depressive symptoms, dyadic-relationship quality, and health-related quality of life of patients with heart diseases and their family carers [26–28]. The elements or components of shared care also have inverse relationships with the strain and depressive symptoms of patients and their family carers (family dyads) [25]. Therefore, the SCM provided a practical and structured framework for developing the patient-family carer partnership intervention for the current study. The three main elements of shared care (communication, decision-making, and reciprocity) were used to guide intervention development.

2. Method

2.1. Study Design. This study adopted a single-blinded RCT with a parallel control (usual care) group and repeated measurements at one- and three-month postintervention. The study is reported in line with the Consolidated Standards of Reporting Trials 2010 Statement. We registered the study in the Chinese Clinical Trial Registry (registration number: ChiCTR1900027087) in October of 2019.

This study hypothesised that the participants in the intervention group would show statistically significant greater improvements at one-month and three-month postintervention, when compared with those in the control (usual care) group, on the followings:

(1) The patients' SBP and DBP levels and proportion of patients with normal controlled BP (primary outcomes), self-care, self-efficacy, antihypertensive drug-treatment rate, antihypertensive drug-titration rate, dyadic-relationship quality, depressive and anxiety symptoms, and health-related quality of life

(2) Family carers' dyadic-relationship quality, depressive and anxiety symptoms, and health-related quality of life

2.2. Participants and Setting. Hypertensive patients receiving home visits and care at two village clinics in Liuyang City, Hunan Province, China, were the potential eligible participants of this study. The eligibility of participants was identified according to the study criteria by the researcher in home visit. People with hypertension and their family carers (dyads) were randomly enrolled in this study.

These two adjacent rural villages are located in Liuyang City, which is the most populous county-level division in the easternmost part of Hunan Province of mainland China. Meanwhile, Hunan Province is located in the south-central part of China, with over 69 million population. Liuyang city (covering an area of around $5,000 \, \text{km}^2$) comprises 1.5 million residents. The villages under study are Gaoping and Longquan villages in Gaoping county, which are remote villages on the east side of Liuyang, being 20–30 km distance from Liuyang City. Each village has over 2,000 residents. Owing to the distance from the city, the village residents usually receive healthcare services provided by doctors at the village clinics. The public village clinics have only one medical staff (village doctor) in each clinic who provides primary health care to all residents there, such as home visits and medical consultations for people with hypertension, diabetes, and other chronic illnesses in the village(s).

Random sampling was used to recruit the eligible participants. The researcher reviewed the hypertensive people's medical records in the two village clinics under study and created a list of potential participants in alphabetical order of their family names after screening. The people on the list were randomly selected using a random number table and approached by the researcher during home visits to confirm the study eligibility and ask for consent for participation. The block randomisation with a block size of four or six and sealed opaque envelopes labelled with group (number) were adopted to ensure the randomisation and allocation concealment, respectively. An independent research assistant prepared the randomisation schedule and sealed opaque

envelopes. The randomisation sequence was generated from an online randomisation programme (https://www.sealedenvelope.com). After baseline measurement, participants opened the sealed envelope and were allocated to either the intervention or the control group, which was concealed from the outcome assessors, as well as the clinic staff. The inclusion criteria for people with hypertension were as follows:

(1) Those aged 18 years or above.

(2) Having essential hypertension without adequate BP control (SBP ≥140 mmHg and/or DBP ≥90 mmHg). Essential hypertension was confirmed by examining the patient's medical records in the village clinics. When "essential" was not clearly marked, the village doctor would check against the patient' medical information in the clinic for interpretation and confirmation.

(3) Living with one or more family members.

(4) Speaking Mandarin or local dialect.

People were excluded if they were as follows:

(1) Diagnosed with a terminal illness (e.g., cancer, end-stage renal disease, and severe heart failure)

(2) Diagnosed with a mental disorder, including dementia, schizophrenia, etc.

(3) Diagnosed with stroke or COPD

(4) Having physical disability, which was defined as needing assistance with or inability in any of the six activities of daily living (e.g., toilet, feeding, dressing, grooming, physical ambulation, or bathing) in the Physical Self-maintenance Scale [29]

(5) Living alone

(6) Participating or having participated recently in a structured hypertension management programme in the last six months

A family carer is a member of a family with a kinship, marital, or coresidence relationship involved in a patient's daily health care [30]. Each person nominated one family carer for participation by asking two questions in the sociodemographic datasheet: (1) "Do you have family member(s) who get involved with your health care in helping with medications, blood pressure monitoring, clinic visits, smoking cessation, alcohol control, weight loss, healthy diet, sodium restriction, or physical activity?"; and (2) "How long do you two spend together every day on average"? The family member who provided more assistance and stayed longer time was selected as the family carer to be enrolled in this study.

The family carers were included if they were as follows:

(1) Aged 18 years or above

(2) Blood, by-marriage, or coresidence relatives of the patient

(3) Contactable by phone or WeChat

Conversely, the carers were excluded if they were as follows:

(1) Having a severe mental disorder such as dementia, schizophrenia, acute or severe depression/anxiety disorders, and/or learning disorder

(2) Taking care of two or more patients in the family

(3) Diagnosed with hypertension

2.3. Sample Size. The sample size was estimated with reference to the effect sizes on the primary outcomes (change in SBP, DBP, and proportion of normal controlled BP) in similar studies. In our previous systematic review [22], the Cohen's effect size (d) of family dyad-oriented psycho-educational intervention for hypertensive people on changes in SBP and DBP was 0.59 and 0.57, respectively, at short-term (immediately to three months) postintervention. From the results, the sample size could be 94 and 100, respectively, with a two-group comparison test such as t-test (two-tailed) with 80% power at the statistically significant level of 5%, by using G∗Power [31]. Moreover, the results of our previous systematic review reported attrition rates between 0% and 19.77%, and most studies had an attrition rate below 10% (13 out of the 15 included studies) [22]. Furthermore, the pilot study of this RCT indicated an attrition rate of 4.55% [32]. Therefore, an attrition rate of 10% was used, and the final sample size was 110 family dyads (i.e., 55 for each group).

2.4. Intervention Group. The people with hypertension and their family carers received the patient-family (carer) partnership intervention (PFPI), which were five individual-based, biweekly face-to-face training sessions. We conducted a pilot study to test the feasibility, acceptability, and preliminary effect of the patient-family (carer) partnership intervention for people with hypertension in a Chinese rural community. The findings of this pilot study indicated that the PFPI was a feasible and acceptable programme, as reflected by its high recruitment and intervention and study-completion rates, as well as positive feedback and perceived benefits from the participants. The results of the pilot study and the structure, content, format, and components of the PFPI have been published somewhere [32]. Improvements in the intervention in current RCT were made based on the findings of pilot study. Table 1 outlines the protocol of the PFPI.

In this study, the PFPI was delivered by the first author, who is a registered nurse and has research experience in chronic disease management (e.g., cardiovascular disease, stroke, and diabetes) in rural communities. Moreover, the researcher could speak the local language of the participants and was familiar with their local culture. This familiarity could facilitate the researcher-participant communication in the delivery of the intervention and in sample recruitment.

2.5. Control Group. Participants in the control and intervention groups received usual care delivered by a village doctor during home visits every three months following government regulations: the village doctor monitored BP, provided advice on hypertension self-care, and responded to people's questions about hypertension management during

TABLE 1: Protocol of the patient-family carer partnership intervention (PFPI).

Session no. and name	Week no.	Time (min)	Main contents
Session 1 information giving	Week 1	30	(i) Measure BP (ii) Inform dyad about the pharmacological therapy (iii) Inform dyad about criteria of healthy behaviours regarding hypertension management (iv) Guide the dyad to identify the patient's problem behaviours *Tool*: Hypertension management booklet (see supplementary file 2)
Session 2 communication skills training	Week 3	30	(i) Measure BP (ii) Dyad reports the progress of behaviour modification (iii) Discuss with the family carer about issues in caring for and living with a family member with hypertension and his/her role as a family carer in hypertension management (iv) Communication skills training (1) Encourage the patient to share his/her symptoms and feelings (2) Use didactic teaching and role-playing with case scenario to train dyad's communication skills in behaviour change, including listening fully and actively, reducing controlling, criticizing, or guilt provoking language, providing the rationale for self-management behaviours, expressing empathy and concern, enhancing choice, and expressing appreciation (v) Encourage the family carer (using the learned communication skills) to help patient implement behaviour change in daily life *Tool*: Case scenarios
Session 3 decision-making techniques training	Week 5	30	(i) Measure BP (ii) Dyad reports the progress of behaviour modification (iii) Assess dyad's implementation of learned communication techniques in daily hypertension care and session (1) Ask the family carer to provide examples of using the learned communication techniques in hypertension care (2) Observe the dyad's communication in session to confirm their communication issues (3) Discuss the issues of using communication techniques in hypertension care in the recent two weeks (4) Further training of communication techniques is provided with additional case scenarios and by further discussion (5) The identified communication issues are recorded in the "checklist of partnership skills implementation in sessions and daily life" (iv) Decision-making techniques training (1) Identify problem behaviours and set goals (2) Discuss the influence of behaviour change (3) Discuss the difficulties of behaviour change and identify the coping strategy (4) Discuss ways to seek information and help when needed (5) Identify an action plan. The dyad is guided by an "action plan for behaviour change worksheet" to develop the plan for actions (v) Encourage the dyad to implement the decision-making techniques and the action plan in daily life *Tools*: An action plan for behaviour change worksheet; checklist of partnership skills implementation in sessions and daily life

Table 1: Continued.

Session no. and name	Week no.	Time (min)	Main contents
Session 4 reciprocity techniques training	Week 7	30	(i) Measure BP (ii) Dyad reports the progress of behaviour modification (iii) Reciprocity techniques training (1) Discuss the existing and potential assistance provided by the family carer and received by the patient in behaviour change (2) Discuss issues of giving and receiving assistance and explore the strategies (3) Express gratitude. Dyad is asked to present his/her obtained achievements and to express their congratulations and gratitude to each other for their achievements (iv) Assess dyad's implementation of learned decision-making techniques in hypertension care (v) Encourage dyad to implement reciprocity techniques in hypertension care *Tools*: An action plan for behaviour change worksheet; checklist of partnership skills implementation in sessions and daily life
Session 5 review	Week 9-10	30	(i) Measure BP (ii) Dyad reports the progress of behaviour modification (iii) Assess the implementation of learned reciprocity techniques in daily life (iv) Review (1) Review the contents of the last four sessions (2) Review the issues of building a positive partnership that arose in previous sessions *Tools*: Hypertension management booklet; an action plan for behaviour change worksheet; checklist of partnership skills implementation in sessions and daily life

home visits. The BP values collected were uploaded to the hypertension follow-up system managed by the Health Bureau of Liuyang City. The village doctors did not prescribe antihypertensive drugs during home follow-up. Patients who needed prescriptions were referred to visit the village clinic or other regional clinics/hospitals for medical care.

2.6. Instruments

2.6.1. Demographic Data Form. The demographic data form was developed and used to collect the sociodemographic and clinical characteristics of people with hypertension and their family carers. The sociodemographic and clinical information of people with hypertension included age, gender, marital status, employment status, education level, body mass index (BMI), smoking status, alcohol status, physical exercise, medical insurance, annual family income, family structure/unit, duration of hypertension, and comorbidities. The family carers' age, gender, marital status, employment status, education level, BMI, smoking status, alcohol status, medical diseases, and the relationship with patient were also collected.

2.6.2. Measure for Outcomes Variables

(1) BP Measurement. The method and procedure for measuring BP followed the Chinese hypertension management guideline [33]. Before starting to measure BP, the patients sat quietly in a chair, feet on the floor, and back supported, for at least 5 minutes; exercise and smoking were avoided for at least 30 minutes before measurement; the bladder was emptied; and the patient's arm was supported (resting on a desk). The middle of the cuff was placed on the patient's upper arm in the same horizontal position as the right atrium which is at the midpoint of the sternum. The correct cuff size adhering to Whelton et al. [34] recommendation was used. An electronic upper-arm sphygmomanometer (OMRON HEM-752) with a validated measurement protocol and the results have been published in a peer-reviewed journal was used to measure BP [35]. BP was measured in both arms, and the arm with a higher BP reading was used for all subsequent BP measurements. BP measurement was repeated at an interval of 1 min, and the mean value of two readings was recorded. If the difference between two readings of SBP or DBP was more than 5 mmHg, it was measured again, and the average value of three readings was recorded [33].

(2) Proportion of People with Normal BP. The number of hypertensive people with normal BP at each assessment divided by the total number of hypertensive people enrolled in the group resulted in the proportion of people with well-controlled or normal BP at that time of measurement. According to the Chinese hypertension management guideline [33], the normal BP level of Chinese adults was below 140/90 mmHg (i.e., both SBP and DBP should achieve this norm-based standard); for patients aged 65 years or above, a normal BP should be less than 150/90 mmHg; and for patients with diabetes, it should be less than 130/80 mmHg. The determination of normal BP control was based on the current BP reading taken by the researcher/data collector in T0, T1, and T2.

(3) Antihypertensive Drug-Treatment Rate. The assessor asked participants a single question (e.g., "Have you taken any antihypertensive drugs prescribed by your doctor in the past two weeks?") to collect data about the antihypertensive drug usage in the past two weeks. The antihypertensive drug-treatment rate refers to the percentage of total number of patients took antihypertensive drugs (in the past two weeks) among the hypertensive patients who participated in this study.

(4) Antihypertensive Drug-Titration Rate. The assessor asked participants the question "Have your antihypertensive drugs prescription been adjusted by your doctor in the past two months?" to collect data about the titration of the antihypertensive drug. The antihypertensive drug-titration rate refers to the percentage of the total number of patients who had drug titration (in the past two months) among the hypertensive patients who participated in this study.

(5) Hypertension Self-Care Profile (HBP SCP). Three scales are included in HBP SCP (behaviour, motivation, and self-efficacy), which can be used together or independently. In this study, the Behaviour and Self-efficacy subscales in the HBP SCP were used to measure hypertensive people's self-care behaviour and self-efficacy, respectively. Each subscale contains 20 items rated on a four-point scale; a higher score indicates a high level of self-care behaviour or self-efficacy. The Chinese version of HBP SCP revealed good psychometric properties in the Chinese hypertensive population. Cronbach's alpha coefficients of the Behaviour and Self-efficacy subscale were 0.86 and 0.93, respectively. Moderate correlations were identified between HBP SCP subscales and Treatment Adherence Questionnaire for Hypertension (TAQPH) scales ($r = 0.45, 0.61, 0.65$, all $p < 0.001$) [36].

(6) Dyadic Relationship Scale (DRS). A Chinese version of the DRS was used to measure the family dyad's partnership quality. It comprised two separate versions, namely, the Patient and the Caregiver version, to evaluate both the patients' and caregivers' perceptions towards the impacts of family care on positive and negative (dyadic strain) interactions [37]. The Patient and Caregiver versions of the DRS were rated on a four-point Likert scale, from 0 (strongly agree) to 3 (strongly disagree). A lower score of the two versions indicated better perceived dyadic relationships by patients and their family carers, respectively. The Chinese versions were tested with 132 hypertensive people and their family carers in China, with good internal consistency (Cronbach's alphas = 0.82 and 0.83 for the Patient and Caregiver version, respectively), positive correlations with the self-efficacy subscale of the Hypertension Self-Care Profile and Zarit Burden Interview schedule (Pearson's $r = 0.70$ and 0.79, respectively; both $p < 0.001$), and test-

retest reliability (ICC = 0.97 and 0.96, both $p < 0.01$) (Zeng, Yang, and Chien, 2022).

(7) Patient Health Questionnaire-9 (PHQ-9) and Generalised Anxiety Disorder Scale-7 (GAD-7). The PHQ-9 and GAD-7 are efficient tools for measuring perceived depressive and anxiety symptoms, respectively. Items in PHP-9 and GAD-7 are rated on a four-point Likert scale from 0 "never" to 3 "almost every day;" and the higher scores of both scales indicated more severe symptoms of depression and anxiety, respectively. Cronbach's alpha coefficient of the Chinese version of PHQ-9 was 0.82 in Chinese rural elderly [38]. The GAD-7 has been translated into a Chinese version and validated in general hospital outpatients, with a Cronbach's alpha coefficient of 0.90 and test-retest reliability of 0.86 [39].

(8) EuroQol Five-Dimensional-Five-Level (EQ-5D-5L). EQ-5D-5L, including the descriptive system and the EQ visual analogue scale (EQ-VAS), was adopted to evaluate participants' HRQoL. Five dimensions of individual health condition (e.g., mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) were measured by the descriptive system using five items with a five-point Likert scale from 0—"No" to 5—"Extreme". The mainland China set value of EQ-5D-5L was used to convert the ratings on five dimensions into a single value, in which a higher score represented poorer HRQoL [40]. The EQ-VAS was a 20 cm vertical, visual analogue scale rating on one's overall health, with an endpoint between 0 (worst imaginable health state) and 100 (best imaginable health state). In Chinese patients with chronic illnesses, Cohen's kappa for the test-retest reliability of the self-classifier ranged from 0.41 to 1.00. Validity was demonstrated using known-group construct validity: seven of 10 priori hypotheses relating the EQ-5D dimensions to SF-36 dimensions were fulfilled [41].

2.7. Process Evaluation.

A checklist of all items of the intervention protocol to check/monitor the intervention fidelity was used by the researcher during each session to monitor the intervention implementation (see supplementary file 1). The family dyads' adherence to the partnership techniques in daily hypertension care is difficult to assess. In this study, strategies, such as behaviour observation during sessions and reporting and the feedback sought from the participants (dyads), were used to assess the family dyad's adherence to the learned partnership and related techniques in daily hypertension care. For example, the researcher asked the family dyad to provide examples of the communication, decision-making, and reciprocity used in hypertension care [28] and observed the dyad' s communication styles and patterns during the training sessions. The identified partnership issues were recorded in the "checklist of partnership skills implementation during training sessions and daily life." Each identified partnership issue was listed and marked as "implemented" or "non-implemented/inappropriately implemented" by the researcher. Further training was implemented in the next or subsequent sessions to address the "non-implemented/inappropriately implemented" skills.

2.8. Data Collection.

The researcher reviewed a total of 702 patients' medical records in two village clinics (387 and 315 records per clinic) under study at Liuyang City, Hunan Province, China, between July and August 2020 and created a list of 530 potential participants in alphabetical order of their family names. There were 180 (33.96%) patients on the list, who were randomly selected and approached during home visits to confirm the study eligibility and ask for consent for participation. After visiting 137 patients, 110 eligible family dyads (patients and their family carers) agreed to participate in the study. The 110 dyads were randomly assigned to either the intervention or control group in equal total numbers in each group, that is, with 55 dyads per group. The recruitment was conducted by the researcher.

Written informed consent was obtained from the participants who agreed to participate in this study. Then, the researcher collected the baseline data (T0). For the participants who could not read and understand the items/contents in instruments, the researcher/assessors read and explained the items and recorded participants' responses to each item.

The researcher delivered the ten-week PFPI from August to October 2020. Postintervention data collection was conducted through home visits at 1-month (T1, November 2020) and 3-month (T2, January 2021) postintervention by a retired village doctor who was blinded to the group allocation. The retired village doctor was trained (in the village clinic) by the researcher to develop skills in data collection. Five hypertensive people were invited to participate in the training session. Peer assessments were performed on these five people with hypertension to ensure BP measurement consistency between the researcher and the assessor. An explanation of the instruments was provided during the assessor training. Considering some of the participants in the rural communities were illiterate, the accessor practiced reading and interpreting each item in the instruments to the participants. The practices for data collection were conducted in the training session until the assessor was competent to collect the data independently.

2.9. Data Analysis.

IBM SPSS version 25.0 (IBM Corp. Armonk, NY, USA) was used for data analysis. Data cleaning was adopted to ensure data quality and study validity. All statistic tests involved were two-sided with the statistically significant level set at 0.05. Descriptive statistics were used to summarise the participants' demographic and clinical characteristics and outcome variables. The assessment of normality for the continuous variables was conducted using Q-Q plot, skewness, and kurtosis statistics.

Chi-square tests and independent t-tests were adopted to test the homogeneity of the sample at baseline measurement. Chi-square test or Fisher's exact test was used for categorical variables. Independent t-tests were applied for the continuous variables that followed a normal distribution.

Intention-to-treat (ITT) analysis was used for data or outcome analysis. ITT analysis method could preserve the sample size and statistical power, thereby resulting in a more accurate, unbiased estimation of the effectiveness of an

intervention [42]. The generalised estimating equation (GEE) model was adopted to analyse the group and time differences of individual outcome variables. In the current study, the data collected at three different time points within the same subject were usually auto-correlated. Therefore, the AR(1) model was selected as working matrices in GEE analyses. The GEE model can be applied when the data missing completely at random (MCAR) [43]. In this study, the results of Little's MCAR test ($\chi^2 = 108.949$, DF = 148, $p = 0.993$) supports the MCAR and GEE can be used.

In the GEE analyses, the interaction (group × time) treatment effects were included in the GEE model to examine the changes in each outcome between the intervention and control groups across the three time points. When the interaction treatment effect was statistically significant in the GEE analysis, pairwise contrast tests were used to identify any statistically significant mean score differences in each outcome measure between groups at postintervention time points (T1 and T2).

Incorporating covariates into the GEE model could minimise the bias of confounding variables and safeguard the statistical power of the intervention effects [44]. In this study, potential covariates were identified based on the results of comparisons for sociodemographic and clinical characteristics and outcome variable scores at baseline between the intervention and control groups. Variables with $p < 0.1$ were considered as potential covariates and adjusted in the GEE model [45].

2.10. Ethical Considerations.

This study was conducted in compliance with the principles outlined in the Declaration of Helsinki. Approvals for this study were obtained from the University Cluster Clinical Research Ethics Committee (CREC Ref. No.: 2019.375). Access permission for this study from the village clinic under study was also obtained. Participant recruitment was followed the voluntary principle. Each potential participant (hypertensive people and their family carers) received a detailed introduction about the study. Informed written consent was obtained from all individual participants before collecting any data. All participants had the right to refuse to participate or withdraw from the study without any influence on usual care services provided by clinical doctors. All data collected were anonymous, kept confidential, and used for research purposes only. The participants were not in any way identifiable in the research reports.

3. Results

110 eligible family dyads (patients and their family carers) participated in the study. Within one month after the intervention (T1), one person with hypertension in the intervention group died after baseline data collection; one family dyad from the control group moved to the city to live with their son. Therefore, the two groups shared the same attrition rate of 1.82% at T1. At three months postintervention (T2), one person with hypertension died after T1 in both groups; one dyad in the intervention group and

two dyads in the control group were out of villages at the time-point of T2. Therefore, the attrition rates at T2 were 5.45% ($n = 3$) for the intervention group and 7.27% ($n = 4$) for the control group; hence, the attrition rate of the study was 6.36% ($n = 7$) at T2. Figure 2 illustrates the flowchart of participants' recruitment, group allocation, and number and reasons for withdrawals.

3.1. Demographic and Clinical Characteristics.

Table 2 presents the demographic and clinical characteristics of people with hypertension. The mean age was 67.65 years (SD = 11.53). The majority of them were female (60.91%, $n = 67$), married (72.73%, $n = 80$), and farmers (93.36%, $n = 106$). 30.00% of the people with hypertension were illiterates ($n = 33$). The mean BMI was 23.52 kg/m^2 (SD = 3.61). About 15% ($n = 17$) and 35% ($n = 39$) were currently drinking and smoking, respectively. More than half of the people with hypertension (54.55%, $n = 60$) took part in farm work. Their average duration of hypertension was 6.25 years (SD = 3.64). About two-thirds of people with hypertension had at least one comorbidity (60.91%, $n = 67$), from whom one-third of them were diagnosed with diabetes (29.09%, $n = 32$). No statistically significant differences were observed in the demographic and clinical characteristics of people with hypertension between the two groups (p values ranged from 0.06 to 1.00).

The demographic characteristics of family carers are summarised in Table 3. About two-thirds of the family carers were spouses of people with hypertension (67.27%, $n = 74$). The average age of family carers was 59.51 years (SD = 9.53), and nearly two-thirds of them (61.82%, $n = 68$) were male. The majority of them completed at least primary school education (66.36%, $n = 73$) and farmers (89.09%, $n = 98$). Their average BMI was 24.91 kg/m^2 (SD = 2.78). About half of them (49.09%, $n = 54$) had one or more medical illnesses. Neither the Chi-square tests nor t-tests identified statistically significant differences in the demographic and clinical characteristics of family carers between the two groups.

3.2. Outcome Variables at Baseline.

The mean scores or frequencies/percentages of the outcome variables are summarised in Table 4. At baseline (T0), the mean SBP values for both study groups were above the normal level of SBP (90–140 mmHg), and the mean DBP values were normal (60–90 mmHg). People with hypertension in the two groups had similar mean score of DRS-C-PT, 12.60 (SD = 3.45) for the intervention group and 12.22 (SD = 3.90) for the control group. The results of independent t-tests showed no statistically significant differences between groups in the outcome variables of people with hypertension, including SBP, DBP, dyadic-relationship quality, self-care, self-efficacy, depressive symptoms, anxiety symptoms, and health-related quality of life at T0, with p values ranging from 0.29 to 0.89; the Chi-square tests did not identify any statistically significant differences in antihypertensive drug-treatment rate ($p = 0.70$) and the rate of hypertensive drugs titration ($p = 0.54$) at T0.
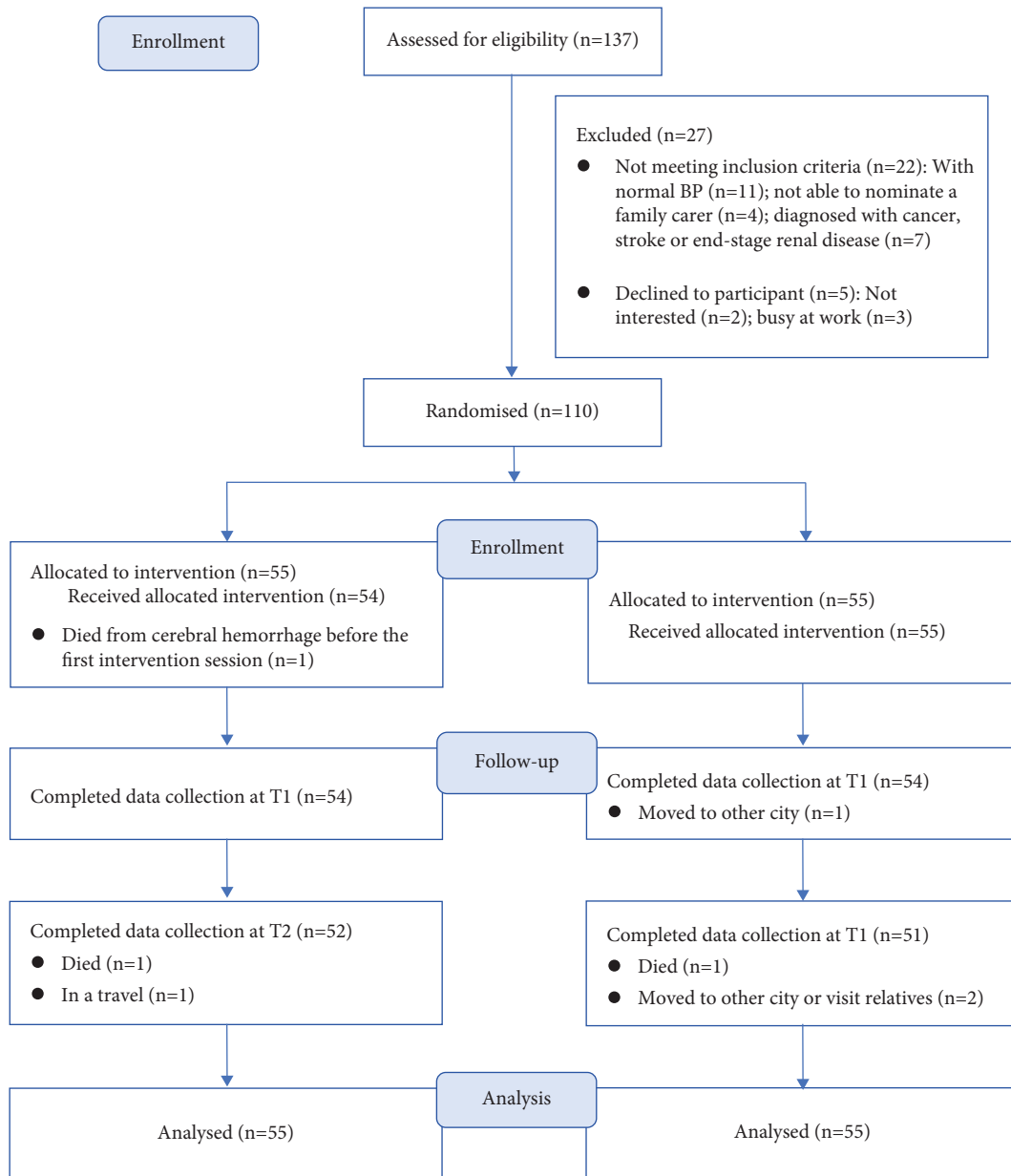
FIGURE 2: The flowchart of participant recruitment and allocation.

TABLE 2: Baseline characteristics of people with hypertension in the intervention and control groups ($n = 110$).

Characteristics	Intervention group ($n = 55$)	Control group ($n = 55$)	χ^2/t	p
Gender			$\chi^2 = 0.34$	0.56
Male	23 (41.82)	20 (36.36)		
Female	32 (58.18)	35 (63.64)		
Age (year)	67.24 ± 12.33	68.05 ± 10.75	$t = 0.37$	0.71
Marital status			$\chi^2 = 0.73$	0.39
Married	37 (67.27)	42 (76.36)		
Single/Divorced/Widowed	17 (32.73)	13 (23.64)		
Job nature				1.00[†]
Farmer	53 (96.36)	53 (96.36)		
Others (e.g., businessman or factory worker)	2 (3.64)	2 (3.64)		
Educational level			$\chi^2 = 1.09$	0.58
Illiteracy	17 (30.91)	16 (29.09)		
Primary school	31 (56.36)	35 (63.64)		
Secondary or above	7 (12.73)	4 (7.27)		

TABLE 2: Continued.

Characteristics	Intervention group ($n = 55$)	Control group ($n = 55$)	χ^2/t	p
Body mass index (BMI)[@]	23.43 ± 3.52	23.61 ± 3.73	$t = 0.27$	0.79
Alcohol drinking			$\chi^2 = 0.16$	0.92
Never	35 (63.64)	37 (67.27)		
Quitted (≥6 months)	11 (20)	10 (18.18)		
Currently drinking	9 (16.36)	8 (14.55)		
Smoking			$\chi^2 = 1.03$	0.60
Never	30 (54.55)	35 (63.64)		
Quitted (≥6 months)	3 (5.45)	3 (5.45)		
Currently smoking	22 (40)	17 (30.91)		
Did you do farm work at least once in the last seven days?			$\chi^2 = 0$	1.00
Yes	30 (54.55)	30 (54.55)		
No	25 (45.45)	25 (45.45)		
Did you have physical exercises at least once in the last seven days?				1.00[†]
Yes (running/jogging)	2 (3.64)	1 (1.82)		
No	53 (96.36)	54 (98.18)		
Annual family income (Yuan)[§]			$\chi^2 = 5.52$	0.06
10,000–20,000^	18 (32.73)	12 (21.82)		
20,000–50,000	25 (45.45)	37 (67.27)		
≥50,000	12 (21.82)	6 (10.91)		
Family structure			$\chi^2 = 0.15$	0.70
Nuclear family*	22 (40)	24 (43.64)		
Stem family[#]	33 (60)	31 (56.36)		
Medical insurance				
New cooperative medical scheme[&]	55 (100%)	55 (100%)		
Duration of hypertension (year)	6.58 ± 3.73	5.91 ± 3.55	$t = -0.97$	0.34
Number of comorbidities			$\chi^2 = 0.63$	0.73
0	20 (36.36)	23 (41.82)		
1	29 (52.73)	28 (51.91)		
≥2	6 (10.91)	4 (7.27)		
Diabetes mellitus			$\chi^2 = 0.71$	0.40
Yes	18 (32.73)	14 (25.45)		
No	37 (67.27)	41 (74.55)		
Have you taken antihypertensive drugs in the past two months?			$\chi^2 = 1.33$	0.25
Yes	34 (61.82)	28 (50.91)		
No	21 (38.18)	27 (49.09)		

Note. [@]BMI is calculated by dividing the weight in kilograms by the square of the height in meters (kg/m^2). [†]Tested by Fisher's exact test. [§]1 Yuan = 0.15 US dollars. ^Two patients with family incomes below 10,000 yuans were included in the "10,000–20,000 yuan" group. *Nuclear family refers to a family group consisting of a married couple with or without children. [#]Stem family refers to those families being made up of three generations, that is, a couple and a married child with children. [&]New Cooperative Medical Scheme is a voluntary and governmentally organized scheme largely financed through government subsidisation. It aims to ensure China rural residents can receive basic healthcare services.

TABLE 3: Baseline characteristics of family carers in two study groups ($n = 110$).

Characteristics	Intervention group ($n = 55$)	Control group ($n = 55$)	χ^2/t	p
Relationship with the patients			$\chi^2 = 1.02$	0.31
Spouse	34 (61.82)	39 (70.91)		
Son/son-in-law/daughter/daughter-in-law	21 (38.18)	16 (29.09)		
Gender			$\chi^2 = 0.62$	0.43
Male	32 (58.18)	36 (65.45)		
Female	23 (41.82)	19 (34.55)		
Age	59.27 ± 9.07	59.75 ± 10.05	$t = 0.26$	0.80
Marital status			$\chi^2 = 0.21$	0.65[†]
Married	53 (96.36)	52 (94.55)		
Single/Divorced	2 (3.64)	3 (5.45)		
Employment nature			$\chi^2 = 1.50$	0.22
Farmer	47 (85.45)	51 (92.73)		
Others (e.g., businessman or service workers or workers in factories)	8 (14.55)	4 (7.27)		

TABLE 3: Continued.

Characteristics	Intervention group (n = 55)	Control group (n = 55)	χ^2/t	p
Educational level			$\chi^2 = 2.33$	0.31
Illiteracy	7 (12.73)	4 (7.27)		
Primary school	38 (69.09)	35 (63.64)		
Secondary or above	10 (18.18)	16 (29.09)		
Body mass index (BMI)	24.72 ± 2.83	25.06 ± 2.75	t = 0.65	0.52
Alcohol drinking status			$\chi^2 = 0.59$	0.74
Never	27 (49.09)	23 (41.82)		
Quitted (≧6 months)	12 (21.82)	14 (25.45)		
Currently drinking	16 (29.09)	18 (32.73)		
Smoking status			$\chi^2 = 2.44$	0.26[†]
Never	23 (41.82)	20 (36.36)		
Quitted (≧6 months)	4 (7.27)	1 (1.82)		
Currently smoking	28 (50.91)	34 (61.82)		
Number of comorbidities			$\chi^2 = 0.70$	0.74[†]
0		30 (54.55)		
1-2	26 (47.27)	21 (38.18)		
>2	25 (45.45)	4 (7.27)		
Diabetes mellitus			$\chi^2 = 0.53$	0.47
Yes	4 (7.27)	12 (21.82)		
No	9 (16.36) 46 (83.64)	43 (78.18)		

Note. [†]Tested by Fisher's exact test.

TABLE 4: Outcome variables of the hypertensive patients and family carers in PFPI and control groups at T0, T1, and T2.

Outcomes (instruments)	PFPI (mean ± SD)	Control group (mean ± SD)	Effect size (Cohen's d/OR)	Comparison of groups at T0	
				t/χ^2	p
Patients:					
SBP					
T0	154.51 ± 9.43	156.6 ± 10.99		1.07	0.29
T1	144.56 ± 9.48	153.50 ± 13.38	0.77 (medium)		
T2	141.44 ± 8.90	151.18 ± 12.02	0.92 (large)		
DBP					
T0	82.27 ± 10.47	83.78 ± 12.67		0.68	0.50
T1	77.91 ± 8.68	82.39 ± 11.63	0.44 (small)		
T2	76.96 ± 8.41	81.75 ± 11.74	0.47 (small)		
People with normal BP					
T0	0	0			
T1	13 (23.64%)	9 (16.36%)	1.58		
T2	23 (41.82%)	9 (16.36%)	3.67		
Dyadic-relationship quality (DRS-C-PT)					
T0	12.60 ± 3.45	12.22 ± 3.90		−0.55	0.58
T1	10.48 ± 2.75	12.22 ± 3.89	0.52 (medium)		
T2	10.06 ± 2.73	12.16 ± 3.70	0.65 (medium)		
Self-care (HBP SCP-Behaviour)					
T0	45.87 ± 5.35	46.89 ± 5.88		0.95	0.34
T1	52.26 ± 5.84	48.04 ± 6.35	0.69 (medium)		
T2	52.06 ± 5.68	48.24 ± 5.99	0.65 (medium)		
Self-efficacy (HBP SCP-Self-efficacy)					
T0	52.84 ± 5.75	53.35 ± 6.64		0.43	0.67
T1	56.06 ± 5.85	53.94 ± 7.08	0.33 (small)		
T2	56.81 ± 6.28	54.65 ± 7.46	0.31 (small)		
Antihypertensive drug-treatment rate[#]					
T0	29 (52.73%)	31 (56.36%)		0.15	0.70
T1	38 (69.09%)	33 (60.00%)	1.49		
T2	39 (70.91%)	34 (61.82%)	1.51		

Table 4: Continued.

Outcomes (instruments)	PFPI (mean ± SD)	Control group (mean ± SD)	Effect size (Cohen's d/OR)	Comparison of groups at T0	
				t/χ^2	p
Hypertensive drug-titration rate[#]					
T0	7 (12.73%)	5 (9.09%)		0.38	0.54
T1	17 (30.91%)	2 (3.64%)	11.81		
T2	20 (36.36%)	3 (5.45%)	9.91		
Depressive symptoms (PHQ-9)[*]					
T0	4.00 (3.00–6.00)	4.00 (3.00–7.00)		0.73	0.47
T1	3.00 (2.00–5.00)	3.50 (2.00–6.25)	0.48 (small)		
T2	3.00 (2.00–5.00)	3.00 (2.00–6.00)	0.33 (small)		
Anxiety symptoms (GAD-7)[*]					
T0	2.00 (2.00–4.00)	3.00 (2.00–4.00)		0.80	0.43
T1	2.00 (1.00–3.00)	2.00 (2.00–4.00)	0.52 (medium)		
T2	2.00 (1.00–2.75)	2.00 (2.00–4.00)	0.48 (small)		
Health-related quality of life (EQ-5d-5L index score)					
T0	0.88 ± 0.06	0.88 ± 0.08		−0.46	0.65
T1	0.92 ± 0.05	0.88 ± 0.07	0.66 (medium)		
T2	0.92 ± 0.05	0.89 ± 0.07	0.49 (small)		
Health-related quality of life (EQ-VAS)					
T0	72.16 ± 8.91	70.18 ± 10.41		−1.07	0.29
T1	76.35 ± 7.78	71.30 ± 8.67	0.61 (medium)		
T2	76.50 ± 7.97	72.16 ± 8.89	0.51 (medium)		
Family carers:					
Dyadic-relationship quality (DRS-C-CG)					
T0	15.02 ± 5.35	14.76 ± 4.48		−0.27	0.79
T1	12.50 ± 4.24	14.06 ± 4.36	0.36 (small)		
T2	12.15 ± 4.00	13.47 ± 4.63	0.31 (small)		
Depressive symptoms (PHQ-9)					
T0	2.65 ± 1.42	2.69 ± 1.57		0.13	0.90
T1	2.13 ± 1.21	2.37 ± 1.39	0.18 (small)		
T2	2.04 ± 1.10	2.41 ± 1.42	0.29 (small)		
Anxiety symptoms (GAD-7)					
T0	2.27 ± 1.31	2.09 ± 1.67		−0.64	0.53
T1	1.69 ± 0.97	2.17 ± 1.22	0.44 (small)		
T2	1.54 ± 0.96	1.86 ± 1.30	0.28 (small)		
Health-related quality of life (EQ-5D-5L index score)					
T0	0.92 ± 0.06	0.92 ± 0.06		0.94	0.95
T1	0.94 ± 0.04	0.92 ± 0.05	0.44 (small)		
T2	0.94 ± 0.04	0.92 ± 0.05	0.44 (small)		
Health-related quality of life (EQ-VAS)					
T0	75.45 ± 8.73	75.42 ± 9.39		−0.02	0.98
T1	78.70 ± 7.66	76.13 ± 7.82	0.33 (small)		
T2	78.83 ± 7.61	77.33 ± 7.60	0.20 (small)		

Note. OR, odds ratio; DRS-C-PT, Chinese version of Dyadic Relationship Scale (patient version); DRS-C-PT, Chinese version of Dyadic Relationship Scale (caregiver version); HBP SCP-Behaviour, Behaviour scale of Hypertension Self-Care Profile; HBP SCP-self-efficacy, Self-efficacy of Hypertension Self-Care Profile; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalised Anxiety Disorder Scale-7; EQ-5D-5L, EuroQol five-dimensional five-level; EQ-VAS, EuroQol Visual Analogue scale. [#]Presented as n (%). [*]Presented as median (lower quartile, upper quartile).

All the outcome variables of family carers were computed using independent t-tests. There were no statistically significant differences between groups in family carers' dyadic-relationship quality, depressive symptoms, anxiety symptoms, and health-related quality of life at T0, with p values ranging from 0.44 to 0.98.

3.3. Effects of PFPI on People with Hypertension. The results of outcome variables for people with hypertension and family carers at T0, T1, and T2 are presented in Table 4. Most of the outcome variables were normally distributed with standard skewness and kurtosis scores between −1.96 and +1.96 and the data points were approximately located on the diagonal line of the Q-Q plot. However, the scores of PHQ-9 and GAD-7 for patients were not normally distributed. The normality of the PHQ-9 and GAD-7 scores across the three data collection time points was met with logarithm transformation. The effect sizes for patients' continuous outcome variables at T1 were small to medium, with Cohen's d values ranging from 0.33 to 0.77; at T2, Cohen's d values ranged from 0.31 to 0.92. Regarding the

categorical outcome variables of patients, the odds ratio ranged from 1.49 to 11.81 at T1 and 1.51 to 9.91 at T2. For the outcome variables of family carers, the effect sizes were small, with Cohen's d values ranging from 0.18 to 0.44 at T1 and 0.20 to 0.44 at T2.

The results of GEE test (Table 5) indicated statistically significant interaction (group × time) treatment effects on the study outcomes, including SBP, DBP, proportion of people with normal BP, DRS-C-PT, HBP SCP-Behaviour, HBP SCP-Self-efficacy, PHQ-9, GAD-7, EQ-5D-5L index score and EQ-VAS of people with hypertension with p values ranged from <0.001 to 0.04, between the two groups over three-month follow-up. Regarding the effects of PFPI on family carers, the results of the GEE test (Table 5) indicated statistically significant interaction treatment effects on GRS-C-CG, GAD-7, EQ-5D-5L index score, and EQ-VAS between groups over the three-month follow-up, with the p values ranged from <0.001 to 0.03.

Pairwise contrast tests in the GEE (Table 5) indicated that, compared with the control group, the people with hypertension in the intervention group reported statistically significant greater improvements in SBP, DBP, DRS-C-PT, HBP SCP-Behaviour, hypertension drug-titration rate, GAD-7, EQ-5D-5L index score, and EQ-VAS at T1 and T2; and in the proportion of people with normal BP, HBP SCP-Self-efficacy at T2. When compared with the control group, the family carers had statistically significant greater improvements in GRS-C-CG and EQ-5D-5L index score at T1 and T2, and in GAD-7 and EQ-VAS at T1.

4. Discussion

4.1. Effects on the Outcomes of People with Hypertension. We supported the study hypotheses that people with hypertension in the intervention group would show statistically significant greater improvements in SBP and DBP values, dyadic relationship, self-care, hypertensive drug-titration rate, anxiety symptoms, and HRQoL at both T1 and T2 and on the proportion of patients with normal BP and self-efficacy at T2, when compared with those in the control (usual care) group. However, the hypotheses concerned with statistically significant greater improvements on the proportion of people with normal BP and self-efficacy at T1 and on antihypertensive drug-treatment rate and depressive symptoms at both T1 and T2 were not supported.

4.1.1. SBP and DBP Values and the Proportion of People with Normal BP. The effect sizes of PFPI on SBP were medium (Cohen's $d = 0.77$) at T1 and large (Cohen's $d = 0.92$) at T2, whereas those on DBP were small at T1 and T2, with Cohen's $d = 0.44$ and 0.47, respectively. The findings of BP control are consistent with and more effective (in SBP and DBP reduction) than the results of our previous systematic review in which eight included RCTs of family dyad-oriented psychoeducational interventions reported that the SBP and/or DBP of people with hypertension statistically significant decreased at less than three months postintervention (medium pooled effect sizes of 0.59 and 0.57, respectively)

[22]. Furthermore, PFPI significantly improved the proportion of people with normal BP across the study period, from zero at baseline to 23.64% at T1 and 41.82% at T2. Among the studies included in our previous systematic review [22], four reported the effects of family support interventions on the proportion of people with normal BP. The improvements in the proportions of people with normal BP in these studies (15.8%–44.90%) were similar to those in the current study (23.64% at T1 and 41.82% at T2). The overall rate of well-controlled hypertension (SBP <130 mmHg and DBP <80 mmHg) in the USA in 2017–2018 was 39.64% [46]. Therefore, PFPI could be useful in improving the proportion of people with normal BP across rural areas, bringing it to the same level in developed countries.

People with hypertension in rural communities could not receive adequate healthcare services [7, 8]. In the current study, the clinic doctor (the only staff in the clinic) needs to provide nearly 300 home visits each month to all patients with hypertension and/or diabetes in the village. The large workload is not conducive to providing complete and effective hypertension care services. The family carers in the PFPI group were trained to supervise and assist in patients' medication intake, BP monitoring, and problem behaviour change and to record BP values and medication adherence in the booklet provided for reference to healthcare providers. Therefore, they were employed as surrogates for formal healthcare providers [47]. This assistance in hypertension care could alleviate the effect of the shortage of healthcare providers on hypertension management in rural areas [48]. Moreover, compared with the previous studies on family-oriented or family support intervention [48, 49], PFPI was delivered in face-to-face individual (for family dyad) sessions during home visits. The scattered living status and underdeveloped transportation in rural areas could prevent patients from actively seeking healthcare services. The healthcare service (e.g., PFPI) delivery format of home visits addresses the health disparities in seeking healthcare service for rural community residents due to long geographical distance.

The construct of SCM, which was adopted for PFPI development in this study, could interpret the statistically significant effect of PFPI in BP control. The three main components (communication, decision-making, and reciprocity with family dyad) in SCM were committed to building an effective patient-family carer (dyadic) partnership in daily hypertension care. The conflicting beliefs, difficulty in talking about an emotional topic, and lack of skills in handling conflict negatively affected the care partnership [15, 16]. PFPI provided dyadic communication skill training improving dyadic communication led to reductions in depressive symptoms for the patients and/or family carers and a positive value for the family. Systematic reviews demonstrated that family-dyadic partnership-/relationship-focused interventions were more likely to lead to reductions in depressive symptoms for patients with chronic illness and their family carers than the family interventions only directed at increasing knowledge and skills for managing the disease [47]. The exchange of values and prefers about self-management strategies between the dyad

TABLE 5: Generalised estimating models for comparing the outcomes across time between the intervention and control groups.

Outcomes	Group effect		Time effect		Group × time effect			Pairwise contrast test			
								T1		T2	
	β (95% CI)	p	β (95% CI)	p	β (95% CI)	Wald χ²	p	MD(95% CI)	p	MD(95% CI)	p
People with hypertension											
SBP	-2.06 (-4.78, 0.66)	<0.001***	-4.68 (-6.90, -2.46)	<0.001***	-8.01 (-11.30, -4.71)	25.98	<0.001***	-8.92 (-13.22, -4.62)	<0.001***	-10.10 (-14.11, -6.09)	<0.001***
DBP	-1.51 (-5.81, 2.79)	0.07	-2.08 (-3.52, -0.65)	<0.001***	-3.15 (-5.12, -1.18)	20.52	<0.001***	-4.84 (-8.65, -1.03)	0.01*	-4.66 (-8.60, -0.72)	0.02*
Proportion of people with normal BP	1.59 (0.61, 4.10)	0.04*	1.02 (0.59, 1.76)	0.02*	2.38 (1.09, 5.20)	4.70	0.03*	0.07 (-0.08, 0.23)	0.36	0.27 (0.08, 0.46)	0.01*
DRS-C-PT	0.44 (-0.81, 1.68)	0.04*	0.13 (-0.24, 0.49)	<0.001***	-2.77 (-3.33, -2.21)	109.30	<0.001***	-1.72 (-2.89, -0.55)	0.004**	-2.34 (-3.50, -1.17)	<0.001***
HBP SCP- behaviour	-0.02 (-2.99, 0.95)	0.02*	1.30 (0.60, 2.00)	<0.001***	4.91 (3.94, 5.87)	138.07	<0.001***	4.30 (2.13, 6.46)	<0.001***	3.89 (1.82, 5.95)	<0.001***
HBP SCP- self-efficacy	-0.51 (-2.70, 1.79)	0.20	0.88 (0.01, 1.75)	<0.001***	3.24 (2.01, 4.47)	29.78	<0.001***	2.21 (-0.12, 4.54)	0.06	2.73 (0.24, 5.22)	0.03*
Antihypertensive drug-treatment rate	0.95 (0.45, 1.99)	0.34	1.42 (1.04, 1.92)	<0.001**	1.90 (1.02, 3.53)	5.50	0.06	0.13 (-0.05, 0.31)	0.17	0.12 (-0.05, 0.29)	0.18
Hypertensive drug-titration rate	1.43 (0.42, 4.87)	<0.001***	0.58 (0.12, 2.69)	0.53	7.00 (1.11, 44.22)	4.96	0.08	0.27 (0.08, 0.46)	0.01*	0.31 (0.12, 0.49)	0.001**
PHQ-9	-0.01 (-0.08, 0.06)	0.25	-0.01 (-0.04, 0.01)	<0.001***	-0.04 (-0.08, -0.01)	6.70	0.04*	-0.04 (-0.10, 0.02)	0.21	-0.06 (-0.12, 0.01)	0.08
GAD-7	-0.03 (-0.09, 0.03)	0.03*	-0.02 (-0.04, -0.01)	<0.001***	-0.04 (-0.08, -0.01)	6.84	0.03*	-0.07 (-0.11, -0.02)	0.01*	-0.07 (-0.12, -0.02)	0.01*
EQ-5D-5L index score	0.01 (-0.02, 0.03)	0.05	0.01 (0.00, 0.02)	<0.001***	0.02 (0.00, 0.04)	18.76	<0.001***	0.03 (0.01, 0.06)	0.003*	0.03 (0.01, 0.05)	0.01*
EQ-VAS	1.98 (-1.32, 5.28)	0.01**	1.34 (0.19, 2.48)	<0.001***	3.03 (1.45, 4.61)	20.89	<0.001***	5.20 (2.34, 8.06)	<0.001***	5.02 (2.00, 8.03)	0.001**
Family carers											
GRS-C-CG	0.26 (-1.49, 2.00)	0.23	-1.14 (-1.59, -0.68)	<0.001***	-1.84 (-2.58, -1.10)	34.16	<0.001***	-1.61 (-3.17, -0.06)	0.04*	-1.59 (-3.17, -0.01)	0.049*
PHQ-9	-0.04 (-0.58, 0.50)	0.31	-0.26 (-0.56, 0.04)	<0.001***	-0.37 (-0.72, -0.01)	4.10	0.13	-0.27 (-0.75, 0.20)	0.26	-0.40 (-0.87, 0.06)	0.09
GAD-7	0.18 (-0.37, 0.74)	0.37	-0.23 (-0.48, 0.02)	<0.001***	-0.47 (-0.80, -0.14)	15.69	<0.001***	-0.48 (-0.88, -0.07)	0.02*	-0.29 (-0.72, 0.14)	0.19
EQ-5D-5L index score	0.00 (-0.02, 0.02)	0.11	-0.00 (-0.01, 0.01)	0.05	0.02 (0.01, 0.04)	7.25	0.03*	0.02 (0.00, 004)	0.03*	0.02 (0.00, 004)	0.02*
EQ-VAS	0.04 (-3.14, 3.21)	0.23	1.55 (0.44, 2.66)	0.001**	2.11 (0.48, 3.73)	15.22	<0.001***	2.90 (0.18, 5.63)	0.04*	2.14 (-0.59, 4.87)	0.12

Note. DRS-C-PT, Chinese version of Dyadic Relationship Scale (patient version); DRS-C-PT, Chinese version of Dyadic Relationship Scale (caregiver version); HBP SCP-Behaviour, Behaviour scale of Hypertension Self-Care Profile; HBP SCP-self-efficacy, Self-efficacy of Hypertension Self-Care Profile; PHQ-9, Patient Health Questionnaire-9; GAD-7, Generalised Anxiety Disorder Scale-7; EQ-5D-5L, EuroQol five-dimensional-five-level; EQ-VAS, EuroQol Visual Analogue scale. *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.

members is the basis of decision-making and action in hypertension care; it could improve the self-care (e.g., medication intake and problem behaviour change) of patients with hypertension [50]. Implementing the action plan with mutual support is highly emphasised in the SCM and PFPI [28]. In the PFPI sessions, the family dyad was guided to identify problem behaviour and set goals; discuss the influence of behaviour change; discuss difficulties in behaviour changes and effective coping strategies; identify ways to seek information, professional help, and community support whenever needed; and formulate an action plan. The family dyad applied these decision-making techniques in daily hypertension care situations when needed to make decisions. Research has demonstrated that the improved decision-making skill of stroke survivor-caregiver dyad was positively associated with survivors' depressive symptoms, dyadic relationship, and survivor coping skills [51]. Dyadic partnership is also a process of giving and accepting physical and emotional help with appreciation [52]. For example, in the PFPI sessions, the family dyads discussed the assistance provided by the family carer and received by the patient in behaviour modification. They also discussed the difficulties and challenges throughout the process of giving and receiving assistance and the strategies to overcome them and express gratitude and appreciation. These reciprocity skills facilitate the family dyad's mutual cooperation in BP monitoring, medication adherence, and behaviour change at home.

Another feature of PFPI is cultural sensitivity. Interventions taking the culture into account are more likely to lead to more positive behavioural changes [53]. In the rural areas of China, family culture and values highly emphasise the responsibilities and obligations of family members in caring for sick family members [10]. Therefore, in PFPI, the family carer was treated as a partner in hypertension care. Each family dyad worked together to promote treatment adherence and lifestyle modification through effective dyadic communication (to avoid conflicts and over-protection) and decision-making in health care.

4.1.2. Dyadic-Relationship Quality.

In this study, the dyadic relationship significantly improved for the intervention group at T1 ($p = 0.004$) and T2 ($p < 0.001$) with medium effect sizes (Cohen's $d = 0.52$ and 0.65, respectively). As the dyadic relationship quality was seldom measured as an outcome in previous studies [47], limited information about the effect of interventions on dyadic relationship quality among people with hypertension could be found. Seber and Woda [28] developed a shared care dyadic intervention based on SCM for patients with heart failure and used a dyadic relationship measure as one of the patient outcomes in their pilot study. However, noticeable differences were found in the participants, sample size, study design, and times of outcome measurements between two studies, which may have led to the difference in their effect sizes on the dyadic relationship quality, with a Cohen's d of 0.65 at three-month postintervention in the current study and 0.25 immediately postintervention in Sebern and Woda's study [28].

In an RCT study, a family partnership intervention was effective in improving perceived confidence and motivation for self-care and reducing dietary sodium among heart failure patients. Other RCT study also demonstrated the effectiveness of family-focused dyadic psychoeducational intervention on the dyadic relationship of stroke survivors and their family caregivers [51]. Therefore, family-dyad partnership intervention may be feasible and effective in improving self-care and self-efficacy for patients with chronic illnesses.

4.1.3. Self-Care and Self-Efficacy.

PFPI significantly improved hypertensive people's self-care and self-efficacy in hypertension management with medium and small effects, respectively (Cohen's $d = 0.65$ and 0.31, respectively). In our previous systematic review [22], three studies reported the results of self-care, all of which revealed statistically significant improvements. Similar to this study, educating family dyad jointly in the educational sessions on knowledge and skills of lifestyle modifications through discussion and goal setting and encouraging family carers to supervise patients' behavioural changes were used in previous studies. These intervention components/contents were also demonstrated (in a systematic review) to be effective in improving self-management for patients with uncontrolled type II diabetes mellitus [54]. PFPI also adopted participatory learning strategies to improve the family dyads' skill in identifying the problem behaviour and making decisions and action plans for behaviour change. The participatory learning strategies encourage more active involvement of participants in the learning process, improve the dyadic communication and cooperative techniques of family dyad in health care, and facilitate changes in their lifestyle behaviour [55].

4.1.4. Antihypertensive Drug-Treatment Rate and Antihypertensive Drug-Titration Rate.

In the current study, the hypertensive people in the intervention and control groups had improved antihypertensive drug-treatment rates. However, the difference between groups was nonsignificant ($p = 0.17$ and 0.18, respectively) at T1 and T2. In the home visit service (usual care), the village doctor monitored the BP of people with hypertension (every three months) and encouraged them to intake hypertensive drugs for those who had uncontrolled BP, which may lead to an improvement in antihypertensive drug treatment [56]. On the other hand, people with hypertension in the intervention group had significantly improved antihypertensive drug-titration rate at T1 and T2 ($p = 0.01$ and <0.001, respectively). Although usual care (with or without PFPI) revealed effect on improving antihypertensive drug-treatment rate, the PFPI together with usual care for the intervention group had a much better effect on the antihypertensive drug-titration rate.

Evaluating the efficacy of antihypertensive drugs in BP control (e.g., BP monitoring) promptly is a prerequisite for drug titration [34]. However, only 24.5% to 34.3% of people with hypertension living in China rural communities

conducted weekly BP measurements [57]. People with hypertension receiving the PFPI had more frequent BP monitoring (e.g., measured BP at each session) than those in the usual care group, which may lead to a higher antihypertensive drug-titration rate. A recent systematic review examined the effects of family involvement in hypertension care on managing medications of older patients with chronic illnesses [56]. The findings indicated that family carers' participation in conveying information about patients' medication adherence and BP values to healthcare providers and receiving feedback and decision-making in managing medications could lead to drug titration more effectively. The intervention combining BP self-monitoring and self-titration to adjust antihypertensive medication could lead to the reduction of 9.2 mmHg in SBP and 3.4 mmHg in DBP for people with hypertension compared with the usual care group [58]. In the current study, we did not collect the data on dose and types of antihypertensive drugs, and the BP values changed after the drug titration. Therefore, the effect of drug titration on BP change remains unknown. Further studies should collect the data of doses and types of antihypertensive drugs used and changed over time, and the BP values changed after the drug titration, to identify the trajectory of BP change.

4.1.5. Depression and Anxiety Symptoms. The findings of this study revealed that PFPI reduced depressive symptoms, but the effect was nonsignificant between groups. However, anxiety symptoms were significantly reduced at T1 and T2 compared with the control group, with medium and small effect sizes (Cohen's $d = 0.52$ and 0.48, respectively). Inconsistent with the findings on depressive symptoms of hypertensive people in the current study, systematic reviews in chronic illness care have provided evidence of the positive effects of family involvement in illness management programs for adults with different chronic illnesses (e.g., stroke survivors and patients with cancer) [59, 60]. The inconsistency may be due to the low level of people's depression at baseline (mean PHQ-9 score was 4.00), where a PHQ-9 score below 10 is considered to be mild in depression symptoms. Such flooring effect of low depressive symptoms at baseline might cause difficulty in showing treatment effects by making statistically significant changes or improvements in their scores. Patients with serious illnesses (e.g., stroke and cancer) often experience more depressive symptoms [47]. The effect of PFPI on reducing hypertensive people' s depressive symptoms should be further studied.

Increasing evidence of the association between anxiety and hypertension exists [61, 62], and anxiety could negatively affect medication adherence [63]. A significant correlation between anxiety, family function, and QoL was found, and anxiety had a partial mediating effect on the relationship between family function and QoL of older adults with hypertension in low-income communities [64]. The effects of family involvement in hypertension care on anxiety could not be found in previous studies. In other chronic illnesses, such as heart diseases, the effect of family dyad intervention on anxiety in patients with coronary heart

disease and family partners was evaluated in a systematic review; the authors could not find significantly lower anxiety levels for patients who received interventions focusing on disease counselling and improving social support than the control group [65]. By contrast, another systematic review demonstrated that interventions targeting the relationship between patients with cancer and their family carers could significantly improve anxiety, depression, and/or distress in both [59]. The potentially effective components of these included studies were education and training about disease knowledge, problem-solving skills, and counselling and discussions in a dyadic manner, similar to the PFPI in the current study. Therefore, even though the evidence of family-dyadic partnership interventions on anxiety symptoms of hypertension and other chronic illnesses (e.g., hypertension, diabetes, and stroke) was limited, the findings of this study supported that family-dyadic partnership intervention could be a promising intervention in improving the anxiety symptoms of people with chronic illness.

4.1.6. Health-Related Quality of Life, HRQoL. PFPI significantly improved the HRQoL of people with hypertension at T1 and T2, with medium and small effects (measured by EQ-5D-5L index: Cohen's $d = 0.66$ and 0.49, respectively; measured by EQ-VAS: Cohen's $d = 0.61$ and 0.51, respectively). An effective family-dyadic partnership was beneficial for QoL of people with hypertension in low-income communities [64]. The structure of SCM also supports a positive relationship between self-care, dyadic relationship, and HRQoL [24]. Similarly, Reid et al. reviewed [63] psychological interventions for patients with coronary heart disease, and their partners demonstrated improvements in the HRQoL of patients at 6 to 13 months post-intervention. The main components of the interventions in the reviewed studies were similar to those in this study, including information giving and counselling in 2 to 8 dyadic sessions within 1.5 to 4 months.

4.2. Effects on the Outcomes of Family Carers

4.2.1. Dyadic Relationship Quality. With no available evidence for the family's perceived dyadic relationship in hypertension care, the GEE test identified statistically significant interaction effects of PFPI on the family carers' perceived dyadic relationship at T1 ($p = 0.04$) and T2 ($p = 0.049$) with small effect sizes (Cohen's $d = 0.36$ and 0.31, respectively). In two pilot studies (with small sample sizes of four and 10 only), shared care interventions developed based on SCM were tested among patients with heart failure and their family carers. These studies reported improvements in the quality of dyadic relationship (also measured by DRS-CG) immediately post-intervention [27, 28]. Dyadic communication and reciprocity in healthcare were the main contents of PFPI in the current study, leading to significant improvements in dyadic relationship. Family-dyadic partnership-focused intervention had positive effects on improving the dyadic relationships in their verbal feedback, such as knowing each other better, expressing suggestions and assistance positively, exchanging

views on illness experiences, and clarifying perceptions [50]. The findings could support further research to employ the patient-family (carer) partnership model of intervention to improve the dyadic relationship of family carers and patients with hypertension.

4.2.2. Depressive and Anxiety Symptoms. The PFPI has positively improved the family carers' depressive symptoms, but the GEE test results did not indicate statistically significant effect between groups. None of the studies reviewed in our previous systematic review provided evidence about the family carers' depressive symptoms in hypertension care. The result of a systematic review and meta-analysis demonstrated that a stronger perception of filial obligation was associated with increased depressive symptoms among family carers, especially in Chinese culture [66]. Family dyadic relationship-focused interventions can significantly improve family carers' depression of patients with stroke, cancer, and arthritis [59]. Since patient and family carer depression influences patient self-care and family carer's contribution to self-care, healthcare providers should assess and treat depression in both members of the dyad to improve self-care [67]. However, caring for seriously ill patients (e.g., stroke and cancer) can bring more caregiving burden and pressure to family care. As discussed above, the low level of family carers' depression at baseline might cause difficulty in showing treatment effects by making statistically significant changes or improvements.

In the current study, family carers' anxiety symptoms were significantly improved at T2, with a small effect size (Cohen's $d = 0.28$). The improved dyadic partnership is conducive to lowering anxiety symptoms, as declared in SCM [24]. No information on anxiety symptoms of family carers for people with hypertension could be obtained from previous studies. The positive effect of interventions involving the family in treatment of the anxiety of family carers has been demonstrated in systematic reviews of patients with other chronic physical diseases, such as cardiovascular disease, arthritis, and diabetes [68]. An "umbrella" review also found that dyadic relationship-focused family interventions could improve the mental health of adult patients with chronic illness and their family carers [47]. Therefore, family-dyadic partnership/relationship intervention may positively affect the family carers' anxiety symptoms, and further research is needed to support the positive effect of PFPI in improving the anxiety symptoms of family carers in hypertension care.

4.2.3. Health-Related Quality of Life (HRQoL). PFPI significantly improved the HRQoL of family carers at T1 and T2 ($p = 0.03$ and 0.02, respectively), with small effects when measured using EQ-5D-5L index (both Cohen's $d = 0.44$). However, the difference in HRQoL measured using EQ-VAS was statistically significant at T1 only ($p = 0.04$) with a small effect size (Cohen's $d = 0.33$). The symptoms, mood, knowledge, and behaviour of people with hypertension towards hypertension management and the family carers' caregiving burden were significantly related to the HRQoL

of the family carer [69]. The results of a systematic review and meta-analysis that showed lower poststroke cognitive performance were associated with poorer caregivers' quality of life [68]. In the current study, with the positive effects of PFPI in improving patients' self-care, anxiety symptoms, and family carers' perceived dyadic relationship, the improvement of HRQoL could also be statistically significant and positive. Similar to other family outcomes used in this study, limited evidence was available in previous hypertension care studies. Further research is suggested to confirm the effect of PFPI on improving the carer's HRQoL.

4.3. Limitations. Several limitations should be acknowledged. First, the participants in this study were recruited in only two villages in Hunan Province in Southern China, thus limiting the representativeness of the participants and the generalisability of this study to other rural areas in China. Second, this study examined the short-term (one- and three-month postintervention) effects of PFPI on the outcome variables of people with hypertension and their family carers. The longer-term (e.g., six months or above) effects of PFPI on these outcomes remain unknown, and they need to be tested in further studies. Third, although a checklist of all items of the intervention protocol was used to monitor the intervention fidelity by the researcher during each session, this study lacked sufficient process evaluation. Future studies are recommended to adopt a process evaluation to thoroughly understand the intervention implementation, compliance of participants, and successful features of the programme [70]. An independent observer or audio and video recording could be used to measure implementation fidelity. Lastly, as an individual's BP values could fluctuate throughout the day, the BP values obtained from measuring at a one time point on the data collection day may not comprehensively reflect the patient's BP controls. A 24-hour ambulatory blood pressure monitoring could be adopted in future research to obtain more accurate BP values.

4.4. Implications. This study provides evidence on integrating the PFPI into hypertension management programmes for rural communities in China. This study also reveals its potential application to a wider hypertensive population in the rural and urban areas of China. Several suggestions were provided to facilitate the implementation of PFPI in practice. First, the study findings could help health policymakers and government administrators realise the importance of patient-family (carer) partnership as the model of intervention in hypertension management in communities, particularly in rural areas with very limited healthcare service. They could also promote the related health regulations or policies to emphasise the adoption of patient-family partnership models of care in community-based hypertension management or services. Second, hypertension care stakeholders need to discuss the barriers and facilitators of integrating PFPI into the current hypertension management service. Third, the village doctors and/or social workers, who are the common healthcare workers in rural areas, should be trained to conduct PFPI.

5. Conclusion

We evaluated the effectiveness of PFPI on people with hypertension and their family carers in rural communities in China. The findings demonstrated statistically significant positive effects of PFPI on the majority of the outcomes of participants. These findings supported integrating PFPI into the current hypertension care programmes/services as it could be a more feasible and effective approach to hypertension management in rural areas of China. Further studies are recommended to apply a mixed-method research design and recruit participants with diverse clinical, sociodemographic, and ethnic backgrounds to evaluate the longer-term effects of PFPI in different China regions.

Data Availability

The datasets used to support the findings of this study are available from the corresponding author upon request.

Additional Points

Reporting Method. The study is reported in line with the Consolidated Standards of Reporting Trials 2010 Statement. Patient or Public Contribution. Eligible hypertensive people receiving home visits and care at two village clinics and their family carers were randomly enrolled in this study. The researcher reviewed the hypertensive people's medical records in the two village clinics under study and created a list of potential participants (those aged 18 years or above and having essential hypertension without adequate BP control) in alphabetical order of their family names after screening. The people on the list were randomly selected using a random number table and approached by the researcher during home visits to further confirm the study eligibility (living with one or more adult family members, speaking Mandarin or local dialect, and without terminal and mental illness, etc.). The researcher introduced the study to the participants and the benefits, risks, participants' rights, and confidentiality when participating in this study. Written informed consent was obtained from the participants who agreed to participate in this study. The researcher delivered the intervention to participants in the intervention group. A retired village doctor was trained to collect data. What Does this Paper Contribute to the Wider Global Clinical Community? (i) The patient-family (carer) partnership intervention has the potential to improve hypertensive people's BP control in rural areas. (ii) The intervention also helps to improve hypertensive people's and family carer's dyadic-relationship quality and mental health at short-to-medium-term follow-ups. (iii) This study provides evidence on integrating the patient-family (carer) partnership intervention into hypertension management programmes for rural communities worldwide. Trial Registration. This study was registered in the Chinese Clinical Trial Registry https://www.chictr.org.cn (registration number: ChiCTR1900027087) in October 2019, and the first participant was recruited in July 2020.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

Supplementary Materials

Supplementary material 1: a checklist of intervention fidelity. The checklist consisted of all items of the intervention protocol. It was used by the researcher during each intervention session to monitor the intervention fidelity. At the end of each session, the researcher checked the completion of each item on the list with family dyad and marked as "completed" or "uncompleted." The "uncompleted" intervention item was made up in time. Supplementary material 2: hypertension management booklet. The booklet comprised four sections, including the goal of BP control, risk assessment for cardiovascular disease, criteria of healthy behaviours and worksheets for identifying behavioural problems, and hypertension self-care. (*Supplementary Materials*)

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Research Article

Effectiveness of a Structured Disaster Management Training Program on Nurses' Disaster Readiness for Response to Emergencies and Disasters: A Randomized Controlled Trial

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Background. Most frontline nurses lack sufficient readiness for effective disaster response. Therefore, designing a disaster management training program (DMTP) to promote nurses' readiness for disaster response is imperative. *Aim.* This study aimed to evaluate the effectiveness of a structured DMTP on nurses' readiness for response to disasters. *Methods.* A randomized controlled trial was conducted. One hundred eligible nurses, recruited using convenience sampling from a medical centre in northern Taiwan, were randomly assigned to either the experimental (EG, $n = 50$) or control (CG, $n = 50$) group. Both groups received regular continuous nursing education. The EG received an extra two-day (16 h) structured DMTP delivered by transdisciplinary collaborations through multiple teaching strategies (lectures, simulations, problem-solving lessons, demonstrations, tabletop exercises, discussions, group presentations, and reflections). Readiness for disaster response, consisting of four subscales (emergency response, clinical management, self-protection, and personal preparation), was assessed at baseline and 12 weeks after the intervention. Generalized estimating equations were used as the primary method of data analyses to evaluate the intervention effects. *Results.* Ninety-four nurses (94%) completed the study, and 100 nurses were included in the intention-to-treat analysis. While participants in the EG had increased readiness for disaster response after training and at the 12-week follow-up, those in the CG exhibited no differences between baseline and 12-week follow-up. When the group × time interaction was examined, the EG had a greater increase in readiness for disaster response and its four domains, including emergency response, clinical management, self-protection, and personal preparedness after 12 weeks, than the CG. *Conclusion.* A two-day structured DMTP utilizing multiple teaching strategies through transdisciplinary collaborations is recommended to enhance hospital nurses' readiness for disaster response. *Implications for Nursing Management.* Nursing leaders should consider incorporating such a structured DMTP into ongoing nursing training as a critical component of professional development programs, thereby strengthening nurses' disaster readiness in hospital settings.

1. Introduction

Disasters have engendered significant repercussions characterized by extensive damage, destruction, and loss of life, property, or livelihoods in communities and societies [1]. Worldwide, nations face potential threats from a wide array of disasters, including natural disasters such as earthquakes, hurricanes, floods, landslides, and wildfires, and anthropogenic catastrophes such as terrorist attacks and warfare. These disasters have profound impacts on both individuals and nations, leading to severe consequences [2, 3].

Taiwan, situated in a geographically vulnerable region, faces a wide spectrum of natural disasters and associated hazards. Among these, earthquakes, typhoons, landslides,

floods, and industrial accidents have historically affected island nations. Over the past few decades, earthquakes have been one of the most devastating events in Taiwan. Previous disaster epidemiology studies related to the 1999 Chi-Chi earthquake in Taiwan, which claimed 2,415 lives and caused injuries to 11,305 people, revealed that the demand for medical care peaked 12 hours after the earthquake and remained elevated for up to three days [4]. These findings highlight the critical significance of timely disaster response for healthcare in Taiwan.

Disasters can result in a range of adverse outcomes, including infrastructure damage, economic consequences, physical injuries, psychosocial impacts, environmental ramifications, and deprivation of essential services such as water, sanitation, and healthcare, forcing people to leave their homes and communities temporarily or permanently and even lose their lives [3, 5]. Therefore, efforts to decrease the unexpected consequences of disasters and develop strategies to mitigate their impacts remain an imperative research focus. However, to minimize the impact of a disaster and ensure timely and effective responses, a robust frontline medical workforce, particularly nurses, is crucial in disaster areas and local hospitals near the affected sites [6, 7]. Frontline nurses must efficiently assess the severity of patients' injuries and prioritize care based on the level of urgency during a disaster when there may be a high volume of patients in need of care. In addition, nurses are responsible for stabilizing patients experiencing a medical emergency with initial treatment, transferring patients to hospitals or medical facilities, offering coordinated care to patients with other healthcare professionals, and providing emotional and psychological support to patients and their families during disasters [8].

Considering the continuous occurrence of disasters and the negative impacts they entail, nurses' readiness to respond is crucial for mitigating the adverse consequences on affected individuals. Recently, the COVID-19 pandemic has highlighted the necessity of having a national nursing workforce prepared with the knowledge, skills, and abilities to respond [9]. Disaster management is the effort to reduce unexpected consequences and disaster risks [10]. Therefore, to ensure effective and efficient disaster management, it is crucial to enhance frontline nurses' readiness for disaster response, thereby saving lives and mitigating adverse health impacts on affected populations [10, 11].

According to the World Health Organization, most disaster-related deaths occur in healthcare facilities that are unprepared for emergency situations [12]. Adequate preparation and disaster readiness of healthcare personnel, especially nurses who often serve as first responders, can significantly reduce fatalities [8, 13]. Moreover, building resilient health systems through better-prepared medical staff is fundamental [8, 11]. The readiness of nurses not only impacts the immediate effectiveness of disaster response but also significantly affects the overall resilience of health systems and predicts the nurses' willingness to engage in these situations [7] and their capacity to deliver adequate care within a disaster environment [14]. Comprising the largest segment of the healthcare workforce, nurses play

a pivotal role in shaping community health outcomes during disasters [15] and managing emergency or disaster medical situations, thereby forming the backbone of the health system. Therefore, it is crucial that nurses possess the requisite knowledge, skills, and competencies, especially readiness, to respond effectively to disasters [16].

However, a significant concern is that many hospital nurses report a lack of readiness for disaster response [15, 17]. Disaster readiness varies significantly across countries, influenced by factors such as economic status, governance, infrastructure, and historical disaster experience [18–21]. For instance, high-income countries like Finland exhibit a proactive approach by incorporating a disaster readiness mindset into governmental strategies [21]. This approach involves identifying potential disaster risks and implementing measures to mitigate them effectively, ensuring a well-coordinated response when disasters occur [21]. In contrast, many countries face challenges in disaster preparedness due to limited resources and infrastructure. Previous studies have highlighted that nurses, especially undergraduate nursing students in these regions, often lack sufficient training and education in disaster management, which is crucial for effective emergency response and clinical management [18, 20, 22]. This gap is evident in regions such as Southeast Asia and parts of Africa, where the frequency of natural disasters like floods and cyclones is high, yet preparedness levels remain inadequate [20, 22]. In Taiwan, a cross-sectional study involving 311 registered nurses at a military hospital found that the majority of nurses demonstrated poor readiness and lacked adequate preparation for disaster situations [11]. Studies have also highlighted that nurses and nursing students with prior disaster-related training and experience in disaster response demonstrate higher readiness and competencies [11, 18]. In India, nurses display moderate levels of preparedness, influenced by various factors such as education, prior disaster experience, mental health, and especially disaster self-efficacy, a vital factor that determines an individual's behavior and performance during disaster situations [23]. In Japan, nurses' disaster readiness has been significantly shaped by the country's frequent exposure to natural disasters. A study examining the disaster preparedness of nurses following the Great East Japan Earthquake found that while they demonstrated moderate levels of overall preparedness, there were notable deficiencies in handling specialized scenarios, such as chemical or biological incidents, and in their psychological preparedness [14]. Thus, the availability and quality of emergency and disaster management training for health professionals vary widely, with many countries offering little to no formal training [14]. Therefore, it is essential to develop structured and effective educational programs to enhance hospital nurses' readiness for disaster response [17].

Disasters also have significant adverse effects on the mental well-being of frontline nurses, who are a high-risk and vulnerable group of medical responders to adverse psychological outcomes [13]. In the context of surging demand, providing high-quality care during disasters is a daunting task. Such situations detrimentally affect the

health of healthcare professionals, especially their psychological well-being, owing to the repetitive exposure to traumatic events inherent in their work. Adapting preventive interventions and mitigation strategies targeted specifically at high-risk hospital nurses would be beneficial in decreasing negative outcomes [13]. The lack of adequate training for healthcare providers is a risk factor for adverse psychological health outcomes after disasters [24]. Therefore, designing and incorporating a well-structured disaster management training program into continuous clinical nursing education can mitigate the negative impacts on the mental well-being of hospital nurses who experience disaster events.

Curricula related to disaster training using multidisciplinary methods of simulation and human factor training have been proposed for implementation by organizations such as the Association of American Medical Colleges in the USA, the Government of the Federal Republic of Germany, and the Research Centre in Emergency and Disaster Medicine and Computer Science Applied to Medical Practice in Italy [17]. However, it is currently recognized that there is brief or nonexistent exposure to disaster training within current clinical training curricula worldwide, which may leave hospital nurses unprepared for an intimidating and unfamiliar setting if assisted in the healthcare workforce. Given that various nursing programs have provided education and training in disaster management in recent decades [17, 25–27], most research has focused on nursing students, and most frontline nurses have also reported insufficient readiness or preparedness in responding effectively to disasters [15, 28]. According to a recent study conducted in Greece that evaluated the effects of disaster education on hospital nurses' knowledge, skills, and expertise through evidence-based interventions, the educational intervention resulted in improved knowledge and self-confidence levels among nurses but did not lead to changes in their behavioral intentions [27]. In addition, most existing disaster programs focus on triage skills during disaster response instead of addressing the full spectrum of disaster management, including preparedness, clinical management, emergency response, and self-protection [11, 17]. Tzeng et al. delineated four critical domains of nurses' readiness for disaster response: emergency response, self-protection, clinical management, and personal preparation [11]. These domains align with the International Council of Nurses (ICN) Core Competencies in Disaster Nursing, outlined in 2019, which emphasizes the necessity for nurses to possess both theoretical and practical understanding of disaster preparedness to respond effectively to emergencies [29]. Emergency response entails managing large-scale emergencies through triage, initial stabilization of patients, incident management, medical evacuation, and transportation [8, 11, 19]. Self-protection focuses on the use of protective clothing; handling chemical, biological, radiological, and nuclear decontamination; infection control; and ensuring safety of both patients and nurses [8, 11, 17, 19]. Clinical management involves performing physical assessments, operating equipment in austere environments, and providing specific medical care such as trauma care, management of burn or

explosion injuries, first aid, and handling toxic substance injuries [8, 11, 19]. Personal preparation includes acquiring basic survival skills; making physical, psychological, and social plans (law/ethics) prior to engaging in disaster response; communication; recovery; and fostering confidence in collaboration with multidisciplinary teams or peer care [8, 11, 19].

Designing educational programs to enhance frontline nurses' disaster readiness without considering the above key domains of disaster management may not only result in the depletion of manpower and material resources but also fail to achieve the expected outcomes. Given that the ICN's core competencies in disaster nursing and the disaster readiness for response to emergencies and disasters are diverse and extensive, enhancing these competencies and readiness inevitably relies on a variety of teaching strategies. In addition, improving learning effectiveness requires the development of skills across different learning dimensions [30]. Therefore, designing disaster curricula or training programs may require multidisciplinary methods and innovative strategies. However, the development of comprehensive disaster management training programs remains limited, particularly in Taiwan, a region that urgently requires a well-prepared disaster nursing workforce.

This study examined the effectiveness of a two-day structured disaster management training program with multiple teaching strategies to promote hospital nurses' readiness for disaster response. We assume that providing such a well-organized disaster management training program delivered by transdisciplinary collaboration through multiple teaching strategies may enhance nurses' readiness for disaster response, possibly increasing their willingness to respond to disasters and mitigating the negative impacts on hospital nurses' mental well-being in the face of future disaster events. Therefore, the practical purpose of this study was to achieve two outcomes: (1) to improve nurses' readiness for disaster response, enabling them to provide timely and efficient care during disasters and (2) to strengthen nurses' resilience, helping them cope with the trauma associated with disaster response, and empowering them with the skills to take on key roles in disaster management teams.

2. Materials and Methods

2.1. Study Design. A two-parallel, randomized controlled trial was conducted at a medical centre in northern Taiwan. Eligible hospital nurses were randomly assigned to either a control group (CG), which received regular continuous nursing education, or an experimental group (EG), which participated in an additional two-day (16-hour) structured disaster management training program (DMTP). The readiness for disaster response including four domains (emergency response, clinical management, self-protection, and personal preparedness) was assessed as outcome measures.

2.2. Participants. Initially, potential participants from a military medical centre in northern Taiwan, affiliated with the national government and responsible for dispatching personnel to disaster-affected areas in Taiwan or overseas,

were recruited by a research assistant. Inclusion criteria were (1) hospital nurses with at least three months' work experience at the local medical centre; (2) aged 20–65 years; (3) full-time employees; (4) able to speak and understand Mandarin; and (5) agreed to participate in the research and to be randomized to one of the two groups. The exclusion criteria were (1) trainee nurses without nursing licenses; (2) new nurses lacking signed contracts because of their inability to work independently; (3) individuals not providing direct care; and (4) those unable to complete the intervention.

Sample size estimation using G* Power (Germany, version 3.1.9) software was based on previous studies with a medium-to-small effect size of 0.15 for the outcome of the expected increase in readiness for disaster response [19, 31, 32], an alpha set at 0.05, number of measurements 2, and a power of 0.80, and each group required 45 hospital nurses [33]. Fifty estimated participants from each group were recruited to account for a 10% loss to follow-up.

2.3. Study Cohorts and Interventions.
Eligible hospital nurses were randomly assigned to the EG or CG using sealed opaque envelopes following computer-generated random serial numbers by the project investigator. All recruited participants underwent monthly continuous nursing education sessions (30–60 minutes/session) in their workplace units/wards. The participants in the EG received an extra two-day structured DMTP through multiple teaching strategies, such as lectures, simulations, problem-solving lessons, demonstrations, tabletop exercises, discussions, and reflections.

Before implementing the DMTP, we assembled a team of 17 transdisciplinary professionals, including a wilderness survival expert with over 10 years of experience, three nursing specialists in disaster nursing education with more than 10 years of experience, an emergency physician with over 20 years of experience, and 12 clinical practice experts. Among the 12 clinical practice experts, six had experience as nurses supporting disaster events, while the other six were nurse leaders with expertise in emergency/critical care, involving the project investigator/corresponding author. This team held consensus meetings to discuss program content and determine effective teaching strategies for a total of 16 hours, with 2 hours/session weekly for eight weeks. The DMTP, implemented following the consensus protocol developed by the consensus/research team, was structured based on four major domains/themes—emergency response, clinical management, self-protection, and personal preparation [11]—to ensure the validity and veracity of the delivered DMTP.

The outline of the two-day (16-hour) DMTP, as presented in Table 1, included a 2-hour lecture and a 14-hour workshop. The 2-hour lecture covered the concepts of disaster nursing, special concepts of disaster, effects of disasters on health, disaster management and its stages, assessment of possible hazards and vulnerabilities, and stages of planning in disasters. The 14-hour workshop consisted of (a) emergency response: mass casualty and triage, medical evacuation, and delivery; (b) clinical

management: trauma care, burn/explosion injury management, first aid treatment, and toxic substance injury management; (c) self-protection: nuclear and biochemical pollution disposal, protective equipment—wear and remove skills—and infection control; and (d) personal preparation: water survival training and rappelling training. In addition, disaster situational responses involve determining the magnitude of a disaster event, planning disaster response, evaluating the health needs of the affected groups, establishing priorities, identifying actual and potential public health problems, determining the resources needed to respond to the needs identified, and collaborating with other professional disciplines and governmental and nongovernmental agencies. Additionally, communication skills were incorporated into the workshop to achieve goals such that the participants could better understand the challenges and complexities of responding to disasters through engagement in hands-on training exercises, role-playing scenarios, and simulations [8, 11, 17].

2.4. Measures.
Sociodemographic characteristics and readiness for disaster response were collected by a separate research nurse who was blinded to the group assignments. Data on sociodemographic characteristics (age, sex, marital status, and educational level), length of nursing work, position (military or civilian nurse), nursing leader (yes or no), work unit/specialty (critical care units/emergency, general/medical-surgical ward, or others such as outpatient department and operation room), previous disaster training (yes or no), and previous disaster nursing experience (yes, no, or not yet but on list) were collected using self-administered questionnaires. Participants, including head and assistant head nurses of hospitals responsible for overseeing nursing staff, coordinating patient care, and managing resources, were categorized as nursing leaders. The EG was invited to assess their readiness for disaster response at the end of the training program. Both the EG and CG completed the evaluation of readiness for disaster response at 12 weeks. Prior to the study, the tool was reviewed by a panel of experts in disaster management, including five disaster-related experts (content validity index: 0.91), to ensure content validity. A pilot test was also conducted with 10 nurses (2 males and 8 females) to assess the tool's clarity, relevance, and ease of use. Furthermore, quality checks were conducted regularly to ensure the integrity and reliability of the data throughout the study period.

2.5. Readiness for Disaster Response.
Nurses' readiness for disaster response was assessed using a 40-item self-administered scale with well-established reliability and validity (acceptable convergent validity with 0.84–0.97), including four domains: emergency response (6 items), clinical management (7 items), self-protection (11 items), and personal preparedness (16 items) [11]. The internal consistency reliabilities of the entire questionnaire and its four subscales (emergency response, clinical management, self-protection, and personal preparedness) were 0.96, 0.86, 0.85, 0.88, and 0.97, respectively. Each item was scored from

TABLE 1: The disaster management training program content in the experimental group.

Content	Teaching strategy	Domain	Time
(1) Concept of disaster nursing, special concepts of disaster, and effects of disaster on health (2) Disaster management and its stages (3) Assessment of possible hazards and vulnerabilities (4) Stages of planning in disasters	Lecture	—	2 hr
(1) Mass casualty and triage (2) First aid treatment, bone injury, and wound care (3) Medical evacuation and delivery/transport (4) Childbirth care at disaster sites (5) Burn/explosion injury management and fluid infusion (6) Management of multiple trauma care	1st-day workshop, six concurrent sessions: lectures, simulations, and problem-solving lessons	a, b	3 hr. (30 min/each topic or session)
Emphasizing personal safety and protection measures for responders and affected individuals during disasters (1) Water survival training (2) Rappelling training	Lectures and demonstrations	c, d	4 hr. (2 hr./each topic or session)
(1) Detection/triage and treatment of nuclear, biological, and chemical contamination/pollution (2) Decontamination practice and treatment for nuclear, biological, and chemical substances (3) Protective equipment—wear and remove skills (4) Infection control in the disaster environment (5) Toxic substance injury management (6) Management of nuclear, biological, and chemical pollution disposal	2nd-day workshop: lectures, simulations, problem-solving lessons, demonstrations, discussions, and reflections	a, b, c	3 hr. (30 min/each session)
Scenario simulation exercises: Conducting simulated emergency scenarios to provide hands-on experience in managing crises, determining the magnitude of the disaster event, planning disaster response, evaluating health needs of the affected groups, establishing priorities, identifying actual and potential public health problems, determining resources needed to respond to the needs identified, and collaborating with other professional disciplines, governmental and nongovernmental agencies, and communication skills	Tabletop exercises, simulations, problem-solving skills, group presentations, group discussions, and debriefing	a, b, c, d	3 hr
Comprehensive discussions	Group discussions and reflections	—	1 hr

Note. [a]Emergency response, [b]clinical management, [c]self-protection, and [d]personal preparation.

1 (strongly disagree or very low readiness), 2 (disagree or low readiness), 3 (neutral or average readiness), 4 (agree or high readiness), to 5 (strongly agree or very high readiness) on a five-point Likert scale, with scores ranging from 40 to 200. Each subscale score ranged from 6 to 30, 7 to 35, 11 to 55, and 16 to 80, in emergency response, clinical management, self-protection, and personal preparedness, respectively. Higher scores represented greater readiness for disaster response. The percentage of total scores was categorized into readiness levels: a score percentage above 75% indicated "highly competent or very good," 50% to 75% indicated "moderately competent or good," 25% to 50% indicated "low competent or fair," and below 25% indicated "incompetent or poor." In addition, the Cronbach's alpha for the scale and its four subscales (personal preparedness, self-protection, emergency response, and clinical management) in this study were 0.92, 0.94, 0.90, 0.82, and 0.76, respectively.

2.6. Ethical Consideration. Approval from the institutional review board was obtained (Reference number: 2-103-05-018) from a local medical centre in Taiwan. Participation in the study was entirely voluntary, and the participants could withdraw from the study at any time.

2.7. Data Analysis. The study employed SPSS version 16.0 (SPSS Corp., Armonk, NY, USA) for all statistical analyses. Descriptive statistics including means with standard deviations (SDs) and numbers with percentages (%) were utilized to present the characteristics of the study participants. The last observation-carried-forward method of data imputation was used for the intent-to-treat analysis. Baseline characteristic comparisons between groups were conducted using the independent t-test or chi-square test. Differences between the groups, both pre- and postintervention, as well as the mean difference between pre- and postintervention within the two groups, were compared using independent t-tests. To assess the intervention effects over time, the generalized estimating equations (GEEs) analysis for longitudinal data was applied, considering the significant interaction of group and time (group × time) [34]. All statistical analyses were two-tailed, and significance was set at $p < 0.05$.

3. Results

3.1. Baseline Characteristics of Participants. Initially, 399 hospital nurses were screened. Of these, 264 nurses declined to participate, and 35 nurses did not meet the inclusion criteria (six had not yet signed contracts with the hospital, four were trainee nurses without nursing licenses, two did not provide direct care, and 23 reported not being able to complete the study intervention). The remaining 100 participants who met the inclusion criteria were randomly assigned: 50 (50%) to the EG and 50 (50%) to the CG.

Of the 100 eligible hospital nurses, 94 (94%) completed the study. The reasons for missed visits, including withdrawal from the study due to absence on the second day of the training program ($n = 4$) and loss in follow-up due to leaving the nursing job at the hospital ($n = 2$) at the 12-week assessment, are presented in the flow diagram (Figure 1). However, 100 participants were included in the data analysis.

The sociodemographic characteristics, working units, experience of previously received disaster training, and personal participation experience in disaster events of the EG and CG are presented in Table 2. The baseline scores of readiness for disaster response and its four subscales (emergency response, clinical management, self-protection, and personal preparedness) for the two groups are shown in Table 3.

3.2. Outcome Evaluation. Table 3 presents the descriptive and univariate analyses of the outcome evaluations. Nurses in the EG had increased readiness for disaster response and its three subscales—emergency response, self-protection, and personal preparedness—immediately after the program and at the 12-week follow-up. However, there were no significant changes in the readiness or its four subscales in the CG. The EG had a remarkably greater increase in the mean differences between pre- and postintervention in readiness for disaster response and its four subscales than the CG.

The effectiveness of the two-day DMTP on readiness for disaster response and its four subscales, including emergency response, clinical management, self-protection, and personal preparedness, assessed through GEE analyses, is shown in Table 4. The analysis revealed a significant interaction between group and time (group × time) regarding readiness for disaster response, indicating that the EG experienced a greater increase at 12 weeks than the CG ($\beta = 27.3$, $p < 0.001$). Specifically, the EG demonstrated significant improvements in emergency response ($\beta = 3.7$, $p = 0.002$), clinical management ($\beta = 3.7$, $p = 0.012$), self-protection ($\beta = 8.4$, $p < 0.001$), and preparedness ($\beta = 10.5$, $p = 0.003$), compared to the CG.

4. Discussion

4.1. Summary of Findings. Our study demonstrates the effectiveness of a two-day, structured disaster management training program provided by transdisciplinary professionals via multiple teaching strategies in improving hospital nurses' readiness for disaster response, including four domains: emergency response, clinical management, self-protection, and personal preparedness. The program significantly enhanced hospital nurses' disaster management readiness. These findings contribute substantively to the existing literature by confirming that active participation in a structured and comprehensive disaster management training initiative can substantially bolster hospital nurses' preparedness, increasing their confidence and willingness to engage in effective disaster response [17, 35]. Moreover, our results align with previous research, emphasizing the importance of a well-structured training program delivered through collaborative efforts across disciplines and employing varied
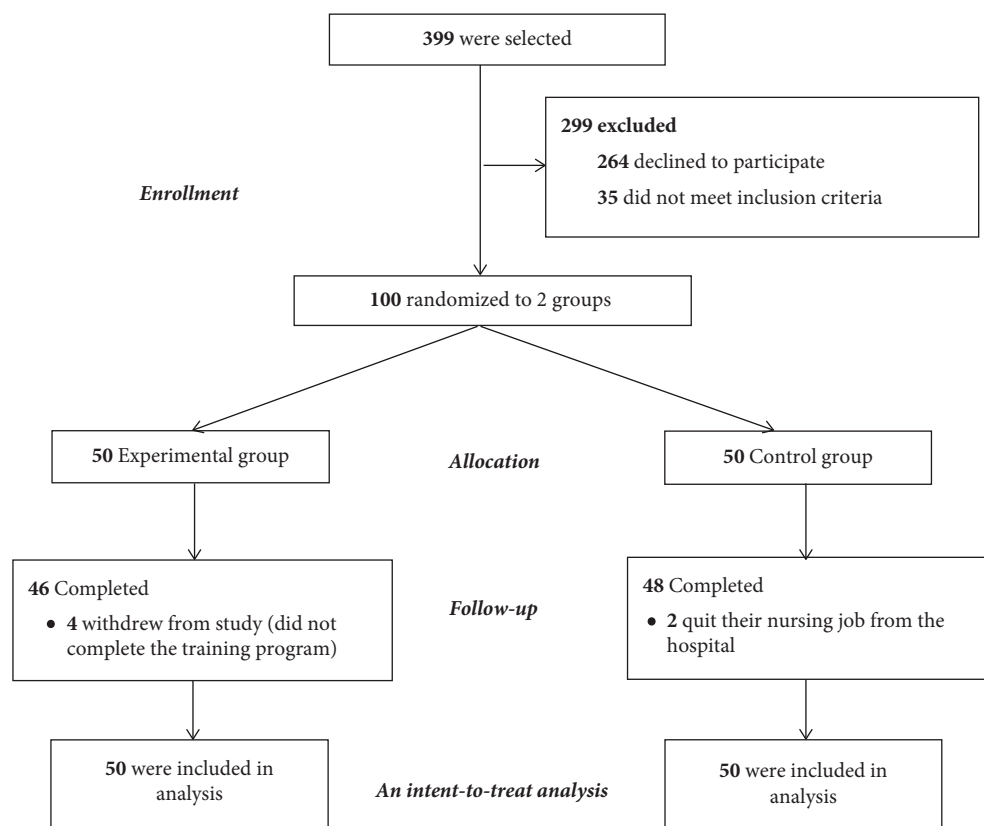
Figure 1: CONSORT diagram of participants' flow through the trial.

Table 2: Comparisons of baseline characteristics between the experimental and control groups.

Variables	Experimental group ($n = 50$)		Control group ($n = 50$)		t/x^2	p
	Mean ± SD	n (%)	Mean ± SD	n (%)		
Age (year)	35.5 ± 8.6		34.8 ± 8.1		−0.43	0.67
Length of nursing work (year)	12.6 ± 8.5		11.2 ± 8.5		−0.82	0.42
Gender					0.00	1.0
Female ($n = 96$)		48 (50.0)		48 (50.0)		
Male ($n = 4$)		2 (50.0)		2 (50.0)		
Marital status					3.28	0.35
Married ($n = 45$)		24 (53.3)		21 (46.7)		
Single ($n = 55$)		26 (47.3)		29 (52.7)		
Educational level					3.84	0.14
Associate ($n = 19$)		6 (31.6)		13 (68.4)		
Bachelors ($n = 53$)		27 (50.9)		26 (49.1)		
Masters and above ($n = 28$)		17 (60.7)		11 (39.3)		
Position					1.50	0.31
Military nurse ($n = 40$)		23 (57.5)		17 (42.5)		
Civilian nurse ($n = 60$)		27 (45.0)		33 (55.0)		
Nursing leader					3.66	0.09
Yes ($n = 33$)		21 (63.6)		12 (36.4)		
No ($n = 67$)		29 (43.3)		38 (56.7)		
Work unit/specialty					3.42	0.18
Critical care units/emergency ($n = 39$)		24 (61.5)		15 (38.5)		
General/medical-surgical ward ($n = 37$)		16 (43.2)		21 (56.8)		
Other ($n = 24$)		10 (41.7)		14 (58.3)		
Previously received disaster training					0.41	0.67
Yes ($n = 33$)		18 (54.5)		15 (45.5)		
No ($n = 67$)		32 (47.8)		35 (52.20		

TABLE 2: Continued.

Variables	Experimental group (n = 50)		Control group (n = 50)		t/x^2	p
	Mean ± SD	n (%)	Mean ± SD	n (%)		
Previous disaster nursing experience					2.11	0.35
Yes (n = 8)		5 (62.5)		3 (37.5)		
Not yet (on list) (n = 23)		14 (60.9)		9 (39.1)		
No (n = 68)		31 (45.6)		37 (54.4)		

Note. The data are presented as mean ± SD or number and percentages (%). *P* values were from chi-square test or Student *t*-test, as appropriate.

teaching strategies, ultimately improving response readiness in complex disaster scenarios [17].

The effectiveness of this disaster management training program offers compelling evidence for an optimal educational approach geared towards improving nurses' readiness for disaster response, encompassing emergency response, clinical management, self-protection, and personal preparedness. In light of the steady rise in the availability of disaster training programs over the past two decades, our hypothesis was that creating a structured disaster management training program, delivered by transdisciplinary professionals utilizing multiple teaching strategies, would enhance individuals' knowledge and skills. Furthermore, as previously reported, we believe that it can also enhance their motivation to overcome perceived barriers and indecisive thinking and, most importantly, strengthen their willingness to actively participate in complex disaster situations [17, 35]. The primary focus of the program was to promote readiness for disaster response through a transdisciplinary professional-delivered approach. In addition, the utilization of diverse teaching strategies in the program served as a valuable model for evidence-based nursing education in clinical settings, specifically for hospital nurses.

4.2. Comparison with Previous Research. Our study findings highlight that transdisciplinary collaboration brings together experts from various professional fields, such as emergency management, public health, education sciences, and nursing, and ensures a holistic understanding of disasters and their impacts. This collaborative approach allows the design of a comprehensive educational training program for disaster response [17, 36]. Diverse experts foster innovative thinking and problem solving by providing various perspectives, ideas, and solutions, leading to more effective and well-rounded disaster preparedness, response, and management plans [17]. For example, during a consensus meeting before the training program, the invited experts shared diverse perspectives on the program's design. Transdisciplinary professionals collectively identified the vulnerabilities and risks associated with various types of disasters, aiding the development of targeted mitigation strategies and risk reduction measures [17]. In addition, our transdisciplinary teams analyzed resource requirements across multiple sectors and identified efficient allocation strategies, optimizing the use of limited resources and prioritizing critical needs during disasters to simulate real-world scenarios. A recent report stated that the emerging trends in disaster research

over the past 20 years, marked by increased international cooperation and the transdisciplinary nature of disaster science, have gained popularity [36]. This demonstrates that valuable lessons can be learned from catastrophes and that these emerging trends serve as a scientific foundation for a clearer understanding of progress in disaster science, providing a reference for rapidly identifying frontier issues in disaster science.

Adopting various teaching approaches such as competency-based, all-hazard, and interprofessional approaches, flipped classrooms, simulations, tabletop exercises, virtual reality, and telenursing care in simulated conditions is the current trend in the design of disaster training programs [17, 37]. Therefore, our study employed multiple teaching strategies, including lectures, simulations, problem-solving lessons, demonstrations, tabletop exercises, discussions, group presentations, and reflections, through transdisciplinary collaborations in designing the disaster management training program for hospital nurses. This program aimed to enhance learning outcomes because individuals have different learning styles and preferences. In addition, participants accommodated various learning styles and engaged in training more effectively, increasing their chances of understanding and retaining information and enhancing learning outcomes. Different teaching strategies promoted active participation and engagement among the participants. Instead of passive learning, participants were actively involved in the learning process through discussions, group activities, and practical exercises. This active engagement facilitates better comprehension, critical thinking, and knowledge application, making training more effective and impactful. In addition, given the rapidly changing nature of disasters, the effectiveness of disaster response remains uncertain, particularly due to the challenges in ensuring the timely arrival of professional rescuers. Therefore, telehealth will play an important role in disaster management. A recent study demonstrated that the quality of telenursing care under simulated conditions was satisfactory during the response phase to disasters at Kerman [37]. Therefore, implementation of telenursing care would be helpful in future disasters; however, more evidence is recommended to support the use of telenursing care training under simulated conditions as an alternative teaching strategy.

Disaster management training requires the development of practical skills such as emergency response procedures, risk assessment, communication protocols, and coordination techniques. Therefore, incorporating hands-on

TABLE 3: Comparison of readiness for disaster response between groups at baseline and 12 weeks.

	Baseline				12 weeks				M.D. between pre- and post-test			
	EG (n = 50) Mean (SD)	CG (n = 50) Mean (SD)	t	p	EG (n = 50) Mean (SD)	CG (n = 50) Mean (SD)	t	p	EG (n = 50) Mean (SD)	CG (n = 50) Mean (SD)	t	p
Readiness for disaster response	111.8 (27.9)	121.2 (25.7)	−1.48	0.14	139.8 (23.3)	122.7 (27.8)	3.34	0.001	28.5 (28.4)	1.4 (14.6)	5.94	<0.001
Emergency response	16.3 (4.9)	17.4 (3.9)	−1.20	0.23	20.1 (3.5)	17.5 (4.5)	3.23	0.002	3.8 (4.6)	0.18 (3.1)	4.67	<0.001
Clinical management	23.0 (6.1)	24.6 (5.4)	−1.41	0.16	26.6 (4.4)	24.8 (5.1)	1.91	0.06	3.8 (5.5)	0.18 (3.8)	3.87	<0.001
Self-protection	26.7 (7.9)	29.2 (7.0)	−1.68	0.10	36.2 (6.9)	30.3 (8.6)	3.78	<0.001	9.5 (8.8)	1.1 (5.3)	5.73	<0.001
Personal preparedness	47.0 (13.9)	50.1 (13.1)	−1.16	0.25	56.9 (11.2)	50.1 (13.1)	2.79	0.01	10.4 (13.9)	−0.02 (3.8)	4.91	<0.001

Note. M.D., mean difference between pre- and post-test (12 weeks); P values were from independent t-test.

TABLE 4: Evaluation of the effectiveness of nurses' readiness for disaster response based on GEE analysis.

	EG (n = 50)			CG (n = 50)			Between group		Interaction: group (EG) × time[c]				
	Mean ± SD	β	Within p^a	Mean ± SD	β	Within p^a	β	p^b	β	SE	95% C.I. Lower	Upper	p
Readiness for disaster response													
Baseline	111.8 ± 27.9	—	Ref	121.2 ± 25.7	—	Ref	−10.2	0.06	27.3	7.4	12.8	41.7	<0.001
After training	145.8 ± 28.1	34.7	<0.001	—	—	—	—	—					
12 weeks	139.8 ± 23.3	28.7	<0.001	122.7 ± 27.8	1.4	0.79	17.1	0.001					
Emergency response													
Baseline	16.3 ± 4.9	—	Ref	17.4 ± 3.9	—	Ref	−1.1	0.23	3.7	1.2	1.3	6.0	0.002
After training	21.0 ± 4.4	4.7	<0.001	—	—	—	—	—					
12 weeks	20.1 ± 3.5	3.8	<0.001	17.5 ± 4.5	0.2	0.83	2.6	0.001					
Clinical management													
Baseline	22.7 ± 5.8	—	Ref	24.6 ± 5.4	—	Ref	−1.8	0.10	3.7	1.5	0.8	6.5	0.012
After training	27.1 ± 5.4	4.3	<0.001	—	—	—	—	—					
12 weeks	26.6 ± 4.4	3.8	<0.001	24.8 ± 5.1	0.2	0.86	1.8	0.05					
Self-protection													
Baseline	26.7 ± 7.9	—	Ref	29.2 ± 7.0	—	Ref	−2.5	0.09	8.4	2.1	4.2	12.6	<0.001
After training	38.9 ± 7.8	12.2	<0.001	—	—	—	—	—					
12 weeks	56.9 ± 11.2	9.5	<0.001	30.3 ± 8.6	1.1	0.48	5.9	<0.001					
Personal preparedness													
Baseline	46.4 ± 13.6	—	Ref	50.1 ± 13.1	—	Ref	−3.7	0.17	10.5	3.6	3.45	17.5	0.003
After training	58.9 ± 12.3	12.4	<0.001	—	—	—	—	—					
12 weeks	56.9 ± 11.2	10.4	<0.001	50.1 ± 13.1	−0.02	0.99	6.8	0.01					

Note. EG: experimental group; CG: control group; C.I., confidence interval; P values were from GEE models, with a group × time interaction term characterizing the intervention effect of interest; [a]reference group: baseline; [b]reference group: control group; [c]reference group: group (CG) × time.

exercises, simulations, and real-life case studies provides opportunities for participants to apply their knowledge and practical skills to make decisions in realistic scenarios. This practical approach helps bridge the gap between theory and practice, building competence and confidence in hospital nurses, thus ensuring their readiness for disaster response. Therefore, using multiple teaching strategies in a disaster management training program not only enhances learning outcomes but also promotes active participation and engagement, facilitates varied perspectives, develops practical skills, improves knowledge retention, fosters collaboration, encourages adaptability, and provides a holistic understanding of the field [17, 36]. These benefits contribute to the overall effectiveness of the training program and equip hospital nurses with effective disaster management strategies.

A recent systematic review reported that, among 23 studies, the majority assessed knowledge (78.3%), attitude (60.9%), or skills (43.5%) following disaster training [35]. This highlights the need for further research on the assessment of readiness for disaster response after such training. Most of the reported disaster programs focused on triage skills during disaster response instead of addressing the full spectrum of disaster management [11, 17]. In addition, the length of disaster training programs ranged from 1 to 28 days, with a median duration of two days [35]. Therefore, we developed and evaluated the effectiveness of a two-day structured DMTP covering the full spectrum of disaster management, including emergency response, clinical management, self-protection, and personal preparedness. Overall, our study found that the DMTP improved hospital nurses' readiness for disaster response, which could be attributed to the enhancement of participants' attitudes, knowledge, and skills in disaster response [35]. In addition, most studies investigating the effectiveness of disaster training programs have used pre- and posttest measures [17]. Therefore, the strength of our study lies in the fact that we conducted a randomized controlled trial to prove the effectiveness of DMTP.

Medical responders are at a high risk of experiencing a wide range of negative psychological health conditions following a disaster. Notably, depression and posttraumatic stress disorder are the most commonly diagnosed conditions among medical responders. A recent report documented that the prevalence of posttraumatic stress disorder among medical workers involved in the earthquake response was 16.4%, highlighting that medical workers involved in responding during disasters should undergo screening for mental health disorders before and after disasters and receive the necessary training regarding stress management and psychological resilience [38]. Particularly, nurses have higher levels of adverse outcomes than physicians and other medical professionals [13]. In addition, when organizations are exposed to disasters, staff members are often unprepared for the potential psychological impacts that can negatively affect their well-being. Fortunately, predisaster training can improve employees' confidence in their ability to cope with disasters [28, 39] and contribute to improving their psychological health [40]. Furthermore, combining reinforcement of emotional intelligence with predisaster training can also facilitate learning outcomes, since emotional intelligence has a significant positive relationship with various components of learning strategies, namely, self-efficacy, rehearsal, critical thinking, cognitive self-regulation, time and study environment management, peer learning, and help seeking [40]. Therefore, lack of structured and comprehensive training is an important risk factor for negative psychological outcomes across all types of disasters [13].

Personal preparedness and self-protection are critical for disaster response management. In challenging disaster environments, emergency services may not be readily available or may become overwhelmed. Individuals who are self-prepared and have basic self-reliance skills are more likely to survive, recover quickly, and be in a position to help others, reducing the risks of injury or death. Therefore, preparedness for self-rescue or self-protection is one of the most important elements of organized and timely emergency response to disaster events [41]. Personal preparedness and self-protection also enable swift responses in the immediate aftermath of a disaster, which is crucial for survival. Additionally, having individuals well-prepared for self-protection during a disaster can alleviate the burden on emergency services, allowing first responders to prioritize those in greatest need [11]. Therefore, personal preparedness and self-protection not only increase individuals' chances of survival and recovery but also contribute to an effective disaster response.

Readiness for disaster response, an important component of disaster management, encompasses the capacity to manage disaster impact quickly and efficiently. Therefore, responding quickly and appropriately to disasters is crucial and depends on frontline nurses' preparedness. Nurses' readiness for disaster response and competencies can vary depending on factors such as their specialty or work area of practice, individual interests, prior experience in in-service training programs, and exposure to deployments in disaster sites [18]. For example, nurses working in emergency departments or critical care settings may have more training and experience in disaster response than those working in other areas of healthcare [28]. However, nurses' readiness for disaster response includes not only clinical management and emergency response but also personal preparedness and self-protection ability [11]. During a disaster event, nurses not only provide first aid and advanced clinical care, monitor physical and mental health needs, allocate resources, conduct efficient communication, and provide crisis leadership [17] but also oversee the use of personal protective equipment, maintain personal emergency supply, prioritize their own safety, utilize appropriate personal protective equipment, and practice infection control measures to minimize exposure to hazards. In addition, according to our previous findings, nurses with prior disaster training were associated with greater readiness for disaster response, including its four major domains: emergency response, clinical management, self-protection, and personal preparedness, after adjusting for potential covariates such as sociodemographics (marital status and educational level), length of nursing

work, nursing position, nursing leaders, work unit/specialty, and previous disaster nursing experience [28]. Therefore, the current study aimed to develop a two-day structured disaster management training program that addresses the full spectrum of disaster management, including preparedness, clinical management, emergency response, and self-protection. Fortunately, we discovered the effectiveness of the training program in increasing hospital nurses' readiness for disaster response, both immediately after the program and at the 12-week follow-up.

4.3. Limitations and Strengths. There are some limitations in this study that should be considered. First, the geographic region in which this study was conducted may limit its generalizability to other cultural groups. Therefore, the current research findings must be interpreted with caution; more rigorous sampling strategies from multiple sites or hospitals are recommended. Second, although the 12-week follow-up effects after intervention are important, evaluation of long-term follow-up might be necessary. While acknowledging these limitations, it is crucial to recognize the strengths of our study as well. These strengths include the random allocation design, provision of a well-structured disaster management training program with multiple teaching strategies, and a high rate of study completion by the participants (94%).

4.4. Contributions and Future Directions. Notably, our study is the first trial to test the effectiveness of a two-day (16-hour) structured disaster management training program that includes four major domains/themes (emergency response, clinical management, self-protection, and personal preparation) through multiple teaching strategies (i.e., lectures, simulations, problem-solving lessons, demonstrations, tabletop exercises, discussions, group presentations, and reflections by transdisciplinary collaborations on readiness for disaster response among hospital nurses). Future studies could apply this training program to confirm its effectiveness across different cultures and focus on investigating competencies, combining knowledge, attitude, skills, readiness, and self-efficacy. This might help to elucidate how the training program improves readiness for disaster response in this population. Moreover, further more studies can (1) conduct longitudinal studies to provide insights into the long-term retention of disaster response skills and identify necessary intervals for refresher training; (2) integrate modern technologies like virtual simulation to potentially elevate training efficacy; (3) explore whether the program not only increases readiness for disaster response but also empowers hospital nurses; and (4) employ focus groups or qualitative methods to examine hospital nurses' perceptions regarding the most helpful aspects of the training. In addition, the feasibility of implementing the intervention in hospitals, educational institutions, and schools is an important next step.

4.5. Implications for Nursing Management. In light of our study findings, which reveal that structured disaster management training programs (DMTPs) utilizing multiple teaching strategies and transdisciplinary collaborations significantly enhance nurses' readiness for emergency and disaster response, nursing leaders or managers should actively integrate such DMTPs into ongoing professional development curricula to fortify hospital response readiness and capabilities. Specifically, nursing leaders are encouraged to prioritize these training modules, ensuring they are recurrent and updated regularly to reflect the latest in disaster response protocols and technology. Moreover, it is recommended that these programs be tailored to the specific needs and challenges of the nursing staff within individual healthcare facilities, considering factors such as existing skill levels and potential disaster risks pertinent to geographical locations. Nursing management could also benefit from establishing a feedback loop where participants in these programs contribute insights and suggestions for improvements. This approach fosters a culture of continuous learning and adaptation, thereby improving individual nurse preparedness and enhancing the overall institutional resilience to disasters.

5. Conclusions

A two-day structured disaster management training program, delivered by transdisciplinary professionals using multiple teaching strategies, can serve as an effective approach to improve hospital nurses' readiness for disaster response. Such disaster training programs might include innovative methods such as virtual reality and be integrated into ongoing nursing education and future curricula to strengthen disaster readiness across healthcare settings. In addition, continuous educational efforts and periodic refresher training are recommended to maintain and update these critical skills. Nursing leaders or managers should consider incorporating such a structured disaster management training program as a critical component of professional development programs, thereby strengthening nurses' disaster readiness in hospital settings, fostering a culture of continuous learning and adaptation, and enhancing overall institutional resilience to disasters.

Data Availability

Data are available from the corresponding author upon reasonable request.

Disclosure

The funding organization had no role in the design, analysis, interpretation of data, writing of the manuscript, or decision to publish the results. The authors retained full independence in the conduct of this research.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

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Review Article

Effectiveness of Individual-Based Strategies to Reduce Nurse Burnout: An Umbrella Review

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Aims. This umbrella review aims to comprehensively synthesize and analyze the findings of available systematic reviews on the effectiveness of individual-based strategies for reducing nurse burnout occurring in hospital-based settings. *Methods*. Following JBI guidelines, an umbrella review was conducted to integrate the effectiveness of various strategies to reduce burnout. Systematic reviews were searched in the Embase, MEDLINE (Ovid), Cochrane Library, CINAHL (EBSCO), Scopus, and WOS databases. Inclusion criteria included studies published in any language from database inception to April 2023. Eligibility assessment involved two independent reviewers who evaluated titles, abstracts, and full texts. The systematic reviews were critically evaluated using JBI SUMARI. The results were narratively synthesized and grouped by strategy. *Results*. Eleven systematic reviews were included, covering the years 2012 to 2021. The appraisal tools varied, though all included reviews were of high quality. The strategies were categorized into three domains: mental health (51%), physical activities (26%), and professional competence (13%). The interventions most identified were mindfulness-based stress reduction for mental health, yoga for physical activities, and professional competence education. These individual-based strategies were shown to effectively eliminate emotional exhaustion (72.7%), depersonalization (44%), and occupational stress (78%) among nurses in hospital-based settings. *Conclusion*. Mental health, physical activities, and professional competence are strategies to reduce nurse burnout. Implementing these approaches in healthcare settings can improve emotional exhaustion, depersonalization, and occupational stress of nurses.

1. Introduction

Globally, nurse burnout is a critical issue impacting on the healthcare workforce which is reported as 11.23% of burnout symptoms [1] and continuously spreading out within the healthcare sector [2].

Indeed, nurse burnout is amplified during the COVID-19 pandemic, given their increased vulnerability to the virus and the multifaceted challenges encountered in providing care [3, 4]. Nurses constitute a large proportion about 60% in hospitals, and an increasing number of nurses are required to assist critical and general patient care during the COVID-19 pandemic [5].

Burnout in nurses has numerous detrimental effects on individuals, organizations, and patient care. It significantly affects the health and well-being of nurses by emotional exhaustion, depersonalization, and low personal accomplishment. These symptoms can have adverse consequences for nurses, including the development of physical and mental health problems such as depression and anxiety [6, 7]. Nurse burnout is linked to poor outcomes such as quality of care and patient satisfaction [6]. Burnout can be detrimental to patient care quality, leading to an increase in medical errors that compromise patient safety [8]. Addressing nurse burnout becomes imperative to uphold quality patient care and sustaining the healthcare system. Improving nursing burnout requires interventions at various levels, including national and organizational policy such as creating a positive work environment and healthy workforce strategies, as well as individual-based approaches. While national and organizational strategies to reduce burnout are generally directed towards the majority, individual-based strategies are needed to be designed for nurses to choose according to their preference.

Numerous interventions have been suggested to assist nurses in practicing self-care with the aim of mitigating or preventing burnout and various individual health-related outcomes [9–13]. For example, physical activities such as yoga, Qigong, and Tai Chi have been proposed to improve sleep quality and alleviate post-shift stress [10]. Emotion-focused tactics and psychosocial programs have been implemented to enhance mental health and prevent burnout [12]. A variety of mindfulness-based interventions (MBSR) have been advocated to enhance nurse well-being. These interventions have shown positive impacts on sleep quality, anxiety, depression, and overall resilience [13–15]. Interventions such as team-based training, communication skills enhancement, cognitive coping mechanisms, and problem-solving techniques have demonstrated efficacy in reducing nurse burnout and maintaining effectiveness [9, 11]. Multicomponent interventions have also positively affected physical and mental health and job satisfaction [12].

Recent research on nursing burnout has increasingly focused on multifaceted interventions with promising potential. These interventions often combined physical or psychological methods, yet researchers are interested in wide range of outcome indicators [16, 17]. Numerous original studies employing different approaches to reduce burnout have yielded varying results due to differences in study design and implementation [17, 18]. Systemic review and meta-analysis on the topic of burnout have emerged prominently since the 1990s and have been essential to integrate the best evidence while evaluating research biases [19]. However, differing criteria for research inclusion and exclusion, search terms, timeframes, language, and type of article have contributed to varied outcomes and interpretations on the efficacy of nurse burnout strategies. The increasing number of such reviews can be overwhelming for those seeking clinical application. Furthermore, while numerous interventions are frequently used, their comprehensive evaluation in many meta-analyses remains lacking [20].

An umbrella review, alternatively known as an overview of reviews, represents a unique literature review format that aggregates findings from multiple systematic reviews or meta-analyses on a specific subject [21]. Unlike traditional systematic reviews that examine primary studies, an umbrella review analyzes evidence from existing reviews to provide a more comprehensive overview of the research area. This method is particularly apt for a comprehensive synthesis of varied strategies and outcomes across a multitude of reviews, providing a more integrated understanding of effective interventions in a thoroughly researched domain [20, 21]. By compiling data from various reviews, an umbrella review yields clearer, more substantial, and elevated insights into the efficacy of individual-based strategies for mitigating burnout among nurses. This type of review facilitates a thorough assessment of current evidence, pinpointing both consistencies and discrepancies in the findings [22]. Therefore, the objective of this umbrella review is to comprehensively synthesize and analyze selected systematic reviews which have evaluated the effectiveness of individual strategies implemented to reduce burnout among nurses.

2. Methods

This umbrella review aims to synthesize the impact of individual-based strategies on reducing nurse burnout within hospital-based settings. The methodology adhered to the guidelines developed by the Joanna Briggs Institute [23] and the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting standards. The umbrella review was registered in the PROSPERO system (Number: CRD42022330618).

2.1. Search Strategy. Six databases, from inception to April 2023 were searched: Embase, MEDLINE (Ovid), Cochrane Library, CINAHL (EBSCO), Scopus, and WOS. The PICO framework guided this umbrella review with the question: Are individual-based strategies effective in reducing burnout among front-line nurses in hospital settings? Language was not restricted. The MeSH and free-text terms related to individual-related strategies for burnout in nurses were searched. The syntax was listed as [(nurse* OR (staff* OR employee* OR officer* OR personnel* OR practitioner* OR profess* OR provider* OR specialist* OR worker*) NEAR/6 (nurs* OR health* OR hospital* OR medical))] AND

[(burnout* OR "burn out*" OR exhaustion* OR (extreme* ADJ 4 fatigue*))]. The SR filter formula used the BMJ Best Practice syntax (https://bestpractice.bmj.com/info/toolkit/learn-ebm/study-design-search-filters/).

2.1.1. Inclusion and Exclusion Criteria.
The selection process applied the following inclusion criteria: (1) studies specifically targeting nurses, (2) interventions that were individual-based and aimed at reducing burnout, (3) primary outcomes related to burnout and their dimensions, such as emotional exhaustion, depersonalization, and reduced personal accomplishment, (4) the context as hospital-based setting, and (5) type of systematic reviews was intervention-based. Studies were excluded if (1) participant data were combined with other healthcare disciplines, (2) no provided data to address the effectiveness in the systematic reviews, and (3) insufficient information to appraising methodologic quality.

2.1.2. Selection of Articles.
Articles meeting the inclusion criteria were uploaded to EndNote X9 (Clarivate Analytics, PA, USA) for article screening. Two independent reviewers assessed eligibility by titles and abstracts followed by full text review of eligible studies. Reasons for the exclusion of papers that did not meet the inclusion criteria were recorded. Any disagreements between the two reviewers were resolved through discussion with a third reviewer. After relevant studies were retrieved, the JBI system for the unified management, assessment, and review of information (JBI SUMARI) (JBI, Adelaide, Australia) was applied to integrate findings.

2.2. Quality Appraisal.
The methodology's quality was evaluated using the JBI SUMARI's systematic review instruments, consisting of the JBI Critical Appraisal Checklist for Systematic Reviews and Research Syntheses (JBI CACSRRS) [24]. The appraisal of systematic reviews or meta-analyses is guided by 11 questions. The answers are rated as "yes," "no," "unclear," "or not applicable." Two independent reviewers used the instruments to appraise eligible studies. A third reviewer was consulted to facilitate discussion and resolve any issues.

2.3. Data Extraction.
The JBI SUMARI was used to extract data from the included reviews. The information extracted included first author's name and country, published year, and review objectives. The details of included studies in each review were extracted and included the number of studies, number of included participants, country, study design, strategies, outcome measurement, and conclusions.

3. Results

3.1. Search Process.
A total of 2424 articles were retrieved from six databases. After removing duplicate records ($n = 1130$) and screening by title and abstract, 52 full-text articles were reviewed. Articles were excluded due to the following: the outcome did not include burnout ($n = 10$), subjects included non-nursing staff ($n = 25$), and the article did not present a systematic review ($n = 8$). Nine articles from six databases were retained. Two additional articles were obtained using a citation search. Eleven articles were included in the analysis (Figure 1).

3.2. Characteristics of Included Articles.
The articles were published between 2012 and 2021, with two of the eleven systematic reviews including meta-analyses (Table 1). The number of studies synthesized with the systematic review ranged from 6 to 25, encompassing a total of 467 to 6,055 subjects. Researchers were represented from Germany ($n = 4$), Canada ($n = 2$), and one each from Taiwan, Korea, Australia, Malaysia, and Iran. The included studies in the review encompassed a global perspective, covering Europe (with countries such as the Netherlands, Spain, Italy, Germany, Ireland, the UK, Portugal, Denmark, Sweden, Norway, Greece, and France), the Americas (the USA, Canada, and Brazil), the Middle East (Iran and Israel), Asia (India, Japan, Turkey, China, Taiwan, Malaysia, Hong Kong, and Korea), and Oceania (Australia). The RCT was the most researched design within the reviews. The outcome indicators represented three categories: mental perception (e.g., stress, burnout, depression, and life satisfaction), physical symptoms (e.g., muscle pain and insomnia), and work-related (e.g., patient care and job satisfaction).

3.3. Quality Appraisal.
The quality of the eleven included articles was evaluated using the JBI CACSRRS. In the eleven systematic reviews, 10 (90.9%) achieved a yes score on 8 of the 11 questions (Table 2). All articles met of 100% for questions 1, 7, 8, 10, and 11. Four questions (Q2, Q3, Q4, Q5, and Q6) were met between 64% and 91%. Question 9, "the likelihood of publication bias," was answered for only one review due to the low number of studies in the other reviews. All eleven systematic reviews were included for qualitative integration.

3.4. Effectiveness of Strategies and Interventions

3.4.1. Strategies and Interventions for Reducing Burnout.
Among the 11 selected systematic reviews, a total of 145 studies were included. After removing duplicates, 131 remained, of which 64 studies discussed the three strategies for the outcome indicators of burnout or occupational stress. Within these 64 studies, the strategies employed included combinations in 6 studies (four mental health + physical activities and two mental health + professional education) and single strategies in 59 studies (25 for mental health, 24 for physical activities, 9 on professional education).

Among the 64 studies, the distribution of strategies applied was as follows: mental health ($n = 31$, 44%), physical activities ($n = 28$, 40%), and professional competences ($n = 11$, 16%). In the 31 studies focused on mental health strategies, three types of interventions were included: mindfulness-based stress reduction (MBSR), stress and relaxation management, and resilience and cognition training. Two studies combined two approaches (stress and relaxation management + resilience and cognition training; MBSR + resilience and cognition training). Thus, in these 31
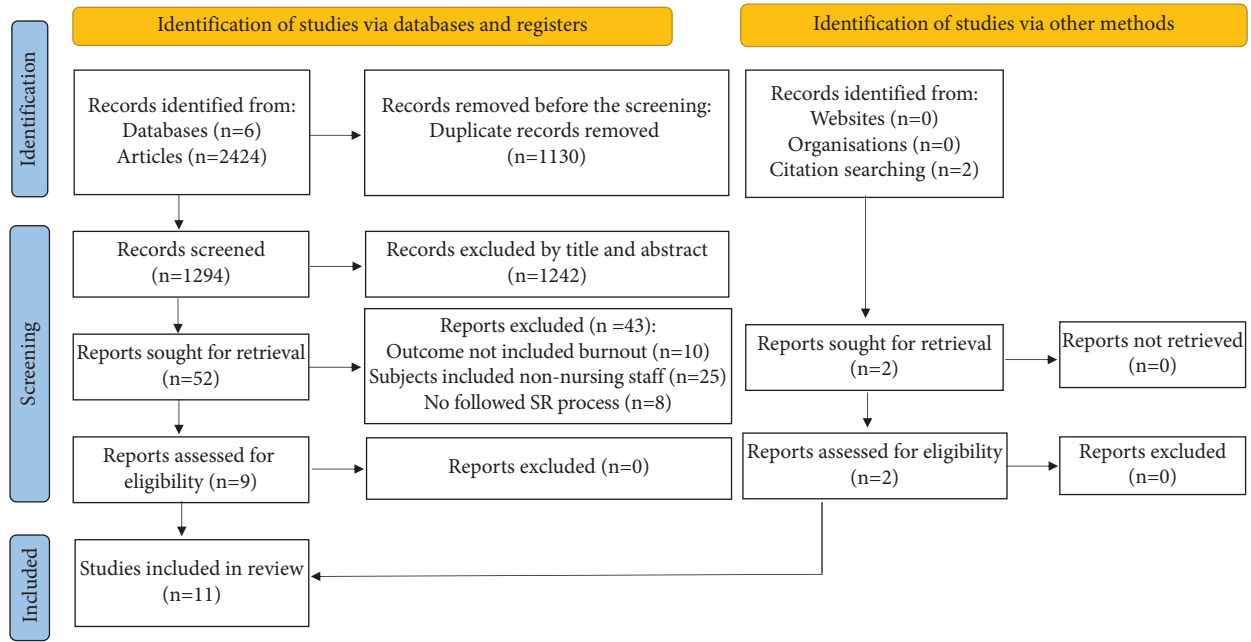
Figure 1: Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram. From: Page MJ, McKenzie JE, Bossuyt PM, Boutron I, Hoffmann TC, Mulrow CD, et al. The PRISMA 2020 statement: an updated guideline for reporting systematic reviews. BMJ 2021; 372: n71. doi: 10.1136/bmj. n71.

mental health strategy studies, the distribution of the interventions was MBSR (48%), stress and relaxation management (27%), and resilience and cognition training (24%). In the 28 studies related to the strategies of physical activities, two types of interventions were yoga and general physical exercise, with their distribution being yoga (71%) and general physical exercise (29%). Among the 11 studies on professional competences strategies, two types of interventions were competence education (73%) and coworker supervision (27%) (Figure 2).

3.4.2. Effectiveness of Interventions for Reducing Burnout. Among the 64 studies reviewed, 23 mentioned the effectiveness of interventions on emotional exhaustion (EE), with 17 (74%) reporting a significant reduction in EE. Among these 17 studies, the interventions most frequently effective in reducing EE included MBSR mentioned 5 times, competence education 4 times, resilience and cognition training 3 times, stress and relaxation management 2 times, coworker supervision 2 times, and yoga once. 19 studies addressed the impact of interventions on depersonalization (DP), with 11 (58%) reporting effective reductions. The most frequently effective measures for reducing DP included MBSR 4 times, resilience and cognition training 3 times, competence education 2 times, stress and relaxation management once, coworker supervision once, and yoga once. 20 studies discussed intervention effects on low personal accomplishment (LPA), with 10 (50%) achieving significant reductions. The interventions most effective in reducing LPA were MBSR, resilience and cognition training, and competence education, each mentioned 3 times, followed by coworker supervision 2 times, stress and relaxation management once,

and yoga once. 42 studies examined the effectiveness of interventions on work stress, with 32 (76%) noting substantial stress reductions. The most frequently effective strategies to reduce work stress were yoga 17 times, MBSR 6 times, stress and relaxation management 5 times, competence education twice, and general physical activities twice (Figure 3).

4. Discussion

An umbrella review included a comprehensive evaluation of evidence derived from eleven systematic reviews of 131 different research studies focused on reducing nurse burnout. Strategies formed three main categories: mental health, physical activity, and professional competence. The interventions which positively contributed on burnout were MBSR, resilience and cognition training, and stress and relaxation as well as yoga in occupational stress.

4.1. Enhancing Mental Health. MBSR is the most frequent mental health strategy applied to reduce burnout based on the study findings. Nurses face a high workload and poor working conditions [29] and are at risk of developing psychological distress [30]. Many studies have documented the effectiveness of MBSR in reducing stress [13, 14]. For physical mechanism, MBSR practices can be crucial for the body's defense against infections and improving health [31, 32]. MBSR practices cultivate self-compassion, helping individuals to face adversity without succumbing to self-criticism or negative self-evaluation, which are key factors in burnout [33]. When conducted in group settings, mindfulness practices strengthen interpersonal connections

TABLE 1: Key characteristics of systematic reviews in the umbrella review ($n = 11$).

First author/year/country	No. of included studies (year of publication)	Total no. of subjects	n/countries represented	n/study designs represented	n/strategies	Outcomes	Conclusions
Stuber/2021/Germany	7 (1994–2018)	1104	4 USA 1 China 1 UK 1 Germany	1 RCT 3 Cohort 3 CCT	2 Stress management and coping 2 Professional enhancement 2 Communication and conflict management 1 Problem-solving	↑ Work atmosphere ↑ Personal competences ↑ Work satisfaction ↓ Psychological strain ↓ Insomnia ↓ Emotional exhaustion	Leadership intervention can maintain or foster mental health among nurses
Jung/2021/Korea	17 (1993–2020)	1430	4 China 3 US 2 Taiwan 2 Japan 1 Korea 1 Greece 1 Turkey 1 France 1 Malaysia 1 Iran	15 Parallel RCT 2 Cross-over RCT	3 Relaxation 3 Music-related 2 Resilience 5 MBSR 4 Yoga 1 Meditation 1 Aromatherapy	↑ Job satisfaction ↑ Quality of life ↑ General health ↓ Burnout ↓ Stress ↓ Anxiety ↓ Depression ↓ Fatigue	Yoga showed significant effect on burnout
Bischoff/2019/Germany	9 (1995–2017)	690 (9–282)	4 USA 1 China 1 Brazil 2 Sweden 1 Taiwan	7 RCT 1 Quasi 1 Pilot pre-post	4 Yoga 2 Physical exercise 1 Qigong 1 Tai Chi 1 Individually designed training	↓Emotional exhaustion ↓ Depersonalization ↓ Stress	Yoga and qigong can reduce stress among health personnel
Gillman/2015/Australia	20 (1994–2013)	1811 (6–563)	8 USA 1 Australia 1 Italy 5 Canada 2 Sweden 1 Wales 1 Taiwan 1 Portugal	4 mixed 5 Grounded 3 Phenomenology 4 cross-sectional 1 concept mapping 2 Pre-post 1 RCT	2 Emotion-focused techniques 9 Stress management and coping 3 Compassion fatigues resilience strategies 2 Hoping and self-transcendence 2 Death education 2 Mentoring or buddy systems 1 Consultation	↑ Resilience ↑ Coping ↑ Job satisfaction ↑ Quality of care ↓ Stress ↓ Burnout	Many strategies can help nurses to cope with work challenges including strategies which promote team connection, help reduce stress and recovery, or help to deal with emotions from experiences

Table 1: Continued.

First author/year/country	No. of included studies (year of publication)	Total no. of subjects	n/countries represented	n/study designs represented	n/strategies	Outcomes	Conclusions
Ghawadra/2019/ Malaysia	9 (2006–2017)	467	1 Canada 3 USA 1 Japan 1 Malaysia 1 Brazil 2 Portugal	2 RCT 3 QCT 4 Pre-post	7 MBSR 1 Mindful-gym 1 Self-related processing	↑ Job satisfaction ↑ Quality of life ↑ General health ↑ Relaxation ↑ Sense of coherence ↑ Self-compassion ↑ Serenity ↑ Empathy ↑ Mindfulness ↑ Happiness ↓ Burnout ↓ Stress ↓ Anxiety ↓ Depression ↓ Fatigue	MBSR can reduce burnout, stress, anxiety, depression, and fatigue, and increase job satisfaction, quality of life and so on among nurses
Otto/2021/ Germany	6 (1997–2019)	716	2 Norway 2 Netherlands 1 Australia 1 USA	6 RCT	2 Comprehensive orientation training 2 Exercise 1 Positive psychology 1 Acceptance and commitment therapy (ACT) 1 Clinical lesson 1 Emotion training 1 supervision meeting 1 Stress management	↑ Job satisfaction ↑ Mental health ↑ Physical health ↓ Burnout ↓ Neck complaints	Cognitive-behavioral and multicomponent interventions can improve physical and mental health, job satisfaction, and can reduce burnout and neck complaints among elderly care nurses
Westermann/ 2014/Germany	16 (2001–2012)	2253 (21–384)	3 Canada 1 Italy 3 Germany 3 Australia 1 Denmark 1 UK 2 USA 2 Netherlands	10 RCT 5 Quasi 1 Pre-post	13 Innovative caring strategies and communication skills for dementia 4 Mentoring or buddy systems 1 Stress coping 1 MBSR 1 Ergonomic and psychosocial training	↓ Low personal accomplishment ↑ Job satisfaction ↑ Intrinsic motivation ↓ Emotional exhaustion ↓ Depersonalization	Only a few interventions have positive influences on nursing staff burnout, we need more evidence to prove that can prevent burnout

TABLE 1: Continued.

First author/year/country	No. of included studies (year of publication)	Total no. of subjects	n/countries represented	n/study designs represented	n/strategies	Outcomes	Conclusions
Ciezar-Andersen/2021/Canada	25 (1998–2019)	1778	10 India 8 USA	12 RCT 1 Quasi 9 Pre-post 2 Qualitative 1 Mixed	25 Yoga	↑ Coping in acutely stressful situations ↑ Psychiatric ↑ Physical health ↑ Self-compassion ↑ Self-care practices ↑ Quality of care ↑ Mindfulness ↑ Concentration ↓ Stress ↓ Anxiety ↓ Depression ↓ Burnout ↓ Musculoskeletal aches and pains	Yoga can improve mental and physical health among HHPs and HHP students
Aryankhes/2019/Iran	18 (12 for nurses) (2006–2017)	6055	2 UK 4 USA 4 Netherlands 1 Australia 1 Japan 1 Canada 2 Turkey 1 Iran 1 Israel 1 China	12 RCT 6 pretest-post-test	1 Thankful event 2 Electronic-mental health care 1 Consultation with physician 1 Participatory program 2 Yoga 1 Communication skill training 1 Professional program 1 Cognitive and emotive training 1 Psychosocial training 1 Coping skill 1 MBSR	↓ Emotional exhaustion ↓ Depersonalization	The interventions used to improve burnout were communication skills, teamwork, participatory programs, and psychological interventions such as Yoga, meditation, and MBRS
Lee/2016/Taiwan	7 (1998–2014)	766	2 USA 2 Netherlands 1 Canada 1 Spain	5 RCT 2 Quasi	1 Cognitive behaviors meeting 2 Coping and stress management 2 Refresher session 2 MBSR 1 Team-based supported 1 Cognitive coping strategies 1 Problem-solving	↓ Emotional exhaustion ↓ Depersonalization ↑ Low personal accomplishment	Coping strategies can reduce nurse burnout

TABLE 1: Continued.

First author/year/ country	No. of included studies (year of publication)	Total no. of subjects	n/countries represented	n/study designs represented	n/strategies	Outcomes	Conclusions
Suleiman-Martos/ 2020/Canada	17 (2005–2019)	632 (13–91)	8 USA 2 Australia 1 Ireland 1 Brazil 1 Portugal 2 Canada 1 Iran 1 Japan	8 RCT 9 Quasi	17 MBSR	↑ Physical health ↑ Mental health ↑ Quality of care ↑ Resilience ↑ Life satisfaction ↑ Self-compassion ↑ Low personal accomplishment ↑ Job satisfaction ↓ Emotional exhaustion ↓ Burnout ↓ Stress ↓ Depression ↓ Depersonalization	MBSR and MBSCR can reduce burnout among nurses. However, it needs more evidence to prove it

Table 2: Quality appraisal of included systematic reviews using JBI ($n = 11$).

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	No. of questions met
[10]	O	O	O	X	O	O	O	O	N/A	O	O	9
[25]	O	O	O	X	O	O	O	O	N/A	O	O	9
[14]	O	X	U	O	O	O	O	O	N/A	O	O	8
[15]	O	O	O	O	O	O	O	O	N/A	O	O	10
[26]	O	O	O	O	O	O	O	O	N/A	O	O	10
[12]	O	O	O	O	O	O	O	O	N/A	O	O	10
[27]	O	X	O	O	O	O	O	O	N/A	O	O	9
[13]	O	O	O	X	O	O	O	O	O	O	O	10
[28]	O	X	O	O	X	X	O	O	N/A	O	O	7
[9]	O	X	O	O	O	O	O	O	N/A	O	O	9
[11]	O	O	O	X	O	O	O	O	N/A	O	O	9
% meeting criteria	100	63.6	90.9	63.6	90.9	90.9	100	100	9.1	100	100	Range 7–10

Note. Met appraisal question (O)/not meet appraisal question (X)/unclear (U)/not applicable (N/A); Question of checklist: (1) Is the review question clear and explicitly stated? (2) Were the inclusion criteria appropriate for the review question? (3) Was the search strategy appropriate? (4) Were the sources and resources used to search for studies adequate? (5) Were the criteria for appraising studies appropriate? (6) Was critical appraisal conducted by two or more reviewers independently? (7) Were there methods to minimize errors in data extraction? (8) Were the methods used to combine studies appropriate? (9) Was the likelihood of publication bias assessed? (10) Were recommendations for policy and/or practice supported by the reported data? (11) Were the specific directives for new research appropriate?
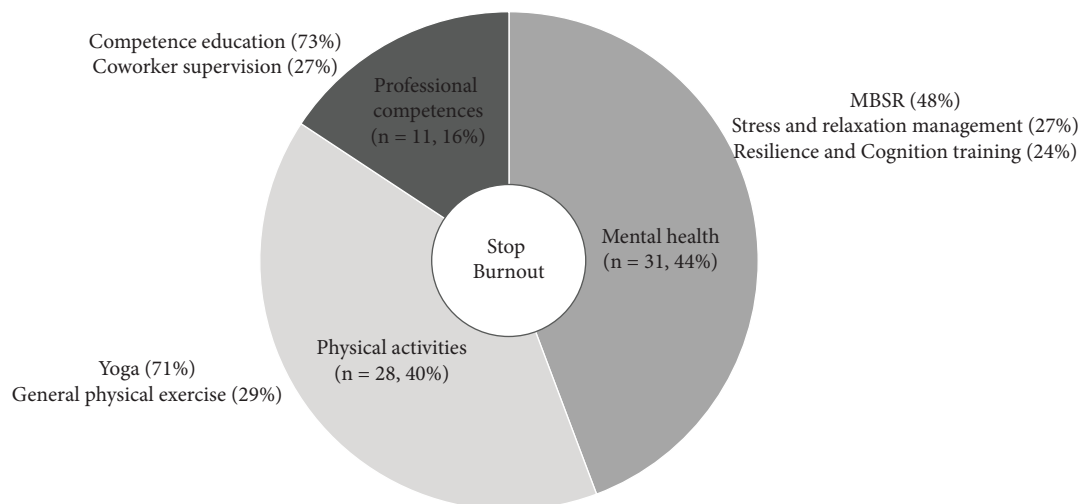
Figure 2: The strategies and interventions for reducing nurse burnout.

among nurses, providing a network of emotional support that is vital for managing work-related stress and reducing the risk of burnout [34].

A typical MBSR program consists of two to three hours of instruction per week for eight weeks and requires regular practice to reap its full benefits. However, some factors should be considered for the individuals [35, 36]. (1) Time commitment: a typical MBSR program consists of two to three hours of instruction per week for eight weeks; it may be challenging for some individuals to commit this amount of time. (2) Requires practice: MBSR requires regular practice to reap its full benefits; a busy schedule may make this difficult for some individuals. (3) Not a substitute for professional help: the MBSR program should not be regarded as a substitute for professional medical or psychological care. In cases involving mental or physical illness, it is essential to seek professional assistance.

4.2. Increasing Physical Activity. Increasing physical activity was the second most frequently strategy for mediating nursing burnout, with yoga being the most common activity. Physical activity influences hormone levels, including the stress hormones. Maintaining physical activity provides a positive contribution to human psychoneuroimmunology and improved mental health [37]. The systematic review of Dutta et al. [38] described the physical and psychological benefits of yoga. However, yoga practitioners must be cautious of (1) musculoskeletal injuries: injuries to the musculoskeletal system are caused by the improper position,
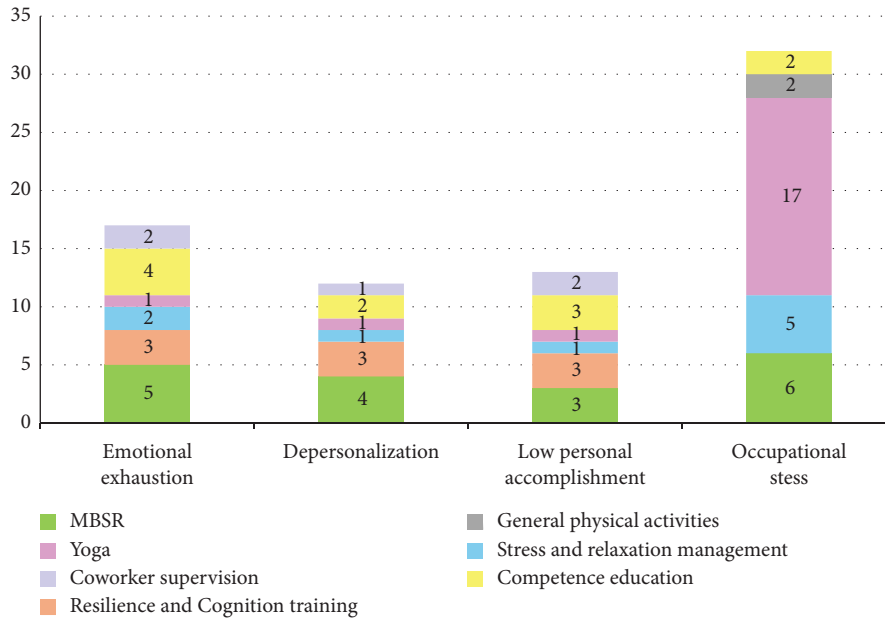
FIGURE 3: The effectiveness of interventions for reducing emotional exhaustion, depersonalization, low personal accomplishment, and occupational stress.

which can lead to muscle, bone, and joint problems [39]; (2) overstretching: an individual who overstretches their body or pushes it beyond its limits can lead to both pulled muscles and torn ligaments as a result of overstretching or pushing the body beyond its maximum ability [40]; and (3) physical exhaustion: for beginners or individuals with underlying health conditions, intense yoga sessions can sometimes result in physical exhaustion [41].

4.3. Improving Professional Competence. Professional competence was the third strategy, and professional competence education and coworker supervision were the important interventions in the current systematic reviews. The nurses' professional competence is reflected in their attitudes, knowledge, and psychosocial and psychomotor skills [42]. Nursing professional competence refers to the ability of nurses to demonstrate various abilities such as personal characteristics, professional attitudes, values, knowledge, and skills as they carry out their professional responsibilities [43]. Some researchers emphasized the significance of professional values on nursing competence and found the negative relationship between professional values and burnout [44, 45]. On the other hand, work-related stress occurs when people are expected to perform tasks beyond their abilities which requires coping mechanisms. Improving professional competence can provide confidence which can lead to a sense of mastery and control. Situational control reduces the stress associated with uncertainty and ambiguity for a decrease in burnout [45, 46]. Nurses possessing high levels of professional competence are typically well-equipped with the necessary knowledge, skills, and experience to adeptly handle challenging situations and workloads [47].

Additionally, nurses with higher levels of professional competence reported stronger relationships with their colleagues, likely because they are more likely to be seen as competent and trustworthy [48]. Many research studies have indicated that good interpersonal relationships are an important factor in combating burnout [49, 50]. Therefore, higher professional competence can positively contribute to good interpersonal relationships and self-confidence at work, which can then reduce stress and burnout.

4.4. Implications for Managers. The umbrella review highlighted the importance of manager facilitation in addressing nursing burnout through individual-based strategies. Key recommendations include routine assessment of burnout level, offering MBSR and yoga programs, fostering workplace social support networks, and organizing professional competence development programs.

First, regular assessment of the burnout level is necessary because the effectiveness of interventions would be ineffective after 6 months [11]. Managers can tailor the schedule for burnout assessments to align with the organization's culture and the individual characteristics of employees. This approach allows for a thorough evaluation of burnout levels, taking into account differences across various professional nursing tiers and considering significant occurrences like hospital accreditation or personal milestones. Second, managers can arrange the MBSR and physical activities such as yoga or general physical exercise training for nurses. Before the nurses practice the MBSR or yoga activities by themselves, well-trained instructors can provide comprehensive training and prevent the adverse events of MBSR and yoga. On the other hand, the instructors can suggest the appropriate period of MBSR or skill of yoga according to individual

characteristics. Third, resilience improvement is also an important factor. Studies indicate that resilience can combat burnout [15, 26]. Health organizations need to improve the well-being of nurses and the managers can implement training courses such as resilience training to prevent the incidence of cumulative burnout [51]. Fourth, nurse leaders can mitigate the negative impact of burnout on their professional values by strengthening and improving their professional value education through seminars and nursing in-service education programs [52]. In addition, nurse managers can provide continuing education opportunities based on the working unit or level of professional capacity to enhance professional competence among nurses [53]. The competence improvement education can teach nurses to determine for themselves how to handle their problems and how to improve their situation through meaningful dialog and engagement with nurse leaders concerning their work-life issues. Finally, the peer support and supervision system is necessary. A network fosters a sense of belonging and security, enhancing individuals' ability to cope with stress and burnout. Designing leisure activities for nurses can contribute to interpersonal relationships and decrease stress [54].

5. Strengths and Limitations

An umbrella review systematically compiled and synthesized evidence on individual-based strategies for reducing stress and burnout among nurses in hospital-based settings. The review marks a significant step in collating evidence and identifying the research on the most frequently used strategies. The review was limited by only including published systematic reviews and omitted grey literature or unpublished studies. Overlapping sources across the systematic reviews led to inconsistent outcomes and may have rendered burnout metrics inaccurate. Additional mental health indicators, such as anxiety or depression, may have confounded burnout findings. The umbrella review revealed that while numerous interventions are commonly used, many have not been thoroughly tested. More research is needed for in-depth analysis of these interventions.

6. Conclusion

Strategies for reducing nurse burnout are focused on mental health, physical activity, and professional competence. Nurses can adopt personal preference strategies and self-help interventions to reduce burnout.

Data Availability

Data are available upon request.

Additional Points

What Is Already Known about the Topic? (1) Nurse burnout is a widespread and global problem. (2) Nurse burnout has been associated with negative individual and work-related outcomes. (3) Various strategies have been implemented to reduce nurse burnout. *What This Paper Adds.* (1) Strategies to reduce burnout can be categorized into three domains:

mental health, physical activities, and professional competence. (2) The interventions most applied were mindfulness-based stress reduction, yoga, and competence education. (3) Individual-based strategies were shown to effectively eliminate emotional exhaustion, depersonalization, and occupational stress.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Effects of Job Crafting and Leisure Crafting on Nurses' Burnout: A Machine Learning-Based Prediction Analysis

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Aim. To explore the status of job crafting, leisure crafting, and burnout among nurses and to examine the impact of job crafting and leisure crafting variations on burnout using machine learning-based models. *Background.* The prevalence of burnout among nurses poses a severe risk to their job performance, quality of healthcare, and the cohesiveness of nurse teams. Numerous studies have explored factors influencing nurse burnout; however, few involved job crafting and leisure crafting synchronously and elucidated the effect differences of the two crafting behaviors on nurse burnout. *Methods.* Multicentre cross-sectional survey study. Nurses ($n = 1235$) from four Chinese tertiary hospitals were included. The Maslach Burnout Inventory-General Survey, the Job Crafting Scale, and the Leisure Crafting Scale were employed for data collection. Four machine learning algorithms (logistic regression model, support vector machine, random forest, and gradient boosting tree) were used to analyze the data. *Results.* Nurses experienced mild to moderate levels of burnout and moderate to high levels of job crafting and leisure crafting. The AUC (in full) for the four models was from 0.809 to 0.821, among which the gradient boosting tree performed best, with 0.821 AUC, 0.739 accuracy, 0.470 sensitivity, 0.919 specificity, and 0.161 Brier. All models showed that job crafting was the most important predictor for burnout, while leisure crafting was identified as the second important predictor for burnout in the random forest model and gradient boosting tree model. *Conclusion.* Even if nurses experienced mild to moderate burnout, nurse managers should develop efficient interventions to reduce nurse burnout. Job crafting and leisure crafting may be beneficial preventative strategies against burnout among nurses at present. *Implications for Nursing Management.* Job and leisure crafting were identified as effective methods to reduce nurse burnout. Nurse managers should provide more opportunities for nurses' job crafting and encourage nurses crafting at their leisure time.

1. Background

Nurses constitute the largest proportion of the healthcare workforce worldwide and play an essential role in clinical treatment, illness prevention, and health promotion. However, because of extensive job demands, scarce resources, work-family conflicts, and complex clinical work environments, nurses experience several burnout symptoms, such as emotional exhaustion, cynicism, and reduced professional efficacy [1, 2]. These phenomena adversely affect the quality of care, patient safety and satisfaction, job performance, turnover rate, and the physical and mental health of nurses [3, 4]. According to a nationwide survey conducted in the United States of America, 16.6%–30.0% of nurses (3,957,661 samples) reported experiencing burnout and 31.5% of them listed burnout as a contributing factor to their decision to leave their positions [5]. A cross-sectional survey in 12 European countries showed that 10%–78% of nurses had burnout symptoms [6]. In the mainland China, the burnout rate is also high; for example, in Shanghai, it is 45.1% [7], and in Hunan, it is at 34.9% [8]. Given the current high levels of burnout among nurses worldwide, it has

become critical for hospital administrators, nurse managers, and nurses themselves to gain a deeper understanding of the factors that contribute to burnout to enhance the quality of clinical care, stabilize nurse retention, and improve the physical and mental health of nurses.

Job crafting is defined as the actions employees take in modifying their tasks and work relationships to promote their cognitive understanding of the job meaning and attain a greater person-job fit [9]. Previous studies have highlighted that job crafting is not only beneficial to employees' health (e.g., well-being and general health) [10, 11], work attitude (e.g., job satisfaction and organizational commitment) [12], and behavior (e.g., work engagement and creativity) [13] but is also conducive to organizational performance (e.g., quality of care and group innovation) [14, 15]. Literature review shows that increasing research had investigated the relationship between job crafting and burnout in nurses. Cumulative evidence has shown that job crafting can maintain a proactive balance between job demands and resources by fostering self-driven work behavior, consequently alleviating nurse burnout [16]. Several studies have found a moderate-to-high influence of job crafting on burnout [16, 17], whereas others have reported a rather small effect of job crafting on burnout [18]. Because the effect sizes of these studies were inconsistent, further investigation is required to provide new evidence.

Leisure crafting is a novel strategy for dealing with depleted resources and was firstly defined by Petrou and Bakker [19]. This strategy refers to individuals' proactive and self-initiated pursuit of off-job life to fulfill their goals, interpersonal connections, learning, and personal growth. Unlike job crafting, leisure crafting motivates individuals' passions and satisfies their psychological requirements by shaping their leisure activities in a proactive, deliberate, and serious manner [20, 21]. Existing studies indicated that leisure crafting can reshape the task and relational bounds of individuals' leisure, improve their sense of mastery, and help them acquire resources [22, 23]. Leisure crafting is believed to address individuals' needs and values and improve their ability to handle workplace stressors, thereby averting the negative effects of job demands [24]. Few studies have explored the effects of leisure crafting on work-related attitudes and behaviors, particularly burnout issues. Moreover, little is known about whether job crafting and leisure crafting have similar effects on burnout.

Conservation of resources' theory assumes that individuals have the motivation to invest their resources for accumulating additional resources to protect their health and well-being [25]. Based on the conservation of resources' theory, an excessive workload is a persistent threat to nurses' valued resources, which results in burnout [26]. While nurses' accumulation of resources can sustain and protect additional resources, which greatly alleviate burnout among nurses, several studies supported that both job crafting and leisure crafting play vital roles in acquiring and adjusting resources [10, 27]. Job crafting and leisure crafting represent resource gain processes as nurses cope with stressful job demands and enrich their leisure time that motivate them and enhance their ability to perform well [28]. Resources gained from job crafting can improve nurses' ability to better fulfill their work obligations, which is conducive to reduce burnout [29]. Resources activated and replenished from leisure crafting can spill over to the work domain to improve nurses' work engagement and hence lighten nurse burnout [27]. Therefore, based on theoretical basis and the empirical studies, the study puts forward hypothesis 1: job crafting and leisure crafting are negatively influencing nurse burnout.

At present, most studies have investigated the factors influencing burnout using multiple linear regression models, which have high requirements for data features (including normal distribution and homoscedasticity). Machine learning, a common artificial intelligence-driven technology, has been successfully integrated into the field of health risk assessment. Unlike traditional statistics, machine learning models do not have any rules for data distribution and learn from provided samples to explore the complex and nonlinear relations among measured variables [30]. Several studies have applied machine learning to test predictors of burnout and achieved good findings. However, most of them only used one type of machine learning model (e.g., convolutional neural network, multitask learning technique, and decision tree) [31, 32], which does not avoid bias caused by the model and confirms the most significant predictors of burnout.

The main objectives of this study were to provide a comprehensive description of job crafting, leisure crafting, and burnout among nurses from Chinese tertiary hospitals. We also aimed to evaluate the effects of job crafting and leisure crafting on burnout by developing and validating four machine learning-based models.

2. Methods

2.1. Study Design. The cross-sectional multicenter study design was employed to describe the status of job crafting, leisure crafting, and burnout among nurses and explore the associations among these variables.

2.2. Participants. There are 107 tertiary hospitals in Shandong Province, China (https://www.doc88.com/p-11461558491027.html). A convenience sampling method was used to recruit hospitals from the 107 tertiary hospitals. Nurses from the included hospitals, who met the inclusion and exclusion criteria, were required to participate in the online survey. The inclusion criteria included registered and licensed practical nurses who directly cared for patients. Nurses on sick leave or those in the process of turnover were excluded from the study.

A total of 1,754 nurses from the four tertiary hospitals were invited to complete the online questionnaires, and 1,235 responses were included in the final analysis (Supplementary file "Participation rate and sample size").

2.3. Measures. A personal demographic form, the Maslach Burnout Inventory-General Survey (MBI-GS), the Job Crafting Scale (JCS), and the Leisure Crafting Scale (LCS) were used for the online survey.

The personal demographic form included 10 questions to investigate nurses' sociodemographic information, such as sex, age, years of service, academic degree, marital status, do they have a child/children, professional qualifications, specialty area, monthly income, and shift work.

The MBI-GS was used to assess the nurses' burnout status. This 16-item seven-Likert scale was developed by Maslach and Jackson [33]. The Chinese version was translated by Li and Shi [34]. Three dimensions of the MBI-GS are "emotional exhaustion," "cynicism," and "reduced professional efficacy." A seven-point Likert scale (0 = never, 6 = every day) was used to score the items. The following equation, developed by Kalimo et al. [35], was used to calculate the total MBI-GS score. Total score for burnout = score for "emotional exhaustion" × 0.3 + score for "cynicism" × 0.3 + score for "reduced professional efficacy" × 0.4. The minimum and maximum scores for burnout range from zero to six, with higher scores indicating severe levels of burnout. Cronbach's alpha coefficients for the MBI-GS were 0.88 in the study.

The JCS used to measure job crafting was developed by Tims et al. [36]. The Chinese version's validity and reliability were tested by Liao [37]. This 21-item scale has four dimensions (increasing structural job resources, increasing social job resources, increasing challenging job demands, and reducing obstructive job demands) and scores on a five-point Likert scale. The score for job crafting is the average score of the total items. Higher scores indicated greater job crafting experienced by nurses. In this study, Cronbach's alpha coefficients for the JCS were 0.95.

The nine-item LCS, developed by Petrou and Bakker [19], measured nurses' crafting during their leisure time. The validity and reliability of the Chinese version were examined by Guo et al. [38]. A five-point Likert scale (1 = not at all, 5 = very many) was used to score each item. The LCS score is the average of nine items. The LCS had good validity and reliability, with Cronbach's alpha coefficients of 0.95 in the current study.

2.4. Data Collection. This study was conducted at four tertiary hospitals between June 3 and October 31, 2022. The Wenjuanxing-Enterprise edition (Changsha Ranxing Information Technology Co., Ltd., Changsha, China) was used to develop the online survey. Two research assistants were recruited from each hospital. All research assistants were given a three-hour investigation training session before conducting the survey. Research assistants delivered an online questionnaire link and explanatory statements to the nurses via e-mail, WeChat, and other communication apps. Nurses who met the inclusion criteria were asked to complete the survey. Two push notifications (Dear participants, please remember to complete the online survey. Thank you.) were sent to nurses. The survey took 10–15 minutes to complete.

2.5. Ethical Considerations. Ethical approval (Human Sciences Ethics Committee of School of **, one University No. 2020-R-030) and hospital permissions were obtained for this study. Nurses who submitted the online survey were considered to have provided informed consent.

2.6. Data Analyses. Data were analyzed using SPSS 24.0, with descriptive analysis, *t*-tests (to compare burnout scores between two groups), ANOVA (to compare burnout scores' differences among three or more groups), and correlation tests (to evaluate the correlations among the measured variables). Kurtosis and skewness were used to describe the normal distribution of measured variables. Values for kurtosis were from −0.237 to 1.002, and values for skewness were between −0.724 and 0.392, indicating that, generally, the data were normally distributed. According to the Harman single-factor analysis, 36.7% of the variance could be explained by one factor, which suggests that no significant common method variance was found in the study. K-means clustering analysis was used to divide burnout into a low burnout group and a high burnout group.

A computer-generated random number sequence divided the data into training (70%) and validation (30%) cohorts. Python 3.9 was employed to conduct four machine learning algorithms (logistic regression model, support vector machine, random forest, and gradient boosting tree) to obtain models for predicting nurse burnout. The logistic regression model is one kind of generalized linear regression categories. Support vector machine employs kernel functions to map linearly indivisible data to a multidimensional feature space, which could deal with complex data such as high dimensional, nonlinear, and small sample size. Random forest is an integrated algorithm which uses decision trees as the main classifier. Random forest is applied to issues of classification and regression. Gradient boosting tree includes decision tree and gradient boosting. It can deal with tasks of classification and regression via additive model and forward distribution algorithms.

The burnout prediction models included 16 variables (independent variables: job crafting and leisure crafting; covariates: significant demographic characteristics; dummy variables: eight variables). Five repetitions of the 10-fold cross-validation were conducted to optimize the model parameters. The area under the receiver operating characteristic curve (AUC), accuracy, sensitivity, specificity, and Brier were calculated to compare the predictive performance of the models. Brier represents the average-squared distance from the predicted probability of the model to the actual probability. The lower the Brier scores, the better the model performance. A two-sided *p* value ≤0.05 was considered statistically significant.

3. Results

3.1. Demographic Characteristics and Burnout of Nurses. Most nurses were women (95.8%), married (80.9%), held bachelor's degrees (85%), and had a child/children (76.2%). Over half were 30–39 years old, had temporary employment, had worked less than 11 years in medical and surgical departments, and had shift work more than four times per month. Of these, 46.4% were lead nurses, and only 23.3% of the nurses' income was higher than 9000 Yuan (1,231 $ USD) (Table 1).

The results of the bivariate statistical analysis showed that nurse burnout levels were significantly different according to age, years of service, marital status, child/children status, professional qualifications, specialty area, and shift work (each $p < 0.01$).

3.2. Descriptive and Correlation Analyses among Burnout, Job Crafting, and Leisure Crafting. The burnout level for nurses was 2.02 ± 1.05, indicating that nurses experienced mild-to-moderate levels of burnout. The average score for job crafting was 4.05 ± 0.56. The average score for leisure crafting was 3.84 ± 0.78, suggesting that nurses had moderate-to-high levels of job and leisure crafting (Table 2).

The correlation analysis showed that burnout was significantly negatively correlated with job and leisure crafting (each $p < 0.01$) (Table 2). Nurses who experienced high burnout generally engaged in less job and leisure crafting.

3.3. K-Means Clustering Analysis for Burnout. According to the K-means clustering analysis, two clusters for burnout were found: the low-burnout group (final cluster center 1.24, $n = 678$) and the high-burnout group (final cluster center 2.97, $n = 557$) (Table 3).

3.4. Model Performance. The binary logistic regression analysis showed that job crafting, age, medical department, paediatric department, and shift work significantly influenced nurse burnout. Nurses who had lower job crafting, were younger in age, worked in medical and paediatric departments, and shifted work had a higher risk of experiencing severe burnout. Supplementary Files eTable 1 and eFigure 1 present the regression model results.

Support vector machine (SVM), random forest, and gradient boosting tree were employed to evaluate significant factors influencing burnout. The importance of the permutation features was calculated using the three machine learning algorithms. In the SVM model, the top five predictors were job crafting, age, child/children status, years of service, and leisure crafting (Supplementary file eFigure 2). In the random forest and gradient boosting tree models, the top five predictors were job crafting, leisure crafting, age, years of service, and professional qualifications (Supplementary file eFigures 3 and 4).

The performance of each model is summarized in Table 4. The receiver operating characteristic (ROC) curves for the validation cohort are shown in Figures 1(a) and 1(b). The gradient boosting tree model performed the best, with an AUC of 0.821, accuracy of 0.739, sensitivity of 0.470, and specificity of 0.919. The Brier score for the gradient boosting tree was the lowest (0.161), indicating that the model was reliable.

4. Discussion

This study aimed to explore the status of job crafting, leisure crafting, and burnout among Chinese nurses and exam the effects of job crafting and leisure crafting on burnout using four machine learning algorithms. This study is one of the first investigations on this topic. We found that nurses experienced mild-to-moderate levels of burnout and moderate-to-high levels of job and leisure crafting. Furthermore, compared with leisure crafting, job crafting played a greater role in predicting burnout in SVM, random forest, and gradient boosting tree models. These important findings suggest that nurses plan their efforts to promote their job and leisure crafting and that nurse managers should adopt effective strategies to reduce burnout symptoms among nurses.

In the current study, nurses had mild-to-moderate levels of burnout. These results are supported by previous studies conducted in other countries [39, 40]. As nurses experience mild-to-moderate burnout, both nurse managers and nurses pay less attention to this chronic, persistent syndrome, which leads to severe outcomes in nurses' physical and mental health, job performance, and organizational commitment [41, 42]. Accordingly, raising managers' and nurses' concerns about burnout is vital, especially in mainland China. Furthermore, effective personal-oriented, organizational-oriented, and personal-organizational combined interventions should be implemented to reduce burnout among nurses.

In this study, the nurses experienced moderate-to-high levels of job crafting. This finding is consistent with the studies of Alharthi et al. [43] and Harbridge et al. [44]. A qualitative study revealed that nurses had passion and strengths in job crafting. They were actively job crafting in all aspects via activities, such as techniques' training, participating in working teams and committees, and being involved in programs [45]. Nurses proactively initiated and altered clinical tasks to address the requirements of their vulnerable patients, which could promote the quality of care and achieve more meaning in their jobs [46].

We found, quite interestingly, that nurses experienced moderate-to-high levels of leisure crafting. Studies have indicated that leisure crafting is an individual's adaptive behavior in leisure life, which can positively benefit work engagement, personal achievement, and organizational performance [47, 48]. Several leisure activities were believed to enhance individuals' leisure crafting, such as hobby participation, enjoying activities, and seeking a sense of purpose during leisure time [49]. Therefore, nurses are encouraged to pursue their hobbies and engage in leisure activities to produce crafting behaviors outside their work.

In the present study, four machine learning models were used to evaluate the effects of differences in job and leisure crafting on burnout among nurses. Although the predictive

TABLE 1: Demographic characteristics and burnout among nurses ($n = 1,235$).

Characteristics	n (%)	Burnout (M ± SD)	Test statistics
Sex			
Men	52 (4.2)	1.98 ± 0.95	$t = -0.271$
Women	1183 (95.8)	2.02 ± 1.05	
Age (years)			
20–29	303 (24.5)	2.13 ± 1.05	$F = 9.077$**
30–39	734 (59.4)	2.06 ± 1.03	
40–49	168 (13.6)	1.72 ± 1.05	
50–59	30 (2.4)	1.48 ± 0.97	
Years of service			
0–11	800 (64.8)	2.09 ± 1.03	$F = 8.211$**
12–23	349 (28.3)	1.99 ± 1.06	
24–35	81 (6.6)	1.49 ± 0.96	
>35	5 (0.4)	1.93 ± 1.28	
Academic degree			
Diploma	8 (0.6)	1.51 ± 1.32	$F = 1.569$
Associate degree	144 (11.7)	2.09 ± 1.00	
Bachelor's degree	1050 (85.0)	2.01 ± 1.06	
Master's degree and higher	33 (2.7)	2.27 ± 0.78	
Marriage			
Single	209 (16.9)	2.29 ± 1.08	$F = 6.002$**
Married	999 (80.9)	1.96 ± 1.03	
Divorced	26 (2.1)	2.05 ± 1.26	
Widowed	1 (0.1)	3.12 ± 0.00	
Had child/children			
No	294 (23.8)	2.26 ± 1.10	$t = 4.470$**
Yes	941 (76.2)	1.95 ± 1.02	
Employment			
Temporary	696 (56.4)	2.07 ± 1.04	$F = 2.649$
Personnel agency	254 (20.6)	2.03 ± 0.99	
Authorized	285 (23.1)	1.90 ± 1.05	
Professional qualification			
Nurse	192 (15.5)	2.07 ± 0.96	$F = 3.584$**
Senior nurse	412 (33.4)	2.11 ± 1.10	
Lead nurse	573 (46.4)	1.98 ± 1.03	
Associate chief nurse	50 (4.0)	1.74 ± 1.05	
Chief nurse	8 (0.6)	1.10 ± 0.66	
Specialty area			
Medical	402 (32.6)	2.10 ± 1.03	$F = 2.592$**
Surgical	256 (20.7)	2.08 ± 1.03	
Gynaecology	106 (8.6)	1.86 ± 1.01	
Paediatric	89 (7.2)	2.26 ± 1.18	
Emergency	27 (2.2)	2.25 ± 1.01	
Operating room	55 (4.5)	1.89 ± 0.96	
Intensive care unit	53 (4.3)	1.92 ± 1.00	
Outpatient services	102 (8.3)	1.81 ± 1.05	
Others	145 (11.7)	1.86 ± 1.09	
Monthly income[#] (RMB, after tax)			
≤3000	90 (7.3)	2.25 ± 1.16	$F = 2.136$
3001–5000	343 (27.8)	2.09 ± 1.06	
5001–7000	345 (27.9)	1.93 ± 1.02	
7001–9000	169 (13.7)	2.01 ± 1.03	
≥9001	288 (23.3)	1.99 ± 1.04	
Shift work			
No	370 (30.0)	1.88 ± 1.03	$F = 5.643$**
<4 times/month	143 (11.6)	1.96 ± 1.01	
≥4 times/month	722 (58.5)	2.10 ± 1.06	

Note. ** $p < 0.01$, [#]1 US dollar = 6.54 Chinese Yuan.

Table 2: Descriptive and correlation analyses among burnout, job crafting, and leisure crafting of nurses.

	M ± SD	Min-max	Burnout	Job crafting	Leisure crafting
Burnout	2.02 ± 1.05	0.00–5.85	1		
Job crafting	4.05 ± 0.56	1.00–5.00	−0.400**	1	
Leisure crafting	3.84 ± 0.78	1.00–5.00	−0.281**	0.666**	1

Note. ** $p < 0.01$.

Table 3: K-means clustering analysis for burnout.

Groups	n	Final cluster centers	Scores
Low burnout group	678	1.24	0.00–2.10
High burnout group	557	2.97	2.11–5.85

Table 4: Model performance in predicting burnout in the validation cohort.

	AUC	Accuracy	Sensitivity	Specificity	Brier
Logistic	0.809	0.647	0.128	0.995	0.253
SVM	0.803	0.720	0.409	0.928	0.180
Random forest	0.820	0.733	0.443	0.928	0.167
Gradient boosting tree	0.821	0.739	0.470	0.919	0.161
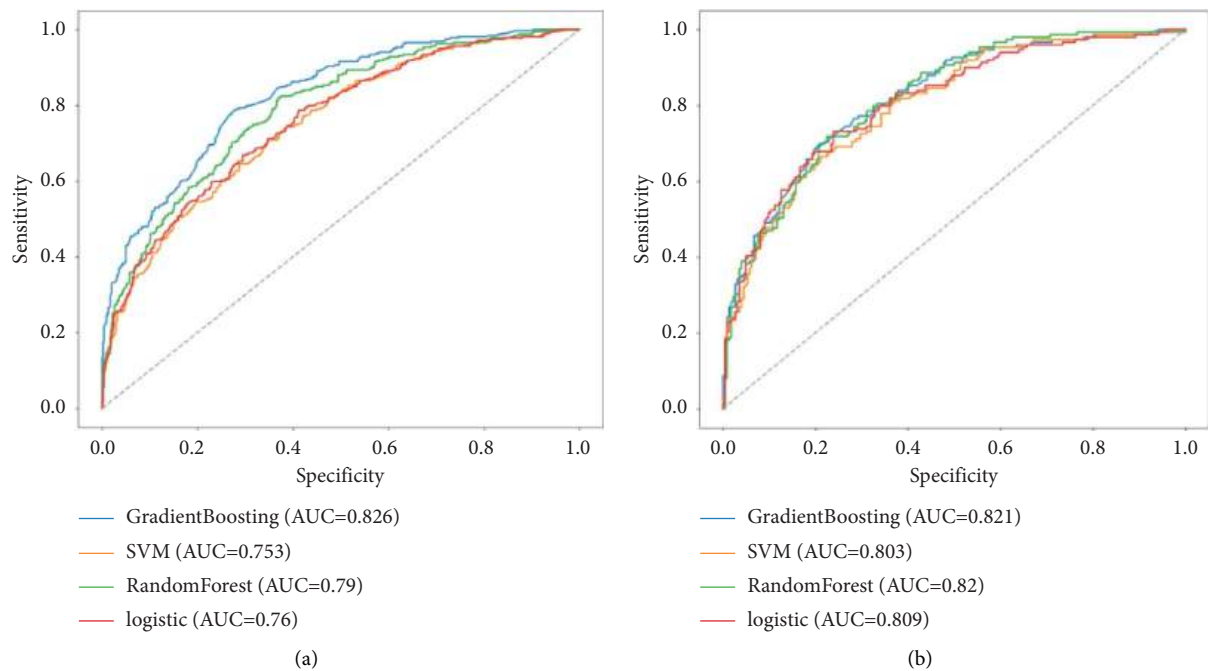
Figure 1: ROC curves of different machine learning models in (a) the training cohort and (b) the validation cohort.

capacity of the models was less satisfactory (AUCs ranged from 0.803 to 0.821), they can help nurse burnout management and their prediction can be improved by including more influencing variables. The sensitivity of the four models ranged from 0.128 to 0.470, indicating a low capacity to target nurses at a high risk of burnout. A possible reason is that some important predictors were not included in the models; as a result, the models could not sensitively include nurses with burnout. The specificity of the four models (ranging from 0.919 to 0.995) was good in the study,

indicating that the models specifically distinguished burnout from similar syndromes. Among the four models, the gradient boosting tree exhibited the best performance, with good sensitivity and calibration efficacy. The performance of the SVM model was similar to that of the random forest model, whereas that of the logistic model was far from satisfactory.

In this study, job crafting was the most important predictor of burnout in the four models. In contrast, the effect size of job crafting on burnout was small in the logistic

regression analysis (odds ratio = 0.123). Martinez et al. [50] reported that job crafting can explain 15.7%–19.7% of the variance in burnout in four dimensions (personal impact dimension, job dissatisfaction, motivational abandonment, and social climate dimension) among male nurses. Roskova and Faragova [18] reported that job crafting combined with age and position explained 14% of the variability in burnout among full-time employees. According to the Job Demands-Resources model, overwhelming job demands and limited job resources lead to burnout and job crafting is one of the mediating factors in this relationship. High job crafting encourages individuals to reframe their perceptions of work, engage in more workplace relationships, and change the nature of their tasks, which could decrease burnout and increase job satisfaction and well-being [51]. Considering the mild but significant effect of job crafting on nurse burnout, nurse managers and nurses must foster nurses' crafting behaviors in their clinical work through several typical interventions (e.g., job crafting workshops and job crafting exercises) [52, 53].

In the study, we creatively revealed the predictive value of leisure crafting on burnout using four machine learning models. Leisure crafting was the second or fifth most important feature for burnout in the SVM, random forest, and gradient boosting tree models. However, leisure crafting was not included in the final logistic regression model. Studies have reported that off-job crafting enables individuals to learn new things, expand existing hobbies, and have new personal connections, which can help them overcome severe challenges, promote personal growth, and achieve a good balance between job and leisure [54, 55]. Ugwu [56] demonstrated that leisure crafting alleviates the negative effects of counterproductive work behaviors caused by high job demands. Therefore, nurse manager and nurses should be aware of the importance of leisure crafting in burnout. Various leisure activities should be organized in establishing new interpersonal relationships, developing new skills, and learning new meanings in work and life [57].

Despite the fact the correlations between job crafting, leisure crafting, and burnout had been tested in the study, several limitations in this present study need to be considered. First, data were collected from four Chinese tertiary hospitals. Data from other hospital levels were lacking, which might have influenced the performance of the model in the external dataset. We suggest collecting sufficient data from different hospitals to validate the model. Second, regarding the cross-sectional study design, the effects of job and leisure crafting on burnout did not present a cause-and-effect relationship. Therefore, a longitudinal study is needed to better understand the predictions of job and leisure crafting on nurse burnout. Third, the study focused only on limited characteristics of nurses, such as demographic, job crafting, and leisure crafting. This might be the primary reason for the low sensitivity of the models. Therefore, several significant factors influencing burnout (e.g., job stress, job resources, work-family conflict, collegial support, and leadership) should be investigated and analyzed in future studies. Fourth, 52 male nurses were included in the study. Generalization of the model for male nurses should be

done with caution, and further surveys of this demographic are needed to clarify the model found in the study. Finally, nurses who were on sick leave and in the process of turnover were excluded from the study. Nurses in these conditions may experience high levels of burnout. Therefore, further studies could recruit nurses in these conditions to promote the generalization of the studies.

5. Conclusions

Burnout is a serious issue among nurses worldwide, raising great concerns among hospital administrators and nurse managers. In this study, nurses experienced mild-to-moderate levels of burnout; moreover, they had moderate-to-high levels of job and leisure crafting. These findings indicate that despite nurses having some burnout symptoms, they tend to apply crafting activities to increase their clinical skills and confidence and promote their interpersonal relationships and self-development. According to the machine learning-based predictive models, job crafting and leisure crafting were significant predictors of burnout, and job crafting was the most important predictor of burnout in the four models. Therefore, nurse managers are encouraged to create a casual crafting environment and take effective measures to improve nurses' crafting behaviors, ultimately reducing their burnout and promoting their clinical performance and organizational commitment.

6. Implications for Nursing Management

Burnout is a critical risk factor for the organizational health (e.g., organizational commitment and development) of hospitals and physical (e.g., inflammation, pain, and sleep disorder) and mental health (e.g., anxiety and depression) of nurses. Therefore, hospital administrators and nurse managers should pay more attention on this severe problem and take effective measures to alleviate burnout among nurses. According to the findings of this study, routine assessment of burnout among nurses should be added in health management strategies for nursing team.

In this study, job crafting was the most significant influencing factor for nurse burnout. Nurse managers should realize the positive effects of job crafting on nurse burnout. Several effective interventions (including job crafting training workshop, job crafting e-learning, and career crafting training) can be selected as training courses to meet the job crafting needs of nurses [58, 59]. Furthermore, nurse managers are encouraged to create a positive working environment and provide more organizational resources and opportunities for nurses to help them successfully deal with work challenges and achieve self-growth. In addition, several kinds of mutual-aid groups should be organized by nurse managers to support nurses find help from colleagues.

Leisure crafting is another new influencing factor for nurse burnout. According to this interesting finding, nurse managers are suggested to support nurses to cultivate personal hobbies and learn new knowledge via several group activities. Nurses are encouraged to fully use their leisure

time to keep good personal relationships, develop new skills, and obtain a different experience. Setting achievable goals and keeping active thinking in leisure activities are also beneficial to nurses work attitude and performance.

Data Availability

Data are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

Supplementary Materials

The supplementary file presents the detailed results of the binary logistic regression analysis, support vector machine (SVM), random forest, and gradient boosting tree. (*Supplementary Materials*)

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Review Article

Elevating Elderly Cancer Care: A Systematic Review of Advanced Practice Nursing's Role in Senior Oncology Patients' Quality of Life

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Background. According to projections based on current trends, it can be anticipated that from 2024 onward, approximately 70% of all cancer cases will be diagnosed in individuals 65 years and older. Given this complex intersection between population ageing and cancer incidence, it is of great importance to address this issue from a comprehensive care perspective. Here comes the importance of advanced practice nurse into play. However, this figure is still not sufficiently valued in many countries. Its roles are also not clearly defined at the international level. For this reason, a systematic review of the scientific literature was carried out to analyze the impact of advanced practice nurse on the quality of life of older adults with cancer. *Methods.* Searches were carried out in PubMed, Web of Science (WoS), Scopus, CINAHL, LILACS, and ScienceDirect databases. They were limited to studies conducted in the last 7 years. Only open-access articles were selected. To analyze the chosen articles and assess their quality, the criteria of the PRISMA and CASPe statements were applied. All authors participated in both the selection of the articles and their analysis. *Results.* Of the initial 58 articles selected, a total of 10 articles were finally included, as they met the eligibility criteria established after further analysis. The results show a positive relationship between the advanced practice nurse intervention and quality of life in older adults with cancer. *Conclusions.* Advanced practice nurse (APN) plays a key role in the care of older adults with cancer, significantly improving their quality of life and contributing to the comprehensive care of these patients. The findings evidenced in this work support the integration of APNs in cancer care teams to improve patient experience and overall well-being.

1. Background

A major challenge is being grappled with modern society: the intertwined issues of population growth and rising life expectancy. Life has been expanded by advances in healthcare, but a complex scenario has been created by declining fertility rates. From 1950 to 2015, the population over 60 quadrupled, and it is projected to be 2.1 billion by 2050 [1]. Public health worldwide is being transformed by demographic changes due to evolving factors, with significant impacts on both health and social aspects [2].

An important concern in this context is the growing prevalence of chronic diseases related to age, including cardiovascular problems, degenerative conditions, dementia, and notably, cancer [1]. From the analysis of the most current statistics, it can be seen that around 20 million

new cases of cancer were reported worldwide in 2020. Among these, breast, lung, colon, prostate, and stomach cancers are noted as standing out, being currently recognized as some of the diseases with the highest incidence rates on the international scene [3]. By 2024 and beyond, around 70% of cancer cases are expected to be diagnosed in people 65 years and older, driven by ageing-related biological changes and a higher likelihood of comorbidities. This poses a significant risk to the quality of life for older individuals [4, 5].

To tackle the challenges of ageing and increased cancer rates, a holistic strategy is essential. Nursing plays a crucial role by adopting a comprehensive perspective, considering individual differences, and tailoring personalized solutions for better elderly life quality [6].

Quality of life in cancer patients is a key concept in nursing, encompassing general well-being in various dimensions. Its understanding has evolved since its origin in the post-World War II in the United States [7]. Originally, quality of life in cancer patients was assessed through objective measures such as survival and physical function. However, psychologists found that these could not fully explain variations. Subjective interpretations, such as happiness and life satisfaction, became crucial. These subjective factors often have a more significant impact on the quality of life of patients than objective factors alone [7].

In this context, the concept of health-related quality of life (HRQoL) emerged to capture the interaction between health and quality of life in a more holistic way [7]. To measure the HRQoL in cancer patients effectively, it is essential to consider multiple components such as functional, cognitive, emotional, spiritual, social, and economic aspects. Assessing specific problems and symptoms, such as pain and fatigue, is crucial. This comprehensive approach not only aids in clinical decision-making but also identifies vulnerable patient groups that need personalized care. It helps to evaluate the impact of treatment on quality of life, tolerability, and adherence. Nursing plays a key role in providing complete care and improving the overall quality of life for cancer patients [4].

In January 2018, the Andalusia Health Quality Agency (Spain) presented a professional competency manual for advanced practice nurses (APNs) in cancer care that includes competence in complex care coordination, such as in the case of the elderly with cancer [8, 9]. In Spain, there is a distinction between generalist and specialist nurses. However, with the increasing demand for health services and the need for highly specialized care, the new role of APNs has arisen. This model draws inspiration from Anglo-Saxon countries such as the United Kingdom, Canada, Australia, and New Zealand, adapting to the evolving complexity of health systems [5]. In the international context, advanced practice nurse is increasingly gaining momentum in different countries. However, there is a common denominator which is the need to provide clarity about this role in the provision of health services [10].

The concept of the APN originated in the United States during the 1960s and was later adopted in other countries, including the United Kingdom, Canada, and Australia.

Following the National Cancer Act of 1971, which established a comprehensive framework for cancer prevention, diagnosis, and treatment in the U.S., APNs initially focused on cancer management and research. As treatments grew more complex, the need for improved coordination across cancer care facets became evident, leading to stronger interdisciplinary collaboration and integrated care. The United Kingdom's Calman–Hine's report recommended specialized multidisciplinary teams and oncology care networks, reflecting these needs. Similarly, in other countries such as Portugal, this role is fulfilled by specialized nurses who, although they may not carry the same title, perform comparable functions in providing expert care and coordinating healthcare services in their areas of specialization [8].

An APN is a highly skilled nursing professional who has obtained advanced educational credentials and clinical training beyond the basic nursing education and licensing required of a registered nurse (RN). APNs are prepared through a postgraduate degree, such as, a master's or doctoral program, which enables them to provide a higher level of care and take on roles that include direct patient care, consultation, education, research, and administration [8].

ICN emphasizes that APNs should conduct direct healthcare practices within their focus population. These nurses can play a crucial role in assessing and diagnosing the needs of senior oncology patients using theories such as the theory of unpleasant symptoms and the symptom management theory. Their expertise helps identify clusters of symptoms and assess their impact on patient's quality of life and functionality [11].

APNs play a multifaceted role in the care of elderly patients diagnosed with cancer, functioning across various capacities that directly impact patient outcomes. As consultants, they provide crucial guidance to healthcare professionals, patients, and families, ensuring personalized and understandable care plans. Their educational responsibilities are profound, with a focus on disseminating advanced nursing practices to clinical nurses in primary care settings and sociohealthcare residences, areas critical to the elderly population. APNs also engage in research, contributing to the development of innovative, evidence-based approaches that enhance cancer care. Furthermore, through transformational leadership, APNs implement significant changes in healthcare practices, advocating for improvements that optimize the treatment and recovery processes for senior oncology patients. These roles exemplify the APNs' integral contribution to a holistic healthcare approach, emphasizing their importance in both direct patient care and broader healthcare improvements [8].

Although the APN role is recognized globally, there is a scarcity of studies examining its impact on the quality of life of senior oncology patients. Updated information is crucial, especially postpandemic, to understand the quality of service perceived by the patient and academic variables related to proper training in this role. Older patients are a heterogeneous population ranging from those who are frail and dependent to those who are extremely active. Therefore, it is necessary to provide adequate geriatric care. Currently,

there is not enough evidence on whether nursing staff apply adequate and comprehensive care to senior oncology patients. APNs could have a relevant role in this comprehensive care, which is why it is important to know the experiences that already exist with these professionals [12].

Therefore, the objective of this research was to conduct a systematic review of the scientific literature to identify research studies that analyze the impact of APNs on the quality of life of older adults with cancer. This study further examines evidence of the effectiveness of advanced practice nurse roles in meeting the healthcare needs specifically the quality of life of senior oncology patients.

2. Materials and Methods

In this study, a systematic review of the scientific literature was carried out in which studies analyzed the relationship between APN interventions and the quality of life of older adults with cancer. PRISMA statement criteria were applied [13] for systematic reviews by comprehensively analyzing the selected articles. The study was carried out according to the guidelines of the Declaration of Helsinki. This research is registered in PROSPERO (International Prospective Register of Systematic Reviews) with the registration number 488680.

The PICO framework is a structured approach that helps in formulating precise clinical research questions. In the proposed study, the focus is on senior oncology patients (population), investigating the effects of advanced practice nurse care (intervention) in comparison to standard nursing care (comparison). The main goal is to determine the benefits of such specialized nursing interventions in terms of improved health outcomes (outcome). Accordingly, the research question formulated is as follows: "What are the benefits of advanced practice nurse care in improving health outcomes compared to standard nursing care among senior oncology patients?" This question aims to capture the specific impacts of advanced practice nurse on the care quality and health results in this vulnerable group, thereby guiding potential improvements in clinical practices.

2.1. Selection Criteria. The systematic review was carried out between February and March 2023 in PubMed, Web of Science (WoS), SCOPUS, CINAHL, LILACS, and Science-Direct databases. The investigation focused on literature published within the past seven years, specifically from January 1, 2016, to March 31, 2023, and exclusively included open-access documents. Our aim was to derive recent and well-supported findings from a range of documentary materials, leading to the decision to incorporate both research studies and reviews, whether systematic or bibliographic in nature.

2.2. Search Strategy. The search strategy was approached by selecting the following search criteria: for PubMed (("Advanced Practice Nurse" [Mesh]) AND "Aged" [Mesh]) AND "Neoplasms" [Mesh]; (("Advanced Practice Nurse" [Mesh]) AND "Neoplasms" [Mesh]) AND "Quality of Life" [Mesh]; for WOS ((ALL = (advanced practice nurse)) AND ALL = (neoplasms)) AND ALL = (quality of life); ((TS = (advanced practice nurse)) AND TS = (neoplasms)) AND TS = (quality of life); ((ALL = (advanced practice nurse)) AND ALL = (aged)) AND ALL=(neoplasms); for SCOPUS (TITLE-ABS-KEY ("advanced practice nurse") AND TITLE-ABS-KEY (neoplasms) AND TITLE-ABS-KEY (aged)) AND PUBYEAR >2016 AND PUBYEAR <2023; (TITLE-ABS-KEY ("advanced practice nurse") AND TITLE-ABS-KEY (neoplasms) AND TITLE-ABS-KEY ("quality of life")); for CINAHL advanced practice nurse AND quality of life AND older adult AND cancer; advanced practice nurse AND neoplasms AND aged AND quality of life; for LILACS (advanced practice nurse) AND (cancer) AND (older adult) AND (quality of life); (advanced practice nurse) AND (aged) AND (neoplasms) AND (quality of life); for ScienceDirect advanced practice nurse AND quality of life AND cancer AND older adult.

2.3. Inclusion and Exclusion Criteria. The following inclusion criteria were used: (a) studies in which APN was analyzed, (b) consideration of quality of life and cancer variables, (c) studies in which the sample was an adult population, and (d) articles published in scientific journals. All articles included in this review had to meet the four criteria detailed above.

Exclusions from this study encompassed various document types, such as editor letters, commentaries, opinions, perspectives, guidelines, standards, and case series. To ensure the reliability and accuracy of our process, three authors (C.U.-G., F.-J.G.-V., and E.C.) independently assessed the relevance of the selected articles to the study's objectives and adherence to the inclusion criteria. When the title, abstract, and keywords of the article were in doubt for inclusion, two other authors were included (R.C.-B.; M.-d.-l.-A.M.-G. and E.-M.B.-M.) to arbitrate the decision on their inclusion or exclusion.

The process of identifying and choosing articles, including those that were ultimately included or excluded, as well as the rationale behind their exclusion during the screening and selection stages, is depicted in the flowchart in Figure 1. This representation aligns with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, which are aimed at enhancing the thoroughness in the reporting of systematic reviews and meta-analyses [14].

2.4. Data Extraction. The data extraction process was carried out through extensive trials and postsearch proceedings. This started by reviewing, primarily and meticulously, the title, abstract, method, results, and conclusions of each article. Data were extracted as found in their respective studies at the time of review and were inserted into Table 1

In this systematic review, the selection of variables was guided by the PICOS framework [25], encompassing participants, interventions, comparisons, outcomes, and study design. With this strategy, it was possible to delimit the inclusion criteria and, based on them, carry out a qualitative analysis of the results. In addition, the research incorporated other pertinent variables such as the authors, year of publication, country, reference article, study objectives,
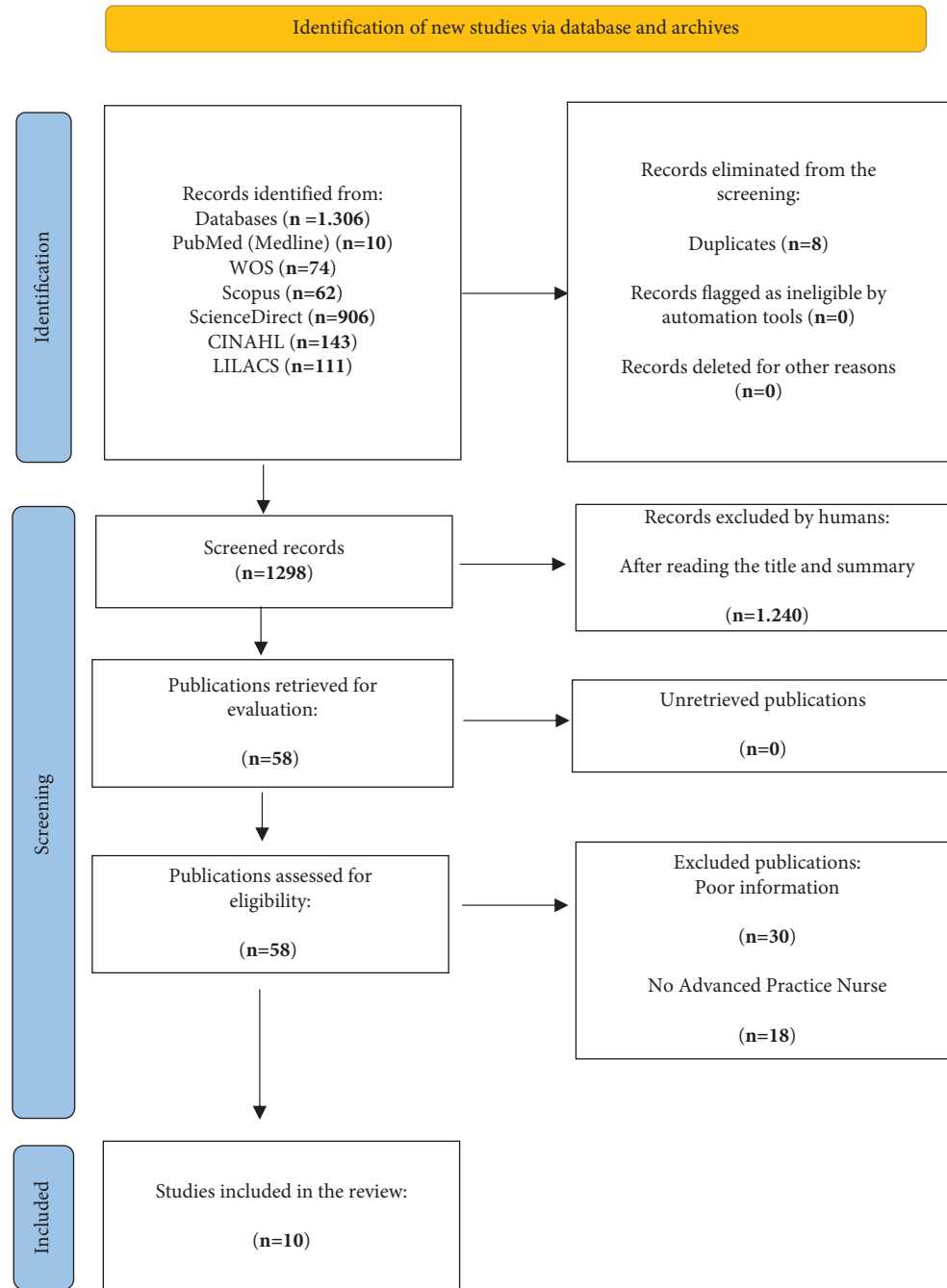
FIGURE 1: Flowchart of the systematic review process according to the statements of the PRISMA protocol.

participant details, variables measured, and the scales used. With data extraction, a document was created with a set of data and was hosted in the Arias Montano Institutional Repository [26].

2.5. Presentation of the Results: Adherence to Quality Initiative (PRISMA). The results of the primary studies, obtained through a systematic and reproducible methodology, were presented qualitatively and quantitatively (Figure 1).

2.6. Quality Evaluation. In selecting articles for this review, we conducted a quality analysis using the criteria of the EPHPP tool [27]. This tool assigns an overall quality rating to each study based on the assessment of six key components. Studies are rated as "strong" if they have no weak components and at least four strong ones. Those with fewer than four strong components and one weak component are deemed as "moderate." Studies receiving two or more weak component ratings are categorized as "weak" [27].

TABLE 1: Characteristics of the studies included in the systematic review.

Author (year) country (reference)	Study design	Comparisons	Objectives of the study	Participants	Measured variable and scale	Interventions	Results
Raphaelis, et al. (2018), Switzerland, Austria [15]	Longitudinal, multicentre, randomized phase 2 study	Written information group and counselling group with an advanced practice nurse	To determine whether written information and/or counselling reduces disease-related uncertainty in women with vulvar neoplasia	$N = 49$ women with vulvar neoplasia from four Swiss hospitals and one Austrian hospital	The German adult form of the Mishel uncertainty of illness scale (MUIS-A)	Written: two booklets during the time from diagnosis to surgery. Counselling: five consultations with APN for 10–50 minutes	Overall, the counselling group showed a better trend of improvement on all uncertainty scales throughout the study. Within the counselling group, uncertainty, ambiguity, inconsistency, and unpredictability decreased significantly over six months
Westman et al. (2019), Sweden [16]	Cross-sectional study including two cohorts of patients	All patients with gynecological, hematological, head and neck CA and upper GTI before and after the intervention of a new nursing figure	To compare patients' perceptions of care before and after the introduction of a new advanced nursing role, the coordinating contact nurse (CCN), in a region of Sweden	$N = 1872$ [patients with gynecological ($n = 598$), hematological ($n = 461$), upper gastrointestinal ($n = 418$) and head and neck cancers ($n = 395$)]	The validated Swedish versions of the European Organization for Research and Treatment of Cancer (EORTC) quality of life questionnaire, QLQ-C30 and QLQ-INFO25, and also a study-specific questionnaire	Interventions were carried out by the new nursing staff. Data were collected in April-May 2015 (baseline) and April-May 2017 (follow-up)	In relation to health-related patient information (overall mean EORTC QLQ-INFO25 score increased from 41.23 to 44.16, $p = 0.0006$), statistically significant improvements were found related to the availability of supportive care resources, e.g., increased informed access to the contact nurse and individual written care plans

TABLE 1: Continued.

Author (year) country (reference)	Study design	Comparisons	Objectives of the study	Participants	Measured variable and scale	Interventions	Results
Serra-barril et al. (2023), Spain [17]	Qualitative phenomenological study	A group of patients and a multidisciplinary group of professionals	To know the lived experience of cancer patients and multidisciplinary professionals in relation to the care provided by the advanced practice nurse	18 professionals and 11 patients	Experiences related to advanced practice nurse, most relevant functions/ characteristics/care offered by this figure, benefits of the care provided, and most relevant aspects of care. The instrument used was self-developed interviews	The study took place from March to December 2021 in four highly complex public university hospitals in Catalonia. Individual interviews with professionals (45–60 minutes each) were conducted online from March to May 2021, using the Microsoft teams platform. From October to December 2021, patient interviews were conducted in person, in a quiet and comfortable hospital room, and lasted approximately 30–45 min	Advanced practice nurses play a critical role in cancer care, making positive contributions to the patient experience and to the work of the multidisciplinary team
Serena et al. (2018), Switzerland [18]	Qualitative descriptive	A multidisciplinary group of professionals and a group of patients	To explore the acceptance of a new role, the advanced practice lung cancer nurse (APNLC), from the perspective of patients and healthcare professionals in a country that lacks regulatory oversight of advanced practice nurse (APN) roles	Multidisciplinary healthcare team, including physicians (n = 6), oncology nurses (n = 5), the social worker, and the APNLC. Patients (n = 4)	The measurement variables were identification of the role of the CLNPA, specific contributions of the role of the CLNPA, and flexibility of the CLNPA service. Semistructured interviews with self-developed items and a self-developed guide for conducting focus group discussions were used for this purpose	Two focus group discussions were conducted with members who had worked closely during the last 6 months with the ANPLC: G1 nurses and social workers and G2 physicians. Semistructured interviews were conducted for ANPLC and patients (lung cancer patients who had received care from ANPLC)	Three main themes were found: identification of the role of the CLNPA, specific contributions of the role of the CLNPA, and flexible service of the CLNPA. Clinicians and patients clearly recognized the role of the CLNPA, noting contributions to continuity of care, psychosocial support, and facilitation of self-management of symptoms

TABLE 1: Continued.

Author (year) country (reference)	Study design	Comparisons	Objectives of the study	Participants	Measured variable and scale	Interventions	Results
Schneider, Kempfer, and Backes (2021) Brazil [19]	Systematic review	—	Seeking evidence on the education of advanced practice nurses through clinical practice and nursing care with cancer patients	A total of 12 experimental studies were identified	The variables that the studies had to address were educational guidance, control of pain or other symptoms related to the disease and/or treatment, and satisfaction and improvement in the quality of life of cancer patients. All of them in studies in which advanced practice nurses had been involved	The searches were carried out in the following electronic data: PubMed, LILACS, Institute for Scientific Information (ISI) Web of Knowledge via Web of Science, Scopus, CINAHL-EBSCO, and Cochrane Central Register of Controlled Trials (CENTRAL). The timeframe was from 15 July 2018 to 15 December 2019	The analysis of these studies showed that advanced practice nurses were adequately trained. This fact was objectified through the conclusions of the experimental studies analyzed, since, through the good practice of advanced practice nurses, an improvement in the control of pain or other symptoms related to the disease and/or the treatment, satisfaction, and improvement in the quality of life of cancer patients was identified
Muñoz et al. (2023), Spain [20]	Cross-sectional, descriptive study with a quantitative approach	Intervention without a control group	To identify the competency profile of advanced practice nurses involved in the care process of oncology patients	$N = 35$ nurses caring for cancer patients at the Hospital del Mar, Barcelona	The variables analyzed were the educational standards required by ICN for advanced practice nurse and postgraduate academic qualifications. The instrument for defining the role of the advanced practice nurse (IDREPA) was used	The data were recorded between February and March 2021 through the completion of the instrument by the professionals	Nine (31%) nurses were identified as meeting the standard in all 6 domains on the IDREPA scale to be considered as advanced practice nurses. Of these 9, 31% met the educational standards required by ICN, 7 (24.1%) with an official master's degree and 2 (6.9%) with a doctorate

Table 1: Continued.

Author (year) country (reference)	Study design	Comparisons	Objectives of the study	Participants	Measured variable and scale	Interventions	Results
Geese et al. (2020), Switzerland [21]	Qualitative analysis study	A single experimental group with two subgroups, one of the patients and one of the relatives of patients	To explore the experience of prostate cancer patients undergoing radical prostatectomy and their partners from diagnosis through to follow-up care and the APN support program	$N = 18$ participants, patients ($n = 10$) spouses ($n = 8$)	The study variables were perceptions of empathetic, trusting, informed, open behaviours, and quality of information received in terms of diagnoses and symptoms, offered by the advanced practice nurse. A series of self-developed semistructured interviews were used as an instrument	Between September 2015 and January 2016, 10 patients with PCa and eight spouses agreed to participate in the study. A series of semistructured interviews were conducted to explore patients' and their partners' experiences from diagnosis to discharge	Patients appreciated the EPA's support program. They noted that the EPA was empathetic, trustworthy, knowledgeable, and open. Patients received specific information about PCa, including related symptoms and postoperative side effects
Alotaibi and Al anizi. (2020), Saudi Arabia [22]	Systematic review	—	To determine how advanced practice nurses (APNs) can contribute to cancer care	$N = 5$ items that met the established criteria	The variables taken into account in this work were support for elderly patients, stress relief, improvement of quality of life, and help in symptom management	A series of systematic searches of research studies conducted from 2005 to 2018 were carried out in the following databases: MEDLINE, CINAHL, PubMed, and AMED	The selected studies showed that EPAs provide support to elderly patients, which helps to relieve stress and improve the quality of life of cancer patients. In addition, it was found that EPAs can help patients with symptom management

TABLE 1: Continued.

Author (year) country (reference)	Study design	Comparisons	Objectives of the study	Participants	Measured variable and scale	Interventions	Results
Kim and Yoo (2022), South Korea [23]	Quasiexperimental study with a pretest-posttest nonequivalent control group	Experimental and control groups	To investigate the effects of an advanced practice nurse-led psychoeducational program on distress, anxiety, depression, cancer coping, health-promoting behaviour, and quality of life among colorectal cancer survivors	$N = 39$. 19 in the experimental group and 20 in the control group	Distress, anxiety, depression, cancer coping, health promotion, and QOL (quality of life) were investigated	A psychoeducational program was implemented by an advanced practice nurse. The program included interventions on anxiety, depression, distress, coping and health-promoting behaviours, and quality of life. Variables were measured before, immediately after, and 4 weeks after the intervention	The psychoeducation program had a positive effect on reducing stress and anxiety in colorectal cancer survivors, improving their coping with cancer and their quality of life
Morgan et al. (2016), USA [24]	Bibliographic review article	—	Describe how the advanced practice nurse (APN) is uniquely suited to meet the needs of older adults across the cancer continuum	$N = 82$. The information detailed in this paper is based on 82 articles found in searchable databases	Cancer care through: (1) preventive care, screening, and early diagnosis; (2) oncology and gerontology-specific care in geriatric oncology clinics and beyond; and (3) throughout survivorship	A series of searches were carried out in the following databases: Google Scholar, PubMed, and CINAHL. Search terms included the following: "Gero-oncology," "geriatric oncology," "advanced practice nurse," "nurse practitioner," "older adult," "elderly," and "cancer". The papers included in this review range from 2002 to 2015	APNs have made great strides in the care of older adults with cancer through prevention, screening and diagnosis, evidence-based geriatric oncology, and throughout the disease process and are well positioned to help understand the complex relationship between risk factors, geriatric syndromes, and frailty and translate research into practice

The findings of this analysis are shown in Table 2. Of the various articles analyzed, 14% had a strong overall score [23], 57% a moderate overall score [15, 16, 20, 21], and 29% a weak overall score [17, 18].

However, although the percentage of strong scores was the lowest proportion, all papers had strong internal components compared to the percentage of participants who made it to the end of the intervention. In addition, most studies showed strength in terms of the instruments used for data collection and the risk of bias [15, 16, 20, 23]. These internal components with a strong score are relevant and can be prioritized with respect to others, as they are more closely related to the objective of the study in this systematic review. Therefore, although the presence of other internal components with weak or moderate score is evident, since the most relevant internal components were strong, all these studies were included in this research. Another aspect to highlight is that the studies with a moderate overall score only presented one weak internal component out of the six evaluated [15, 16, 20, 21]. Similarly, those with a weak overall score had only two weak internal components [17, 18].

3. Results

3.1. Selection of Studies and the Data Extraction Process.

After conducting a comprehensive search and applying the controlled terms (DeCS and MeSH) together with Boolean operators as specified in the search strategy, a total of 1306 relevant articles were collected. The first search was conducted in Web of Science (WoS), where 74 articles were found; the second search was conducted in the Scopus database, gathering a sum of 62 articles; the third search was conducted in PubMed, obtaining a total of 10 articles; subsequently, different searches were conducted in ScienceDirect, CINAHL, and LILACS, obtaining a total of 906, 143, and 111 studies, respectively. Eight duplicate articles were eliminated, resulting in a total of 1298 papers.

The criteria detailed in the data extraction were applied. The first level of screening involved examining the titles and abstracts of articles in all databases, retaining those that looked promising for a full-text review. This stage left a pool of 58 articles for further analysis.

Subsequently, inclusion and exclusion criteria were applied to these 58 articles, resulting in the elimination of 48 of them. The reasons for excluding these 48 articles in the context of this review were based on several considerations: insufficient information ($n = 30$) and insufficient discussion of the topic of APN ($n = 18$).

Finally, after this selection process, a total of 10 articles were identified and retained that met the relevance and quality criteria established for this research. To reduce the selection bias, each article was independently reviewed by three of the researchers (C.U.-G., F.-J.G.-V., and E.C.), who decided whether each article met the criteria. If these researchers did not reach a consensus on the inclusion of a paper, the other two researchers (R.C.-B.; M.-d.-l.-A.M.-G. and E.-M.B.-M.) mediated the decision.

3.2. Characteristics of the Studies: Result Synthesis.

Table 1 provides exhaustive details of the main data related to each of the studies included in this review. These data include relevant information such as names of authors, year of publication, country of origin, type of study, comparisons examined, study objectives, participant population, variables considered, measurement instruments used, interventions, and, finally, the results obtained.

Of the ten research articles included in this review, one (10%) was a longitudinal, multicenter, randomized phase 2 study [15]; one (10%) a cross-sectional study involving two cohorts of patients [16]; three (30%) were qualitative studies [17, 18, 21]; two (20%) were systematic reviews [19, 22]; one (10%) a descriptive cross-sectional study with quantitative approach [20]; one (10%) a quasiexperimental study [23]; and one (10%) a literature review study [24].

In terms of the countries in which the work was carried out, three (30%) were carried out in Switzerland [15, 18, 21], one (10%) in Sweden [16], two (20%) in Spain [17, 20], one (10%) in Brazil [19], one (10%) in Saudi Arabia [22], one (10%) in South Korea [23], and one (10%) in the USA [24].

Concerning the area of study topic addressed by the different articles, five (50%) investigated patients' perceptions of the APN [15, 16, 22–24] two (20%) investigated perceptions of both patients and professionals of the multidisciplinary team [18, 20], two (20%) on the adequacy of APN education [19, 20], and one (10%) on perceptions of patients and family members [21].

Regarding the perceptions of APNs in relation to adult oncology patients, satisfactory results were obtained from patients and other professionals in the multidisciplinary team, with direct clinical practice, coordination, consultation, advice, and education being the most important [17]. In addition, the figure of obtaining information and applying advice on self-management of physical symptoms is positively valued [18]. Similarly, relatives of senior oncology patients also showed their appreciation for this professional, which is considered a valuable resource in the counselling about the disease [21].

From the ten studies analyzed, the following conclusions are drawn regarding the role of advanced practice nurses and the adequacy of their training: They play an essential role in assessing and diagnosing the needs of senior oncology patients by performing a comprehensive geriatric assessment. It also collaborates in the promotion of regular cancer screening and detection [24]; plays a crucial role in the early detection of complications and toxicities related to cancer treatment, contributing to a more accurate diagnosis and more effective care planning [17, 22]; contributes to the assessment and diagnosis of the needs of older patients with colorectal cancer by providing a comprehensive assessment of patients' needs, as well as continuity of care, psychosocial support, and facilitation of self-management of symptoms [18, 23]; and promotes care and facilitates the transition process from diagnosis to end of life. It also plays an important role in education and collaboration with multidisciplinary teams [19]; influences the improvement of patient variables such as uncertainty, ambiguity, inconsistency, and unpredictability, and increases the safety and confidence of

TABLE 2: Quality assessment components and ratings for the EPHPP instrument.

Articles	Components**						Overall score*
	1	2	3	4	5	6	
Raphaelis et al. [15]	S	S	M	W	S	S	M
Westman et al. [16]	S	M	M	M	S	S	M
Serra-barril et al. [17]	M	W	S	W	M	S	W
Alotaibi and Al [22]	M	W	M	W	M	S	W
Muñoz et al. [20]	S	W	S	M	S	S	M
Geese et al. [21]	M	M	M	M	W	S	M
Kim et al. [23]	S	S	M	M	S	S	S

*W, weak; M, moderate; S, strong. **1 = risk of bias; 2 = design; 3 = confounding factors; 4 = masking; 5 = data collection; 6 = withdrawals.

patients and relatives [15, 21]; and improves the acquisition of information related to supportive care resources [16]; their training in most cases meets the training standards required by ICN and this is evidenced by their clinical and care practice [19, 20].

3.3. Association between the Different APN Interventions with the Quality of Life of Senior Oncology Patients. APNs prioritize and effectively manage pain, providing vital emotional and psychological support during cancer treatment. Through empathetic communication and family participation, they improve both quality of life and patient ability to self-manage their health [19]. In certain cases, the APNs called patients after initial chemotherapy sessions to assess symptoms and provide advice, addressing both physical and psychological aspects of quality of life. This approach was proven to be more effective than interventions that focus solely on targeting quality of life [16]. Emotional and psychological support, with the use of active listening by APNs, also led to improvements in quality of life through reduced stress and anxiety [16]. Another key element was advance care planning in gerontological end-of-life care. People involved in this type of care are more likely to know and fulfill their wishes at the end of life, which improves patient and family satisfaction [24].

The groups with APN counselling showed a better trend of improvement on all uncertainty scales [15]. On the other hand, the reviewed studies have also shown how APNs can provide support to senior oncology patients through external means. The provision of telephone support facilitated access to the system and provided a rapid response to patients' problems and needs [16, 17]. Finally, it was also observed how APNs can make referrals to support services for patients and their families, such as support groups or counselors and mental health services, as they can identify signs of depression or emotional distress and collaborate with other mental health professionals when necessary. All of this had an impact on improving the quality of life of patients and families [15, 19, 24].

4. Discussion

The aim of this systematic review was to identify research papers that analyzed the impact of APNs on the quality of life of older adults with cancer.

Cancer care has become increasingly complex due to an ageing population and the growing need for comprehensive and personalized approaches to cancer treatment [1]. This review highlights multiple findings that underscore the essential contribution of APNs in enhancing quality of life and providing comprehensive care to senior oncology patients.

APN collaborates with the multidisciplinary team to carry out a comprehensive geriatric assessment, achieving a substantial change in treatment decisions in more than 40% of patients. With the intervention of this professional, great advances in prevention, detection, and diagnosis are achieved [24]. To grasp the significance of this finding, it is essential to appreciate the role of the global geriatric assessment in adults. Older people undergo a transformation in their health, affecting their functional, psychological, and social aspects. A dependable global geriatric assessment that is valid, feasible, and simple aids in diagnosing health problems across all dimensions. It streamlines medical care and improves the overall quality of life for the elderly [28].

Early implementation of palliative care with APN in cancer treatment significantly improves patient's quality of life, reduces depression, and minimizes the need for intensive care. This approach may also contribute to increased survival, as demonstrated in postoperative patients who received home APN intervention compared to those who did not [15, 19]. These findings emphasize the vital role of APNs in end-of-life care, where their advanced clinical decisions and specialized knowledge in cancer care directly contribute to improved quality of life. This ensures that older adults receive optimal treatment, leading to longer survival in most cases [20].

Nurses are increasingly taking on new roles in different countries. Health education is becoming one of its key functions. There is a significant improvement in patients' perception of the health-related information they receive [16]. All this makes a positive contribution to the patient's experience and to the work of the multidisciplinary team [17].

The health education provided by APNs goes beyond providing general information to senior oncology patients. It plays a crucial role in the ongoing dialogue with patients, offering guidance and education on managing reported side effects during medication treatment [18, 29–31]. Similarly, these nurses work closely with social workers, pharmacists, and physicians. This interdisciplinary and coordinated

approach can have a significant impact on the quality of life of senior oncology patients by providing a smoother and more effective transition from the hospital setting to outpatient or home care [16].

On the other hand, it has also been observed that with the intervention of APNs in psychoeducational programs for cancer survivors, their coping improves, as well as their quality of life. This is due to the positive effect on the reduction of stress and anxiety [23]. Patient-centered care, which includes both physical and psychological aspects of quality of life, produces more effective results than interventions that focus solely on quality of life. APNs, with their knowledge and experience, play a crucial role in achieving this, contributing to the reduction of chemotherapy-related symptoms [22, 23]. However, it should be kept in mind that an intervention directed only towards health education is unlikely to lead to a complete behavioural change. To improve the level of behavioural change in senior oncology patients, it is also necessary to implement regular physical activity and dietary practices [32]. Physical activity is an important factor that affects the prognosis and psychosocial adjustment of senior oncology patients [33].

One of the most distressing things for senior oncology patients is the uncertainty they experience. The disease process they are going through has many variables that are completely unknown to them [34]. Raphaelis and collaborators' [15] findings indicate that APN counselling reduces uncertainty related to vulvar neoplasia in adult women. Personalized counselling by APNs showed a significant decrease in uncertainty measures in six months, while written information did not produce significant decreases over time in another group [21]. This corroborates what has already been evidenced in other research, where participants stated that APNs were a key point of support: people who were there for any concerns that were difficult to discuss with a social network or other healthcare providers [35].

In terms of perception of the multidisciplinary team, Serena and collaborators [18] detailed promising results in their research. Physicians perceived APNs as adding value in facilitating access to care, supporting symptom management, providing psychosocial support, and improving continuity of care [18]. These results are consistent with other studies, which emphasize the concurrent empowerment of medicine and nursing. The specialization of nursing roles, such as APNs, contributes significantly to the overarching goal of healthcare, improving patient wellbeing. Medical professionals recognize and value this nursing role as a valuable complement to their clinical work [36].

Families' perceptions of the APNs were also identified in several studies as favorable [18, 21]. Families noted that, after the intervention, they and their ill relatives received targeted information about cancer, its symptoms, and side effects. In addition, APNs referred them to support services, including self-help groups, sex therapy, and psycho-oncology [18]. However, despite the results, Hart and colleagues [37] estimated in their study that only 65% of patients were willing to be seen by an APN for the first time.

All the scientific literature reviewed agrees that it is necessary to provide individualized, multidimensional and multidisciplinary care to senior oncology patients. For this, the figure of APNs is fundamental, as it is a specialization that requires formal training and education [38, 39]. Currently, there are multiple training initiatives in Spain, such as organizing symposiums, conferences, and courses, although it would still be necessary to include this training and specialization in the curricular training of both geriatric nurses and oncology specialists [9].

This study has limitations, including the heterogeneity of incorporated works due to methodological variations, participant characteristics, intervention specifics, and outcomes. It is difficult to extrapolate conclusions with qualitative studies or systematic reviews; however, in this research, there are also several studies with a control group, a cohort study, and a randomized study, which present greater control of bias [40] and therefore the possibility of extrapolating their conclusions. Despite these limitations, the research addresses a contemporary question in the context of recent global challenges, especially the pandemic. There is a scarcity of studies on the influence of APNs on the quality of life of cancer patient's postpandemic, making this investigation novel. Furthermore, it is a work in which the PRISMA declaration criteria [13] for systematic reviews have been rigorously followed through the exhaustive analysis of the selected articles. However, future research with various interventions and randomized trial designs by APNs is recommended to further advance knowledge in this area, taking into consideration a greater margin of years regarding the publication date for database searches. It would also be appropriate in future research to carry out a meta-analysis after making the systematic review.

5. Conclusions

Carrying out systematic reviews such as those in this study is a challenge due to the lack of recognition that currently exists for these professionals. However, the evidence reflected represents relevant conclusions for the profession in particular and for public health in general.

APNs play a crucial role in the care of older adults with cancer, significantly improving their quality of life and contributing to comprehensive patient care. The research conclusions in this review highlight various aspects of the work of APNs in oncological care for the elderly, including comprehensive geriatric assessment, early detection of complications, personalized care planning, emotional support, educational guidance for patients and families, and vital collaboration within multidisciplinary teams. It is evident that advanced practice nurse (APN) is an emerging practice that improves the care of older people.

In summary, the findings presented in this paper endorse the inclusion of APNs in oncology care teams for a better patient experience and overall well-being. It is crucial to acknowledge and appreciate the significant contribution of APNs in oncology. Advocacy for greater recognition and regulation of its role in the care of senior oncology patients, along with its participation in clinical trials, is essential. The

work of APNs not only enhances the quality of life of these patients but also positively influences clinical outcomes and the health workforce.

6. Implications to Nursing Management

The study highlights the critical role of advanced practice nurses (APNs) in enhancing the care of senior oncology patients, suggesting significant implications for nursing management and leadership. APNs lead multidisciplinary teams effectively, advocating for shared leadership to improve decision-making and care execution. Nursing management should leverage APN expertise in policy advocacy, particularly in expanding their roles within oncology, which is essential for enhancing patient care and operational efficiency.

APNs' ability to manage early complications and provide personalized care underscores the need for ongoing professional development and involvement in quality control measures. Nursing leaders should prioritize continuous education for APNs and empower them to initiate care plan adjustments, ensuring high standards of patient safety and care quality.

Furthermore, establishing robust feedback mechanisms for APNs can enhance the effectiveness of nursing practices. This feedback is crucial for refining patient care strategies and advancing nursing leadership, aligning with the goals of improving clinical outcomes and the overall patient experience in healthcare settings.

Data Availability

The data used to support the findings of this study are included within the article.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Effects of Personality Traits and Mentalization on Workplace Bullying Experiences among Intensive Care Unit Nurses

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Aim. This study aimed to investigate the effects of intensive care unit nurses' personality traits and mentalization on workplace bullying after controlling for organizational culture. *Background.* Nurses' personality traits and mentalization may significantly influence workplace bullying. *Methods.* This cross-sectional study collected data from 416 nurses using an online survey in July 2022. Major variables were evaluated using the Pathological Narcissism Inventory, Perfectionistic Self-Presentation and Psychological Distress Scale, Short Dark Triad, Mentalization Scale, Positive Nursing Organizational Culture Measurement Tool, and the Negative Acts Questionnaire-Revised. . A multiple regression analysis was performed. *Results.* Narcissistic vulnerability, mentalization, and perfectionistic self-presentation significantly influence workplace bullying (victim aspect). Dark personality, mentalization, and perfectionistic self-presentation significantly influence workplace bullying (perpetrator aspect). *Conclusions.* Individual nurses could become either victims of bullying or perpetrators according to their personality traits. Therefore, it is necessary to determine their personality traits, so that they do not become influencing factors in workplace bullying. *Implications for Nursing Management.* Efforts at a nursing organization level are crucial to understand nurses' personality traits, enhance their mentalization, minimize the manifestations of the negative aspects of their traits, and positively affect the prevention and alleviation of workplace bullying.

1. Background

Workplace bullying causes practice errors among nurses, affects patient outcomes [1], significantly influences turnover [2], and increases workload and stress among the remaining nurses [3], resulting in a vicious cycle. Workplace bullying in nursing organizations remains an unresolved problem, and the understanding of contributing factors is still lacking [4]. In the nursing profession, research on workplace bullying has been conducted for the past 30 years, and various intervention methods have been suggested, but it is difficult to find noticeable improvements [5]. A systematic review of the literature on interventions over the past decade [6] also indicated that while it is significant that diversified antibullying interventions have been applied and evaluated, problems with conceptual clarity and effectiveness measurement still exist.

Meanwhile, the intensive care unit involves complex treatment and nursing due to higher patient severity than in other hospital departments; moreover, tasks must be performed quickly and accurately [7]. Furthermore, as most intensive care units are restricted, contact with outsiders such as patients and guardians is limited compared to general wards; however, there is much contact with medical personnel, resulting in conflicts [8]. In particular, the violence among intensive care unit nurses is mostly horizontal violence related to nursing work, that is, workplace bullying [9]. ICU nurses reported experiencing more work-related bullying than other types [10]. In a recent study of ICU nurses, the perpetrators of bullying were mainly nurses [11]. Workplace bullying among nurses is repeated, continuous, covert [4], and perpetrated by individuals [12]. Parke et al. [11] emphasized that negative behaviors such as bullying need to be recognized, reported, and effectively addressed

rather than normalized within healthcare professions and workplace environments. Thus, nurses must be aware of their personality traits [13]. Understanding the relationship between personality traits and bullying may be a way to break the vicious cycle of bullying.

Johnson [14] recommended a multifaceted ecological model approach to understand bullying and develop interventions, wherein the microsystem is the smallest of the four interrelated systems, and the individual characteristics of the bully and target constitute an approach to this microsystem [14]. Personality traits refer to the patterns of thinking, feeling, and acting that have been formed over time, become stabilized under various conditions, and are distinguished from other characteristics [15]. Particularly, self and interpersonal functioning are key components of personality traits (American Psychiatric Association [16]); evaluating these factors is crucial to understanding personality pathology [17]. However, nurses' personality traits were analyzed as predictors of engagement among nursing professionals [18] and related factors of critical care nursing competence [19]. While previous studies on the relationship between personality and bullying exist, most have focused on adolescent bullying [20, 21]. A recent study targeting nurses [22] dealt with workplace bullying and personality traits as factors influencing nurses' health status but did not deal with the detailed characteristics of personality traits. To determine the relationship between workplace bullying and personality, this study focuses on pathological narcissism, perfectionistic self-presentation, dark personality, and mentalization among personality traits.

Pathological narcissism is characterized by a marked lack of empathy, a sense of entitlement, exploitative or arrogant behaviors or attitudes (narcissistic grandiosity), a desire for admiration, and frustration at the lack of admiration from other people (narcissistic vulnerability) [16]. While nurses with narcissistic personalities work with other nurses, such personality traits are likely to manifest in the form of workplace bullying victims or perpetrators. Previous studies show that narcissistic personalities induce counterproductive work behaviors toward colleagues [23] and that narcissistic behavior among nurses might have detrimental effects on their colleagues and institutions [24].

Perfectionist self-presentation refers to the desire to be seen as perfect [25]. People with high levels of perfectionistic self-presentation tend to promote behaviors perceived as perfect and conceal behaviors that they think are perceived as imperfect [26]. This means that beyond the desire to be perfect, these people are concerned with expressive desires, such as how they behave to be seen as perfect, which is an extreme and deceptive presentation of themselves to other people [26]. According to the Perfectionism Social Disconnection Model [27], perfectionistic self-presentation represents a set of defensive interpersonal behaviors including securing other peoples' love and respect (perfectionistic self-promotion) and preventing humiliation and rejection by other people (nondisplay of imperfection and nondisclosure of imperfection). Such behaviors have reportedly contributed to or exacerbated various forms of psychological distress and maladaptation, including depression, loneliness, hopelessness, and social anxiety [25, 28].

Paulhus and Williams [29] referred to individual tendencies to commit crimes or cause social problems as the "Dark Triad of personality," which comprises three constructs: narcissism, Machiavellianism, and psychopathy; all three constructs commonly have negative characteristics such as coldness, lack of empathy, and duplicity [29]. Coldness and lack of empathy induce a tendency to manipulate other people [30]. Cold people appear attractive in short-term interactions with other people. However, this may negatively affect their relationships with others in long-term interactions owing to their low empathy and exploitative behaviors in pursuing their interests [31]. Disruptive behaviors (e.g., unproductive work behavior and abusive supervision) associated with the dark triad can adversely affect safety and productivity in organizations [32, 33]. Since a "dark" personality can be more excessively exhibited in a psychologically competitive organizational environment [34], it is important to identify the dark triad in employee selection and organizational culture improvement.

Mentalization refers to the ability to consider one's own and other people's mental states [35]. The ability to mentalize emotions is a construct of emotional competence in a broader sense and promotes an understanding of interpersonal relationship behaviors and self-regulation [36]. The deterioration of the ability to mentalize can put various psychological issues and bullies at risk. Moreover, victims are particularly vulnerable to mentalizing anger and are consequently more likely to perceive anger and happiness as behavioral conditions rather than mental states [37]. According to a previous study, the inability to mentalize can affect the ability to suppress violent behaviors [38].

A previous study on the effects of personality traits and perceived nursing organizational culture on workplace bullying among nurses [39] reported that higher perceived relationship-oriented and innovation-oriented cultures among nurses were associated with lower perceived workplace bullying, while higher nurse-perceived hierarchy-oriented and task-oriented cultures among nurses were associated with higher perceived workplace bullying. Other previous studies also reported that organizational culture was a significant influencing factor in workplace bullying [39, 40]. Therefore, this study aimed to analyze the effects of personality traits (pathological narcissism, perfectionistic self-presentation, and dark personality) and mentalization on workplace bullying among nurses after controlling for organizational culture.

2. Methods

2.1. Study Design. A cross-sectional study design was used.

2.2. Participants. The inclusion criteria were as follows: (1) nurses working in intensive care units (ICUs) at tertiary hospitals in South Korea at the start of this study and (2) nurses belonging to a nursing department. The exclusion criteria were as follows: (1) physician assistants, (2) nurses working in medical departments, (3) those not engaged in nursing-related work, and (4) those

diagnosed with mental health problems or receiving treatment for mental health problems.

2.3. Data Collection and Ethical Considerations.

An online survey was conducted in July 2022. The minimum number of samples required for multiple regression analysis was 322 with a two-tailed test, a significance level of 0.01, a power of 0.99, 16 predictors, and an effect size of $f^2 = 0.15$ (medium) using the G∗power 3.1.9.7 version program. Considering a dropout rate of approximately 20%, 400 participants were targeted, and data were collected online through a Google Forms link in the form of an open call invitation. A warning was displayed to the participants not to respond more than once. The promotional notices on the survey were posted on online communities used mainly by nurses, such as tertiary hospital groupware bulletin boards and the online platform of the Korean nursing representatives. Finally, we collected 432 completed questionnaires; 416 (except for 16 that met the exclusion criteria) were finally analyzed.

This study was approved by the institutional review board (IRB) of the university to which the authors of this study belong (No. 1041078-202203-HR-96, approved on June 7, 2022). The participants who accessed the survey through the link received information about the study's purpose, methods, and voluntary withdrawal at any time. Those who agreed to participate in this study submitted electronic informed consent by clicking an "agree" button. All participants were provided with a guarantee of anonymity throughout the process.

2.4. Measurements.

Information regarding participants' general (age, sex, marital status, religion, educational level, and subjective health status) and work-related characteristics (total working years, position, antibullying education, and experience of workplace bullying) was collected using self-report questionnaires. Specifically, regarding subjective health status, participants were asked, "How do you feel about your health condition?" Responses were provided using a 5-point Likert scale (1 = very bad, 2 = bad, 3 = moderate, 4 = good, and 5 = very good); a score of below three was considered to reflect a poor subjective health status, and a score of three or above was considered to reflect a good subjective health status. Participants were also asked to answer "yes or "no" to the question, "Do you attend religious services regularly?" to assess their religion status, referring to a previous study on nurses' workplace bullying [13]. Permissions were obtained for the original version/ Korean version of all instruments.

2.4.1. Pathological Narcissism.

Pathological narcissism was evaluated using the Pathological Narcissism Inventory Korean version (a total of 35 items), which was culturally adapted for Koreans by Yang and Kwon [41], and the Pathological Narcissism Inventory (52 items), developed by Pincus et al. [42]. Additionally, this tool can be used to evaluate two phenotypes of pathological narcissism, namely, narcissistic grandiosity and narcissistic vulnerability. This tool is rated on a 7-point Likert scale (scoring range: 0–210 points); a higher score indicates more severe pathological narcissism. Cronbach's α at the time of the development of the original inventory [42], in the Korean version in a study by Yang and Kwon [41], and in this study was 0.95 (0.78–0.93), 0.92 (0.85–0.92), and 0.96 (0.91–0.95) respectively.

2.4.2. Perfectionistic Self-Presentation.

Perfectionistic self-presentation was evaluated using the Korean version [26] of the Perfectionistic Self-presentation and Psychological Distress scale (PSPDS) [25]. The PSPDS comprises three subdomains (perfectionistic self-promotion, nondisplay of imperfection, and nondisclosure of imperfection) with 27 items and is a 7-point Likert scale (1 = strongly disagree; 7 = strongly agree). Its Korean version comprises 19 items, of which 8 were deleted in cultural adaptation from the original scale. Cronbach's α during its development [25], in its Korean version [26], and this study was 0.91~95, 0.85 (0.75~0.88), and 0.90 (0.76~0.91), respectively.

2.4.3. Dark Personality.

Dark personality was evaluated using the Korean version [43] of the Short Dark Triad (3 factors: narcissism, Machiavellianism, and psychopathy; a total of 27 items) [44]. The Korean version is a 17-item scale, in which 10 items from the original scale were deleted. Machiavellianism and psychopathy were grouped into one factor. Each item is rated on a 5-pointLikert-type scale (1 = strongly disagree; 5 = strongly agree); the total score ranges from 17 to 85 points. Cronbach's α at its development, in a Korean version in a study by [43], and in this study was 0.73~0.78, 0.85 (0.75~0.84), and 0.90 (0.80~0.87), respectively.

2.4.4. Mentalization.

Mentalization was evaluated using the Korean version [45] of the Mentalization Scale (28 items) developed by Dimitrijević et al. [46]. It is a 25-item5-pointLikert-type scale (1 = completely incorrect; 5 = completely correct) comprising three domains: self-related mentalization, other-related mentalization, and motivation to mentalize. Cronbach's α of the original scale, the Korean version, and that in this study was 0.84 (0.74–0.79), 0.88 (0.74–0.84), and 0.84, respectively.

2.4.5. Organizational Culture.

Organizational culture was evaluated using the Positive Nursing Organizational Culture Measurement Tool [47]. This tool comprises four factors (positive leadership of the nursing unit manager, the pursuit of common values, forming an organizational relationship based on trust, and the fair management system), with 26 items. Each item is rated on a 5-pointLikert-type scale (scoring range: 24–120 points). A higher score indicates stronger perceived positivity toward nursing organizational culture. Cronbach's α of the tool during its development and in this study was 0.95 (0.83~0.95) and 0.96, respectively.

2.4.6. Workplace Bullying (Victim and Perpetrator Aspects).
The workplace bullying (victim aspect) was evaluated using the Korean version [48] of the Negative Acts Questionnaire-Revised (NAQ-R) [49]. This tool is a 22-item and 5-pointLikert-type scale (scoring range: 22–110 points). Cronbach's α of the original scale during its development [49] and in a Korean version in a study by Nam et al. [48] was 0.93 and 0.96, respectively. The workplace bullying (perpetrator aspect) was evaluated using the Negative Acts Questionnaire-Perpetrator [13], which was modified for the perpetrator aspect from the Negative Acts Questionnaire-Revised (NAQ-R) [49], and tested for its reliability and validity; Cronbach's α was 0.97 both during its development and in this study.

2.5. Statistical Analysis. Data were analyzed using the SPSS Statistics program 26.0 version (IBM Corp., Armonk, NY). Differences in workplace bullying according to participants' general and work-related characteristics were analyzed using a *t*-test and a one-way ANOVA. Ad hoc testing was further performed for variables with a significant intergroup difference using the Scheffé test. The correlations between pathologic narcissism (narcissistic grandiosity and narcissistic vulnerability), perfectionistic self-presentation, dark personality, organizational culture, mentalization, workplace bullying victim, and perpetrator aspects were analyzed using Pearson's correlation coefficients. Multiple regression analysis was also performed to identify the influencing factors of workplace bullying from the victim and perpetrator perspectives. The normality of the residuals was determined using the Kolmogorov–Smirnov test.

3. Results

3.1. General and Work-Related Characteristics of the Participants. The mean age and total working experience of the participants were 30.82 years old (standard deviation: 5.47 years) and 5.96 years (standard deviation: 4.49 years), respectively. Of the 416 participants, 380 (91.3%) were female, 299 (71.9%) were unmarried, 340 (81.7%) had a bachelor's degree, and 369 (88.7%) were staff nurses (Table 1).

3.2. Comparison of Workplace Bullying according to General and Work-Related Characteristics. The score for workplace bullying (victim aspect) was statistically significantly higher among women, those who attended religious services, staff nurses, and those with poor subjective health status. The score for workplace bullying (perpetrator aspect) was high among those with a religion, 3-year nursing college graduates, poor subjective health status, and those who completed antibullying education within 1 year (Table 2).

3.3. Correlation among Major Variables. Workplace bullying (victim aspect) was positively correlated with narcissistic grandiosity, narcissistic vulnerability, perfectionistic self-presentation, and dark personality, whereas it was negatively correlated with working years, mentalization, and organizational culture. Workplace bullying (perpetrator aspect) was positively correlated with working years, narcissistic grandiosity, narcissistic vulnerability, perfectionistic self-presentation, and dark personality, whereas it was negatively correlated with mentalization and organizational culture. Additionally, workplace bullying (victim aspect) and workplace bullying (perpetrator aspect) (Table 3) were positively correlated.

3.4. Factors Affecting Workplace Bullying

3.4.1. Workplace Bullying (Victim Aspect). Variables that significantly differed in workplace bullying (victim aspect) according to participants' characteristics and those that were significantly correlated with workplace bullying (victim aspect) were input into a regression model using the enter method. There was no multicollinearity between the independent variables (variance inflation factor: 1.04–3.62). Moreover, the Durbin–Watson index was 2.03. This confirmed the independence between error terms, thereby satisfying the assumptions of the regression analysis. The normality of the residuals was also confirmed ($Z = 0.04$, $p = 0.531$). This regression model explained 36.2% of the workplace bullying variance. Narcissistic vulnerability ($\beta = 0.25$, $p < 0.001$), followed by organizational culture ($\beta = -0.23$, $p < 0.001$), mentalization ($\beta = -0.16$, $p < 0.001$), working years ($\beta = -0.14$, $p = 0.002$), subjective health status ($\beta = 0.12$, $p = 0.005$), and perfectionistic self-presentation ($\beta = 0.11$, $p = 0.019$) were found to significantly influence workplace bullying (victim aspect). In other words, the score for workplace bullying (victim aspect) was higher among those who had a more severe narcissistic vulnerability, a more negative organizational culture, a lower mentalization, fewer working years, and a more severe perfectionistic self-presentation compared with their counterparts (Table 4).

3.4.2. Workplace Bullying (Perpetrator Aspect). Variables that significantly differed in workplace bullying (perpetrator aspect) according to participants' characteristics and those that were correlated with workplace bullying (perpetrator aspect) were input into the regression model using the enter method. There was no multicollinearity between the independent variables (variance inflation factor: 1.07–3.65). Moreover, the Durbin–Watson index was 1.90. This confirmed the independence between error terms, thereby satisfying the assumptions of the regression analysis. The normality of the residuals ($Z = 0.05$, $p = 0.269$) was also confirmed. This regression model explained 41.0% of the workplace bullying (perpetrator aspect) variance. Dark personality ($\beta = 0.48$, $p < 0.001$), followed by mentalization ($\beta = -0.17$, $p < 0.001$), education level ($\beta = 0.15$, $p = 0.023$), perfectionistic self-presentation ($\beta = -0.13$, $p = 0.007$), and subjective health status ($\beta = 0.13$, $p = 0.001$) were found to significantly influence workplace bullying (perpetrator aspect). Specifically, the score for workplace bullying (perpetrator aspect) was higher among those with a darker

TABLE 1: General and work-related characteristics ($N = 416$).

Characteristics	Categories	N (%)	M (SD)
Age (years)			30.82 (5.47)
Sex	Female	380 (91.3)	
	Male	36 (8.7)	
Marital status	Single	299 (71.9)	
	Married	117 (28.1)	
Religious service attendance	No	227 (54.6)	
	Yes	189 (45.4)	
Educational level	3-year college	50 (12.0)	
	Bachelor's degree	340 (81.7)	
	≥master's degree	26 (6.3)	
Total working years			5.90 (4.49)
Position	Staff nurse	369 (88.7)	
	Charge nurse	47 (11.3)	
Subjective health status	Poor	67 (16.1)	
	Good	349 (83.9)	
Antibullying education	No	238 (57.2)	
	Yes	178 (42.8)	
Experience of workplace bullying (victim aspect)	No	319 (76.7)	
	Yes	97 (23.3)	

M, mean; SD, standard deviation.

personality, lower mentalization, a weaker perfectionistic self-presentation, and poor health status and those who graduated from a three-year nursing college compared with their counterparts (Table 5).

4. Discussion

This study investigated the effects of personality traits and mentalization (individual factors) on workplace bullying among nurses after controlling for organizational culture (organizational factor). It demonstrated that narcissistic vulnerability had the greatest influence on workplace bullying (victim aspect) among nurses. People with more severe narcissistic vulnerability may experience more negative emotions, such as depression, owing to their unrealistic expectations; thus, they demand only positive responses from others [17] and may also feel ashamed for seeking recognition from others [50]. A previous study on the effects of personality factors on workplace bullying among nurses reported that narcissistic vulnerability was significantly positively correlated with depression, anger, and negative emotions and negatively correlated with positive emotions [41]. Therefore, nurses who exhibit narcissistic vulnerability are considered vulnerable to other peoples' negative evaluations or comments and are highly likely to perceive them as workplace bullying. Therefore, interventions such as emotion regulation and self-esteem regulation must be provided to nurses to actively regulate emotions and self-esteem according to their levels of narcissistic vulnerability [13, 41].

Another major influencing factor of workplace bullying (victim aspect) was mentalization. Mentalization is the ability to focus on and understand the mind of oneself or other people [35]. Low or impaired mentalization can cause difficulties in inferring the mental activity of oneself or other people, resulting in psychopathologies such as difficulties in

emotion regulation and interpersonal problems [45]. Conversely, high mentalization has been associated with high life satisfaction, low depression, and low anxiety [46, 51]. Mentalization is developed through individuals' attachment relationships with their primary caregivers during their growth process but is also a fragile brain function that can be easily damaged by stressful situations [52]. Therefore, nurses with this tendency may be more likely to experience workplace bullying (victim aspect). It is thus necessary to develop and provide nurses with interventions that can reduce stress, help in coping with stress appropriately, and maintain stable mentalization.

Perfectionistic self-presentation also impacted workplace bullying (victim aspect). Specifically, higher scores for workplace bullying (victim aspect) were associated with higher perfectionistic self-presentation. People with high perfectionistic self-presentation conceal their imperfections and tend to appear perfect to consequently receive and maintain a favorable reputation from others [26]. As people with severe perfectionistic self-presentation tend to avoid other peoples' negative evaluations of themselves and gracing their shortcomings [17, 26], they are presumably more vulnerable to other peoples' negative evaluations or criticisms of their shortcomings that they may receive at work.

This study also showed that dark personalities had the greatest influence on workplace bullying (perpetrator aspect). Coldness (lack of empathy), one of the common characteristics of the three constructs of dark personality, inevitably induces a tendency to manipulate other people [30]. This may result in low empathy and exploitative behavior so that one pursues their interests in long-term interactions with others [31, 43]. This characteristic may be the basis for a major factor affecting workplace bullying (perpetrator aspect).

Table 2: Comparison of workplace bullying by general and work-related characteristics ($N = 416$).

Characteristics	Categories	N	Workplace bullying (victim aspect)			Workplace bullying (perpetrator aspect)		
			M (SD)	t/F	p	M (SD)	t/F	p
Sex	Female	380	53.69 (19.04)	2.11	0.036	37.29 (16.49)	0.60	0.550
	Male	36	46.69 (18.89)			35.58 (15.64)		
Marital status	Single	299	54.17 (19.16)	1.86	0.064	36.88 (16.48)	0.53	0.596
	Married	117	50.31 (18.75)			37.83 (16.26)		
Religious service attendance	No	227	50.93 (18.99)	2.54	0.011	34.44 (14.75)	3.75	<0.001
	Yes	189	55.67 (18.96)			40.40 (17.70)		
Educational level	3-year college (a)	50	54.66 (16.22)	0.93	0.398	45.42 (19.44)	8.54	<0.001 (a) > (b)
	Bachelor's degree (b)	340	53.20 (19.37)			35.68 (14.97)		
	Master's degree (c)	26	48.50 (20.74)			40.42 (22.64)		
Position	Staff nurse	369	53.74 (19.10)	1.98	0.048	37.08 (16.44)	0.23	0.820
	≥ charge nurse	47	47.89 (18.54)			37.66 (16.28)		
Subjective health status	Poor	67	65.54 (17.91)	6.07	<0.001	46.94 (20.40)	4.46	<0.001
	Good	349	50.69 (18.41)			35.27 (14.83)		
Antibullying education	No	238	52.49 (19.38)	0.73	0.467	35.16 (15.55)	2.88	0.005
	Yes	178	53.87 (18.76)			39.80 (17.17)		
Experience of workplace bullying (victim aspect)	No	319	47.15 (16.37)	13.89	<0.001	33.98 (13.49)	7.62	<0.001
	Yes	97	72.59 (13.75)			47.57 (20.44)		

M, mean; SD, standard deviation.

TABLE 3: Correlation among variables (N = 416).

	Working years	Narcissistic grandiosity	Narcissistic vulnerability	Perfectionistic self-presentation	Dark personality	Mentalization	Organizational culture	Workplace bullying (victim aspect)	Workplace bullying (perpetrator aspect)
	$r(p)$	$r(p)$	$r(p)$	$r(p)$	$r(p)$	$r(p)$	$r(p)$	$r(p)$	$r(p)$
Working years	1								
Narcissistic grandiosity	−0.01 (0.841)	1							
Narcissistic vulnerability	0.04 (0.368)	0.77 (<0.001)	1						
Perfectionistic self-presentation	0.03 (0.565)	0.48 (<0.001)	0.53 (<0.001)	1					
Dark personality	0.03 (0.489)	0.71 (<0.001)	0.68 (<0.001)	0.48 (<0.001)	1				
Mentalization	−0.11 (0.030)	−0.07 (0.144)	−0.28 (<0.001)	0.05 (0.330)	−0.15 (0.002)	1			
Organizational culture	−0.01 (0.920)	−0.03 (613)	−0.19 (<0.001)	−0.01 (0.821)	0.36 (<0.001)	0.24 (<0.001)	1		
Workplace bullying (victim aspect)	−0.11 (0.023)	0.35 (<0.001)	0.49 (<0.001)	0.29 (<0.001)	0.57 (<0.001)	−0.29 (<0.001)	−0.36 (<0.001)	1	
Workplace bullying (perpetrator aspect)	0.10 (0.036)	0.41 (<0.001)	0.47 (<0.001)	0.17 (0.001)	0.57 (<0.001)	−0.31 (<0.001)	−0.11 (0.023)	0.53 (<0.001)	1

TABLE 4: Factors influencing workplace bullying (victim aspect) ($N = 416$).

Variables	B	SE	β	t	p	VIF	95% confidence interval	
							Lower	Upper
Constant	73.65	8.77		8.40	<0.001		56.41	90.89
Sex[†]	−4.50	2.72	−0.07	1.66	0.098	1.04	−9.85	0.84
Religious service attendance[†]	0.96	1.56	0.03	0.62	0.538	1.07	−2.10	4.02
Position[†]	1.81	2.63	0.03	0.69	0.493	1.24	−3.37	6.99
Subjective health status[†]	6.17	2.18	0.12	2.84	0.005	1.14	1.90	10.45
Working years	−0.59	0.19	−0.14	3.17	0.002	1.26	−0.96	−0.23
Narcissistic grandiosity	0.01	0.10	−0.01	0.02	0.981	3.18	−0.20	0.19
Narcissistic vulnerability	0.25	0.07	0.25	3.39	0.001	3.62	0.11	0.40
Perfectionistic self-presentation	0.13	0.06	0.11	2.35	0.019	1.54	0.02	0.24
Dark personality	0.14	0.10	0.08	1.39	0.166	2.31	−0.06	0.34
Mentalization	−0.30	0.08	−0.16	3.71	<0.001	1.26	−0.45	−0.14
Organizational culture	−0.23	0.04	−0.23	5.34	<0.001	1.21	−0.32	−0.15
Adjusted $R^2 = 0.36$, $F = 22.41$, $p < 0.001$								
Durbin–Watson's $d = 2.03$ (du = 1.89, 4-du = 2.11), Kolmogorov–Smirnov test ($Z = 0.04$, $p = 0.531$)								

[†]Dummy variable (reference). Sex (female), religious service attendance (no), position (charge nurse), subjective health status (good). SE, standard error; VIF, variance inflation factor.

TABLE 5: Factors influencing workplace bullying (perpetrator aspect) ($N = 416$).

Variables	B	SE	β	t	p	VIF	95% confidence interval	
							Lower	Upper
(Constant)	27.70	8.02		3.45	0.001		11.93	43.47
Religious service attendance[†]	2.23	1.29	0.07	1.73	0.084	1.07	−0.30	4.77
Education level[†]	7.57	3.31	0.15	2.28	0.023	3.03	1.05	14.08
Subjective health status[†]	5.89	1.80	0.13	3.28	0.001	1.14	2.36	9.43
Antibullying education[†]	4.04	2.45	0.11	1.65	0.100	3.06	−0.78	8.87
Working years	0.17	0.15	0.05	1.14	0.255	1.13	−0.12	0.45
Narcissistic grandiosity	0.01	0.08	0.01	0.07	0.948	3.20	−0.16	0.17
Narcissistic vulnerability	0.08	0.06	0.10	1.34	0.182	3.65	−0.04	0.21
Perfectionistic self-presentation	−0.12	0.05	−0.13	2.71	0.007	1.54	−0.22	−0.03
Dark personality	0.70	0.08	0.48	8.35	<0.001	2.33	0.53	0.86
Mentalization	−0.27	0.07	−0.17	4.03	<0.001	1.30	−0.40	−0.14
Organizational culture	−0.01	0.04	−0.01	−0.28	0.783	1.19	−0.08	0.06
Adjusted $R^2 = 0.41$, $F = 27.03$, $p < 0.001$								
Durbin–Watson's $d = 1.90$ (du = 1.89, 4-du = 2.11), Kolmogorov–Smirnov test ($Z = 0.05$, $p = 0.269$)								

[†]Dummy variable (reference), religious service attendance (no); education level (above bachelor's degree); subjective health status (good); antibullying education (no); SE, standard error; VIF, variance inflation factor.

Mentalization was a major influencing factor of workplace bullying (perpetrator aspect). Specifically, lower mentalization was associated with higher scores for both workplace bullying victim and workplace bullying perpetrator aspects. Previous studies showed that mentalization was negatively correlated with borderline personality traits, depression, and anxiety [45]. Bullying victims are particularly vulnerable to mentalizing anger [37], and the inability to mentalize may affect the ability to suppress violent behavior [38]. Therefore, lower mentalization is presumably associated with higher workplace bullying.

Perfectionistic self-presentation was also a factor affecting workplace bullying (perpetrator aspect). This study showed that the score for workplace bullying (perpetrator aspect) was higher among those with weaker perfectionistic self-presentation, which contradicts results showing that the score for workplace bullying (victim aspect) was higher among those with stronger perfectionistic self-presentation. As people with high levels of perfectionistic self-presentation tend to be concerned about how they appear to other people to avoid making mistakes in social situations and tend to value harmony with other people [53], they are likely to have low scores for workplace bullying (perpetrator aspect). A previous study [54] showed that other-oriented and socially prescribed perfectionism showed unique relationships indicative of social disconnection and hostility, whereas self-oriented perfectionism showed unique relationships indicative of social connection. That is, since the perfectionism social disconnection model may not be applicable to all forms of perfectionism, it is necessary to confirm the association between perfectionism and bullying (victim and perpetrator aspects) through additional research [54, 55].

4.1. Limitations. This study had some limitations. First, as this is a cross-sectional study, it was difficult to determine the causal relationship between the major variables. Second, because this study involved ICU nurses at tertiary hospitals in South Korea, the possibility of selection bias (sampling bias) cannot be eliminated. Accordingly, generalizing the results of this study is limited. Therefore, longitudinal studies are needed to determine the causal relationship between personality traits and workplace bullying. Moreover, subsequent studies including background factors such as religion, education level, and subjective health status, all of which may affect workplace bullying, are also needed to strengthen the evidence. Additionally, it is necessary to develop and implement education and intervention programs that can reduce negative personality traits among nurses and improve mentalization and conduct studies on the effects of respective programs.

5. Conclusion

This study investigated the effects of personality traits and mentalization on workplace bullying among nurses. Under tense and unique working conditions, nurses occasionally become either workplace bullying victims or perpetrators. Accordingly, there is a need for continuous efforts at a nursing organization to understand nurses' personality traits, develop the mentalization that enables them to understand their own and other peoples' thoughts, and establish a positive organizational culture so that nurses can understand and support each other.

6. Implications for Nursing Management

This study demonstrated that personality traits might influence workplace bullying among nurses. However, assuming that certain nurses may be at risk of becoming workplace bullying perpetrators or victims owing to their personality traits, such individual nurses should not be stigmatized as victims or perpetrators. Nursing managers can help ICU nurses improve their self-awareness of personality traits and recognize the relationship between personality traits and bullying to prevent workplace bullying. It is necessary to develop and implement interventions to improve and reinforce mentalization that can help one properly perceive and interpret the thoughts and situations of oneself and others. Additionally, efforts at the nursing organization level are needed so that nurses' personality traits can harmonize with the culture of nursing organizations and generate positive effects. This will contribute to improving the quality of patient care and forming a positive organizational culture. Moreover, based on the study findings, nursing managers can raise awareness of personality traits and prepare interventions at the organizational level to prevent and cope with workplace bullying of ICU nurses.

Data Availability

The data presented in this study are available on request from the corresponding author and with permission of the Institutional Review Board of Chung-Ang University.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Evaluation of the Relationship between the Levels of Patience and Tranquillity and Conflict Resolution Styles of Executive Nurses

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Aims. This study examined nurse managers' conflict resolution styles, tranquillity and patience levels, and their relationships. *Background.* Managers are supposed to know how to manage conflict to reduce the destructive effects of conflict and create constructive effects. *Methods.* The study was a descriptive cross-sectional study and in a city centre in Karadeniz region, in May 2022. It was aimed to reach all executive nurses but was completed with 41 executive nurses. The data were collected face to face using a Sociodemographic Questionnaire, the Rahim Organizational Conflict Inventory, the Patience Scale, and the Tranquillity Scale. *Results.* 51.2% experienced conflict with colleagues and 46.3% with other employees. In conflict management, the most commonly used style was integrating and the least was dominating, respectively. The Patience Scale score (39.15 ± 6.09) and Tranquillity Scale score (3.70 ± 0.70) were moderate. At the same time, long-term (10.19 ± 2.18), short-term (8.90 ± 2.54), and total patience scores were significantly lower in case of conflict with nurses. Interpersonal patience levels were significantly lower in case of conflict with other employees. There was a negative correlation between working as a manager and compromising style. *Conclusion.* It was concluded that executive nurses used the integrating style more, and their patience and tranquillity levels were moderate. In addition to using the integration style more, the fact that nurse managers have moderate levels of patience and calmness will reflect positively on the quality of patient care. It will also increase employee satisfaction. Increasing the level of peace in health institutions will support patience, happiness, and a sense of belonging among employees.

1. Introduction

Conflict is a disagreement or incompatibility between two or more people or groups, a clash of interest, power, and status [1] and occurs when conflicting activities happen [2]. Conflict is a contestation of interests, power, and status between two or more individuals or groups and occurs when conflicting activities occur. The differences in values, ideas, and attitudes, communication and coordination disorders, uncertainties about the management field, and sometimes the poor functioning of the management process can be considered the root causes of conflict in hospitals [1, 3, 4]. Conflict is not always positive or negative; it can signify danger or a harbinger of new opportunities. Whether

conflict outcomes are positive or negative is related to how it is managed [1]. Constructively worked conflict is said to bring about healthy competition, strengthen team participation, and bridge the communication gap [5]. Therefore, conflict management is one of the skills managers require [6].

Conflict resolution is the method used to resolve conflicts in social situations [7]. Different strategies such as integration, obliging, dominating, compromising, and avoiding are used in conflict management. The "integration" strategy adds up to a high interest for self and others, plus involves preciseness, information exchange, and questioning. As for the strategy of "compromising," the individual neglects his self-interest to satisfy the other party's anxiety,

resulting in the situation's characterisation as obedience and compliance with the requests of the opposite party. In addition, it is used when the protection of relations with the other party is more important than the satisfaction of needs. Contrary to the strategy of "integration," "domination" adds up to a high interest for oneself and a low interest for others. The dominant person will do anything to win, resulting in their ignorance of the other party's needs and expectations. Conflict is viable unless it is between the superior and the subordinate, but it can lead to a stalemate when both sides are on equal footing. The "avoiding" strategy involves low interest, both for oneself and others. In other words, an avoidant cannot satisfy both his anxiety and others. Instead of resolving the conflict, postponement can be used to gain time for one of the parties. The "obliging" strategy involves both parties giving up on something to reconcile mutually. Therefore, it is unsuitable for dealing with complex problems requiring a problem-solving approach. However, it is useful when building a consensus is impossible and both parties need a temporary solution to a complex issue [1, 8, 9].

Nurse managers experience conflict daily and are central to conflict management [10]. A study revealed that 61.4% of the nurses in charge of the service had conflicts with the nurses they worked with, most of which were caused by organisational reasons (61.5%) [11]. The leading causes of conflict between physicians and nurses are ambiguity in job descriptions, communication problems, rude and destructive behaviours of physicians, perception of the profession [12], and differences in doctors' demand for power and nurses' demand for influence [13]. In addition, other studies have found moderate to high levels of stress [14–16], job burnout [17], low job satisfaction [15, 18–21], and occupational fatigue [22] in nurses. Factors affecting stress and job satisfaction, such as high workload, shift work and overtime, staff shortage, job uncertainty, workplace violence, and managers' attitude [15, 16, 22–24] can also be considered as factors that cause conflict.

The reasons for the conflict among the executive nurses were affected by variables such as the hospital, age, and professional experience. In addition, the job description and workload caused the conflict [25]. Regarding conflict management, it was determined that the service managers used the integration strategy the most and avoidance the least [11]. Accordingly, nursing students mostly used the strategy of obliging and least domination [26]; in addition, the conflict strategies of university students did not differ according to gender [27]. Different strategies were used to resolve the conflict between doctors and nurses; the most used strategies were integration, compromising, and avoidance, whereas the least used one was dominating [12]. While determining the appropriate strategy in a conflict, considering its contribution to organisational effectiveness, satisfying social needs, and meeting members' ethical and moral needs are crucial. However, excessive integration and obliging strategies help solve strategic problems [1].

Patience, which is among the characteristics expected in managers [28, 29], is defined as a person's tendency to stand calmly in the face of disappointment, distress, or suffering [30]. The concept of patience gives the manager purpose, tolerance,

openness to change, and empathy. It is expected by employees to be more compassionate, open-minded, and willing to manage any situation [29]. Patience has long been recognised as a human strength and a critical component of moral excellence [31]. Its structure saves the individual from negative emotions and increases life satisfaction [32]. The demonstration of true patience depends on both behavioural and emotional components [30]. Patience is positively related to subjective well-being, positive coping, and success [31]. It also includes powerful virtues, such as balance and justice. Patients have less negative affect, lower depression, fewer health problems, and increased life satisfaction [32]. Nurses' patience levels were above the average [33], and it was determined to be a component that affects nurses' resilience in Iran [34].

On the other hand, tranquillity reflects feelings such as comfort, calmness, and serenity, expressed by the characteristics of [35] individuals, such as harmony, balance, comfort, confidence, and inner peace [36]. When there is no threat in daily life, feelings of satisfaction, tranquillity, and well-being emerge, and people generally express their expectations from life in two different ways: tranquillity and happiness [35]. Although studies on patience and tranquillity in the healthcare field are limited, tranquillity and employee performance are positively associated [37]. In this respect, it is thought to be a pioneering study.

Conflicts can frequently emerge due to the complex structure of health services, which are also areas where different disciplines work together. They can happen between health personnel, resulting in medical errors with severe consequences if they are not resolved [38, 39]. Since all conflicts in health institutions will affect cooperation and the delivery of quality health services, managing the conflict with a positive outcome is crucial. Therefore, it is necessary to determine the use of conflict resolution strategies by executive nurses. In addition, nurses work in extraordinary situations such as pandemics. Also, these processes cause nurses to experience depression, stress, and anxiety [40]. These negative emotions can affect the level of patience and peace of mind of nurses. Patience and peace levels of nurse managers will be reflected on the working environment and nurses and will affect the quality of service. The level of patience and peace affected may also influence the choice of conflict resolution strategy. Therefore, this study aims to determine executive nurses' conflict resolution strategies, tranquillity, and patience levels and examine their relationship.

Research Questions.

(1) Which conflict resolution strategies is the most used by nurse managers in conflict resolution?

(2) Which levels of tranquillity and patience the nurse managers need?

(3) Is there a relationship among conflict resolution strategies, tranquillity, and patience levels?

The hypotheses of this study are formulated as follows.

Hypothesis 1. There is a relationship between the patience levels of nurse managers and their conflict resolution styles.

Hypothesis 2. There is a relationship between the serenity levels of nurse managers and their conflict resolution styles.

Hypothesis 3. Patience level and serenity level are related to each other.

2. Methods

2.1. Population and Sample of the Study. This study was conducted as a descriptive cross-sectional study. The study population comprised 60 executive nurses working in the Education and Research Hospital and the State Hospital in a city centre in Karadeniz region. It was aimed to reach all administrative nurses without dealing with the sample determination process. The study was completed with 41 executive nurses who agreed to participate and obtained consent in May 2022. 68% of the research population has been reached.

Inclusion criteria were as follows:

Working as an executive nurse

Volunteering to participate in the study

2.2. Sampling Strategy. The questionnaires were distributed to the executive nurse and collected after they were filled out.

2.3. Data Collection Tools. The data were collected face to face using the Sociodemographic Questionnaire, the Rahim Organizational Conflict Inventory Scale, the Patience Scale, and the Tranquillity Scale.

2.3.1. Sociodemographic Questionnaire. The questionnaire developed by the researcher consists of 11 questions, including age, gender, marital status, educational status, working time in the profession, working time in the current institution, working time as a manager, condition of a conflict with nurses, condition of a conflict with other employees, and state of finding oneself patient and peaceful.

2.3.2. Rahim Organizational Conflict Inventory (ROCI-II). This scale was developed by Rahim in 1983 to identify five different conflict management strategies. It was adapted into Turkish by Gumuseli and Taymaz and consisted of three forms. Form A includes conflict management strategies used by subordinates in conflicts with superiors. Unlike form A, form B holds strategies superiors use in conflicts with subordinates. Form C consists of strategies organisation members use in conflicts with their peers. In this study, form B, also called ROCI II, was used. The scale, which was designed in a 5-point Likert type, consists of 28 items and has options such as always (5), often (4), sometimes (3), rarely (2), and very rarely (1). It reveals individuals' use of five conflict management strategies to what extent. Also, it has the following five subdimensions: integration, compromising, dominating, avoiding, and obliging. Items "1, 5, 12, 22, 23, and 28" are related to the "integration" strategy, items "2, 11, 13, 19, and 24" to "compromising," "8, 9, 18, 21,

and 25" to "dominating," "4, 7, 10, 14, 15, and 20" to "obliging," and items "3, 6, 16, 17, 26, and 27" to the "avoiding" strategy. The score intervals of 4.20–5.00 (always), 3.40–4.19 (often), 2.60–3.39 (sometimes), 1.80–2.59 (rarely), and 1.00–1.79 (very infrequently) are used in grading and interpreting the weighted averages obtained from the scale. A high score from any subdimension indicates that that specific conflict management strategy is used more than others. In contrast, a low score from any subdimension shows that that particular strategy is used less than different strategies [8, 41]. Cronbach's α of the scale subscales was calculated as 0.81 [41]. In this study, Cronbach's α values of the scale were found in the range of 0.66–0.89.

2.3.3. Patience Scale. The Patience Scale was developed by Schnitker, and its validation study in Turkish was conducted by Dogan and Gulmez. There are three subdimensions on the scale, namely, interpersonal patience: 1, 4, 7 (r), 9, 11; long-term patience (patience in life hardships) 2, 5, 8; and short-term patience (patience in daily life) 3, 6, 10 (r). It was designed in a 5-point Likert type with 11 items and covered the options between "strongly agree" and "strongly disagree." Also, it contains nine positive and two opposing statements. Items 7 and 10 are reverse scored. The highest score on the scale is 55, and the lowest is 11 points. The highest and lowest score ranges that can be obtained from the subdimensions of the scale are interpersonal patience "5–25," long-term patience "3–15," and short-term patience "3–15." A high score obtained from the scale indicates that the patience levels of the individuals are high, whereas a lower score shows a lower level of patience [30, 42]. Cronbach's α of the scale was found to be 0.78 [42]. The Cronbach's α value was found to be 0.68 in the study.

2.3.4. Tranquillity Scale. The Tranquillity Scale developed by Demirci and Eksi is an 8-item one-dimensional scale. Items 5 and 6 are reverse scored. It was designed in a 5-point Likert type, including options such as not at all suitable for me (2), not suitable for me (3), somewhat suitable for me (4), fairly suitable for me (5), and completely suitable for me. The highest score on the scale is 40, and the lowest is 8 points. A high score obtained from the scale indicates that the tranquillity levels of the individuals are high, whereas a lower score shows a lower level of tranquillity. The Cronbach's α internal consistency coefficient of the scale was calculated as 0.78 [35]. Also, its Cronbach's α value was found to be 0.84 in the study.

2.4. Statistical Analysis. For the statistical analysis of the data, the SPSS Statistics 22 software was used. Elements such as percentage, mean, and standard deviation were used to analyse descriptive data. In addition, the Student t-test, Mann–Whitney U test, one-way ANOVA, Kruskal–Wallis test, pairwise comparisons, Tukey's HSD post hoc test, and the Pearson correlation analysis were used according to the normal distribution of quantitative data. In the correlation

analysis, 0–0.39 was considered a weak correlation, 0.40–0.69 a moderate correlation, 0.70–0.89 a strong correlation, and 0.90–1.00 a powerful correlation [43]. The level of significance was accepted as $p < 0.05$.

2.5. Ethical Considerations. The study data were collected by obtaining the Ethics Committee's permission of the university numbered 2022/89 and institutional permissions from the relevant units. Participants agreed to participate voluntarily.

3. Results

37 (90.2%) of the executive nurses participating in the study were women, 38 (92.7%) were married, and their age average was 37.90 ± 7.35. If we look at their educational status, 27 (65.9%) of them have a bachelor's degree, 8 (19.5%) have an associate's degree, 4 (9.8%) are postgraduates, and 2 (4.9%) are high school graduates. Their working hours in the profession are 14.5 ± 7.31, in the current institution 11.8 ± 7.23, and as a manager 5.69 ± 5.07. 21 (51.2%) of the participants stated that they had conflicts with their colleagues, 19 (46.3%) had conflicts with other employees, 38 (92.7%) were patient, and 29 (70.7%) were peaceful. When the reasons stated by those who have conflicts with their colleagues are classified, we develop six themes. The highest cause of conflict is due to working conditions such as lack of personnel and heavy workload, as shown in Figure 1.

When we group the themes as per the literature, 8 (44.4%) of the conflicts are happening due to individual reasons (lack of love and respect, not taking responsibility, lack of empathy, and personal problems), 10 (55.6%) of them due to organisational reasons (working conditions and health policies).

Observations revealed that executive nurses always used the integration strategy, mostly the obliging and compromising strategies and, occasionally, the avoidance and domination strategies. The average score of the Patience Scale is considered moderate with a value of 39.15 ± 6.09, and its subdimension scores were determined as 9.88 ± 2.42 for short-term patience, 18.02 ± 2.98 for interpersonal patience, and 11.24 ± 2.35 for long-term patience, respectively. Participants' level of tranquillity is considered moderate, with a score of 3.70 ± 0.70. In addition, their average scores from the scales are shown in Table 1.

Accordingly, executive nurses' long-term, short-term, and total patience levels were significantly lower in case of conflict with the nurses ($p = 0.002$, $p = 0.007$, and $p = 0.001$). Their interpersonal patience levels were also substantially lower in case of conflict with other employees ($p = 0.037$). There was no significant difference in the Patience Scale according to gender, marital status, educational status, and being patient and peaceful. No significant difference was found in the Tranquillity Scale by the independent variables. (Table 2).

According to the analysis in Table 3, there was a significant difference in terms of using the strategies of integration and obliging as conflict resolution methods as to

Distribution of Conflict Causes

- Lack of love and respect
- Not taking responsibility
- Lack of empathy
- Working conditions
- Bringing personal problems to work
- Health policies
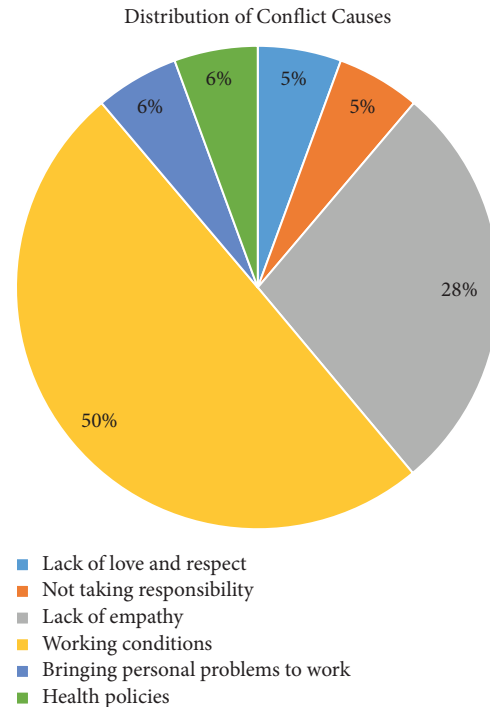
Figure 1: Reasons for conflict of executive nurses with colleagues.

Table 1: Participants' Patience Scale, Rahim Organisational Conflict Inventory Scale, and Tranquillity Scale scores.

Scales	n	Minimum	Maximum	χ	Sd.
Patience Scale					
İnterpersonal patience	41	11	21	18.02	2.98
Long-term patience	41	5	15	11.24	2.35
Short-term patience	41	4	15	9.88	2.42
Total patience	41	27	47	39.15	6.09
Rahim Organizational Conflict Inventory (ROCI II)					
İntegration	41	19	30	4.40	0.52
Compromising	41	8	25	3.61	0.79
Dominating	41	6	25	2.56	0.83
Avoiding	41	6	30	2.93	0.82
Obliging	41	18	30	4.04	0.55
Tranquillity Scale	40	16	40	3.70	0.70

the educational status of the executive nurses ($p = 0.040$, $p = 0.049$). While this difference was observed between postgraduates and high school and undergraduates regarding the integration strategy, it was only seen between postgraduates and undergraduates in the obliging strategy. The table also reveals that postgraduates use the integration and obliging strategies less often. There was no significant difference between conflict resolution strategies by gender, marital status, conflict with nurses and other employees, and state of being patient and peaceful variables. (Table 3).

The corelation analaysis revealed that a weak negative correlation was determined between the variable of working time in the institution and both compromising ($r = -0.34$) and obliging ($r = -0.37$). There was a weak negative ($r = -0.37$) correlation between the working time as

TABLE 2: The analysis of the Patience Scale and the Tranquillity Scale with certain variables.

Independent variables	Long-term patience		Short-term patience		İnterpersonal patience		Total patience		Tranquillity Scale	
	Mean ± sd	t/F p	Mean ± sd	t/F p	Mean rank	U-Z/KWX² p	Mean ± sd	t/F p	Mean ± sd	t/F p
Gender										
Woman	11.24 ± 2.39	t = −0.01	10.11 ± 2.27	t = 1.91	21.70	U = 48.00	39.51 ± 6.05	t = 1.18	3.76 ± 0.66	t = 1.75
Men	11.25 ± 2.21	p = 0.996	7.75 ± 3.09	p = 0.063	14.50	Z = −1.16 p = 0.274	35.75 ± 6.13	p = 0.245	3.13 ± 0.97	p = 0.088
Marital status										
Married	11.16 ± 2.37	t = −0.83	9.79 ± 2.41	t = −0.83	21.21	U = 49.00	39.00 ± 6.22	t = −0.54	3.68 ± 0.73	t = −0.45
Single	12.33 ± 2.08	p = 0.412	11.00 ± 2.64	p = 0.411	18.33	Z = −0.40 p = 0.723	41.00 ± 4.35	p = 0.590	3.88 ± 0.33	p = 0.655
Educational status										
High school	13.50 ± 2.12	F = 1.07	9.00 ± 5.65	F = 0.19	29.00	KWX² = 1.20	42.00 ± 9.89	F = 0.21	3.69 ± 1.33	F = 0.46
Associate's degree	10.63 ± 1.50	p = 0.371	10.38 ± 2.61	p = 0.898	20.69	p = 0.752	39.13 ± 4.25	p = 0.889	3.41 ± 0.69	p = 0.712
Bachelor's degree	11.11 ± 2.63		9.81 ± 2.54		20.17		38.78 ± 6.81		3.75 ± 0.71	
Postgraduates	12.25 ± 0.95		9.75 ± 2.50		23.25		40.25 ± 2.87		3.81 ± 0.60	
Condition of a conflict with nurses										
Yes	10.19 ± 2.18	t = −3.27	8.90 ± 2.54	t = −2.86	18.05	U = 148.00	36.29 ± 5.65	t = −3.48	3.58 ± 0.72	t = −1.13
No	12.35 ± 2.03	p = 0.002	10.90 ± 1.83	p = 0.007	24.10	Z = −1.64 p = 0.101	42.15 ± 5.08	p = 0.001	3.83 ± 0.68	p = 0.266
Condition of a conflict with other employees										
Yes	11.21 ± 1.98	t = −0.08	9.37 ± 2.52	t = −1.26	16.87	U = 130.50	37.89 ± 5.02	t = −1.23	3.51 ± 0.69	t = −1.65
No	11.27 ± 2.67	p = 0.934	10.32 ± 2.29	p = 0.214	24.57	Z = −2.08 p = 0.037	40.23 ± 6.81	p = 0.226	3.87 ± 0.68	p = 0.106
Are you patient										
Yes	11.18 ± 2.35	t = −0.57	9.95 ± 2.49	t = 0.64	21.03	U = 56.00	39.16 ± 6.32	t = 0.04	3.70 ± 0.72	t = 0.18
No	12.00 ± 2.64	p = 0.570	9.00 ± 1.00	p = 0.521	20.67	Z = −0.05 p = 0.981	39.00 ± 1.00	p = 0.966	3.63 ± 0.66	p = 0.857
Are you peaceful										
Yes	11.48 ± 2.21	t = 1.01	10.24 ± 2.48	t = 1.51	23.26	U = 108.50	40.03 ± 6.13	t = 1.47	3.75 ± 0.72	t = 0.66
No	10.67 ± 2.67	p = 0.318	9.00 ± 2.08	p = 0.137	15.54	Z = −1.90 p = 0.060	37.00 ± 5.64	p = 0.149	3.58 ± 0.68	p = 0.513

sd: standard deviation, KW: Kruskal–Wallis, U: Mann–Whitney U.

TABLE 3: The analysis of conflict resolution strategies with certain variables.

Independent variables	Compromising		Dominating		Integration		Avoiding		Obliging	
	Mean ± sd	t/F p	Mean ± sd	t/F p	Mean rank	U-Z/KWX² p	Mean ± sd	t/F p	Mean ± sd	t/F p
Gender										
Woman	3.64 ± 0.81	t = 0.69	2.53 ± 0.86	t = −0.72	21.41	U = 59.00 Z = −0.666 p = 0.505	2.95 ± 0.86	t = 0.55	4.05 ± 0.56	t = 0.15
Men	3.35 ± 0.72	p = 0.490	2.85 ± 0.44	p = 0.472	17.25		2.71 ± 0.44	p = 0.584	4.00 ± 0.53	p = 0.879
Marital status										
Married	3.62 ± 0.77	t = 0.03	2.55 ± 0.85	t = −0.22	21.11	U = 53.00 Z = −0.202 p = 0.840	2.93 ± 0.81	t = −0.03	4.04 ± 0.55	t = 0.13
Single	3.60 ± 1.25	p = 0.974	2.67 ± 0.70	p = 0.823	19.67		2.94 ± 1.18	p = 0.970	4.00 ± 0.60	p = 0.896
Educational status										
High school	3.60 ± 1.13	F = 1.21	1.90 ± 0.42	F = 0.45	28.25	KWX² = 8.297 p = 0.040	3.00 ± 0.24	F = 0.32	3.83 ± 0.71	F = 2.87
Associate's degree	3.53 ± 0.46	p = 0.318	2.53 ± 0.64	p = 0.719	17.19		2.79 ± 0.81	p = 0.811	4.00 ± 0.49	p = 0.049
Bachelor's degree	3.74 ± 0.85		2.61 ± 0.93		23.63		3.01 ± 0.88		4.17 ± 0.53	
Postgraduates	2.95 ± 0.62		2.65 ± 0.59		7.25		2.63 ± 0.84		3.38 ± 0.37	
Condition of a conflict with nurses										
Yes	3.56 ± 0.67	t = −0.43	2.69 ± 0.83	t = 0.98	19.05	U = 169.0 Z = −1.081 p = 0.280	3.02 ± 0.66	t = 0.76	3.99 ± 0.53	t = −0.57
No	3.67 ± 0.92	p = 0.669	2.43 ± 0.83	p = 0.332	23.05		2.82 ± 0.97	p = 0.448	4.09 ± 0.58	p = 0.570
Condition of a conflict with other employees										
Yes	3.49 ± 0.71	t = −0.89	2.57 ± 0.82	t = 0.05	19.50	U = 180.5 Z = −0.753 p = 0.451	2.92 ± 0.81	t = −0.04	3.97 ± 0.54	t = −0.71
No	3.72 ± 0.86	p = 0.376	2.55 ± 0.86	p = 0.958	22.30		2.93 ± 0.86	p = 0.967	4.10 ± 0.56	p = 0.477
Are you patient										
Yes	3.66 ± 0.79	t = 1.25	2.50 ± 0.83	t = −1.71	21.74	U = 29.00 Z = −1.417 p = 0.156	2.95 ± 0.85	t = 0.56	4.06 ± 0.09	t = 0.85
No	3.07 ± 0.61	p = 0.219	3.33 ± 0.11	p = 0.095	11.67		2.67 ± 0.50	p = 0.578	3.78 ± 0.43	p = 0.398
Are you peaceful										
Yes	3.63 ± 0.88	t = 0.16	2.63 ± 0.87	t = 0.79	22.16	U = 140.5 Z = −0.971 p = 0.332	2.95 ± 0.88	t = 0.32	4.10 ± 0.61	t = 1.138
No	3.58 ± 0.58	p = 0.873	2.40 ± 0.74	p = 0.433	18.21		2.86 ± 0.71	p = 0.748	3.89 ± 0.34	p = 0.262

sd: standard deviation, KW: Kruskal–Wallis, U: Mann–Whitney U.

a manager variable and the obliging strategy. A weak positive ($r = 0.35$) correlation was determined between short-term patience and the level of tranquillity.

Then again, a moderate positive correlation was found between the strategies of integration and compromising ($r = 0.66$), a strong correlation with obliging ($r = 0.77$), and a weak positive correlation with the level of tranquillity ($r = 0.31$). The correlation analysis is shown in Table 4.

4. Discussion

This study, which investigated the strategies of nurses working in managerial positions in two different hospitals in conflict management and their levels of patience and tranquillity, revealed that 51.2% of the participants had conflict with their colleagues and 46.3% with other employees. In similar studies, 61.4% of the nurses in charge of the service stated that they had conflicts with the other nurses [11], and conflict was experienced by all critical care nurses, with 42.5% of the studied nurses having had moderate conflict [44]. This can be explained by the fact that different professional members work together in the health sector, working conditions are complex, and the workload is high. As per the study, the participants mostly used the "integration" strategy in conflict management, the second most "obliging," and the least "dominating." Similar to this study, in other relevant studies, it was stated that the strategies of integration and compromising [11, 12, 25, 45–48] were used the most, and the domination [12, 25] strategy was used the least. In addition, some studies indicate the least used strategy was avoidance [11, 45, 46]. The fact that the nursing students mainly used the compromising strategy and least the domination strategy shows similarity with our results [26]. According to the literature, strategic solutions can be solved by integrating and obliging [1]. Consistent with this information, executive nurses use the strategies desired in conflict resolution more. Although administrative nurses and nursing students use the compromising strategy more often in conflict resolution, the data show that conflict continues at high rates in hospitals. Therefore, it is crucial to attempt to solve the individual and organisational factors that are considered to be the cause of this situation. In a study, it was shown that by using tele-nursing application, it can improve the delivery of health services by increasing access to specialised services where mutual communication and interaction are well established [49]. Similarly, tele-nursing application can be tried in conflict resolution.

According to our study, postgraduate executive nurses used "integration" and "obliging" strategies less than high school and undergraduate nurses. While it was similar in one study that undergraduates used the compromising strategy less than other strategies [46], the educational status variable did not make a significant difference in conflict resolution strategies in other studies [11, 45, 47]. This difference may be due to the different grouping of the educational status variable. The fact that postgraduates are positioned in senior management is not unexpected. On the other hand, executives are more likely to resolve strategic

conflicts involving differences in planning and objectives, and the literature suggests using the strategies of integration and obliging in strategic conflict resolution. Integration and compromise styles allow all employees to adopt the organisation's goals and objectives. So, the reason for the decrease in integration and generous strategies, which were widely used by students and postgraduates, should be investigated in other studies.

As the duration of work in the profession and the hospital increases, the usage of the strategies of compromising and obliging decreases. Similarly, one study found that the compromising strategy decreased as the experience and seniority increased, which supports our study results [46]. This study has also revealed that the compromising strategy decreased as the working time as a manager increased. According to another study, while the generous strategy was used more in those who worked as a manager for 20 years or more, avoidance was used more in those who worked for 6–10 years [45]. Working as a long-term manager can increase organisational commitment and the use of a compromising strategy. The difference in this study may be that nurses have less managerial experience. Besides, there are studies in which these variables do not make a difference [47].

In this study, the age average was 37, and no significant relationship was found between age and conflict resolution strategies. There are other supporting studies with the same results [47]. However, as a result of this study, the compromising strategy was used significantly more by employees over 45 [45]. The majority of the young population in this study, which showed a positive correlation between age and experience, may explain the difference from the other research.

In the study, similar to the literature, the gender [27] and marital status [45] variables did not make a significant difference in conflict management strategies. Unlike this study, there are studies where males prefer to use the generous [46] or avoidance [47] strategies more, while females prefer to use the integration strategy more [47].

92.7% of the participants think that they are patient. When we look at the scale scores, their patience levels are above average in total and subdimensions, similar to a study [33]. Also, it was observed that although executive nurses' long-term, short-term, and total patience levels decreased during a conflict with the nurses, their interpersonal patience levels did not change. These results suggest that executive nurses maintain communication with nurses by looking at events situationally to ensure the continuity of their work. Their interpersonal patience levels decrease during a conflict with other employees. This may suggest that they individualise the events more. The literature shows a positive relationship between patience and decision-making skills [50]. Therefore, the decrease in the interpersonal patience levels of executive nurses may affect their problem-solving skills and create new clash environments. In this case, it may lead to communication loss with other employees. The study found no relationship between patience level and conflict resolution. In this case, hypothesis 1 is rejected.

Table 4: The correlation between independent variables, the Patience Scale, the Tranquillity Scale, and the Rahim Organisational Conflict Inventory Scale.

Variables	r	Working time in the profession	Working time in the current institution	Active time as a manager	İnterpersonal patience	Long-term patience	Short-term patience	Total patience	İntegration	Compromising	Dominating	Avoiding	Obliging	Tranquillity level
Age	r	0.77***	0.69***	0.49**	0.01	−0.04	−0.12	−0.06	−0.21	−0.23	−0.05	−0.08	−0.24	−0.03
Working time in the profession	r	1.00	0.88***	0.67***	0.01	−0.02	−0.09	−0.04	−0.23	−0.34*	−0.17	−0.17	−0.37*	0.04
Working time in the current institution	r		1.00	0.73***	0.1	0.05	−0.06	0.06	−0.22	−0.34*	−0.13	−0.20	−0.37*	0.02
Working time as a manager	r			1.00	0.07	0.14	0.05	0.11	−0.24	−0.26	−0.16	−0.17	−0.34*	0.08
İnterpersonal patience	r				1.00	0.52***	0.47**	0.88***	0.13	0.07	0.15	0.17	0.22	−0.07
Long-term patience	r					1.00	0.22	0.73***	−0.01	−0.06	0.16	0.02	0.09	0.11
Short-term patience	r						1.00	0.71***	0.02	0.08	0.12	0.08	0.06	0.35*
Total patience	r							1.00	0.07	0.04	0.19	0.12	0.17	0.14
İntegration	r								1.00	0.66***	0.10	0.27	0.77***	0.31*
Compromising	r									1.00	0.26	0.65***	0.70***	0.16
Dominating	r										1.00	0.54***	0.40**	0.11
Avoiding	r											1.00	0.50**	−0.09
Obliging	r												1.00	0.11

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

70.7% of the participants in the study stated that they were peaceful, and their tranquillity levels were found to be moderate according to the scale. Also, there was a positive correlation between their tranquillity and short-term patience levels. This finding supports hypothesis 3. During a conflict with nurses whose short-term patience levels are low, there is expected to be a decrease in the tranquillity levels of executive nurses. The fact that their tranquillity level could have been higher in this study may be the fact that they always use the integration strategy. Considering this study, a positive correlation was found between the integration strategy and the level of tranquillity. This relationship supports hypothesis 2.

4.1. Limitations and Strengths. Including only public institutions in the study and the small number of managers may be a limitation. However, it is a strength that the issues of patience and peace of mind are addressed together. What makes this work powerful is that no studies have been found in the healthcare field in which conflict management strategies are being studied together with tranquillity and patience. In addition, the fact that studies on patience and tranquillity in nurses are limited in general makes this study vital.

5. Conclusion and Recommendations

Accordingly, the participants used all conflict management strategies, mostly "integration" and frequently "obliging" and "compromising." Also, their educational status was influential in their conflict management strategy preferences. In addition, the patience and tranquillity levels of the participants were moderate. While their long- and short-term patience levels decrease in case of a conflict with nurses, their interpersonal patience levels decrease in a conflict with other employees in the hospital. This study has also revealed that the level of tranquillity increases as the integration strategy is used in conflict resolution. On the other hand, no relationship was found between patience and conflict management strategies. This finding indicates that executive nurses maintain professionalism and exhibit the same attitude in the face of events.

Due to its nature, health services have a complex structure, and it is an area where different disciplines work together, so conflicts are inevitable. They need to be managed in a way that will result in a positive outcome as it will affect cooperation and quality of health service delivery. For tranquillity, activities such as in-service training are recommended to increase the use of "integration" by all managers. It is crucial to draw attention to this issue, especially in the postgraduate education process. A unit can be established within the organisation for staff only, where nurses can receive support when they feel that their level of patience and peace of mind has decreased. It is recommended that similar issues be studied with nurses and other health professionals in future studies. In addition, qualitative research methods can be used to examine the issues in depth.

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Research Article

Enhancing Nurses' Well-Being: Exploring the Relationship between Transformational Leadership, Organizational Justice, and Quality of Nursing Work Life

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Aim. The study's aim was to examine the relationship between transformational leadership, organizational justice, and nurses' quality of work life. *Background*. There is an increasing emphasis on the welfare of nurses and their influence on healthcare services. There is a dearth of comprehensive studies on the influence of transformational leadership and justice within organizations on work-related quality of life. Understanding these connections is critical for improving workplace dynamics and fostering nurse well-being. *Methods*. This cross-sectional research included a convenience sample of nurses working in a general hospital. The data were obtained through self-report questionnaires encompassing three reliable and validated scales: the global transformational leadership scale, organizational justice scale, and quality of nursing work-life scale. The data were then analyzed with SPSS 23 and statistical methods (descriptive statistics, Pearson correlation coefficient, and hierarchical linear regression). This study adhered to the STROBE guidelines. *Results*. A sum of 527 out of 566 nurses responded to the questionnaires (response rate = 93.1%). The nurses had a high perception of transformational leadership behaviors but had a more moderate view of organizational fairness and the quality of their nursing work life. Transformational leadership was significantly associated with organizational fairness. Also, a positive relationship was found between transformational leadership, justice within organizations, and nurses' quality of work life. *Conclusions*. Nurses who consider their leaders as transformative and have the sense of a fair organizational climate are more likely to have higher levels of quality of work life. *Implications for Nursing Management*. Nurse managers should strive to develop transformational leadership behaviors and promote organizational justice to enhance the well-being and satisfaction of nurses in their work environments.

1. Introduction

The World Health Organization (WHO) estimates that by 2030, the world will need nine million nurses and midwives to attain the goal of health and well-being [1]. Within the healthcare industry, nurses hold a significant position as they are the frontline caregivers who have a profound impact on patient outcomes and overall healthcare quality [2]. In this context, healthcare organizations require leaders who possess not only a position of authority but

also the ability to inspire and guide their teams effectively. The achievement of improved organizational practices in the field of nursing relies on the combined efforts of leadership and staff collaboration. Transformational leadership plays a crucial role in this process, acting as a mediator and yielding favorable outcomes for all parties involved [3].

Transformational leadership is characterized by its capacity to inspire followers to embrace the organization's vision, goals, and strategies actively. This leadership style, marked by its inspirational and motivating nature, has a significant impact on the nursing turnover rate [4]. The implementation of transformational leadership concepts has the potential to impact various aspects of both the workforce and the company. These effects encompass the reduction of burnout, the enhancement of job satisfaction, the retention of nursing staff, and the improvement of overall productivity [5]. As leaders, nurse managers are also essential in fostering a secure, empowering, and gratifying atmosphere for staff members and patients [4].

Transformational leaders tend to promote a fair and equitable work environment, fostering trust, respect, and the provision of adequate resources [6–9]. Nurses working under transformational leaders perceive organizational justice, including distributive justice, procedural justice, and interactional justice, which positively affect their job satisfaction, commitment, and overall well-being [7, 10, 11].

Nurse managers bear the responsibility of maintaining patient safety, promoting quality of care, enhancing quality of work life, and managing the dynamics of change in health care [7]. The leadership/management style is a significant factor influencing nursing job satisfaction and has a direct impact on nurses' quality of work life [12].

Quality of work life is a complex concept that encompasses a range of factors, including possibilities for professional growth, the effective application of talents and abilities, pay, the balance between work and personal life, and the overall state of well-being within the work setting [5].

Transformational leadership is essential to improve productivity at work and quality of life simultaneously. Worker happiness and a sense of justice inside the workplace are also connected to the quality of work life. Nurses' quality of work life and job happiness may improve if managers are fair in their dealings, use inspiring leadership techniques, and make fair decisions [13]. The consideration of leadership's effect on nurses' productivity and working-life quality is of significant importance. Developing a transformational nursing leadership style is a viable organizational approach to enhance nurse performance and foster improved patient care outcomes [12]. The transformational approach of leadership is widely acknowledged as a successful leadership style that may significantly influence several aspects of an employee's professional life, such as career satisfaction, engagement, and performance [2, 11, 14, 15].

Additionally, organizational justice, a critical aspect of workplace dynamics, has a documented association with nurses' health and well-being, as well as positive work-related outcomes [16]. Organizational justice pertains to the perceptions held by employees on the just and equitable treatment they receive within the organization. This concept incorporates various aspects such as equity, fairness, and social ties that are present in the workplace [17]. Nurses who possess a perception of fairness and justice within their respective healthcare organizations are inclined to exhibit behaviors that surpass their prescribed job responsibilities [16, 17].

Organizational justice has been found to have a significant impact on the quality of work life [18–21]. High organizational justice improves work-related outcomes, health, and well-being among registered nurses environment [16, 22–24]. On the other hand, low organizational justice is linked to undesired work-related outcomes and health problems [16, 23, 24]. Nurses who perceive low organizational justice may experience dissatisfaction with their profession and organization, leading to a lower quality of work life.

Furthermore, previous studies have demonstrated a significant association between organizational justice in healthcare environments and the level of job satisfaction among nurses [20, 25]. Berthelsen et al., [26] have also demonstrated a positive correlation between the perception of organizational justice at the unit level and the reported quality of care by staff members. In light of the intricate nature of the present-day healthcare landscape, it is imperative for nurse leaders to accord utmost importance to the concept of organizational justice [16].

Nevertheless, the current body of literature mostly examines transformational leadership, organizational justice, and quality of work life as distinct concepts, failing to acknowledge the potential combined impact they may have on improving the well-being of nurses and the quality of healthcare. The study aims to provide significant findings that can help healthcare leaders, administrators, and policymakers implement strategies to enhance nurse well-being, justice practices within organizations, and overall quality of nursing life at the workplace.

1.1. Aim of the Study. The aim of this study is to investigate the relationship between transformational leadership, organizational justice, and the quality of work life in the nursing profession.

1.2. The Theoretical Framework. The conceptual model employed in this study was founded upon a theoretical framework that has been constructed from the job demands-resources (JD-R) model (Figure 1). The JD-R model provides a framework for examining the impact of job characteristics on employees' well-being [27, 28]. Job demands referred to the physical cognitive or emotional requirement of a job that can be perceived as stressful or challenging for employees. These demands can include high workload time pressure emotional labor and other factors that require effort and may drain employee energy. On the other hand, your job resources are the aspect of the work environment that can help employees to achieve their work goals [27, 28]. According to the job demands-resources model (JD-R), transformational
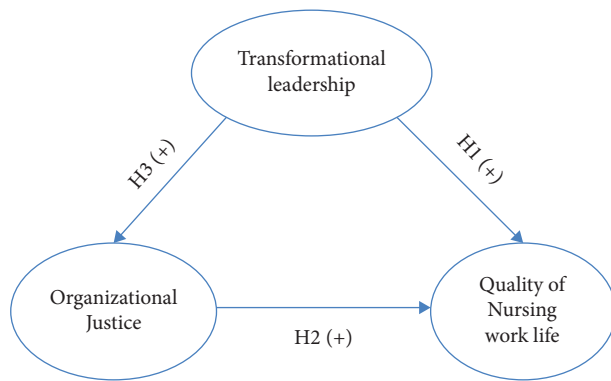
FIGURE 1: The proposed conceptual model of the study.

leadership and organizational justice can be viewed as job resources that can enhance the quality of nursing work life by providing support, autonomy, and fairness.

1.3. Literature Review and Hypotheses Development

1.3.1. Transformational Leadership and Quality of Nursing Work Life. Transformational leadership is a leadership style characterized by the leader's ability to inspire and motivate their followers to achieve their higher level of performance and personal growth [29]. This leadership approach has been widely studied and recognized as a key determinant of employee satisfaction, commitment, and overall organizational success [10, 30]. In the context of nursing, the transformational leadership style has been founded to positively influence various aspects of nurses' work life and include job satisfaction, organizational commitment, and professional development [2, 3, 7, 12, 21, 31]. Therefore, the following hypothesis developed:

> H1. Higher levels of transformational leadership will be positively associated with improved quality of nursing work life.

1.3.2. Organizational Justice and Quality of Nursing Work Life. Numerous studies examined the relationship between organizational justice and quality of work life. These studies consistently suggested that higher levels of organizational justice are associated with improved work-related outcomes. For instance, Arab and Atan [22] argued that perceived distributive, procedural, and interactional justice all contribute to employee job satisfaction and job performance. Berthelsen et al. [26] demonstrated that the shared perception of organizational justice climate was significantly associated with perceived quality of care and affective commitment to the organization. In the nursing context, the study of Dong et al. [17] revealed that perceived job characteristics and organizational justice can improve nursing care quality through work engagement. We can conclude that nurses are more likely to feel valued and motivated, leading to increased job satisfaction, commitment, and overall positive work outcomes. Therefore, the following hypothesis developed:

H2: High perceptions of organizational justice will correlate with enhanced quality of nursing work life

1.3.3. Transformational Leadership and Organizational Justice. Transformational leaders are more likely to be perceived as fair and just by their employees. This is because they are seen as role models who exhibit ethical behaviors, treat employees with respect, and involve them in the decision-making process. The leaders that exhibit transformational leadership conduct in a manner that is regarded by their followers as respectful, fair, and aligned with moral and ethical principles might anticipate a higher level of organizational attachment from their followers as a suitable reaction to the provision of interactional justice [32]. The study of Deschamps et al. [33] demonstrated that transformational leaders have a positive impact on their employees' motivation through different aspects of organizational justice. Also, the mediation study of Gillet et al. [31] revealed that transformational leaders influenced positively on nurses' perception of organizational justice. Therefore, the following hypothesis developed:

> H3. Higher levels of transformational leadership will be positively associated with increased perceptions of organizational justice among nurses

The proposed conceptual model of the research was developed to visually clarify the relationship between the study variables. The circular shapes were employed to represent the key study variables, and arrows indicated the directional relationships, with plus (+) denoting positive associations.

2. Methods

2.1. Study Design and Setting. The present cross-sectional research was conducted at a general hospital that is associated with the Egyptian Ministry of Health institutions. This hospital serves a catchment area with an estimated population of over 300,000 individuals. The hospital offers a wide range of medical services including many disciplines such as internal medicine, obstetrics and gynecology, surgery, pediatrics, ophthalmology, orthopedics, dermatology, and psychiatry. In addition, the facility provides diagnostic services including laboratory testing, radiography, and ultrasound. The healthcare system in Egypt is pluralistic, with public and private providers offering diverse services. The government ensures universal health coverage, while private services are accessible to those with financial means. The study follows the STROBE reporting guidelines [34].

2.2. Participants. The study utilized a convenience sample strategy due to its practicality and ability to recruit the participants efficiently. The study included registered nurses who are experienced nurses with at least one year in their current nursing position, full-time employed, and directly involved in patient care. Nursing interns and nurses who held management positions or served as shift leaders were excluded from this study. The Egyptian nursing syndicate

categorizes registered nurses based on their level of education and qualifications. These categories encompass nurses with technical education, comprising nurses holding a diploma or institute nursing degree (referred to as technical nurses), as well as those possessing a bachelor's degree and postgraduate degree (referred to as specialist nurses).

2.3. Data Collection Procedure. The study employed self-administered hard-copy questionnaires to collect data. The initial page of the anonymized questionnaire included the aim of the study and clear instructions on how to complete the surveys, and the deadline for receiving questionnaires was set a week to encourage timely responses and emphasize confidentiality. Following distributing a questionnaire to a group of nurses, the researchers reminded the participants about the significance of their responses. They explicitly requested truthful answers and guaranteed the nurses that the gathered data would be exclusively utilized for scientific research endeavors. Additionally, the researchers checked each questionnaire immediately upon receipt from the nurses after a limited time to avoid missing data. The data collection period spanned from February 10, 2023, until April 25, 2023.

2.4. Measures. The questionnaires had three scales that assessed the research variables and the demographic features of the nurses.

This study's demographic factors included age, gender, marital status, nursing categories, and experience.

The researchers utilized the global transformational leadership scale created by Carless et al. [35] to assess the perception of transformational leadership exhibited by nurses' direct leaders/managers. The scale comprises seven items designed to assess four dimensions: two items measure idealistic impact, two measure inspirational motivation, two items measure individual consideration, and one item measures intellectual stimulation and critical thinking. The value of Cronbach's alpha found in this research was 0.87.

The organizational justice scale was developed by Niehoff and Moorman [36] to assess nurses' perceptions of fairness within healthcare organizations. The scale consists of twenty items categorized into three primary dimensions of justice: (1) distributive justice, which encompasses five items; (2) interactional justice, consisting of nine items; and (3) procedural justice, which includes six items. The Cronbach's alpha coefficients for the constructs in this study were as follows: organizational justice (Cronbach $\alpha = 0.94$), distributive justice (Cronbach $\alpha = 0.87$), interactional justice (Cronbach $\alpha = 0.90$), and procedural justice (Cronbach $\alpha = 0.75$).

The quality of nursing work-life scale was initially developed by Brooks [37] to evaluate nurses' subjective perception of the quality of life at their workplace. The scale comprised a total of forty-two items, which were classified into four distinct subscales: (1) work life/home life, consisting of seven items; (2) work design, consisting of ten items; (3) work context, consisting of twenty items; and (4) work world, consisting of five items. The study reported Cronbach's alpha coefficients for various constructs as

follows: quality of nursing work life (Cronbach $\alpha = 0.81$), work life/home life (Cronbach $\alpha = 0.80$), work design (Cronbach $\alpha = 0.75$), work context (Cronbach $\alpha = 0.87$), and work world (Cronbach $\alpha = 0.71$).

The nurses were asked to indicate their degree of agreement with sixty-nine questionnaire items. They were given a 5-point Likert scale, ranging from one represented "strongly disagree" to five represented "strongly agree."

The evaluation of the study variables was determined by calculating the average score of each variable, which was obtained by dividing the total score by the number of items within the corresponding scale and subscales. The approach utilized in this study involved the conversion of original ratings into a standardized Likert scale, which encompassed a range from 1 to 5. Hence, scores falling within the range of 1–2.59 signify a low level of perception, while scores ranging from 2.60 to 3.39 suggest a moderate level of perception. On the other hand, scores falling within the range of 3.40–5.0 signify a high level of perception [38].

The researchers adhered to a translation and back-translation methodology for the English version of the scales that aligned with established practices observed in previous studies [39–42]. The researchers translated the study scales from English to Arabic and compared the translated texts to generate an initial version. An English teacher translated the scales back into English, and a native English speaker reviewed it to ensure it matched the original version. A panel of five specialists evaluated the Arabic version of the scales to assess readability, clarity, meaningfulness, and face validity. The final version was validated after incorporating revisions suggested by the reviewers. Translating the scales into Arabic acknowledges participants' linguistic proficiency in their native tongue, reduces language barriers, enhances cultural relevance, respects linguistic diversity, and improves data accuracy. This method aligns with research best practices and emphasizes the need for a careful translation process for validity and reliability.

The scales included in our research, namely the global transformational leadership scale, organizational justice scale, and quality of nursing work-life scale, were subjected to a thorough evaluation of content validity following the principles outlined by Davis [43]. The content validity of all scales was found to be strong, with scores of 1.00, 0.97, and 0.98, respectively. The subscales present in these instruments likewise demonstrated values over the threshold of 0.90, while the individual items had an item-content validity index that topped 0.80. The obtained results provide confirmation of the meticulous construction and validation process of our instruments, confirming their pertinence and suitability for assessing the constructs of our study [43]. Before data collection, the researchers conducted a pilot study that included 25 nurses to assess the research framework and methodologies and address any potential challenges. The pilot study data were excluded from the total study population. Based on the recommendations provided by the pilot study sample and experts' input, the rating scale for assessing the quality of nursing work life was modified from a six-point Likert scale to a five-point Likert scale. This modification was implemented based on the belief that the five-point Likert scale would offer

enhanced clarity and facilitate more effective respondent comprehension and response.

2.5. Ethical Considerations. The participants were provided with information on the voluntary nature of their involvement, the assurance of anonymity in their replies, and the option to withdraw from the study at any point. Their choice to participate did not affect their professional occupation. Participants provided verbal consent before distributing a questionnaire, and they further solidified their consent by signing an informed consent form. The study received ethical approval from the College of Nursing Ethics Committee at Mansoura University, Egypt, with reference number [P.0397].

2.6. Statistical Analysis. The statistical analysis was performed using IBM SPSS Statistics, version 23. The normality assumption was accepted based on the central limit theory as a sample size greater than 30 participants [44]. The descriptive statistics included demographic characteristics and study variables. Categorical variables were provided as frequency and percentage, while continuous data were represented by mean and standard deviation. The study employed Pearson correlation coefficients analysis to investigate the associations among transformational leadership, organizational justice, and quality of nursing work life. The study utilized hierarchical linear regression analysis on two occasions. The initial hierarchical linear regression analysis, referred to as model 1, was used to identify factors associated with quality of nursing work life (dependent variable). The first step included the demographic variables. Transformational leadership was added in the second step (independent variable) and organizational justice in the third step (independent variable). The second hierarchical linear regression (model 2) was conducted to ascertain the factors that are linked to organizational justice (dependent variable). The initial stage involved including demographic data to mitigate their influence. The inclusion of transformational leadership occurred during the second phase (independent variable). The categorical variables were recoded as dummy variables (control variables).

Before conducting hierarchical linear regression, the research variables underwent mean-centering before multiplication. This was carried out to mitigate the issue of multicollinearity throughout the analysis and uphold the assumption of independence of errors among the variables. The possible presence of multicollinearity for the regression model was assessed through tolerance (model 1: 0.17–0.98; model 2: 0.17–0.96) and the variance inflation factor (model 1: 1.03–6.02; model 2: 1.04–6.03), confirming that the basic requirements of regression analysis were satisfied. Statistical significance was set at an alpha level of 0.05 for inferential data analysis.

3. Results

Out of a total of 566 nurses, 527 nurses completed the survey resulting in a response rate of 93.1%. The mean age of the nurses included in the study was 33.23 years, with a standard deviation of 7.18 years. Most of the nurses were female (96.2%), married (85.2%), and had a technical degree of education (67.9%). The mean experience year of the nurses was 11.79, with a standard deviation of 7.95 (Table 1).

The mean score of transformational leadership was found to be 3.42 (SD = 0.70). The mean organizational justice score was 2.93 (SD = 0.65). In terms of the subscales of organizational justice, the mean scores for distributive justice, interactional justice, and procedural justice were 2.97 (SD = 0.73), 2.90 (SD = 0.76), and 2.94 (SD = 0.66), respectively. The mean score of quality of nursing work life was 3.29 (SD = 0.44). The subscales work life/home life, work design, work context, and work world received mean scores of 2.97 (SD = 0.59), 3.39 (SD = 0.45), 3.49 (SD = 0.53), and 2.77 (SD = 0.76), respectively (Table 2).

Positive relationships were observed between transformational leadership and organizational justice and its subscales. There is a positive correlation between transformational leadership and the quality of nursing work life and the various subscales. There was a favorable relationship between organizational justice and the quality of nursing work life and its subscales (Table 3).

Hierarchical regression model 1 explains 24.9% of the variance in organizational justice. The strongest predictor of organizational justice was transformational leadership ($\beta = 0.468$, $p < 0.001$), followed by age (31–40 years) ($\beta = -0.133$, $p = 0.021$) and nursing categories ($\beta = 0.112$, $p = 0.006$). This indicates that technical nurses who perceived their leaders as transformational were likelier to report higher organizational justice levels. Also, nurses aged 31–40 years had a significant negative association with organizational justice, suggesting that they perceived lower levels of justice compared to those aged more than 40 years. Hierarchical regression model 2 explains 51.7% of the variance in the quality of nursing work life. The highest predictor of quality of nursing work life was organizational justice ($\beta = 0.451$, $p < 0.001$), followed by transformational leadership ($\beta = 0.350$, $p < 0.001$). This means nurses who had their leader as transformational and experienced elevated levels of organizational justice were more likely to report a higher quality of nursing work life (Table 4).

4. Discussion

This study aimed to explore the relationship between transformational leadership, organizational justice, and quality of nurses' work life. Additionally, the study aimed to evaluate the variables under investigation.

The study's findings provided empirical support for hypotheses 1 and 2, demonstrating that transformational leadership and organizational justice emerge as substantial predictors of the quality of nursing work life. This underscores the pivotal role these factors play in shaping nurses' experiences and job satisfaction. These findings may be due to different assumptions; first, transformational leadership fosters a positive and supportive work environment where nurses feel valued and motivated. This enhances the overall quality of nurses' work life by promoting job satisfaction and engagement [2, 12, 23]. Second,

TABLE 1: Demographic characteristics of the studied nurses (N = 527).

Variables	N (%)
Age (years)	
20–30	212 (40.2)
31–40	233 (44.2)
>40	82 (15.6)
Mean (SD)	33.23 (7.18)
Gender	
Male	20 (3.8)
Female	507 (96.2)
Marital status	
Unmarried	78 (14.8)
Married	449 (85.2)
Nursing categories	
Technical nurse	358 (67.9)
Specialist nurse	169 (32.1)
Experience years	
1–5	150 (28.5)
6–10	116 (22.0)
>10	261 (49.5)
Mean (SD)	11.79 (7.95)

TABLE 2: Descriptive statistics of the study variables (N = 527).

The study variables	Min-max	Mean (SD)
Transformational leadership	1.43–5.00	3.42 (0.70)
Organizational justice	1.30–4.45	2.93 (0.65)
Distributive justice	1.00–5.00	2.97 (0.73)
Interactional justice	1.00–4.89	2.90 (0.76)
Procedural justice	1.00–4.33	2.94 (0.66)
Quality of nursing work life	2.12–4.43	3.29 (0.44)
Work life/home life	1.29–5.00	2.97 (0.59)
Work design	2.00–4.70	3.39 (0.45)
Work context	2.00–4.60	3.49 (0.53)
Work world	1.00–5.00	2.77 (0.76)

organizational justice enhances trust and respect among employees, as they believe that the organization treats them fairly [9]. Trust and respect are vital components of a high-quality work life, leading to stronger work relationships and job satisfaction [22]. Third, fostering a positive work environment and promoting perceptions of justice can contribute to the mitigation of burnout and turnover intentions among nurses. Consequently, this enhances the overall quality of the nursing work environment [24].

The study aligns with Akar and Ustuner's [6] research, which found a positive correlation between teachers' perceptions of transformational leadership by school administrators and their work-life quality. This relationship was mediated by their perceptions of organizational support and justice. The study conducted by Gillet et al. [31] revealed that transformational leadership directly affects the quality of work life for nurses and this effect is mediated by justice. In a study, Kasim and Aldarmaki [45] investigated the connection between justice, quality of work life, and turnover intention among police personnel in the United Arab Emirates. Their findings suggested that the quality of work life acts as a mediator in the relationship between justice and turnover intention.

The study by Totawar and Nambudiri [13] discovered that organizational justice has a positive relationship with quality of work life and that this relationship was mediated by job satisfaction. The study by Prameswari et al. [46] found that organizational justice and transformational leadership positively and significantly impact job satisfaction, which is a crucial aspect of the overall quality of nursing work life. Kamel et al. [47] observed a significant positive correlation between the quality of nursing work life, organizational justice, and citizenship behaviors. Moghimi et al. [19] examined the correlation between organizational justice and quality of work life in public organizations in Qom Province, Iran. The study revealed a positive association between distributive, procedural, and interactional justice, and quality of work life.

The study's findings support the cognitive evaluation theory, which suggests that transformational leadership promotes intrinsic motivation in nurses by meeting their needs for autonomy, competence, and relatedness [48]. Transformational leaders empower nurses by granting them autonomy in decision-making, fostering professional growth opportunities, and creating a supportive work environment. These studies have shown that nurses' intrinsic motivation and job satisfaction are improved, leading to a higher quality of work life [12, 19, 49].

The study's results supported the third hypothesis, revealing a favorable link between transformational leadership and organizational justice, which is consistent with previous research conducted in numerous settings and nations [10, 30, 31, 33, 50–52]. Transformational leaders tend to advocate for fairness and transparency and encourage participative decision-making, which are essential components of organizational justice [8]. When nurses perceive their leaders as transformational, they are more likely to feel that decisions are made fairly and that their voices are heard, leading to a higher level of organizational justice perception [31]. Transformational leadership behaviors of nurse managers, such as inspiring, stimulating, considering, and influencing their staff nurses, have been associated with positive outcomes for nurses, patients, and organizations. The results involve diverse aspects including favorable work settings, employee behaviors, fairness in the workplace, safety culture for patients, and contentment with the job [11, 15, 53, 54].

The study found that nurses demonstrated a high perception of transformational leadership, suggesting the presence of positive and inspiring leadership behaviors in their work environment. Furthermore, the participants' perception of justice was at a moderate level. This suggests that there exists an ascertain level of fairness and equity within the workplace, but there may be areas that need to be improved. Additionally, the study showed that nursing work life exhibited a moderate quality from nurses' perspectives. These findings indicate that nurses' work conditions, job satisfaction, and well-being were moderately satisfactory indicating potential for improvement in their work-related experiences. These findings indicate that nurses' work conditions, job satisfaction, and well-being are moderately satisfactory, indicating potential for improvement in their

TABLE 3: Correlation matrix among the study variables ($N = 527$).

	1	2	3	4	5	6	7	8	9	10
(1) Transformational leadership	1									
(2) Organizational justice	0.480***	1								
(3) Distributive justice	0.413***	0.800***	1							
(4) Interactional justice	0.463***	0.952***	0.637***	1						
(5) Procedural justice	0.396***	0.899***	0.601***	0.807***	1					
(6) Quality of nursing work life	0.582***	0.632***	0.561***	0.596***	0.527***	1				
(7) Work life/home life	0.330***	0.539***	0.507***	0.489***	0.456***	0.719***	1			
(8) Work design	0.338***	0.383***	0.307***	0.393***	0.296***	0.748***	0.473***	1		
(9) Work context	0.635***	0.547***	0.470***	0.517***	0.469***	0.915***	0.521***	0.552***	1	
(10) Work world	0.301***	0.510***	0.505***	0.462***	0.407***	0.646***	0.399***	0.397***	0.442***	1

*** $p < 0.001$.

TABLE 4: Predictors of organizational justice and quality of nursing work life.

Steps and predictors	Model 1: Quality of nursing work life				Model 2: Organizational justice			
	Unstandardized coefficients (β)	Std. Error	Standardized coefficients (β)	t	Unstandardized coefficients (β)	Std. Error	Standardized coefficients (β)	t
Step 1								
Age (reference: >40 years)								
20–30	−0.0180	0.152	−0.088	−1.188	−0.186	0.189	−0.092	−0.987
31–40	0.060	0.093	0.030	0.642	−0.269	0.116	−0.133	−2.321*
Gender (reference: female)								
Male	0.016	0.162	0.003	0.098	0.202	0.201	0.039	1.001
Marital status (reference: married)								
Unmarried	−0.056	0.087	−0.020	−0.648	−0.152	0.108	−0.054	−1.404
Nursing categories (reference: specialist nurse)								
Technical nurse	0.037	0.070	0.017	0.537	0.239	0.086	0.112	2.767**
Experience (reference: >10 years)								
1–5	−0.042	0.143	−0.019	−0.293	−0.095	0.178	−0.043	−0.532
6–10	−0.192	0.110	−0.080	−1.741	−0.047	0.138	−0.019	−0.341
Step 2								
Transformational leadership	0.350	0.035	0.350	10.037***	0.468	0.038	0.468	12.215***
Step 3								
Organizational justice	0.451	0.035	0.451	12.788***				
R, R^2, Adj. R^2, F, p	0.725, 0.525, 0.517, 63.472***				0.510, 0.260, 0.249, 22.757***			

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

work-related experiences. These findings align with prior studies conducted by Gillet et al. [31]; Sürücü [52]; Akdemir [50]; and Khan et al. [51], which reported high transformational leadership perceptions between nurses and other participants.

Regarding organizational justice, the study by Sürücü [52] aligns with our findings, indicating moderate levels of organizational justice. In contrast, Gillet et al. [31], Moghimi et al. [19], and Yasir et al. [30] reported divergent findings, indicating that nurses exhibited low levels of justice perception and experienced an unfavorable quality of work life. The literature presents diverse findings regarding the quality of nursing work life. Kamel et al. [47] observed a high level of work-life quality and organizational justice. Conversely, Akar and Ustuner [6] discovered a moderate work-life quality and organizational justice level.

4.1. Limitations of the Study. This study had some limitations. First, the utilization of a cross-sectional design in this study presents limitations in establishing causal relationships between variables. Second, the utilization of convenience sampling in this research may potentially add selection bias and restrict the ability to generalize results to a broader population of nurses. Finally, it is crucial to recognize that the study was carried out solely inside the confines of a singular general hospital, which may potentially restrict the generalizability of the findings to alternative healthcare settings.

4.2. Further Research. In the light of limitations mentioned previously, there are several avenues for further research that can enhance the depth and the breadth of our understanding in this area. Future research should consider employing longitudinal or experimental designs to better establish causal relationships between the variables of interest. Furthermore, conducting an inquiry into the fundamental mechanisms and potential moderators of these associations can offer a more profound comprehension of how to optimize the nursing work environment and boost the quality of patient care. Also, the forthcoming studies should utilize random sampling procedures, such as simple random sampling or stratified random sampling, and include multiple healthcare settings to overcome selection bias and restriction of generalizability of results to a broader population of nurses in the other healthcare settings.

5. Conclusions

The study discovered that nurses had a high perception of transformational leadership and moderate levels of organizational justice and quality of nursing work life. Moreover, a positive correlation existed between transformational leadership and organizational justice, indicating that these factors significantly improve the quality of work life for nurses. Those who view their leaders as transformational and work in a fair organizational climate are more likely to report higher levels of quality of work life.

6. Implications of the Study

Hospital administrators should invest in developing transformational leadership training programs for nurse leaders to promote a fair and supportive work environment. Additionally, efforts to improve organizational justice and fairness in resource allocation can lead to enhanced nurse well-being and overall job satisfaction. Therefore, nurse managers can enhance the work environment for nurses and yield benefits for both employees and the organization by prioritizing these factors.

Data Availability

The data that support the findings of this study are available upon request from the corresponding author.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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Research Article

Environmental Risk Assessment of Low Back Pain in ICU Nurses: An Instrument Development Study

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Aim. To develop a valid, reliable assessment tool to measure risk factors associated to low back pain (LBP) in intensive care unit (ICU) nurses. *Background*. LBP is defined as the pain extending from the 12th rib to the iliac crest and often coexists with buttock pain. Nursing has been identified among the top professions at risk of LBP. A mean of 70% prevalence per year in ICU nurses was reported, exceeding those employed in heavy industry. Environmental factors in workplace were also most important risks related to LBP in this population except factors including individual, physical, psychosocial, and lifestyle. However, there is lack of tools to assess environmental risk related to LBP for nurse managers currently. *Methods*. Focus group interviews, field research, and panel discussion were used to develop item pool. Two-round expert reviews and preinvestigation were carried out to form initial scale named Environmental Risk Assessing Instrument-Occupational Low Back Pain in Nurses (ERAI-N). A cross-sectional survey with 188 ICU participants in Hunan Province in China was implemented to collect data. Cronbach's alpha, split-half reliability, and test-retest reliability were used to test ERAI-N's reliability. Expert review was performed to test ERAI-N's content validity, and confirmatory factor analysis (CFA) was performed to assess its construct validity, being carried out in IBM SPSS Amos 26 Graphics. *Results*. Final version of ERAI-N scale had five dimensions with 18 items that were space, equipment, belief, guideline, and safe culture. ERAI-N scale's score of Cronbach's alpha, Guttman split-half, and intraclass correlation coefficient (ICC) was 0.958, 0.927, and 0.994, respectively. Item-level content validity scores ranged from 0.89 to 1.0, and scale-level content validity was 0.983. Standardized factor loadings ranged from 0.567 to 0.974. Model adjusted fit statistics were as follows: the chi-square statistic and degrees of freedom (χ^2/df) = 3.943, root mean square error of approximation (RMSEA) = 0.071, incremental fit index (IFI) = 0.905, comparative fit index (CFI) = 0.904, parsimony normed fit index (PNFI) = 0.641, and parsimonious comparative fit index (PCFI) = 0.661. *Conclusions*. ERAI-N scale had moderate reliability, content validity, and construct validity. *Implications for Nursing Management*. Designers may use ERAI-N scale to plan the interior layout when design a new ICU. Nurse managers might utilize this instrument as a managing tool to assess whether there is environmental risk factors related to LBP in ICU.

1. Introduction

Low back pain (LBP) is defined as the pain extending from the 12th rib to the iliac crest and often coexists with buttock pain [1]. LBP is one of the most common public health problems, especially in middle-aged to older women, with the prevalence [2] ranging [3] from 40% to 90% [4]. LBP has some other prominent features such as high annual incidence leading to severe functional limitation [5] in addition to high prevalence. A study done in 195 countries found that LBP was the leading cause of worldwide productivity loss as measured in years and the top cause of years lived with disability [6].

Nursing has been identified among the top professions at risk of LBP [7], especially for those on duty in intensive care unit (ICU). A mean of 70% prevalence per year was reported,

exceeding those employed in [8] heavy industry [9]. It is also reported that being a nurse is independently related to spinal pain [10]. LBP can induce disrupted or reduced proprioceptive signaling which likely plays a pivotal role in driving long-term changes in the top-down control of the motor system via motor and sensory cortical reorganization [11]. There were lots of publications which revealed that LBP for ICU nurses may lead to work absenteeism, reduction of nursing workforce efficiency [12], and burnout [13] and may incur economic costs of personal or national finance.

In order to reduce the prevalence of LBP among ICU nurses, investigations have been focused on individual, physical, psychosocial, and lifestyle factors which might play an essential role on the [14] occurrence of LBP [15] in recent decades. Based on human factors theory [16], lots of publications revealed that environmental factors in workplace were the most important risk factors for LBP [17, 18] in ICU nurses [8]. Omura et al. [19] proved that the use of a sliding sheet can significantly lower levels of low back subjective fatigue for caregiver in clinic when performing patient repositioning [19]. Alamgir et al. [18] found that healthcare workers preferred to use ceiling lifts because of less physically demanding work [18]. It is also reported that high-level lift availability was half as likely to have work-related LBP [20]. However, less than half (46%) of respondents working in ICU reported that their employer provided lifts [20], and this means limited availability and adoption of lifting equipment have been a persistent problem [21].

On the other hand, spatial requirements for a bed space are also essential in a critical care setting [22]. It is reported that an average of $23.26 \, m^2$ was needed for a bed-to-bed transfer followed by $22.87 \, m^2$ for a resuscitation task [23]. Nevertheless, little investigations were made to make sure whether the bed space in ICU meets the requirements. In terms of culture of safe nursing activities for the prevention of LBP in ICU nurses, there is research indicating that it is urgent to make efforts to broadcast safety operations, to formulate nursing procedures for nurses such as manual handling task, and to carry out guidance for safe handling patients, so as to reduce the occurrence of occupational LBP [24] in ICU nurses [25].

In spite of this, there are currently less reports about these strategies and no established research instruments designed to measure them as well. The aim of the current study was to develop and validate the Environmental Risk Assessing Instrument-Occupational Low Back Pain in Nurses (ERAI-N), with the intent of providing a high-quality instrument with clinical practical value that may be utilized by nurse administrators or researchers.

2. Methods

2.1. Participating Units.
This was an instrument development and validation study. Sample and data collection was performed in the tertiary general hospitals in Hunan Province in China from March to May 2022, except those specialized hospitals like military hospital, child care hospital, maternal and child health care hospital, stomatological hospital, tumor hospital, reproductive hospital, and traditional Chinese medicine hospital. The final scale used in this investigation has 20 items. The sample size was calculated according to 5 to 10 times of the number of items, 100 to 200 ICUs would be selected for this assessment, and the final sample size was about 110 to 220 ICUs, considering a 10% sample failure rate. There were 2 ICUs being assessed in every tertiary general hospital with random sampling principle. A flowchart of the sampling method is shown in Figure 1.

2.2. Procedure

2.2.1. Item Generation.
A qualitative study was conducted from January to March 2022. The initial questionnaire was developed through focus group interviews and field research, which were instructed by human factors theory. A convenience sample of 5 head nurses and 3 registered nurses working in a single prestigious general health care center was selected for group interviews. The interview was carried out by 3 of our research team in one conference room in the hospital. Participants were asked to discuss about LBP and environmental risk and safe culture related to the pain. Interviews continued until data saturation was achieved. For further certainty in addition to the focus group interviews, a field research was performed, and descriptive observation and focal observation were used by 2 of our research team in two ICUs. Subsequently, based on the qualitative study and literature review, the preliminary questionnaire containing 27 items was developed.

2.2.2. Content Validity.
An expert reviews process based on Delphi [26] was used for this study. The number of experts to be consulted for the Delphi method ranged from 15 to 30, depending on the depth of the research content [27]. Because the instrument is intended to measure factors of working environment and safe culture related to LBP in the context of an inpatient department, 20 researchers in the field of nursing management, ergonomics, or occupational safety were identified as experts, who were from the provinces of Taiwan, Beijing, Hunan, Gansu, Shanghai, Jiangsu, Chongqing, Guangxi and Anhui in China, respectively. All experts were contacted by WeChat and consented to participate in the study.

Two rounds of expert reviews were conducted. Nineteen of these twenty reviewers (95.0%) completed the first round review and 18 of them (94.7%) completed the second round. All of nineteen experts have achieved the top class technique title in the research, and 11 of them had completed postgraduate degree education. For the two-round reviews, the authority coefficient of experts (Cr) was 0.76~1.00 (0.90 ± 0.08) and 0.75~1.00 (0.89 ± 0.08), respectively, greater than 0.7; Kendall's W values of the measurement items were 0.223 ($P < 0.001$) and 0.107 ($P < 0.001$); and coefficient of variation (CV) was 0.05~0.29 (0.11 ± 0.06) and 0.05~0.22 (0.09 ± 0.03), less than 0.25, indicating that the overall coordination degree of expert scores was at a relatively high level. Experts used Likert 5-score scale to rate each questionnaire item's relevance and its respective concept; a score of 5 means very important, and a score of 1

FIGURE 1: Flowchart of the cluster stratified sampling with random principle.

means not important. The screening criterion was the combination of an item importance score with a mean of ≥4 and CV ≤ 0.25. In the first round, 11 experts put forward suggestions for modification, accounting for more than 57.9%. In the second round, 5 experts put forward suggestions for revision, accounting for 26.3%. After synthesizing expert opinions and group discussions, 6 items were merged, 2 were deleted, 1 item was added, and 2 items were modified. The initial scale with 20 items was obtained.

2.2.3. Preliminary Investigation. To further screen the items of the initial scale that whether their descriptions were suitable for ICU nurse administrators, preinvestigation was performed in 31 ICUs of tertiary medical institutions in Changsha, which were half of nonprofit tertiary hospitals in Changsha. Critical ratio, correlation coefficient, and factor analysis method were used for the screening criteria for project analysis.

2.3. Instruments. The final ERAI-N instrument was used as the instrument to collect the data. Participants responded to each item of the scale using a Likert-type scale with five response options: very inconsistent = 1, not very consistent = 2, uncertain = 3, fairly consistent = 4, and very consistent = 5.

2.4. Statistical Analysis

2.4.1. Validity Test. After the initial scale was formed, 9 authoritative and highly motivated experts who participated in the first reviews were consulted to test its content validity, evaluating fit degree between the measured content of the scale items and the expected measured content. Experts used the content validity index (CVI) to rate each questionnaire item's relevance and its respective concept. The item CVI (I-CVI) is determined by calculating the proportion of experts rating each item as "quite relevant" or "very relevant." The I-CVIs were averaged to calculate a scale CVI (S-CVI). I-CVI and S-CVI were used to evaluate item-level and scale-level content validity, respectively.

Construct validity was assessed using confirmatory factor analysis, being carried out in IBM SPSS Amos 26 Graphics. According to the literature, the chi-square statistic and degrees of freedom (χ^2/df) and the root mean square error of approximation (RMSEA) were used as absolute fit indices, comparative fit index (CFI), incremental fit index (IFI), and normed fit index (NFI) were used as incremental fit indices, and parsimony normed fit index (PNFI) and parsimonious comparative fit index (PCFI) were used as parsimonious fit indices [28]. The overall model fit was confirmed to be acceptable when χ^2/df was between 3 and 5 and excellent if it was between 1 and 3. Other acceptable fit criteria were RMSEA < 0.08, CFI > 0.9, IFI > 0.9, NFI > 0.9, PNFI > 0.5, and PCFI > 0.5. Guided by modification indices, residual correlations were specified for several items. Standardized factor loading was used for item-level content validity assessment. Factor loading greater than 0.40 was considered to be adequate. After confirming the model fit, individual standardized parameter estimates of paths (i.e., coefficients values) were assessed for magnitude, statistical significance ($p \leq 0.05$), and direction.

2.4.2. Reliability Test. Internal consistency reliability was assessed using coefficient alpha and split-half reliability, calculated in SPSS (IBM 26). McDonald's omega reliability

Figure 2: Distribution of the hospital locations.

coefficient was calculated using SPSSAU (https://spssau. com/). Nunnally and Bernstein [29] suggest that internal consistency reliability values greater than 0.7 are generally sufficient [29]. In this study, test-retest reliability was also performed to assess the instrument's reliability. Forty ICUs were reevaluated 2 weeks after the initial survey. Intraclass correlation coefficients (ICCs) were used to determine test-retest reliability. A series of two-way mixed-effects models with measures of absolute agreement were used. ICCs were determined as <0.40 (poor), 0.40~0.75 (fair to good), and >0.75 (excellent) [30].

2.5. Ethical Considerations. The Medical Research Ethics Committee of Xiangya Hospital of Central South University approved the study protocol (#202109003). Prior to collecting the data, written informed consent was obtained from each participant. The study was conducted in accordance with the Declaration of the World Medical Association and the Helsinki Declaration on the testing of human subjects.

3. Results

3.1. Characteristics of the Participating Units. Of the 94 third-level hospitals surveyed, 19 were in Changsha, accounting for 20.2%, followed by Shaoyang, Changde, and Zhuzhou, with 10 (10.6%), 9 (9.6%), and 9 (9.6%), respectively. The distribution is shown in Figure 2. Fifteen (16.0%) hospitals had <1000 available beds, 50 (53.2%) had 1000–1999 beds, 12 (12.8%) had 2000–2999 beds, and 17 (18.1%) had ≥3000 beds. 56.4% of ICUs were available with 10–19 beds, and 28.7% of ICUs were available with 20 and more beds. In 57.4% of ICUs, half or more of the nurses complained of low back pain due to nursing operations. In 27.7% of ICUs, half or more of the nurses suffered acute low back muscle injuries caused by nursing operations (Table 1).

3.2. The Final ERAI-N Instrument. Our hypothetical model, the ERAI-N, theorized that five distinct mechanisms in hospital units contribute to LBP in nurses. These

mechanisms are spatial requirement, equipment, belief, guideline, and atmosphere of safe culture. An initial set of items was developed based on human factors theory and was refined through focus group interviews and field research. The final ERAI-N instrument comprises 18 items, with each construct measured by a minimum of 3 and a maximum of 5 items. The total scale score was 18-90. The maximum value in this survey was 90, and the minimum value was 21, with a mean value of 54.7 ± 16.3.

3.2.1. Reliability

(1) Cronbach's Alpha Score. Cronbach's alpha scores ranged from 0.793 to 0.982 for the instrument's five factors. Guttman split-half scores ranged from 0.708 to 0.928. McDonald's omega reliability coefficient ranged from 0.866 to 0.986., The overall scale was 0.963 (Table 2). These scores all exceed the 0.7 standard proposed by Nunnally [29].

(2) Test-Retest Reliability. In this study, ICC was further analyzed to comprehensively examine the reliability level of the scale, ICC scores ranged from 0.616 to 0.924, and the scale's ICC was 0.994 (Table 3).

3.2.2. Validity

(1) Content Validity. In this study, 9 authoritative and highly motivated experts were consulted for the evaluation opinions on the correlation of scale items. The results show that item-level CVI ranged from 0.89 to 1.0, greater than 0.78 [31]. A total of 17 items in the scale were unanimously rated as "relevant" by all experts (3 or 4 points), the scale-level unanimity CVI was equal to 0.85, greater than 0.8 [32], and scale-level average CVI was 0.983, greater than 0.9 [32], which mean the content validity of both item level and scale level was good.

Table 1: General information of participating units ($n = 188$).

Characteristics	Number (n)	Percentage
Type of ICU you work in		
Comprehensive ICU (central ICU)	90	47.9
Specialty ICUs	98	52.1
Respiratory ICU	40	21.3
Emergency ICU	22	11.7
Neurology ICU	8	4.3
Neurosurgical ICU	16	8.5
Cardiac surgical ICU	2	1.1
PICU	4	2.1
Cardiovascular ICU	6	3.2
Number of beds available in your ICU		
<10	28	14.9
10–19	106	56.4
≥20	54	28.7
Have any nurses from your ICU complained of low back pain as a result of nursing operations?		
75–100%	48	25.5
50–74%	60	31.9
26–49%	68	36.2
1–25%	8	4.3
0%	4	2.1
Have nurses from your ICU suffered acute low back muscle injuries as a result of nursing operations?		
75–100%	24	12.8
50–74%	28	14.9
26–49%	82	43.6
1–25%	36	19.1
0%	18	9.6

Table 2: Coefficient reliability estimates.

Scale	Coefficient alpha	Split-half reliability	McDonald's omega
Space	0.793	0.708	0.866
Equipment	0.808	0.759	0.875
Belief	0.982	0.938	0.986
Guideline	0.946	0.855	0.965
Atmosphere	0.823	0.806	0.884
The overall scale	0.958	0.927	0.963

Table 3: Test-retest reliability.

Dimensionality	The first	The second	ICC
Space	13.55 ± 3.43	13.3 ± 3.96	0.819**
Equipment	13.60 ± 3.49	13.03 ± 3.93	0.772**
Belief	14.33 ± 5.82	12.98 ± 5.98	0.924**
Guideline	8.83 ± 3.36	8.10 ± 3.52	0.834**
Atmosphere of safe culture	15.43 ± 2.92	14.80 ± 3.07	0.616**
The overall scale	65.73 ± 16.76	62.20 ± 18.50	0.994**

ICC, intraclass correlation coefficient. ** $p < 0.001$.

(2) Construct Validity. Construct validity was assessed by confirmatory factor analysis. The maximum likelihood method was used to estimate the factor loadings. In the initial model, χ^2/df was approximately 5, and neither IFI nor CFI was equal to or greater than 0.9. After several times adjusting of model and group discussion, 2 items were deleted. The final model fit indices showed acceptable model fit (Table 4). All parameters in the model were significant at $p < 0.001$ (Figure 3).

The five-factor hypothesized adjusted model resulted in the following goodness-of-fit indices. The standardized factor loadings ranged from 0.567 to 0.974 and exceeded the recommended 0.40 threshold (Table 5).

3.2.3. Minimum Detectable Change. Nurses' complaints of low back pain due to nursing operations were negatively correlated with scale scores, with a Spearman correlation

Table 4: Modified model fit test.

Index classification	Indices	Evaluation criterion	Fitted value	Meet the standard
Absolute fit indices	$\chi^2/\mathrm{d}f$	<3 good 3~5 (fail to good)	3.943	Yes
	RMSEA	<0.08	0.071	Yes
Incremental fit indices	IFI	>0.9	0.905	Yes
	CFI	>0.9	0.904	Yes
Parsimonious fit indices	PNFI	>0.5	0.641	Yes
	PCFI	>0.5	0.661	Yes

$\chi^2/\mathrm{d}f$, the chi-square statistic and degrees of freedom; RMSEA, root mean square error of approximation; IFI, incremental fit index; CFI, comparative fit index; PNFI, parsimony normed fit index; PCFI, parsimonious comparative fit index.

Figure 3: CFA model diagram of Environmental Risk Assessing Instrument-Occupational Low Back Pain in Nurses (ERAI-N).

coefficient of −0.434. Using receiver operating characteristic (ROC) curve analysis, ICUs in which ≥50% of nurses had complained of low back pain due to nursing operations were considered high risk. The AUC was 0.745, $p = 0.001$, the maximum Yordon index was 0.414, and the cutoff value was 62.5 (Figure 4).

4. Discussion

Environmental factors in the work place have been found to be an important risk related to LBP in ICU nurses [8, 33]. HealthWISE published by the World Health Organization and International Labour Organization indicated top ten

TABLE 5: Scale items and standardized factor loadings.

Scale items	Standardized factor loadings
Space	
Spatial requirements for a bed space meets the standard of 15 to 18 square meters	0.567
The height of the sickbed is adjustable	0.630
The height of the work surfaces (desks, trolleys, and shelves) is adjustable for nurses working with the natural posture	0.771
The height of the seat and the height of the lumbar support pillow are adjustable, and the structure of the lumbar support pillow is elastic and rigid enough, so it is comfortable and stable	0.798
Equipment	
Auxiliary equipment such as slip and bed easy is available at any time	0.610
Patient lifting system is available at any time	0.772
The height of the interface of common devices is suitable. Nurses do not need to bend or bend excessively when operating the interface (such as monitoring devices and ventilators).	0.709
Belief	
An organizational policy system of working safely has been established	0.917
Promote the concept of "safe patient handling, no manual lift" in the work place	0.952
Training nurses about the knowledge of ergonomics related to the prevention of lumbar and back musculoskeletal injury	0.974
Training nurses on the skill of biomechanics of lumbar spine related to the prevention of lumbar and back musculoskeletal injury	0.973
Evaluate nurses' knowledge and skills in the prevention of lumbar and back musculoskeletal injury	0.965
Guideline	
There were safe work procedures for nurses to prevent low back musculoskeletal injury	0.985
There was risk assessment checklist of safe patient handling	0.856
There were emergency plans to deal with lumbar and dorsal musculoskeletal injuries for nursing staff	0.929
Atmosphere of safe culture	
Nurses have the vision of "I want to work safely"	0.636
Nurses have the initiative to carry out the risk assessment of safe patient handling	0.877
There was a culture of safety named "team work, safe patient handling" in the work environment	0.646

ergonomic principles including working in neutral positions, keeping everything within easy reach, and maintaining a comfortable environment [34]. However, these were instructive principles, and a tool with the capacity of accurately identifying risks in clinic would be more popular than those theoretical principles for clinical administrators. Therefore, we sought to develop such a simple instrument to help clinical administrators complete the identification of environmental risk factors related to LBP in nurses.

4.1. Scale Content Analysis. ERAI-N scale had five dimensions with 18 items that were space, equipment, belief, guideline, and safe culture. Jafari et al. [35] developed a scale for predicting LBP occurrence among nurses, including three dimensions with 40 items, which were occupational, psychosocial, and individual [35]. Kazemi [36] developed an instrument to assess occupational low back pain prevention behaviours among nurses, including six aspects that are knowledge, attitude, behaviour, self-efficacy, reinforcing factors, and enabling factors. But the knowledge subscale was with low reliability [36]. However, previous scales related to the low back pain risk assessment in nurses have focused

less on the direct and controllable factors that produce these risk behaviours. In addition to safe working procedures [37] and improving nurses' work posture, a safe working environment is also essential. A study showed that providing ceiling lifts was associated with reduced LBP in nurses [21]. Therefore, the instrument is intended to measure factors of working environment and safe culture related to LBP in the context of an inpatient department.

4.2. The Results from the Expert Consultation Are Reliable. The experts participating in this review were involved in the fields of nursing management, ergonomics, or occupational safety. The authority coefficient of experts for two reviews was higher than the standard, and it indicated that the experts in this study were highly authoritative. More than half experts put forward suggestions for modification and participated in the consultation for the evaluation of model fit degree, and they fully expressed their concern and support for this study. Furthermore, CV scores were less than 0.25 in two-round reviews indicating that the overall coordination degree of expert scores was at a relatively high level.
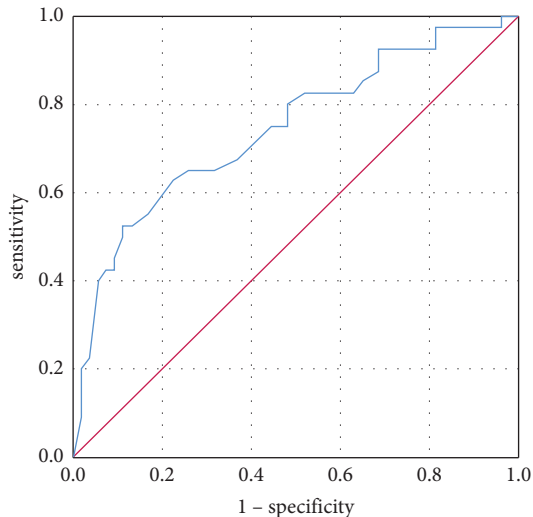
Figure 4: ROC curve.

4.3. ERAI-N Had Moderate Reliability. In terms of the internal reliability, this scale only had a moderate internal consistency.

Reliability analysis is to test the reliability of measuring tools, which is an index reflecting the consistency degree of the result measured from the tool. In this study, coefficient alpha, split-half reliability, and test-retest reliability were used to test ERAI-N's reliability. Coefficient alpha reliability coefficient is the most commonly used reliability coefficient, and it is often used to test scale's intrinsic consistency. The method of split-half reliability means to divide the survey item into two halves and then calculate the correlation coefficient of the scores of the two halves, and it is also used to test scale's intrinsic consistency. For the data analyzed in this study, both coefficient alpha reliability and split-half reliability surpassed generally accepted standards, and this means ERAI-N had moderate reliability. In order to test the results' stability, 40 ICUs were reevaluated 2 weeks later. The scale's ICC was 0.994, greater than the standard of 0.75, indicating that the stability of ERAI-N was excellent [36].

4.4. ERAI-N Had Moderate Validity. In this study, in order to ensure the accuracy of phrasing and the importance of entry item, two-round expert consultation was carried out. In the consultation letter, open information collecting columns of "Indicators to be added" and "Opinions and suggestions" was set to obtain experts' advice as more as possible. The evaluation from authoritative experts showed that the CV of both item level and scale level exceeded the standard, this indicated that ERAI-N had excellent content validity, and its items had a good correlation with the corresponding dimension and content.

In order to ensure the scientific research, it is necessary to test the suitability of the questionnaire model. The indices of the initial model including absolute fit indices, incremental fit indices, and parsimonious fit indices basically meet the relevant parameter requirements. Based on it, the initial model was modified in this paper so as to pursue better fitting results. The fitness test results of the modified model showed that χ^2/df was not at the range of excellent, but at the range of fair to good. Meanwhile, CFI, IFI, PNFI, and PCFI reached up to the level of excellent. These findings indicated adequate internal consistency of the items within each factor and a close alignment with the ERAI-N's theoretical factor structure. Therefore, it can be illustrated that ERAI-N had a moderate goodness of fit.

4.5. Implications for Nursing Management. There are several clinical and research implications that follow this study. When a new ICU is built, ERAI-N may help the designer to decide the number of sickbed for an area so that a bed space meets ICU spatial requirement standard. It also can help them to determine the location of special equipment such as invasive ventilators that are frequently operated by the nurse so as to keep operators in a natural posture while operating the equipment's interface. Nurse managers can utilize ERAI-N as a managing tool to assess whether there are environmental risk factors related to LBP in their own unit and then form an improvement report and put forward it to supplementary departments. Researchers may tentatively utilize the tool to assess the status quo of environmental risks leading to LBP in ICU.

4.6. Limitations of ERAI-N and Future Directions. ERAI-N was developed and tested on a sample from one province; therefore, there is a need for future research focusing on further evaluating the ERAI-N's reliability and validity. For example, it would be national and cross-cultural study with variation in the ERAI-N structure and distribution. The individual factors related to LBP in ICU nurse population can be summarized and set up a connection with the ERAI-N scale. Otherwise, it is urgent to develop practical intervention strategies according to specific conditions for ICU. Of course, it is important for researchers in the future to focus on the study of putting into effect interventions to reduce or eliminate these risk factors, so as to realize its real value of research and development.

5. Conclusion

This study introduces a reliable and valid instrument (ERAI-N) for clinical administrators to measure risk factors of low back pain in ICU nurses. The ERAI-N scale had five dimensions with 18 items that were space, equipment, belief, guideline, and safe culture. It demonstrates good levels of reliability, content validity, and construct validity in the process of initial testing and appears promising. Clinical administrators or researchers may tentatively utilize the tool to assess the status quo of environmental risks leading to LBP in ICU. There is a need for future research focusing on further evaluating the ERAI-N's reliability and validity, developing and putting into effect interventions to reduce or eliminate these risk factors, so as to realize its real value of research and development.

Data Availability

Data are available on request from the authors.

Ethical Approval

Disclosure

Lihui Zhang and Yangyang Liu are co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Lihui Zhang and Yangyang Liu collected and analyzed the data and prepared the first version of the manuscript. Su'e Yuan helped develop ideas for the study, designed the study, and prepared the manuscript for publication. Lihui Zhang and Yangyang Liu contributed equally to this work.

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Research Article

Examining Predictors of Intention to Leave in Home Care and Differences among Types of Providers

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The retention and recruitment of care providers are ongoing concerns in healthcare globally. Examining intention to leave (ITL) as a measure of retention, the existing literature has focused on nurses working in hospitals, with less attention paid to other care providers and other areas of practice. The purpose of this study was to gain a better understanding of the unique factors influencing ITL among three categories of care providers in home care: registered practical nurses, registered nurses, and personal support workers. This study assessed and compared predictors of ITL, including organizational commitment, job satisfaction, perceived supervisor support, burnout, role stress, work/family conflict, and community satisfaction. A convenience sample of home care staff working in one agency in a Canadian province was sent an electronic survey by e-mail in 2021. Responses ($n = 185$) underwent data analysis including descriptive statistics, analysis of variance, and multiple linear regression, as well as thematic analysis of two open-ended items. The results of the study indicated that 54% ($n = 99$) of respondents were considering leaving their job, and respondents were dissatisfied with their salary and benefits. Role stress, work-family conflict, and burnout differed significantly between groups. Several themes emerged for strategies to promote employees to stay with the agency, with the overwhelming strategy being higher wages/salary. Themes for why employees stayed with the agency included love for clients and commitment to their care, as well as fondness for the teams within which respondents worked. The findings of the study lead to several important implications and recommendations for the home care sector. Advocating for wage parity among healthcare sectors and other opportunities for compensation for home care workers is necessary. Additional strategies include supportive and innovative approaches for scheduling, teamwork, and working with staff to identify barriers and solutions in home care.

1. Introduction

Recruitment and retention of staff is an ongoing and global issue for healthcare agencies, presenting challenges for maintaining the adequate staffing needed to provide quality care. Intention to leave (ITL) is a common measure used to help assess retention in the workforce. In nursing, leaving positions, employers, and sometimes the profession has been a concern researched for decades. This "turnover" is especially problematic in times of nursing and staff shortages. Within home care in Canada, these concerns are heightened by lower rates of pay and the need to increase capacity to support greater provision of care in the community.

The significance of ITL is better documented in nursing than among unregulated care providers, such as personal support workers (PSWs). Within nursing, the concern of pending shortages over the last two decades has been linked to the aging population and the looming retirement of nurses. In 2009, the Canadian Nurses Association (CNA) reported concerns about significant shortages over the next 15 years in Canada [1] which we are currently acutely experiencing. The intention to leave and subsequent turnover are causes of concern for the quality of patient care and work environments. In addition, there are significant financial implications of ITL due to the reorientation of staff, overtime for covering shifts, and increased absenteeism.

Concerns over turnover and retention are also noted in rural communities, which present additional challenges. This is important to consider in the content of ITL in home care, which spans both urban and rural communities in Canada. Physical isolation, fewer resources, and providers requiring a broader knowledge base, as well as personal factors such as finding jobs for a spouse, a sense of belonging, and relationships with rural organizations have all been reported to influence recruitment and retention in rural settings [2].

The study aimed to better understand the unique factors influencing ITL among the different types of care providers in home care, including RNs, PSWs, and registered practical nurses (RPNs), also known as licenced practical nurses across Canada. Although there is significant literature related to ITL among hospital nurses, there are few studies examining ITL in home care. Understanding these predictors will help inform organizational initiatives targeting recruitment and retention strategies as part of health human resource planning. Prior to the COVID-19 global pandemic, home care was experiencing staffing shortages, which have only worsened with the pandemic and heightened the need to better understand the unique factors in home care that attract and retain staff to ensure quality delivery of care. While this study focuses on home care in Canada, the findings have broader implications for understanding and preventing turnover in home care in various healthcare structures. From the literature reviewed, many regions of the world are grappling with the recruitment and retention of healthcare workers, including in home and community care settings. The findings of this study point to both issues and practical measures in home care that could benefit studies of ITL across the globe.

1.1. Conceptual Framework. A conceptual framework of ITL [3] guided the study. The framework proposes that job satisfaction, workplace organization, community characteristics and satisfaction, and individual worker characteristics either directly or indirectly predict ITL [3], which subsequently relates to turnover.

1.2. Literature Review. The literature reviewed for ITL identified several predictors, the most important of which are discussed below and align with the components of the conceptual framework.

1.2.1. Intention to Leave. The decision to leave a job or organization is usually superseded by one's intention to leave a job. The construct of ITL is recognized as the greatest predictor of turnover behavior, with corresponding features that can be grouped as workplace factors and personal factors. Attributes of the workplace influencing ITL are readily found in the literature and include organization commitment as one of the most commonly reported predictors, along with job satisfaction, work environment, and empowerment.

In Irvine and Evans [4] seminal study on ITL, they reported that ITL is a key predictor of retention. Yet, measurement of ITL is often inconsistent, and different language is used (e.g., ITL, intention to stay, and intention to search). A literature review conducted by Hayes et al. [5] found that the inconsistent usage of terms in related research can lead to a lack of comparability over time. For example, varying applications of the term "turnover" in ITL studies can make it challenging to monitor trends and compare findings. Despite these concerns, variations in measures of behavioural intentions have continued to be used. For example, some studies have included "intention to stay" as opposed to ITL. This is the case in Berta et al. [6], where researchers examined the relationship among workplace factors and outcomes (i.e., intention to stay) of PSWs in Ontario long-term care and community care settings. Berta et al. reported that intent to stay was significantly associated with job satisfaction, work engagement, and organizational commitment. These findings align with similar studies using the measure of ITL in nurses, suggesting that despite such variations, the findings are comparable and applicable to research examining ITL [7].

1.2.2. Job Satisfaction. Similar to ITL, job satisfaction is variously defined in literature. Despite this potential for variation and subjectivity, studies reveal that there are specific aspects of one's job that are consistently reported to be important to job satisfaction, specifically in the healthcare context. Pay [8], work design, and management support [9] are all factors that influence healthcare workers' job satisfaction and, in turn, their ITL and their decision to stay or leave an employer.

Chamberlain et al. [10] studied individual and organizational predictors of PSWs' job satisfaction in long-term care in Western Canada. Job satisfaction was reported to be an important factor in the intention to leave the job, and lower reported job satisfaction was associated with increased reporting of burnout [10]. Similarly, in their literature review examining international research published between 2000 and 2016, Halcomb et al. [11] ascertained that job satisfaction is consistently found to be a predictor of nurses' intentions to leave or stay. However, the researchers concluded that while the relationship between job satisfaction and ITL is well established in scholarship, the contributing factors to job satisfaction (or dissatisfaction) are less well known. They point to the need for more research on such contributing factors to better understand ITL and thus improve retention rates of nurses.

1.2.3. Workplace Organization. Examinations of workplace organization as a factor in ITL predominantly consider workplace organization in acute care settings [5]. Recent studies that do examine ITL and the role of workplace organization in home care point to the specific elements that influence ITL in home care, including increasing pressures due to an aging population and decreasing support due to limited resources and high turnover [12]. Factors that have been found to encourage home care nurses to remain on the

job are similar to those noted for hospitals: greater autonomy, flexible scheduling, manageable workloads, sufficient support, and adequate pay [8]. Looking to fill the gaps in evidence regarding the home care work environment and patient outcomes (rates of hospitalization and discharge), Olga et al. [13] studied RNs in home care agencies across three states (California, New Jersey, and Pennsylvania). Characteristics of a "poor" work environment included longer shifts, whereas "better" work environments had more satisfied nurses and fewer reports of burnout. Olga et al. [13] found that home care agencies with good work environments had lower rates of nurse burnout and hospitalization and higher rates of discharge.

1.2.4. Community Characteristics and Satisfaction. One factor considered in relation to home care or community care nurses is community satisfaction. Stewart et al. [3] reported that community satisfaction was a significant factor associated with ITL for rural and remote nurses across Canada. The researchers assessed items such as community friendliness, social and recreational activities, quality of school, safety, ability to stay current in practice, level of anonymity, size of community, and distance from larger centers.

1.2.5. Individual Characteristics. Typically collected through surveys, analyses of demographic characteristics have identified several individual or personal characteristics that predict ITL. These include age, years of experience, level of education, and home-life obligations such as having children or other dependents [3, 5, 14].

Recently, Möckli and colleagues [15] reported that work-family conflict and work stressors were strongly correlated with emotional exhaustion (a component of burnout) in home care workers in Switzerland. Some specific concerns related to home care that Möckli et al. report include time pressure while commuting and the need for flexible scheduling to promote work-family balance. These unique concerns align with previously reported influences on intention to stay among Ontario home care nurses [8].

In summary, there is limited research examining retention or ITL in home care. The majority of ITL studies have focused on RNs working in hospital settings; hence, there is a gap in knowledge to guide decision-making. The originality of this study is that it seeks to examine factors influencing ITL among different types of workers (RNs, RPNs, and PSWs).

2. Research Questions

To identify the predictors of ITL in home care, across different categories of care providers, and to understand the relationship between these predictors, the following research questions were investigated:

(1) What is the relationship between personal characteristics, community characteristics and satisfaction, job satisfaction, workplace organization, and ITL?

(2) Do the predictors of ITL differ between categories of healthcare providers (RN, RPNs, and PSWs)?

(3) What do healthcare providers identify as strategies to promote their retention in home care, and do these differ between categories of healthcare providers (RN, RPNs, and PSWs)?

3. Materials and Methods

The research design for the study was quantitative and nonexperimental and incorporated a cross-sectional survey. Prior to commencing the study, ethical approval was obtained from the Trent University's Research Ethics Board (File #26700). The study was initiated in partnership with a home care agency. The home care agency provides services across the province of Ontario, Canada's second-largest province and home to approximately 13.5 million people across one million square kilometers [16] in rural, urban, and remote communities. Services provided by the agency include those funded by the provincial government, such as visiting nursing, personal support and homemaking, and end-of-life care, as well as programs within schools and other residential settings. Options for alternative employment vary greatly across the province, with more options available in highly populated areas. An advisory group from the agency, consisting of five leaders with responsibility for home care delivery across the province, contributed to the proposal development, survey development, and recommendations.

Measurement tools used to assess the key constructs of the framework are identified in Table 1. The measures assessed personal factors, workplace/organizational factors, community characteristics and satisfaction, and ITL. In addition to the tools, demographic questions were included, along with an open-ended question asking participants to identify strategies that would encourage them to stay working in home care and with their current employer. In total, the survey asked participants to rate 108 items and 2 open-ended items, for a total of 121 questions.

3.1. Sample. A convenience sample was used. A total of 1038 employees from one home care agency in Ontario, including RNs, RPNs, and PSWs were surveyed. The advisory group provided lists of employee emails for the researcher to distribute the electronic survey by e-mail, which occurred from November to December 2021. A total of 225 respondents opened the survey but only 185 respondents were useable for data analysis. The overall response rate was 18%.

3.2. Data Analysis. The raw data was only available to the researchers. Descriptive and inferential statistics were completed using SPSS© (version 28). To answer the first two research questions, data analysis included bivariate correlations, multiple linear regression, and one-way and multivariate analysis of variance. The data from the open-ended questions was analyzed in Microsoft excel by the principal investigator and research assistant, both with previous experience completing thematic analysis. Thematic analysis

Table 1: Measurement tools assessing key constructs of conceptual framework.

Component of theoretical model	Variable	Measurement tool (source)
Personal factors	Home-life obligations	Work-family conflict [17]
	Stress	Role stress [18]
	Burnout	Burnout assessment tool [19]
Job satisfaction	Job satisfaction	Global job satisfaction [20]
	Aspects of job	Component of Casey-Fink new nurse experience survey [21]
Workplace organization	Organizational commitment	Organizational commitment questionnaire [22]
	Supervisor support	Perceived supervisor support scale [23]
Community characteristics and satisfaction	Community satisfaction	Community satisfaction [24]
ITL	Intention to leave	Turnover intention [25]

was used to identify themes in the written responses of participants [26]. Initially, analysis was completed separately, then findings were shared by the principal investigator and research assistant, and congruency was found among themes.

4. Results

An equal number of RNs and RPNs completed the survey, 46 in each group, and a larger number of PSWs, 77 completed the survey. Most respondents were employed full-time, female, working one job, and associated with the visiting nursing program. Table 2 provides characteristics of the sample.

4.1. Study Variables. Table 3 provides ranges, means, and reliability coefficients of the measures used for the study variables. Cronbach's alpha ranged from 0.84 to 0.97, including subscales. Given the reliability, minimal missing data (less than 5%), and normal distribution of the data, data analysis proceeded.

4.1.1. Intention to Leave. A total of 99 respondents, 54% of sample, indicated they were thinking about leaving their job in a subsequent question (*If you are thinking about leaving your job, are you considering. . .*). Respondents who indicated they were thinking about leaving their job could select more than one option to specify their intentions. Respondent selections were as follows: leaving home care ($n = 62$), leaving healthcare ($n = 32$), staying in home care but leaving their current employer ($n = 27$), going back to school ($n = 27$), and moving to a new community ($n = 10$). Many respondents selected "other" ($n = 43$) A variety of comments were received but the most frequent was retirement ($n = 12$). In follow-up, respondents were asked the following subsequent question: If you are considering leaving your job, when do you plan to leave?" Most respondents indicated they were unsure or did not know ($n = 37$). Others responded that they planned to leave within 6 months ($n = 20$), planned to leave within the year ($n = 16$), or planned to leave in greater than 2 years ($n = 16$). Finally, some indicated they were leaving immediately or had taken another job ($n = 7$)

4.2. Question 1. The first research questions examined the relationship among personal characteristics, community characteristics and satisfaction, job satisfaction, workplace organization, and ITL. As expected, significant correlations were noted among the study (see Table 4). Multiple linear regression was used to test the conceptual framework of ITL for the entire sample. The overall analysis was significant ($F = 7.264$, $p < 0.001$), and the model accounted for 39% of the variance in ITL (measured by turnover intention). Organizational commitment was significantly associated with ITL (standardized $\beta = -0.42$, $p < 0.001$). None of the other variables entered in the model significantly relate to ITL.

4.3. Question 2. The second research question examined if the predictors of ITL differ between categories of healthcare providers (RNs, RPNs, and PSWs). The data met the assumptions for one-way analysis of variance (ANOVA) and multivariate analysis of variance (MANOVA). Initially, MANOVA determined that there were significant differences among the group means, followed by one-way analysis of variance. The results (see Table 5) identified significant differences in means between groups for the measures of role stress, work-family conflict, and burnout. Post hoc analysis was done using the Bonferroni method to understand the differences in these measures among the groups, with both tests identifying the same significant differences among groups. For RNs, role stress was significantly higher than for PSWs. Examining the subscales of role stress (role ambiguity and role overload), role overload was higher in RNs, contributing to the significant difference. For RNs and RPNs, work-family conflict was significantly higher than that reported by PSWs, although not significantly different between RNs and RPNs. For RNs, burnout was significantly higher than reported by PSWs. Finally, satisfaction with several aspects of the job was also rated. These job aspects included salary, vacation, benefits, scheduling, weekends off, amount of responsibility, orientation and onboarding, opportunities for professional development, traveling, and amount of responsibility. Of these aspects, satisfaction with salary was significantly different between role types ($F = 7.76$, $p < 0.001$), with RPNs reporting lower satisfaction than PSWs and RNs, despite all categories reporting low satisfaction with salary.

TABLE 2: Characteristics of study participants ($n = 185$).

Characteristic	Frequency (n)	Percentage	Mean (SD)
Role description			
RN	46	25	
RPN	46	25	
PSW	77	42	
Length of time working in healthcare (years)			15.65 (11.72)
Length of time employed with the agency (years)			8.14 (8.87)
Number of jobs (including with the agency)			
One	115	62	
Two	33	18	
Three	3	2	
Job status with the agency			
Full-time	109	59	
Part-time	44	24	
Casual	17	9	
Sex			
Female	150	81	
Male	14	8	
Age (years)			46.1 (12.48)
Marital status			
Single	52	28	
Married	102	55	
Other (included widowed, divorced or separated)	14	8	
Dependents			
Yes	106	57	
No	62	34	
Size of community			
Metropolitan	56	30	
Community	82	44	
Rural	34	18	
Education level			
High school	5	3	
College certificate	36	20	
College diploma	80	43	
University undergraduate degree	29	16	
University graduate degree	17	9	

TABLE 3: Study measurement of variables (ranges, means and reliability coefficients).

Scale (subscales)	Range	Mean (SD)	Reliability coefficients (Cronbach's alpha)
Organizational commitment	9–63	39.72 (12.31)	0.91
Role stress	8–40	21.55 (6.85)	0.84
Role ambiguity	5–25	12.35 (4.07)	0.75
Role overload	3–15	9.21 (3.46)	0.80
Work family conflict	5–25	15.39 (5.90)	0.93
Job satisfaction	10–50	33.73 (8.37)	0.87
Turnover intention	4–20	11.06 (5.13)	0.93
Community satisfaction	11–55	49.63 (7.70)	0.88
Perceived supervisor support	16–112	72.24 (24.67)	0.97
Burnout assessment tool	23–115	51.29 (14.46)	0.93
Exhaustion	8–40	23.79 (7.10)	0.91
Mental distance	5–25	10.91 (4.09)	0.81
Cognitive impact	5–25	8.09 (3.42)	0.89
Emotional impact	5–25	7.83 (2.95)	0.81

4.4. Question 3. The third research question explored what care providers identify as strategies to promote their retention in home care and whether there are differences between RNs, RPNs, and PSWs. A total of 156 responses were provided for the two open-ended items, and thematic analysis was completed. The themes that emerged, along with descriptions of the strategies and examples offered by respondents, are presented in Table 6. For strategies to keep

TABLE 4: Pearson's correlations among study variables.

	Organizational commitment	Role stress	Work–family conflict	Job satisfaction	Supervisor support	Turnover intention	Community satisfaction
Role stress	−0.420**						
Work–family conflict	−0.285**	0.505**					
Job satisfaction	0.709**	−0.483**	−0.378**				
Supervisor support	0.518**	−0.424**	−0.340**	0.742**			
Turnover intention	−0.575**	0.419**	0.359**	−0.584**	−0.420**		
Community satisfaction	0.269**	−0.167*	−0.176*	0.285**	0.184*	−0.188*	
Burnout	−0.392**	0.601**	0.544**	−0.437**	−0.438**	0.377**	−0.198*

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

TABLE 5: Results of one-way analysis of variance.

Measure	Mean by group (standard deviation)			F value	p value
	RNs	RPNs	PSWs		
Organizational commitment	39.52 (10.30)	38.74 (12.41)	41.32 (12.89)	0.68	0.51
Role stress	23.80 (6.82)	22.05 (6.73)	19.55 (6.54)	5.69	<0.05
Work family conflict	17.16 (5.74)	16.68 (5.79)	14.00 (5.45)	5.57	<0.05
Job satisfaction	33.80 (7.78)	33.33 (7.58)	34.30 (8.72)	0.19	0.83
Supervisor support	73.19 (24.74)	73.86 (26.42)	73.55 (22.78)	0.01	0.99
Turnover intentions	11.40 (5.12)	11.67 (5.19)	10.14 (4.90)	1.61	0.20
Community satisfaction	49.12 (7.73)	50.88 (7.07)	48.90 (8.01)	0.94	0.39
Burnout	54.77 (14.02)	51.85 (13.55)	48.18 (14.00)	3.02	0.05
Satisfaction with salary	2.11 (1.30)	1.59 (0.70)	2.26 (1.31)	7.76	<0.001

staff (i.e., promote retention), three themes emerged: compensation, scheduling, and management opportunities. Overall, the themes were the same between RNs, RPNs, and PSWs with the following exceptions: nursing respondents (RPNs and RNs) suggested more training and education, and RPNs suggested safety concerns be addressed by management.

Respondents were also asked why they stayed with the home care agency. Five themes emerged from these responses (see Table 7) and included patients/clients, nature of community care, the "Team," work practices, and financial need. Overall, the themes were the same between RNs, RPNs, and PSWs apart from work practices by nursing respondents. Both RPNs and RNs reported the unique skill set used in community nursing and opportunities for learning.

5. Discussion

The primary motivation for the study was to determine if there were differences in predictors of ITL among categories of home care workers (RNs, RPNs, and PWSs) to help inform retention and recruitment strategies. While there was no difference in reported ITL among RNs, RPNs, and PSWs, organization commitment was the key predictor of ITL. There were significant differences among some of the predictors, including role stress, work-family conflict, burnout, and one aspect of job-satisfaction with salary and wages. These predictors and differences among categories are discussed .

Overall, the relationships among the study variables were expected. Although weak, higher community satisfaction correlated with lower role stress, lower work-family conflict, and lower burnout. In previous research, community satisfaction was identified as a unique predictor of ITL in rural RNs [3, 24]. To better understand if there was a difference in community satisfaction between rural and urban respondents, additional analysis was completed, yet no difference was found. Therefore, community satisfaction seems to be important regardless of whether one lives or works in urban or rural communities, yet further investigation is warranted, including consideration of how an employer can contribute to community satisfaction or dissatisfaction.

5.1. Organizational Commitment. When examining all the predictors of ITL for the entire sample, the most significant predictor of ITL was organizational commitment. The items assessed in the measurement of organization commitment include alignment of one's values with the organizational values. Organizational commitment is a globally a well-recognized predictor of retention in nursing, yet little evidence is available for home care and the different categories of workers. Research that does exist indicates that strategies that promote employee empowerment [27, 28], supervisory support and leadership [27], professional development and training [28], and the implementation of evidence-based leadership approaches [29] can contribute to organizational commitment and thus reduce ITL.

5.2. Role Stress. RNs reported higher role stress than both RPNs and PSWs. Upon investigation, the component of role stress that differed was role overload. Role overload is the result of being expected to complete a variety of tasks in insufficient time [18]. The unique skill set of RNs in home care and the concerns noted about scheduling practices may contribute to issues of overload. Workload has been recognized by nurses as contributing to ITL, especially for new nurses, where workload contributes to stress [30]. Additional research could further examine the relationship between workload and category of employment in community care to determine, for example, if and how higher skill set requirements contribute to role stress in the specific environment of community care.

5.3. Work-Family Conflict. Both RNs and RPNs reported higher work-family conflict than PSWs. Upon further examination, there were no significant differences in the groups having dependents at home which may contribute to this; however, other contributing factors were not explored to help understand what is contributing to the conflict. From the themes that emerged, traveling and scheduling practice may influence work-family conflict. Studies have shown that work-family conflict is a significant predictor for healthcare workers' ITL and that this is particularly the case for home care workers [31]. However, more research is needed to understand the variables that contribute to this relationship,

TABLE 6: Themes on strategies to keep staff.

Theme	Details from respondents	Quotes
Compensation	Overwhelming theme across the three groups, with suggestions for salary and wage increases Discrepancies between sectors acknowledged, and not reflective of responsibilities Additional types of compensation acknowledged (improved vacation, benefits, bonuses for "staying," improved mileage or provision of gas cards)	"Pay parity with hospitals"
Scheduling	Desire for greater continuity of patient assignment Fewer weekends Less pressure to pick up shifts Job sharing opportunities Improve scheduling to reduce driving Options for settings that don't require driving (e.g., clinics) Avoid consecutive days or shifts More staff needed to improve workloads and scheduling Provide time for hand-off Refrain from mandatory overtime	"Almost every shift" (mandatory overtime)
Management opportunities	Treat staff fairly and provide recognition for their work Personal contact-listening, showing concern (including for mental health) Improved communication and approachability more training and education* Address concerns of safety and accommodations**	"Favouritism" "It's not fair" "Overall, not appreciated"

*RN and RPN respondents. **RPN respondents.

TABLE 7: Themes related to why employees stay.

Theme	Details from respondents	Quotes
Patient/clients	"Love" for clients Concern for clients if not there	"Wake up every morning excited to go to work," "the patients keep me..."
Nature of community care	Being close to home Having an impact on the community The duties work and skills (critical thinking)*	"Believe in the value, necessity and quality of community health care"
The "team"	The company, management, and coworkers Friendly and helpful coworkers	"Feels like a family," "amazing supervisor" "Love the team"
Work practices	Having vacation and sick days, flexibility and independence, availability of overtime Opportunities for continued learning	"Love the support"
Financial need	Years of services and pension stopped employees from leaving Need for job/wages contractual obligation	

*RN and RPN respondents.

specifically with respect to different employment categories within home care.

5.4. Burnout.

RNs reported higher burnout than both RPNs and PSWs. The burnout measure consisted of four subscales, including exhaustion, mental distress, cognitive impact, and emotional impact. Upon further examination, it was the exhaustion subscale that was significantly different. Schaufeli and colleagues [19] describe exhaustion as the "heart of the burnout syndrome" (p. 13) and one of the core symptoms of burnout. The items assessing exhaustion considered both mental and physical exhaustion. Burnout is a recognized predictor of ITL in nurses [9, 32].

These concerns about burnout align with the findings from Moloney and colleagues [9] in New Zealand who reported that workload and work-life interference contributed to burnout in RNs, which in turn was a significant predictor of ITL. Although Moloney's findings were not specific to home care, focused on RNs only, and were in a different jurisdiction, the findings align with this study. The concern of role overload and work-family conflict reported in nursing respondents, especially RNs, are likely contributing to the exhaustion. Therefore, strategies to address workload, work-family conflict, and exhaustion should be considered in a retention strategy.

5.5. Dissatisfaction with Salary and Wages.

Dissatisfaction with wages and salaries was a quantitative and qualitative finding from the study. Among the categories of work, all three groups reported low satisfaction with salary and wages but there was a significant difference with RPNs, who reported greater dissatisfaction than PSWs. Although details of the salary dissatisfaction were not obtainable, other studies have found that dissatisfaction with wages and compensation greatly contributes to overall job dissatisfaction and ITL [33]. This is especially so when healthcare workers feel there is a disparity between workload and compensation, which is often found to be the case in community care [34]. Dissatisfaction with wages has also been found to contribute to ITL early in employment (e.g., within the first year), particularly for those working in home care [35].

5.6. Recommendations.

Based on the results of the study, the following recommendations are made. The recommendations support retention.

5.6.1. Address Compensation Dissatisfaction.

Addressing the dissatisfaction with compensation includes increasing salary and wages of home care workers and providing additional compensation strategies including mileage, travel time, and benefits are needed. The respondents recognized the differences in wages between healthcare sectors as well as the complexity of seeking wage increases, noting the need to work with the government and advocacy for the change. Although all members of the team can advocate, senior leaders are well positioned and can use existing relationships with government at the provincial level. Advocating for wage parity among healthcare sectors will also signify an understanding and respect for home care. Without this parity, the low wages represent undervalue of home care and the workers in the sector.

Separate from wage parity, other payment strategies can be considered and seen as advantageous for staff. Non-wage-related compensation strategies suggestions include increasing mileage compensation and payment for travel time between clients' homes. For benefits, it was recognized by respondents that the cost of current benefits was disproportionate to their wages. Although the details of the cost of participating in benefit programs were beyond the scope of this study, it is recommended that a review of options and employee costs be undertaken. Many respondents recognized the increased costs associated with the vehicle requirement of working in home care. Specific recommendations to address these include increasing the mileage provided to support the cost of gas and vehicle maintenance. In addition, some respondents suggested offering work that does not require traveling, such as clinics.

5.6.2. Examine Scheduling Practices.

A variety of strategies were suggested by respondents for improving scheduling, including some conflicting suggestions (for example, less overtime and more overtime offered). Several strategies can be considered to enhance satisfaction with scheduling in the workplace. It is recommended that practice includes creating a staff scheduling committee and ensuring a common understanding and application of collective agreements. A staffing scheduling committee with staff can help address scheduling concerns raised by staff and serve as a forum for management and supervisors to be present with staff. In addition, revisiting and possibly revising scheduling practices could ensure fairness and efficiency in terms of assignments (less travel time), staff satisfaction, and continuity of clients [3, 36]. In a review of literature on nurse's ITL, Al Zamel et al. [37] highlight the consistent significance of job satisfaction and work environment. They suggest that ensuring job satisfaction includes monitoring and being aware of staff concerns and then implementing specific strategies that address those concerns. Creating a staffing scheduling committee would provide ongoing opportunities to understand and respond to such concerns.

Given the comments regarding fairness in scheduling, it is suggested that where appropriate (i.e., for unionized environments), education to managers, supervisors, and schedulers be provided to help ensure a common understanding of the collective agreements and application, specifically for scheduling. This is consistent with findings in the study conducted by Stewart et al. [3], which examined nurses' intentions to leave in rural care, Canada. Stewart et al. noted that factors contributing to the intention to leave within the next 12 months of the study included high stress and dissatisfaction with scheduling. In contrast, in the study carried out by Tourangeau et al. [8], home care nurses in community settings in Canada reported a higher intention to remain employed when scheduling practices were flexible, work environments were supportive, and workloads were

manageable and varied. Opportunities for collaboration, education, and support from leadership are conducive to positive work environments, increased workplace safety, and lower dissatisfaction overall [29, 38]. Managers can take a proactive and open approach to concerns around safety. Butler [38] determined in a study involving 252 home care aides that the ability to discuss concerns with leadership promoted feelings of safety for employees.

5.6.3. Enhanced Management Support and Practices. Managers and supervisors are positioned to promote the team dynamic and demonstrate appreciation and recognition of staff. Based on the findings of this study, the need for recognition for work done and providing support was separate from compensation. On a positive note, the "team" was an important reason for staying with the home care agency. Recommendations to help management (and supervisors) meet identified needs and promote the "team" include creating opportunities for teams to work together, utilizing reward and recognition programs, and implementing a values-based approach to recruitment to promote organizational commitment.

Existing studies support the significance of fostering team cohesion and supportive work environments. In their study involving survey results from 16,707 nurses in England, Carter and Tourangeau [39] conclude that adequate support and resources contribute to a more positive work environment. They further highlight that a positive work environment is a significant factor in employee retention. Nurses who reported feeling more engaged (psychologically involved) in their work had lower rates of ITL. Collegial work settings, improved work relationships, and an emphasis on team building have been shown to benefit home healthcare workers and have been suggested to improve retention [33].

Opportunities for teams to work together, learn about one another, and work directly with managers are needed. If these opportunities are already present, seek feedback from staff about what is missing from the meetings, what can be added to make them more engaging and meaningful, and hear what else might be done. These strategies will not only help open communication channels, create teams, and foster trust among team members, but will also provide an opportunity for management to engage in authentic and transactional leadership practices. There are many resources for supporting team development available, for free, from several organizations.

Additional efforts could be made to implement or strengthen recognition programs. Research shows that perceiving the workplace as fair and feeling appreciated are factors in reducing the intention to leave [29]. If a recognition system already exists, evaluate how it is being used by managers and supervisors, including what barriers might prevent its use and what might encourage its use of the system. Depending on the barriers and staff feedback on the existing system, consider what a new recognition system might look like. There are many examples of innovative recognition systems ranging from formal recognition (e.g., certificate of recognition) to informal types of recognition (e.g., peer-recognition). In addition to being connected with organizational commitment, recognition and rewards in the workplace have been linked to staff resilience and improved mental health [40].

Secondly, given the importance of the link between organizational commitment and retention in the workplace, leaders need strategies that promote organizational commitment as early as the recruitment phase. Organizational commitment has been demonstrated to be a significant factor in ITL in that the higher the organizational commitment, including in healthcare work environments, the lower the level of ITL [5, 29]. In terms of fostering organizational commitment as early as recruitment, one approach to interviewing is values-based [41]. Values-based interviews focus on how and why an individual is oriented towards making certain choices in the workplace. Questions in the values-based approach seek to gain information about what is important to the applicant and assess if their values are appropriate for the role and organization.

5.6.4. Maintain and Expand upon Existing Practices That Support Staff. The findings highlighted several practices that should be reinforced and continued. Respondents were satisfied with orientation, onboarding, and professional development opportunities. These practices are essential in a healthy work environment, which supports recruitment and retention in the workplace. In addition to the connection with clients/patients, the "love" and "joy" staff reported to have received from providing care were evident and an overwhelming finding from the comments received.

Ongoing monitoring of the onboarding and orientation activities, inclusive of feedback from participants should be practiced to continually improve in these areas. In their literature review of research on job satisfaction, [42] note that "what makes a job satisfying or dissatisfying does not only depend on the nature of the job but also on the expectations that individuals have of what their job should provide" (p. 1018). Many of the studies examining ITL in healthcare incorporate self-report surveys, and employees consistently report that support from managers as well as opportunities for engagement and professional development contribute to job satisfaction. Professional development opportunities for all staff could be enhanced with special consideration for nursing and the unique skill set required by nursing in home and community care. An approach that takes into consideration the specific circumstances of home and community care is more likely to encourage retention in this sector [34].

Leaders can explore opportunities to learn more about what can be done to help employees find joy in home care and/or remove barriers so that they have improved work enjoyment. The Institute of Health Improvement, Framework for Improving Joy in Work, is a free resource that organizations can use to help guide leaders identify barriers to joy in the workplace and work with colleagues to create meaningful strategies. This suggestion is consistent with literature demonstrating that healthcare providers who feel

more engaged in their workplace, who have a sense of being part of a team, and who are provided opportunities for being "psychologically involved" in their work report lower ITL [39]. Seeking opportunities for a more positive work environment that emphasizes teamwork can contribute to job satisfaction and subsequent retention [43].

5.7. Limitations. There are several limitations to this study, including the use of a convenience sample, the cross-sectional design method, self-reporting, and the sample size. Future studies would benefit from a random sample, with multiple employers and additional measures. The self-reporting approach to data collection used in this study has the potential for response bias such as carelessness, social desirability, or acquiescence [44]. Furthermore, the study and analysis required a high response rate. Although there was good representation across each category of worker, more responses were desired from RNs and RPNs to help distinguish differences among the groups of workers. Therefore, generalization of the results is limited, and future research is needed with consideration for other research methods and larger sample sizes.

In addition, the survey was circulated and completed during the COVID-19 pandemic. Although limited comments were received related to the pandemic in the open-ended items, the impact of the pandemic on healthcare providers must be acknowledged as a potential limitation to the study. Results may be influenced by the ongoing stress of being an essential service, including but not limited to working short-staffed due to restrictions on multiple employers imposed by the government and the risk of transmissibility in the community.

6. Conclusion

This study has contributed to the existing literature by examining the unique factors that influence ITL among home care providers in three categories: registered practical nurses, registered nurses, and personal support workers. In assessing and comparing predictors of ITL (organizational commitment, job satisfaction, perceived supervisor support, burnout, role stress, work/family conflict, and community satisfaction) for 185 respondents, this study has led to several significant implications for possibilities to improve both recruitment and retention in home care.

The chief concern among all three categories of care providers was dissatisfaction with wages and salaries. Strategies aimed at wage parity across the healthcare sector and increased opportunities for compensation for home care workers should be encouraged to improve recruitment and retention. Another commonality among the categories was an expressed dedication to the clients, to the team, and to the job. However, inadequate pay and insufficient recognition of the unique circumstances of home care contributed to feelings of being underappreciated and dissatisfied. As such, scheduling practices should be revisited and improved to ensure fairness and respond to the specific concerns and needs of home care providers. Incorporating or enhancing opportunities for team cohesion, management and supervisor support, and staff recognition are also suggested for both recruitment and retention efforts. The implications of high rates of turnover in healthcare represent an ongoing concern and a growing issue, particularly in the face of an aging population and the lingering impacts of a global pandemic. This paper contributes to an understanding of ITL in home care and offers suggestions to improve recruitment and retention specific to the unique work environment of home care.

Data Availability

The data used to support the findings of this study are restricted. Participants of this study did not give written consent for their data to be shared publicly.

Additional Points

What Is Known about This Topic? (i) ITL is known to be a key predictor of turnover, influenced by organizational, personal, and community factors. (ii) The models of ITL have been studied on Registered Nurses but limited evidence is available assessing models with different workers. (iii) Home care faces unique challenges which may influence ITL and retention. *What This Paper Adds?* (i) Similarities and differences of predictors of ITL among Registered Nurses, Registered Practical Nurses, and Personal Support Workers working in home care are reported. (ii) Dissatisfaction with wages and salary was reported by the three categories, along with recognition of disparity across sectors. For some respondents, wage disparity contributes to the feeling that home care is undervalued and underappreciated. (iii) Unique considerations for home care workers related to retention include scheduling, continuity of clients assigned, travel time, concerns of mileage and related expenses, and safety with traveling and being in the community.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Review Article

Examining the Director of Nursing Role in Long-Term Care: An Integrative Review

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Aim. To identify and examine the structures and processes that support the director of nursing role in long-term care homes. *Background*. The director of nursing in long-term care homes is central to overseeing and supporting the workforce and delivery of safe, quality resident care. With ongoing health human resource challenges and an aging population requiring care from long-term care homes, it is important to understand what individual and organizational factors support the director of nursing leadership in these settings. *Evaluation*. This review was guided by Cooper's five stages of the integrative review process. Donabedian's structure-process-outcome framework was applied to synthesize the literature. *Key Issue(s)*. Five individual-level structures (years of experience, level of education, demonstrated leadership capabilities, completed certification and/or established linkages with a professional association, and completed continuing education); three organizational-level structures (physical presence of leadership across the organization, a clear job description, and salary); and four processes (nursing home administrators and the director of nursing relationship, availability of onsite continuing education opportunities targeting directors of nursing and support for continuing education, cultivating relationships and enhancing networks beyond the long-term care home, and orientation to the role) were identified across 11 articles to support the director of nursing role in long-term care homes. *Conclusion(s)*. The findings indicate that there are individual characteristics that support the director of nursing in their role. Notably, there are organizational structures and processes that can be modified at the practice and policy level to better recruit, retain, and support the performance of directors of nursing. *Implications for Nursing Management*. There are actionable steps that leaders and decision-makers can take to support nursing leadership across long-term care homes and directly address health human resource challenges.

1. Introduction

1.1. Background

1.1.1. The Long-Term Care Setting. Long-term care homes provide 24-hour health and personal care services to individuals with complex needs who do not require hospital level care but cannot be safely cared for in their own home [1]. Despite strict regulations within long-term care homes in North America, quality of care across homes remains an ongoing concern [2, 3]. The COVID-19 pandemic was an example of the shortcomings in long-term care homes globally creating an environment that is increasingly unpredictable, underresourced, and complex to lead [2, 4–8]. A public inquiry into the operations of the long-term care sector in Ontario, Canada, instigated by poor resident and family outcomes in the first wave of COVID-19, revealed a neglected system and called for immediate government attention and investment [2, 9, 10]; similar findings were also noted across long-term care homes in the United States [11] and Australia [12]. In European countries, factors contributing to the virus' spread in long-term care homes were

inadequate staff training, lack of personal protective equipment, poor surveillance testing for both staff and residents who are at increased risk by virtue of their underlying health conditions, and the congregate type setting [13]. Critical to the success of implementing many of the recommendations outlined in these reports is the director of nursing, who alongside the nursing home administrator and medical director, is a member of the senior interprofessional leadership team with direct responsibility for the nursing department [14].

1.1.2. The Director of Nursing Role. The director of nursing in long-term care homes is defined as a senior nurse leader who is responsible for planning, organizing, and directing nursing care in the nursing department. They are also a clinician expert, educator, collaborator, and advocate in the home and participate in quality improvement, emergency planning, risk management, regulation compliance, and advancing the health and safety of staff [3, 15].

Research demonstrates a link between the director of nursing role performance and staff satisfaction, retention, quality improvement, and overall performance in the home [16, 17]. Despite the reach and demonstrated importance of the role in the literature, there is a sustained history of long-term care homes experiencing vacancies or high turnover rates for this critical leadership position published in the literature that ranges from 24% to 147% a year [17, 18]. Factors influencing the director of nursing turnover include a disconnect between preferred and expected responsibilities [19], low satisfaction and low perception of autonomy/ participation in decision-making, and working in a for-profit home [20]. Lower levels of tenure were also noted amongst directors of nursing with higher levels of education and those working in for-profit chain homes, as compared to directors of nursing working in not-for-profit homes or in for-profit nonchain homes [21]. The consequences of high turnover rates of the director of nursing role result in a disruption to the team and negative impact on the quality of care to residents [17, 22–24].

The director of nursing role may not be mandated in long-term care homes internationally; rather, the specific regulations and requirements for this role can vary depending on the governing bodies in different countries and regions [8, 25]. However, in Ontario, Canada, and across the US, the director of nursing role is mandated within the long-term care homes with minimum qualifications (i.e., being a Registered Nurse (RN) with at least one year of experience working in the sector, three years of experience working in a managerial/ supervisory capacity in a healthcare setting, and demonstrated leadership and communication skills) with no expectation for continued education or formal leadership training [11, 14]. Two recent scoping reviews examined the characteristics of the nursing home administrator/director of nursing senior leadership role in long-term care homes and impact on quality outcomes [26, 27]. Both reviews found that the influence of the nursing home administrator/director of nursing role on quality is inadequately described in the literature, role preparedness in aged care is poorly defined and focused

primarily on the nursing home administrator role, and quality outcomes mostly relate to care and to a lesser extent as an outcome to the leader and organization. Despite the critical nature of the director of nursing role in long-term care homes, none of the included studies in these reviews focused on specifically examining the structures and processes of the director of nursing role as a unique role that differs from the nursing home administrator and influences work ethos and quality care. The current review will contribute to the growing body of the literature by examining international research in which the director of nursing is exclusively sampled and identifying modifiable structures at the organizational level and processes that may support their leadership role in long-term care homes.

2. Aim

The aim of this integrative review is to synthesize the literature related to the director of nursing role through the application of Donabedian's structure-process-outcome quality framework by addressing the research question: What are the structures and processes that support the role of the director of nursing in long-term care homes?

3. Methods

3.1. Design. An integrative review approach was employed, as it provides the opportunity to examine phenomenon broadly through the inclusion of both empirical and theoretical publications, which are common to nursing research [28, 29]. Cooper's five stages of the integrative review process were applied as follows: problem formulation, literature search, data evaluation, data analysis, and presentation [30].

3.1.1. Theoretical Framework. The theoretical framework underpinning the analysis for this review is Donabedian's structure-process-outcome quality framework [31, 32]. This framework is commonly utilized in research to examine factors influencing quality in healthcare such as program delivery, characteristics of leaders, and burnout amongst care providers [16, 33, 34]. The framework consists of three distinct components—structures, processes, and outcomes. Structures have been described as the physical and organizational setting where care is delivered; processes as the mechanisms and actions allow for healthcare delivery; and outcomes describe the result on individuals and/or communities [31, 32].

For the purposes of this review, we examined structures and processes, defined as characteristics of the individual and organization, and actions of individuals and organizational approaches that impact the director of nursing role, respectively. Outcomes stemming from their performance are outside the scope of this literature review.

3.2. Search Strategy. The review assessed electronically available papers that were published between January 2000 and February 2022. The search was limited to this timeframe because long-term care homes changed considerably in 2000, with an increase in resident frailty, integration of

technology, and workforce challenges that all impact the director of nursing role [2]. A university health science librarian assisted with the search strategy in five electronic databases: Medline, Embase, CINAHL, AgeLine, and Cochrane Database of Systematic Reviews. Table S1 in the online appendix describes the full-search strategy.

The inclusion criteria for studies were as follows: (a) focused on the role of the registered nurse in a director of nursing position within the long-term care home with oversight of the nursing department; (b) for qualitative studies or mixed methods studies, described a relationship or theme relating to a structure or process describing or influencing the role; (c) for quantitative studies, reported a relationship between the structure and process and an outcome measure directly related to the role; and (d) published in the English language. The exclusion criteria for studies were as follows: (a) settings that were not long-term care; (b) focused on other executive roles (e.g., administrator); and (c) other reviews, dissertations, conference proceedings, editorials, personal reflections, and commentaries. A snowball search of the reference lists from eligible studies was also completed; from this, 21 studies were identified. However, they were not included in the final review as they did not meet the eligibility criteria.

3.3. Data Screening, Extraction, Study Evaluation, and Analysis

3.3.1. Data Screening. Screening of papers took part in two stages using Covidence: at the title/abstract level and at the full-text level. During screening, JF and AW reviewed abstracts and full texts independently. KM and CC resolved any conflicts. After abstract screening, the primary researcher electronically contacted four authors directly to obtain five articles following the Dillman total design survey method [35]. The authors also utilized the university's interlibrary loan services which can access additional closed-access journals beyond the institution's library collection in an attempt to acquire the digital copies of the same five articles and one additional article. From these efforts, three articles were obtained: one from authors and one through interlibrary loan. The remaining four articles were not included as they were not available.

3.3.2. Data Extraction. Data were extracted from each article into a Microsoft Excel table. Study, setting, and sample characteristics are available in Table S3 in the online appendix. To ensure rigor in the data extraction process, JF and AW extracted data independently, and comparison and conflict resolution was performed by JF.

3.3.3. Data Evaluation/Quality Assessment. The quality of each individual study was appraised using the Mixed Methods Assessment Tool (MMAT) [36]. The MMAT tool was selected to be inclusive of all possible research designs. Each study was appraised independently by JF and AW against the corresponding criteria, and KM and CC resolved

any conflicts. All articles were retained to support a comprehensive review of the literature [36].

3.3.4. Data Analysis and Presentation. Data were analyzed by JF by reviewing each article and identifying subthemes that met the descriptions under each structure and process component of the framework. Structures were identified at the individual level to provide insight into characteristics of the director of nursing and at the organizational level to determine factors that were modifiable. The subthemes were then counted to determine the frequency in which they appeared in the literature and were categorized into larger themes as appropriate. The data were then analyzed by comparing commonalities, relationships, and differences to draw conclusions in the review [28, 29]. The results are presented in a PRISMA flow diagram in Figure 1 with tables and thematic narration detailed in Supplementary Materials.

4. Results

The initial search yielded 4,716 findings. Following the removal of duplicates, 2,905 papers proceeded to title/abstract screening. After full-text screening, 11 papers were included in this review. Figure 1 includes the PRISMA flow diagram which illustrates the search findings, and Table S2 in the online appendix demonstrates the impact of limiters.

4.1. Study Characteristics and Quality Assessment. Five of the 11 studies in this review were quantitative [24, 37–40], and six were qualitative [3, 15, 23, 41–43]. Study and setting characteristics are described in Table S3 in the online appendix.

4.1.1. Sample Characteristics. Sample sizes of the participants ranged from 4 to 247 across the 11 studies. The age of the director of Nursing was reported as a mean in five of the studies, with a mean range of 46–50 years of participant age [3, 15, 23, 37, 38]. The sex of the director of nursing was reported in three of the studies, with females representing 83% to 98.7% of the samples [3, 15, 38]. Educational preparation was reported in six of the studies, with participants holding predominantly a nursing diploma or an associated degree. Current tenure was reported as a mean of 4- 5 years across three studies [23, 24, 37].

Of the 11 studies, directors of nursing were sampled exclusively in three studies [23, 37, 38], and the remaining eight studies included directors of nursing and other personnel including unit managers, nursing home administrators, and staff nurses in their samples.

4.1.2. Quality Assessment. Results of the quality assessment are presented in Tables S4-S5 in the online appendix. The most common limitations were the use of convenience sampling ($n = 4$), small samples ($n = 2$), and low response rates ($n = 1$), which impacted generalizability of findings, and secondary analysis of data ($n = 3$) which limited researchers' ability to confirm interpretation.
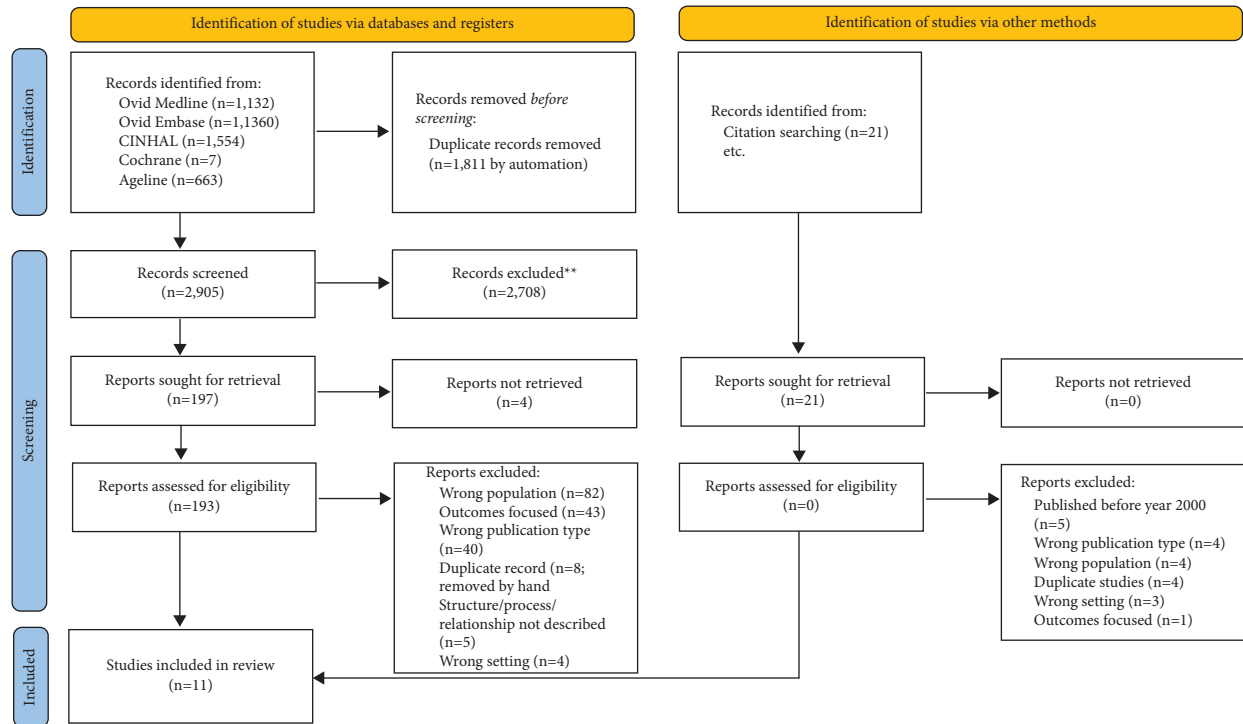
FIGURE 1: PRISMA illustration.

4.2. Structures Related to the Director of Nursing Role. Five structures were identified in the studies at the individual director of nursing level: years of experience ($n = 7$), level of education ($n = 5$), demonstrated leadership capabilities ($n = 4$), completed certification and/or established linkages with a professional association ($n = 2$), and completed continuing education ($n = 2$). Three structures were identified at the organizational level: physical presence of leadership across the organization ($n = 4$), job description that outlines the director of nursing's key responsibilities and expectations ($n = 3$), and salary ($n = 1$). Tables S6 and S7 in the appendix describe the structures.

4.2.1. Director of Nursing-Level Structures. Previous years of experience was shown to have the greatest effect on the director of nursing role and was the most reported structure across the studies ($n = 7$). This was reported in the form of years of experience as a registered nurse, as a director of nursing, and as a nurse leader/manager. The most commonly reported level of experience was experience as a director of nursing which was reported across six studies [15, 24, 37, 38, 40, 42]. The literature suggests that previous years of experience enhanced the director of nursing's knowledge and ability to lead in complex, unpredictable environments.

Level of education was the second most reported director of nursing structure across five studies [23, 24, 37, 41, 43]. The literature suggests that advanced education beyond a diploma or an associate degree strengthens the director of nursing's ability to strategically

plan finite resources and support the interprofessional care team based on advanced knowledge of scopes of practice [23, 43].

Demonstrated leadership capabilities were reported across four studies [3, 15, 39, 41]. Cruttenden [41] observed directors of nursing demonstrate compassion and care through their engagement and support of staff, their belief in ongoing learning, and their desire to be a role model. Siegel et al. [15] noted directors of nursing demonstrating commitment by working long hours to "make a good building" (pg. 220) and advancing their vision through negotiation and influence.

Completed additional licensing certification and/or established linkages with professional associations were reported in two studies [37, 41]. Aroian et al. [37] found directors of nursing that were licensed long-term care administrators scored higher on professional nursing and long-term care leadership than directors of nursing without licensing. In the study by Cruttenden [41], directors of nursing highlighted the importance of gerontological nursing knowledge and being visible in the community and establishing a collaborative insight to help with policy and managerial learning.

Similarly, completed continuing education that furthered professional development was also reported in two studies as helping to further develop competencies and connections [37, 42]. In the study by Aroian et al. [37], continuing education was found to be the most significant structure other than education preparation or experience to support the director of nursing performance.

4.2.2. Organizational-Level Structures. Physical presence of leadership across the organization was an organizational-level structure reported in four studies [15, 23, 38, 42]. This was expressed as the physical presence of leaders in critical roles such as the administrator, department heads, and consulting experts that collaborated with the director of nursing and provided expertise [15, 23, 38, 42].

A job description that outlines the director of nursing key responsibilities and expectations was noted in three studies to support the director of nursing [15, 23, 43]. The literature showed that despite the varied nature of the director of nursing role which, depending on the organization, focused more on either clinical or administrative duties [15, 23, 43], a clear job description made a difference to support the abilities of the director of nursing.

Finally, one study found that a higher salary was an organizational-level structure that impacted the director of nursing. Directors of nursing earning more than $60,000.00 USD were found to be more involved in organization development, professional nursing, and long-term care leadership than directors of nursing who earned less than $60,000.00 USD, who spent more time on resident care and care plans [37].

4.3. Processes Related to the Director of Nursing Role. Four processes were identified: nursing home administrator and director of nursing relationship ($n = 4$), availability of onsite continuing education opportunities targeting directors of nursing and support for continuing education ($n = 4$), cultivating relationships and enhancing networks beyond the long-term care home ($n = 3$), and orientation to the role ($n = 3$). Table S8 available in the online appendix describes process-related themes.

The nursing home administrator and director of nursing relationship was cited across four studies [3, 15, 23, 42]. A relationship built on trust, mutual respect, and collaboration was reported as integral to the director of nursing's ability to perform their role and their sense of autonomy [23]. This was described as the nursing home administrator supporting the director of nursing's continued training and professional development and engaging the director of nursing in decision-making that influences the long-term care home and organizational goals [23].

The availability of onsite continuing education opportunities targeting directors of nursing and support for continued education was a process factor found across four studies [37, 38, 41, 42]. These opportunities were described as onsite workshops, in-services, and meetings on a variety of clinical and nonclinical topics targeted for the director of nursing. Support for continued education was demonstrated through lessening barriers for participation, such as facilitating time away from responsibilities and providing financial reimbursement [37, 38, 41, 42].

Cultivating relationships and enhancing networks beyond the long-term care home setting was a process found across three studies [37, 41, 42]. This was described as a physical presence in the community, participation in meetings, and membership with associations to facilitate peer networks [37, 41]. Peers helped directors of nursing find resources in the community, addressed learning needs related to policies and human resources, and helped manage stress associated with the work environment, role responsibilities, and the regulatory process [37, 41].

Orientation to the director of nursing role was a process identified in three studies [23, 42, 43]. Furthermore, the experiences of directors of nursing that received support from parting directors of nursing, nursing home administrators, or associate directors of nursing were more successful in their transition and orientation to their role and in their overall performance than those without this support [23].

5. Discussion

To our knowledge, this is the first review to focus exclusively on the director of nursing, rather than as part of a subset of the sampled population with results describing the collective experiences of medical directors, nursing home administrators, and nonnursing leaders in long-term care. The literature examining the role of the director of nursing in long-term care describes a disconnect between the minimal qualifications required to perform the role and actual duties, responsibilities, and reach impacting their duration in the role. This review describes several modifiable structures at the organizational level and processes that may support the director of nursing in their role which can impact the high turnover of directors of nursing who are often in their roles for less than a year and those with higher levels of education leaving the role sooner [20, 21, 24, 37, 43]. For those who remain in the position longer, the literature shows that the first five years of the director of nursing role is critical. The identified structures and processes can be targeted within this timeframe to enable directors of nursing ability to effectively lead, positively influence job satisfaction, and remain in the role over time. For example, effective staff orientation during the director of nursing transitions has shown positive effects on their experiences in the role [23]. Skills and knowledge-based competencies including expertise in gerontology that increase directors of nursing confidence and enhance the effectiveness of the director of nursing leadership across long-term care homes can only develop over time.

The organizational-level structures that influence the director of nursing role were the physical presence of leaders across the organization in roles such as nursing home administrators and department directors, a clear job description that outlines roles and responsibilities, and salary. Research shows that the continual pull on the director of nursing role to take on roles and responsibilities outside of nursing may result in job dissatisfaction and further perpetuate laissez-faire or a transactional approach to leadership, with a focus on tasks and not on relationships [23, 24, 39, 43]. Hence, the presence and support of these nursing home administrators and other leaders serve as valuable support to help the director of nursing advance transformative change across the long-term care home. Additional research on the role of the director of nursing

within quality assurance and the interprofessional context, including but not limited to the role of the medical director and nurse practitioner, needs to be conducted.

Furthermore, a clear job description assists in determining education, training, certification, and competencies required for the role. It is clear from the literature that expectations of the director of nursing role vary between long-term care homes with some directors of nursing performing their roles focusing on clinical care and others focusing on staffing and responding to regulatory requirements which require leadership and managerial competencies [15, 43]. Future research is needed to determine which type of role leads to better staff and resident outcomes.

The nursing home administrator plays an integral role in the mentorship, coaching, and support of the director of nursing and the directors of nursing effectiveness in leading within the long-term care home. A strong relationship rooted in trust and respect is foundational to the director of nursing authority and decision-making ability. Fleming and Kayser-Jones [23] also recognize the power dynamics of the relationship, as the director of nursing is hired by and reports directly to the nursing home administrator, suggesting that not all directors of nursing may be comfortable with asking the nursing home administrator for support. Understanding the nuances of the nursing home administrator/director of nursing relationship and the impact this has on the director of nursing retention is another area for future research.

5.1. Strengths and Limitations. The review has several strengths. First, the search strategy included several databases and snowball searching of relevant articles. Second, the review was guided by expert researchers with advanced knowledge in the theoretical model, the integrative review process, and the long-term care home sector. A team approach was used throughout the integrative review process to enhance the quality of the review [44]. One limitation of the review is that our definition of the director of nursing required an RN to fulfill the position which is common practice in North America; however, this may have excluded articles focused on the director of nursing role held by another profession. The quality of the results is limited by the quality of the studies included, which includes a relatively small number of studies that were found to be relevant. Furthermore, not all authors reported findings equally for each of the sampled populations (e.g., nursing home administrator education was reported, but director of nursing education was not reported) [40]. Our search was also limited to electronically available peer-reviewed articles and did not include grey literature such as government reports or dissertations; as such, we may have missed examples of other supports that enhance the director of nursing performance in their role. Many of the included studies in this review had methodology weaknesses in their design, thus limiting generalizability of findings. Lastly, our review findings and implications are limited to the North American context.

6. Conclusions

The 11 articles synthesized in this integrative review present the structures and processes that support the director of nursing role in long-term care homes. The findings of this review have implications for leaders, decision-makers, practice experts, and researchers and identify specific structures and processes to focus interventions and innovations to support the director of nursing. Inadequate preparation, poor hiring practices, lack of orientation, unclear expectations, and increases in regulatory practices and stress as described across the studies can impact recruitment and retention of competent directors of nursing to the role, further perpetuating the human health resource crisis.

6.1. Implications for Nursing Management. There have been long-standing issues with the nursing leadership workforce in long-term care that have only worsened during the pandemic; this coupled with an increasing need for long-term care, concerns around quality, and a health human resource crisis made for a sector that is expected to deliver care to vulnerable populations while experiencing tremendous pressure. The director of nursing role within long-term care homes is critical to the overall operations impacting workforce stability and the delivery of quality care. Given the impact of this nursing leadership role, investment in the director of nursing role in the form of orientation, mentoring, and support for continued professional development is also an investment in the staff and the residents that call long-term care their home.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare no conflicts of interest.

Supplementary Materials

Table S1: search terms and search strategy for the electronic database. Table S2: overview of imported articles. Table S3: description of the included studies by study, setting, and sample characteristics ($N = 11$). Table S4: quality assessment of qualitative studies using MMAT ($N = 6$). Table S5: quality assessment of quantitative studies using MMAT ($N = 5$). Table S6: structure-related themes at the individual level. Table S7: structure-related themes at the organizational level. Table S8: process-related themes. (*Supplementary Materials*)

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Research Article

Experienced Nurses' Motivation, Intention to Leave, and Reasons for Turnover: A Qualitative Survey Study

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There is a global nurse shortage, and researchers have made great efforts in trying to unveil the reasons for turnover and how to increase retention. However, such research has had a tendency to study variables related to intention to leave (ITL) or turnover as isolated phenomena. *Objective*. To simultaneously explore what factors motivate experienced nurses in the workplace and the underlying reasons for strong ITL and high staff turnover within the profession. *Design*. An inductive qualitative content analysis was used based on data from open-ended survey questions. The data originated from the longitudinal analyses of nursing education/employment/entry (LANE) in work-life study. The qualitative data analyzed in this study were distributed in October 2017–January 2018, to all nurses in three cohorts corresponding to 11-, 13- and 15-year postgraduation. Of the 2,474 nurses answering the survey, 1,146 (46%) responded to one or more of the open-ended questions. *Results*. The result showed that what motivates experienced nurses, their intention to leave (ITL), and reasons for turnover could be described in the form of five broad categories, namely, organizational characteristics, work characteristics, relationships at work, work recognition, and health issues. There was rarely a one single reason described, rather several reasons needed to be experienced over time for nurses to stay motivated or leave the profession. *Conclusions*. There is no single reason that makes nurses leave the profession, nor is there one single reason that makes them motivated to stay. Retention and turnover are complex processes and need to be addressed as this, not as a single isolated phenomenon.

1. Introduction

Nursing is defined by autonomous as well as collaborative care with the aim of preventing illness and nursing sick, injured, disabled, or dying people of all ages. Moreover, nursing encompasses caring and advocating for families and loved ones, shaping healthcare policy, management, education, and research [1, 2]. Since the start of the COVID-19 pandemic in 2020, the vital role nurses play in society and healthcare systems worldwide has become more evident than ever before [3]. Today, nurses make up over half of all healthcare professionals and are often the first, and sometimes the only healthcare professional a patient will meet,

which further highlights the significance of nurses in the healthcare sector [4–6].

Nurses perform a plethora of tasks and care for people in a multitude of healthcare settings, often shouldering a high workload and working long hours [7]. During the last decade, increased staff turnover among nurses has led to a global needs-based shortage of nurses [6, 8]. Global efforts have been made to increase the number of nurses, including various local retention strategies [9, 10] and increasing the number of places in nursing programmes. Despite these efforts, the World Health Organization (WHO) forecasts a shortfall of almost 6 million nurses by the year of 2030 and emphasises the importance of retaining experienced nurses

in the workforce [6]. For some time now, researchers have made great efforts to try to understand the reasons why nurses leave the profession.

Studies looking at why nurses leave the profession often focus on intention to leave (ITL) or the underlying reasons for staff turnover [8, 11]. ITL is clearly a complex issue triggered by organisational factors, such as the work environment, leadership, staffing levels, and the state of working relationships [12, 13], as well as individual factors such as stress, burnout, and a sense that the work nurses perform is not valued [13, 14]. Earlier studies have revealed that turnover is driven by management style, highlighting a lack of good visible leaders, high workload, stress, disempowerment, and/or lack of autonomy [8, 15]. Previous research has shown that the final decision of nurses to leave the profession (turnover) is often proceeded by a lengthy period of consideration, or ITL [16]. It therefore seems unviable to study these variables independently.

One way to understand retention and/or turnover is Herzberg's two-factor theory, which relates job satisfaction/dissatisfaction to motivation [17]. According to the theory, there are two dimensions to job satisfaction: hygiene and motivation. Hygiene factors are essential to maintain a pleasant workplace, and their absence will lead to dissatisfaction; meanwhile, motivation factors can create satisfaction by fulfilling the employee's needs for personal growth and a sense of meaning [18]. In the context of nursing, hygiene factors include a manageable workload, sufficient staffing levels, and reasonable salary and benefits, while motivators include a diversity of tasks, stimulating responsibilities, and seeing patients recover [19, 20]. Although the two-factor theory has proved useful in exploring job satisfaction and retention in nursing, it has also been found that, when describing their motivators, nurses contradict the basic tenets of the theory [19]. This suggests that further research on motivation may be beneficial in terms of understanding retention.

Given the global shortage of nurses and the general high level of work-life stress in the nursing profession, there is every reason to increase our understanding of all aspects that influence nurses to remain in or leave the profession. Rather than seeking to understand motivation, ITL, or turnover as isolated phenomena, this study aims to simultaneously explore what factors motivate experienced nurses in the workplace and the underlying reasons for strong ITL and high staff turnover within the profession. This approach may help further understand both the turnover and retention of nurses.

2. Materials and Methods

The data used here originate from the longitudinal analysis of nursing education (LANE) study [21]. The LANE study is a prospective national study in which three Swedish national cohorts (2002, 2004, and 2006) of nurses were repeatedly surveyed early in their career, with a follow-up 11–15 years after graduation. The qualitative data analyzed in this study were collected through open-ended questions in a survey distributed between October 2017 and January 2018 to all nurses in the three cohorts, i.e., 11, 13, and 15 years after graduation.

2.1. Sample. Of the 2,474 nurses answering the survey, 1,146 (46%) responded to one or more open-ended questions and thus constituted the sample for this study.

2.2. Data Collection. Initially, all nursing students enrolled at the 26 Swedish universities offering nursing programmes graduating in the autumn of 2002, 2004, and 2006 were invited to participate in the LANE study. A total of 4,316 graduates consented to participate when invited, and 4,002 were still eligible for participation when the long-term follow-up (11–15 years after graduation) was conducted in 2017. The response rate at the long-term follow-up was 62% (2,474). Data used in this study were collected from three open-ended questions included in the long-term follow-up questionnaire. The three questions addressed (a) engagement and motivation, (b) ITL, and (c) reasons for leaving the profession. The open-ended questions and the number of answers in the form of written comments to each question are presented in Table 1. In total, 1,146 participants gave 1,542 answers to the questions (29 participants answered all three questions, 338 answered two questions, and 779 answered one question).

2.3. Data Analysis. The analysis process followed the inductive qualitative content analysis framework presented by Graneheim and Lundman [22]. The written comments to the three questions (Table 1) constituted the unit of analysis and were initially treated as three subject areas: professional work motivation, why nurses intend to leave, and why nurses have left the profession/turnover. All the written comments were scanned and digitally transferred to the data analysis program NVivo [23]. The primary responsibility for analysing different subject areas was shared among the researchers. CG and MSN analysed the text about motivation, while AH and AR analysed the text related to ITL and turnover, all following the analytical steps outlined below. In the first step, the written comments were read and meaning units—the relevant text for the purpose of the study—were identified. In the second step, the meaning units were coded. Coding involved labelling the meaning units with a descriptive word close to the original text [24]. In the third step, the codes were abstracted and sorted into subcategories. These three steps were followed by a comparison of the two research groups' preliminary results. The purpose of this comparison was to identify similarities and differences related to the three subject areas. During this process, the labelling and definition of five categories could be completed (Table 2). Finally, each category could be described based on what emerged in all three subject areas.

2.4. Ethical Considerations. Approval for the study was received from the Regional Research Ethics Committee at Karolinska Institutet, Stockholm, Sweden (ref. no. 01–045), and the Regional Ethics Review Board in Stockholm, Sweden

TABLE 1: The open-ended questions from the LANE survey and the number of answers in the form of written comments to each question (total number of comments 1,542).

Areas	Question in survey	Number of comments
Professional work motivation	"If you have something else you would like to say about yourself or the study, you are welcome to write it here. Of particular interest are your views and experiences regarding what factors do you consider to be crucial for being engaged and motivated in the work in the long-term?"	807
Intention to leave the profession	"If you are thinking about leaving the profession—please state why below." The open-ended question was preceded by three closed-ended questions on intention to leave the nursing profession including thoughts about leaving and leaving behaviour (i.e., 1. I think a lot about leaving the profession, 2. I am actively looking for another job outside the nursing profession, and 3. I will leave the nursing profession as soon as possible)	542
Exit: having left the profession	"If you have chosen to leave the profession as a nurse/specialist nurse/midwife/other specialization, - if possible, please state why below."	193

TABLE 2: Example of the analysis process and verbatim quotes to each subcategory.

	Meaning unit	Code	Subcategory	Category
Motivation	Having some say over daily working hours, duties and long-term shift arrangements is an important motivator	Ability to control working hours	Influence over working hours	Organization characteristics
ITL	The desire for a job that does not require that almost all off-duty time be used for recovery. A job without weekend or night shifts that allows me to spend weekends and holidays with my family and friends	Call for work that enables private and family life	Working hours affect private and family life	Organization characteristics
Turnover	I was no longer able to cope with constantly changing working hours and shifts, the sense that I never had time to get everything done, to do the job I was supposed to be doing	Unsustainable scheduling	Difficulty to combine work with private life	Organization characteristics
Motivation	That, as a nurse, you have the time and opportunity to develop knowledge and skills. A career ladder: which paths and opportunities are open to me? A good salary. Responsive managers that take matters seriously	Opportunities for professional development in nursing	Development and challenges	Work characteristics
ITL	Nursing is a demanding and responsible career that can be burdensome at times. Even at home, it can be difficult to stop thinking about work	Demanding and distressing work	Emotional and physically distressing work	Work characteristics
Turnover	There is no time to be the nurse I want to be. Sometimes I am completely drained after having responsibility for almost 50 patients	No chances to perform the care I believe in	No opportunity for nursing care	Work characteristics
Motivation	The most important factor for engendering commitment and motivation is a pleasant work climate: understanding and helpful colleagues, and a manager who is responsive, fair, sympathetic, humble and capable of leading the team	Pleasant work climate	Well-functioning team collaboration	Relationships at work
ITL	Does not enjoy the job because of the high workload and poor climate between colleagues, and between colleagues and management	Bad collegial climate	Lack of teamwork	Relationships at work
Turnover	I had no possibilities to influence my work situation and the work environment was too hierarchical	Hierarchies in healthcare	Hierarchical collegial structure	Relationships at work
Motivation	I consider appreciation of the work one does to be vital to wellbeing. The most important factor is an adequate salary. This is why I have worked as a travel nurse for the last two and a half years. This provides me with a good salary. I can influence my own working hours and I am appreciated at work every day	Good and fair salary	Fair salary	Recognition
ITL	In my current workplace, there is little possibility to affect my salary even if I continuously develop my competence and take on greater responsibility	Little opportunity to affect salary	No influence on the salary	Recognition
Turnover	The working hours and high workload cause ill health. I no longer wish to work for the regional health authority because of the poor pay and dreadful salary development	Poor pay and salary development	Not the right salary for the job performed	Recognition
Motivation	—	—	—	—
ITL	The stress of my job affects me physically. I don't want to become ill with stress. I would like to have a job without responsibility for other people's health. The responsibility is too great	Worries about the own health	Fear of developing health issues	Health issues
Turnover	Stress and the dreadful working conditions, with such weak leadership, made me ill [. . .]. I didn't see how I could ever be well as long as I remained in the profession	Didn't think I could stay and get well	Health negatively affected	Health issues

(ref. no. 04–587 and ref. no. 2016/793–32). All respondents in the study gave informed consent to participation. A cover letter emphasising the voluntary nature of participation and the option to terminate participation in the study at any time was attached to the survey, as was information on how to contact the research team. All participants gave informed consent.

3. Results and Discussion

Among the respondents, 1,035 (90%) were female, and the age distribution was as follows: 504 (44%) were younger than 39 years, 391 (34%) were aged 40–49 years, and 251 (22%) were older than 50 years. It had been between 11 and 15 years since they graduated from nursing education. In addition, 57% of the respondents had received specialist nurse education, and they worked across various sectors of the healthcare system, including inpatient care, outpatient care, home care, prehospital ambulance care, research, and management.

The result showed that what motivates experienced nurses, what sparks their ITL, and reasons for high turnover could be divided into five broad categories: organisational characteristics, work characteristics, relationships at work, work recognition, and health issues (Figure 1). The three subject areas motivation, ITL, and turnover are illustrated horizontally, and descriptions of the categories and subcategories within each of the three subject areas are illustrated vertically.

It was rare for a single motivator or underlying cause for ITL or turnover to be stated. Motivation often seemed to be linked to several accumulating factors. Similarly, a combination of reasons was often stated by nurses who either intended to leave or had already left the profession. Although the content of the categories interacts in the interests of clarity, the categories will be described separately. Verbatim quotes related to each subcategory can be found in Table 2.

3.1. Organisational characteristics

3.1.1. Motivation. Nurses were motivated when the organisation clearly defined roles, goals, and tasks. Another motivator was when management offered employees opportunities to influence routines and work schedules. This was particularly true of scheduling working hours, which enabled nurses to better plan their personal lives and achieve work-life balance, both between shifts and when not scheduled to work. A manager's ability to translate overarching organisational objectives into tangible and specific daily goals was also an important motivator. Those who could do this and reorganise work when workloads became excessive and ensure adequate staffing were described as responsible managers.

3.1.2. ITL. Organisational characteristics could also be found in data regarding why nurses often thought about leaving the profession. These included working hours, the difficulty of combining work with family or personal life, lack of time for recovery, and frustration with management and the organisation of work. The nurses also described a lack of organisational resources, including inadequate staffing levels. The results of the analysis also revealed that nurses who felt unable to influence their work often considered leaving the profession.

3.1.3. Turnover. Among the organisational characteristics referred to by the nurses who had left the profession were poor leadership, lack of influence, and inadequate staffing levels. These nurses described a lack of leadership and a lack of trust in their immediate manager, as well as discontent with constant reorganisation. Excessive administrative demands and a high nurse-to-patient ratio were described as draining. The decision to leave was also made due to demanding working hours that precluded a healthy work-life balance. More specifically, a schedule with too many short turnarounds with inadequate rest, too many shifts in a month, or excessive overtime were stated as the reasons for high staff turnover, as was a lack of foresight regarding holidays and scheduling that made it impossible to combine work with family life.

3.2. Work Characteristics

3.2.1. Motivation. Work characteristics described as motivational included being able to nurse based on a humanistic approach and in line with the nurse's own personal values. This was described as a matter of considering and protecting the patient's dignity and integrity throughout the care situation. Another motivational factor was being afforded a large measure of professional autonomy. Autonomy was described as the opposite of when tasks were controlled in detail by others. Nursing was also considered motivational when the nurse was able to take responsibility, both individually and as a member of a team, for achieving operational goals, developing nursing, and providing high-quality, evidence-based care. Continuing professional and personal development was also a motivator.

3.2.2. ITL. Nurses with intention to leave the profession also highlighted specific work characteristics. Several nurses described their duties as not being in line with nursing ethics and values. The issue of patient safety was raised, such as when managers and nurses had different thresholds for when patient care could be considered safe. They highlighted moral distress experienced when unable to meet the personal needs of patients and their loved ones by providing high-quality care. Work factors were described as emotionally and physically demanding; caring for the sick had begun to drain them. They also noted that the nature of their work left no opportunity for desired personal and professional development. Nurses described changing job or profession as one way of acquiring this sought-after development.

Subject area	Motivation	Intention to leave	Turnover
Category **Subcategories**	**Organisational characteristics** Clearly formulated goals and tasks Influence over working hours Flexibility in life (e.g., family) Responsive managers Adequate staffing	**Organisational characteristics** Working hours affect private and family life Frustration about organizational changes and the management Lack of sufficient organizational resources Little opportunity to influence work and working hours	**Organisational characteristics** Lack of leadership Too much administration Too high patient/nurse ratio Inconvenient working hours Lack of influence on working conditions Impossible to combine work with private life
Category **Subcategories**	**Work characteristics** Humanistic work approach Shared values Work content aligned to nursing ethics and values Personal responsibility Evidence based work Development and challenges	**Work characteristics** Not shared values about patient safety and care Emotional and physically distressing work Tired of the sick Sees no professional development Looking for new personal challenges	**Work characteristics** Emotionally and socially distressing work No opportunity for nursing care Unused competence Lack of professional development Looking for personal development
Category **Subcategories**	**Relationships at work** Well-functioning team collaboration Qualified, competent and supportive colleagues Humor at the workplace Safe collegial climate Being part of a work community	**Relationships at work** Frustration with colleagues Lack of teamwork	**Relationships at work** Hierarchical collegial structure
Category **Subcategories**	**Recognition** Fair salary Salary development in relation to competence and responsibility Societal recognition Respectful feedback from manager, colleagues and patients	**Recognition** Unfair salary in relation to working hours, work performed and education No influence on the salary Unsatisfactory salary development The profession is not recognized	**Recognition** Not the right salary for the job performed No salary development Lack of recognition from managers
Category **Subcategories**		**Health issues** Deteriorating health Emotionally exhausted Insomnia Fear of developing health issues	**Health issues** Developed a work-related illness Health negatively affected

Figure 1: Illustration of the result including subject areas (horizontal), categories, and subcategories (vertical).

3.2.3. Turnover. Nurses who had left the profession described the job as unsustainable by nature due to the weight of emotional and ethical distress. They also stated that there was too little focus on patient safety and providing high-quality nursing care. One major reason for turnover was the perception that caring had "disappeared" from nursing, their competence as nurses was not being utilised, and they were therefore unable to provide patients with high-quality care. Nurses who had left the profession also stated that there was little opportunity for professional development and that they wanted to develop both personally and professionally.

3.3. Relationships at Work

3.3.1. Motivation. Good relationships and well-functioning teamwork among competent, qualified, and supportive colleagues were stated as important motivational factors. A supportive, collegial climate was also described as facilitating continuous learning and development and thus as particularly motivational. The important qualities in a relationship included being able to express one's thoughts, feelings, and opinions freely and to share laughter with colleagues even when work was stressful or emotionally taxing. A safe, tolerant, and inclusive collegial climate that provided a sense of belonging was also a motivation. It was also considered

important that equality should be an accepted part of the work community.

3.3.2. ITL. Frustration with collegial relationships was mentioned as one reason why nurses often thought about leaving the nursing profession. That said, these comments consisted of short statements that lacked further detailed information. Although brief, many comments concerned a lack of teamwork and a lack of trust and collaboration with the colleagues closest to the respondents.

3.3.3. Turnover. Nurses who had left the profession mentioned the professional hierarchy as a reason. One cause of hierarchical tension was when the nurse believed that they were considered to be doing no more than following orders given by doctors.

3.4. Recognition

3.4.1. Motivation. Recognition is clearly important for sustaining motivation at work, including in terms of being paid a reasonable living wage. The factors that nurses included in the definition of a reasonable wage included individual salary setting, as well as the profession's salary level. It was considered motivating when the salary was set fairly

taking into account individual performance and hard work, unsociable working hours, competence, and training. Remuneration for additional responsibilities or developing work on the ward was perceived as having a motivational effect. Moreover, a salary commensurate with the important societal function of the nursing profession was seen as important to sustaining motivation. It was also considered motivational when, in addition to any personal recognition nurses might receive, the significance of nursing as a profession was acknowledged at governmental and societal levels. For example, nurses described themselves as motivated when political decisions concerning the organisation of healthcare including the nursing perspective, or when the mass media covered the work of nurses in an insightful way. Recognition at a personal level was described in terms of nurses being treated with respect, receiving positive feedback, and feeling appreciated by patients, colleagues, or management.

3.4.2. ITL. One frequently stated reason why nurses often thought about leaving the profession was a lack of recognition, particularly in terms of salary. Salary was described as unfair in relation to the workload, commitment, unsociable working hours, and short shift turnaround. Furthermore, when the salary was not perceived as compensating for the price nurses pay in terms of their family and personal life, they began to consider leaving the profession. There were descriptions of salaries not rising despite efforts such as further education, taking on extra assignments, or showing commitment. Aside from salary, lack of recognition from colleagues, patients, managers, and society was also mentioned as the reason to consider leaving the profession.

3.4.3. Turnover. In terms of recognition, the nurses who had left the profession did name the lack of a fair salary, salary development, or recognition from managers as a reason for leaving the profession.

3.5. Health Issues. The fifth category, health issues, was represented in two of the subject areas (ITL and turnover).

3.5.1. ITL. Common reasons behind ITL were deteriorating health, emotional exhaustion, and/or insomnia. Some nurses who often thought about leaving stated that, although their health had not yet been affected, they were afraid that their health would suffer if they continued working in nursing.

3.5.2. Turnover. Stress, insomnia, and fatigue were described as contributing factors to deteriorating health and a reason for leaving. From some of the comments, it was clear that, while the nurses themselves did not want to leave the profession, they felt that this was the only way to take control of their health and sustain a personal life.

4. Discussion

To the best of our knowledge, this is the first study to simultaneously explore motivation, ITL, and turnover in the context of nursing. The current view of staff turnover in nursing is that it is the result of a negative spiral that ultimately ends with nurses abandoning the profession [25], hence Selberg and Mulinari's [25] concept of turnover contagion; one nurse's decision to leave a failing clinic prompts other nurses to follow suit. In other words, "quitting leads to quitting" (p.96). By addressing all four areas in which, according to the result of this study, there seems to be an interrelation between motivation, ITL, and turnover, we may be able to not only halt a negative spiral but also increase motivation and, in the long term, wellbeing in the workplace.

Taken together, the five categories—organisational characteristics, work characteristics, relationships at work, recognition, and health issues—are crucial for sustaining motivation and avoiding staff turnover. This study reveals that while organisational characteristics can be highly motivating, they can also be the underlying causes of ITL and staff turnover. Judging by the result of this study, organisational characteristics can motivate nurses even when involving a high level of responsibility and challenge; however, this is highly dependent on management and leadership. This is in line with the previous research showing that nursing leadership plays a vital role in creating healthy work environments and manageable workloads [12, 26, 27]. Nurses in leadership positions also play an important role in ensuring that their fellow nurses have control over their work and shifts and have sufficient time for recovery [28, 29], as well as authorising work schedules that take account of the individual nurse's life situation [26, 30]. The organisational characteristics category clearly showed the underlying problems in terms of affording nurses the possibility to influence their own work and working hours and to recover between shifts. Furthermore, the result of this study clearly shows that nurses that are unable to achieve a healthy work-life balance find it difficult to sustain motivation and remain in the profession.

In the category work characteristics, nurses stated that meeting and caring for patients were highly motivational, thus revealing a true passion for the profession of nursing. Even among those who intended to leave or had left, there was clearly a strong wish to continue nursing; however, according to their accounts, the situation made it impossible to provide care in a manner consistent with their professional values. Also, in the category of work characteristics, nurses who had left the profession gave emotional distress as one of the reasons for doing so. Nursing is clearly demanding work, and the negative impact of emotional stress on the wellbeing of nurses has been thrown into stark relief by the COVID-19 pandemic [3, 5]. It could be argued that the stress that nurses experience is inherent to the profession, given the highly unpredictable nature of the job and the unsociable working hours nurses must work in order to provide healthcare around the clock. To make such demanding work characteristics motivational, and so that nurses can thrive in their jobs, the emphasis should be on providing adequate resources and individual control over their work [31]. Toode et al. [30] underline that even a more intense workload may be motivating when it leads to an

increased sense of professional accomplishment, career opportunities, or professional development. This reasoning is in line with the findings of another Swedish study conducted by Gadolin et al. [32], which showed that when nurses perceived that their contribution was valued and their wellbeing was being safeguarded, they could focus on their main task of providing care.

Furthermore, Gadolin's results [32] reveal the importance of validating nurses' sense of competency and utilising their competence in the role of nurse. The results of our study also show that when nurses perceived their nursing competence to be valued and appropriately utilised by the organisation, it positively influenced their working experience. One core characteristic of nursing has been said to be that of "caring about" patients and their loved ones by providing psychosocial support, compassion, and sympathy [33]. At the same time, paradoxically and partly contrary to these earlier studies, our study shows that nurses did not feel that their competence was being fully utilised; in other words, there is a discrepancy between what nurses have the ability to do and what they were permitted to do. It has been argued that the lingering and obsolete traditionalist view of nurses as being merely the physician's assistant continues to play down and negatively affect the expertise of nursing practice [34]. In the relationships at work category of this study, these views were described in terms of hierarchical collegial relationships and as one reason for turnover. More and more noncaring tasks, such as cleaning and administration, have also been described as stealing valuable time away from caring [33]. Incongruity between the nurse's professional values and competence and tasks they are expected to perform may leave them caught in-between and faced with ethical dilemmas [35].

The category relationships at work also highlight how important relationships in the workplace and being able to rely on the competence of colleagues are to motivation and remaining in the profession. Management in workplaces perceived as healthy organisations is described as creating a culture of openness, respect, fairness, and justice [36]. Coomber and Louise Barriball [37] describe poor relationships with colleagues as one of the most significant factors behind work-related stress, leading to ITL and turnover. The social aspects of the workplace, such as being able to share and discuss opinions and concerns about patient care with colleagues, have been found to be associated with empowerment, thus reducing the likelihood of nurses leaving the profession [12]. Furthermore, good collaboration, social support, and positive team spirit on a ward where nurses are treated as equally valued healthcare professionals has been highlighted as important motivators [30]. Although interpersonal relationships are presented as hygiene factors in Hertzberg's two-factor theory [18], the result of our study, in line with prior research [19, 30], concludes that nurses describe good collegial relationships as motivational factors that contribute to job satisfaction and motivation for retention. Gadolin et al. [32] recently demonstrated that sound relationships with colleagues are vital if nurses are to feel supported by the organisation,

which in turn is associated with a variety of favourable outcomes such as greater commitment and improved wellbeing [38]. It is also a prerequisite if quality improvement work in healthcare is to succeed [39]. So, the results of this study support previous studies in underlining the importance of collegiality in healthcare.

The results of the present study further highlight the importance of recognition to the work of nurses, and this was emphasised in all subject areas. One of the key aspects of recognition is a fair and adequate salary, and the study shows that nurses' salaries are frequently perceived as both unfair and inadequate. According to the findings in the review by Coomber and Louise Barriball [37], one often-stated concern regarding nurses' salaries was the perceived inequity of pay given the high level of knowledge, responsibility, and workload compared to "less qualified professions." Experienced nurses also felt that their level of experience was not recognised as important [37]. Recognition of such factors, or lack thereof, in a nurse's pay packet can either be a motivator or lead to ITL and staff turnover. Again, the result of this study contrasts Hertzberg's two-factor theory [18] as salary and monetary compensation are hygiene factors. The result of the present study indicates that recognition in terms of a fair salary can be motivation factors as it signals that nurses are recognized as important. That said, it is important to emphasise that, in line with prior research, this study demonstrates that while salary was often stated as one reason for ITL or leaving the profession, it was rarely the sole source of discontent; nurses also demanded other forms of recognition [12].

Although health issues were only raised in two subject areas, they were described as a major obstacle to remain in the profession, prompting ITL and departures. This confirms the results of an earlier quantitative study showing that early-career burnout left nurses feeling disengaged and exhausted at work, leading to higher [14] and escalating levels of intention to leave the profession [40]. Moreover, there were increasing symptoms of burnout, while undergraduates predicted nurses' ITL and turnover after graduation [41]. Interestingly, this qualitative study based on nurses' own words raises similar issues regarding fear of or actual deteriorating health. It is clear that, while health was not considered a motivational factor at work, the deleterious effects of the job on health were considered too high a price to pay for remaining in the profession. Hence, employers taking preventive measures that detect the early signs of burnout in order to reduce staff turnover is important.

4.1. Limitations. Among respondents who stated that they had left the nursing profession, some had moved on to other roles in healthcare such as university teachers, ward managers, or working with healthcare development. As these are vocations in which Sweden clearly needs nursing competence, one must question why these nursing graduates felt that they had left the profession. Further research is needed to investigate whether nurses themselves see a distinction between leaving the profession and carving out a career elsewhere in healthcare, such as in academia or

management: is remaining "in the profession" solely associated with clinical practice?

In this study, data quality did not allow for coding of the "underlying" meaning (i.e., it was not considered possible to derive any themes). Therefore, the analysis resulted in a descriptive manifest level of the data [24]. The quality of data varied from concise answers to more expansive descriptions. At times, it was problematic to separate mutually exclusive categories, and the right level of abstraction was sometimes hard to determine. This was partly due to the interconnectedness of content, i.e., descriptions of a series of events that all affected one another. For example, working in a context in which it feels possible to provide high-quality care to patients is a prerequisite for feeling both that one is working effectively and that one is supported by the organisation, and various organisational aspects might explain why nurses felt that they had no time for recovery.

Being aware of potential errors in the coding process, the authors checked and discussed coding precision during the analysis. As the units of analysis provided insight into experiences of work motivation, ITL, and departures from the nursing profession without direct interaction between the researchers and informants, interviewer bias could be avoided [42]. One obvious limitation was the lack of opportunity to ask follow-up questions to deepen contextual understanding. Another disadvantage was the absence of information from nurses who did not answer the open-ended questions. That said, postal surveys can be assumed to exert minimum pressure on respondents to give 'socially acceptable' responses. So, it may have been easier for some groups to respond—for example, those with critical opinions, those who are more reticent or nurses on sick leave—and harder for others, such as nurses with reading and writing difficulties. The strength of the study was the large national sample with a wide range of experience gained in many parts of the healthcare sector, which improved the prospects of shedding light on a range of experiences relating to work motivation and turnover. The transferability of results is restricted by the fact that this is a "self-selected" subsample within the LANE study. However, by representing a subsample of the larger national LANE study, the context of the sample was well defined [21] and represents 46% of the nurses in the LANE study cohorts.

5. Conclusions

Although motivation, intention to leave the profession, and turnover are complex phenomena influenced by multiple factors, by exploring them together, it was possible to identify important clues as to how the profession might retain more experienced nurses. Based on the results of this study, we conclude that ensuring that nurses have a manageable workload, that they have autonomy, that their competence is utilised, and that they enjoy adequate support from management will go some way to addressing the forecast shortage of nurses, by promoting the wellbeing of and motivating experienced nurses and decreasing staff turnover. Furthermore, according to nurses with over ten years of professional practice, a sustainable working life is

dependent on collegiality, being able to work in competent teams, and being afforded multiple career opportunities. When deciding whether to remain in or leave the profession, recognition of the demands of the profession and individual knowledge and skills in the form of a fair and reasonable salary are considered key factors. The result of this study also indicates that what may be considered hygiene factors in some contexts may function as motivation factors in nursing. Finally, the study makes clear that an organisation must be alert to and able to address the early signs of work-related ill health in its employees if it is to mitigate ITL and staff turnover.

Data Availability

Data obtained for the study will not be accessible to others due to survey respondents being assured raw data would remain confidential.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

Acknowledgments

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Research Article

Exploring the Associations between Chronotype, Night Shift Work Schedule, Quality of Work Life, and Sleep Quality among Maternal and Child Health Nurses: A Multicentre Cross-Sectional Study

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Aim. To examine the state of sleep quality among maternal and child health (MCH) nurses and explore the associations between chronotype, night shift work schedule, quality of work life, and sleep quality among MCH nurses. *Background*. MCH nurses, who play an important role in protecting the health of women and children, often experience poor sleep quality. However, research on the sleep quality of MCH nurses has been scarce following implementation of the three-child policy in China. *Methods*. A multicentre cross-sectional study was conducted with 1426 MCH nurses. Data were collected using a demographic questionnaire, participants' self-reported chronotype, the Pittsburgh Sleep Quality Index, and the Work-Related Quality of Life-2 scale. A chi-squared test, independent samples *t*-test, Pearson correlation test, and binary logistic regression analysis were used to analyse the data. *Results*. Of the 1426 respondents, 57.9% reported poor sleep quality. Binary logistic regression analysis indicated that chronotype, including intermediate-morning, intermediate-evening, and evening (reference: morning), and quality of work life, including stress at work, control at work, and general well-being, had effects on sleep quality among MCH nurses. Older age, frequent caffeine intake, and irregular meals were also associated with poor sleep quality. However, night shift work schedule did not affect sleep quality in the adjusted model. *Conclusions*. Poor sleep quality was common among MCH nurses. The findings of this study also illustrate that chronotype and quality of work life are closely related to sleep quality. *Implications for Nursing Management*. Nursing managers should be aware of MCH nurses' chronotype and quality of work life and tailor interventions to address both modifiable and nonmodifiable factors associated with sleep to improve MCH nurses' sleep quality.

1. Background

The health of women and children is an important global concern and an indicator of people's health on a national level [1]. According to the People's Republic of China's National Health Commission, in 2022, China's maternal mortality ratio had dropped to 15.7 deaths per 100,000 people, while infant mortality had dropped to 4.9 deaths per 1000 people [2], owing to the efforts of maternal and child health (MCH) workers [3]. As the largest professional group

of MCH workers, MCH nurses play a vital role in safeguarding the health of women and children. Women and children are generally considered a vulnerable population. Physically, women require specialised care because of pregnancy and the possibility of gynaecological disorders [1]. Children require extra care and attention because they are immature and less able than adults to adapt to their surroundings [4]. Psychologically, women and children are susceptible to social and family pressures and have complex psychological needs that require care and comfort [5, 6].

Therefore, MCH nurses need compassion, concentration, and expertise in their work to meet the needs of these special groups and provide the best possible nursing care. Furthermore, children are prone to emergencies at night due to their young age and frailty [7], and nighttime births are highly likely [8]; therefore, MCH nurses need to be alert and provide constant observation and care during night shifts. The nighttime environment and work intensity can negatively affect MCH nurses' sleep quality. Furthermore, China's "three-child" policy has led to increasing rates of pregnancies in women of advanced reproductive age or repeated caesarean deliveries [9], exacerbating the shortage of MCH nurses. Based on these conditions, MCH nurses in China may bear the burden of increased workloads, resulting in poor sleep quality. Therefore, nursing managers should pay close attention to this issue.

Sleep quality is a crucial health indicator, reflecting self-perceived levels of satisfaction with sleep [10]. However, people are increasingly reporting complaints of poor sleep quality and its negative impact on daytime functioning [11]. Poor sleep poses numerous risks to individual health, including cognitive impairment, chronic fatigue, metabolic syndrome, cardiovascular disease, and hormonal disease [12–14]. Poor sleep has become a widespread issue among medical staff. Over half of nurses and midwives have reported severe or very severe daytime dysfunction [15]. Moreover, research has shown that between 32.18 and 64.5% of MCH nurses experience poor sleep [16–18], which is associated with increased rates of burnout (59.71%) and health-risk stress (54.3%) [19, 20]. Furthermore, poor sleep can affect the of MCH nurses' professional performance and increase their risk of errors and accidents, which can cause patients to feel frustrated and uncomfortable [21, 22]. Higher staff turnover caused by sleep problems negatively affects the functioning of MCH hospitals, which can directly and indirectly affect the health of women and children. In addition, research shows that sleep quality is closely associated with physical, psychological, environmental, occupational, social, and behavioural factors [23, 24]. Dissonance between an individual's chronotype and shift work schedules may be the mechanism responsible for poor sleep. Quality of work life may also affect the occurrence of sleep issues because it is a multidimensional definition that reflects well-being and quality of life in the workplace. Work-related factors, such as shift work schedules, are arranged by nursing administrative staff and deserve further exploration. Previous research has also noted the impact of work schedules involving 16-hour night shifts, 12.5-hour night shifts, and three-shift rotations on sleep quality in Japan [25]. However, the prevalence of poor sleep among MCH nurses remains unclear. No extensive research has been conducted on whether chronotype, night shift work schedule, and quality of work life affect sleep quality. In response to these gaps in the literature, this study aimed to investigate the associations between chronotype, night shift work schedule, and quality of work life with sleep quality among MCH nurses.

2. Materials and Methods

2.1. Setting and Sampling. This study used a cross-sectional survey and followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. The sample size was estimated using the single population proportion formula: $N = (Z\alpha/2)^2 \times p(1-p)/d^2$. According to a meta-analysis, the prevalence of poor sleep among Chinese nurses is 49.9% [26]. Given this criterion ($\alpha = 0.05$; $d = 0.03$), 1068 participants were required. We ultimately decided on a minimum sample size of 1187 after considering a 10% nonresponse rate. The following inclusion criteria were used: MCH nurses who have (a) obtained professional qualification certificates and (b) agreed to participate in the study. The exclusion criteria were as follows: (a) retired nurses, refresher nurses, and student nurses; (b) less than 6 months of work experience; and (c) missing more than one month of work due to illness, marriage, maternity, or other personal matters. Cluster sampling was used to recruit the study participants. Based on the annual reported number of nurses in the province, four MCH hospitals were required to meet the sample size requirements. First, convenience sampling was used to select four MCH hospitals in Fujian province. Second, all MCH nurses working at those hospitals who met the inclusion and exclusion criteria were recruited for the study between December 2022 and January 2023.

2.2. Measures

2.2.1. Demographic Questionnaire. A demographic questionnaire was designed by the researchers based on a literature review. Personal variables included age, height, weight, sex, educational level, marital status, number of children, duration of mobile phone use before bedtime, frequency of irregular meals, frequency of caffeine intake, frequency of sugar intake, and physical activity. Physical activity was assessed using the short version of the International Physical Activity Questionnaire (IPAQ-SF). The Chinese version of the IPAQ-SF has been validated among Chinese university students [27] and measures the intensity, frequency, and duration of physical activity over the last seven days. According to the guidelines for data processing and analysis of the IPAQ [28], participants' physical activity levels were categorized into three groups: low, moderate, and high.

Work-related variables included personal monthly income, department, professional rank, employment type, and night shift work schedule. Participants' night shift work schedules were classified as non-night shift, forward-rotating night shift (i.e., evening shift between 16:00 and 24:00 h and night shift between 00:00 and 08:00 h the next day), backward-rotating night shift (i.e., night shift between 00:00 and 08:00 h and evening shift between 16:00 and 24:00 h the next day), and 12-hour rotating night shift (i.e., night shift between 20:00 and 08:00 h).

2.2.2. Self-Reported Chronotype. Chronotype reflects an individual's preferred time of day for an activity/rest cycle. Chronotypes were assessed using a subjective question

asking participants to self-classify themselves by chronotype. Individuals were classified according to the following chronotypes: morning ("definitely morning person"), intermediate-morning ("more a morning than an evening person"), intermediate-evening ("more an evening than a morning person"), and evening ("definitely evening"). Self-reported chronotypes have been validated using self-reported sleep-wake times [29].

2.2.3. The Pittsburgh Sleep Quality Index (PSQI). The PSQI is a 19-item self-report instrument that measures sleep quality during the last month [30]. The PSQI consists of seven components: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbance, sleep medication, and daytime dysfunction. Each component included one or more items scored on a scale ranging between 0 and 3 points, where 0 indicated "normal", 1 indicated "mild dysfunction", 2 indicated "moderate dysfunction", and 3 indicated "severe dysfunction". The scores of the seven components were summed to obtain a global score ranging between 0 and 21, with higher scores indicating poorer sleep quality. The Chinese version of the PSQI demonstrates good overall reliability ($r = 0.82$–0.83) and test-retest reliability ($r = 0.77$–0.85) [31]. In addition, a cutoff point of seven could effectively differentiate between good and poor sleep quality in the Chinese population [32]. Therefore, the poor sleep group was defined as participants with a PSQI total score >7, while the good sleep group was defined as participants with a PSQI total score ≤7. In this study, Cronbach's α coefficient for this scale was 0.752.

2.2.4. The Work-Related Quality of Life-2 Scale (WRQOL-2). The WRQOL-2 is a 34-item instrument used to assess quality of working life and was developed by Van Laar et al. and translated into Chinese and modified by Shao et al. [33, 34]. The WRQOL-2 measures seven dimensions: working conditions (WCS), stress at work (SAW), control at work (CAW), home-work interface (HWI), employment evaluation of nurses (EEN), general well-being (GWB), and job and career satisfaction (JCS). Respondents indicated their level of agreement for each dimension on a five-point scale. Furthermore, a reverse scoring method is employed for the SAW dimension. Higher scores signified a higher quality of nursing work life. The Chinese version has demonstrated good psychometric properties, with previous research reporting Cronbach's α coefficients of 0.939 for the total scale and between 0.652 and 0.859 for each dimension [33]. In this study, Cronbach's α coefficient was 0.960 for the total scale and ranged between 0.744 and 0.931 for each dimension.

2.3. Data Collection. Permission was obtained from the nursing department directors at each of the four hospitals prior to the study. The researchers conducted a uniform training session for the four investigators from the sample hospitals and presented the study protocol. Data were collected via WenJuanXing (a professional questionnaire survey platform). After obtaining informed consent from the participants, the investigators explained the method for completing the questionnaires to the participants using questionnaire guidance language. The participants were guaranteed anonymity and confidentiality and could withdraw freely from the study at any time and for any reason.

2.4. Statistical Analyses. IBM SPSS version 27.0 was used for all data analyses, and GraphPad Prism version 9.0 was used to prepare the graphs. All the data were found to be approximately normally distributed. Continuous variables were presented as mean ± standard deviation (M±SD), and categorical variables were presented as frequencies and percentages. A chi-square test and independent samples t-test were used to identify statistically significant differences in demographic characteristics, night shift work schedule, chronotype, and quality of work life scores between the good sleep and poor sleep groups. Pearson's correlation test was used to examine the correlation between quality of work life and sleep quality. A binary logistic regression analysis model was used to calculate odds ratios (ORs) and 95% confidence intervals (95% CIs) for poor sleep quality (PSQI > 7), which was adjusted for potential confounding variables (univariate correlates: age, educational level, duration of mobile phone use before bedtime, frequency of irregular meals, frequency of caffeine intake, personal monthly income, department, professional rank, and employment type). The model was verified using the Hosmer–Lemeshow goodness-of-fit test. All tests were two-sided, and a P value <0.05 was considered statistically significant.

2.5. Ethical Considerations. This study was approved by the Ethics Committee of the main researcher's hospital (No. 2022YJ071). All participants took part in the study voluntarily and could withdraw at any time. All methods in this study were performed according to the relevant guidelines and regulations.

3. Results

3.1. Participant Characteristics. Among the 1510 questionnaires, 1426 valid questionnaires were obtained after removing those with apparent logical errors, representing an effective response rate of 94.4%. The mean participant age was 30.20 (SD = 7.60), ranging between 20 and 60 years. Participants' average BMI was 20.95 (SD = 2.70) kg/m^2. Most participants were female ($n = 1401$, 98.2%), married ($n = 766$, 53.7%), graduated from junior college ($n = 754$, 52.9%), had no children ($n = 725$, 50.8%), used their mobile phones for 1–3 hours before bedtime ($n = 753$, 52.8%), had irregular meals 1-2 times/week ($n = 821$, 57.6%), had a caffeine intake frequency of 3–5 times/week ($n = 787$, 55.2%), had a sugar intake frequency of 3–5 times/week ($n = 972$, 68.2%), engaged in a moderate level of physical activity ($n = 634$, 44.5%), were senior nurses ($n = 604$, 42.4%), and worked as contract employees ($n = 952$, 66.8%; Table 1).

TABLE 1: Demographic characteristics of participants ($n = 1426$).

Variables	N (%)/$M \pm$ SD			t/x^2	p
	Overall ($n = 1426$)	Good sleep ($n = 600$)	Poor sleep ($n = 826$)		
Age (years)	30.20 ± 7.60	29.66 ± 7.71	30.59 ± 7.50	-2.266	**0.024**
Body mass index (kg/m^2)	20.95 ± 2.70	21.03 ± 2.75	20.89 ± 2.67	0.941	0.347
Sex				3.354	0.067
Female	1401 (98.2)	585 (97.5)	816 (98.8)		
Male	25 (1.8)	15 (2.5)	10 (1.2)		
Educational level				6.152	**0.046**
Technical secondary school degree	76 (5.3)	37 (6.2)	39 (4.7)		
Junior college degree	754 (52.9)	334 (55.7)	420 (50.8)		
Bachelor degree and above	596 (41.8)	229 (38.2)	367 (44.4)		
Marital status				0.214	0.644
Unmarried	660 (46.3)	282 (47.0)	378 (45.8)		
Married	766 (53.7)	318 (53.0)	448 (54.2)		
Number of children				0.017	0.992
0	725 (50.8)	304 (50.7)	421 (51.0)		
1	387 (27.1)	163 (27.2)	224 (27.1)		
≥2	314 (22.0)	133 (22.2)	181 (21.9)		
Duration of mobile phone use before bedtime				6.936	**0.031**
<1 hour	411 (28.8)	194 (32.3)	217 (26.3)		
1–3 hours	753 (52.8)	307 (51.2)	446 (54.0)		
>3 hours	262 (18.4)	99 (16.5)	163 (19.7)		
Frequency of irregular meals				130.179	**<0.001**
Never	212 (14.9)	152 (25.3)	60 (7.3)		
Sometimes (1-2 times/week)	821 (57.6)	354 (59.0)	467 (56.5)		
Often (3–5 times/week)	339 (23.8)	83 (13.8)	256 (31.0)		
Always (6-7 times/week)	54 (3.8)	11 (1.8)	43 (5.2)		
Frequency of caffeine intake				15.669	**<0.001**
Sometimes (0–2 times/week)	376 (26.4)	182 (30.3)	194 (23.5)		
Often (3–5 times/week)	787 (55.2)	332 (55.3)	455 (55.1)		
Always (6-7 times/week)	263 (18.4)	86 (14.3)	177 (21.4)		
Frequency of sugar intake				3.923	0.141
Sometimes (0–2 times/week)	301 (21.1)	141 (23.5)	160 (19.4)		
Often (3–5 times/week)	972 (68.2)	400 (66.7)	572 (69.2)		
Always (6-7 times/week)	153 (10.7)	59 (9.8)	94 (11.4)		
Physical activity				0.067	0.967
Low	182 (12.8)	75 (12.5)	107 (13.0)		
Moderate	634 (44.5)	268 (44.7)	366 (44.3)		
High	610 (42.8)	257 (42.8)	353 (42.7)		
Personal monthly income (yuan)				18.278	**0.001**
<3000	38 (2.7)	22 (3.7)	16 (1.9)		
3000–5999	386 (27.1)	183 (30.5)	203 (24.6)		
6000–8999	530 (37.2)	216 (36.0)	314 (38.0)		
9000–11999	340 (23.8)	117 (19.5)	223 (27.0)		
≥12000	132 (9.3)	62 (10.3)	70 (8.5)		
Department				15.175	**0.034**
Delivery room	106 (7.4)	38 (6.3)	68 (8.2)		
Obstetrics	239 (16.8)	113 (18.8)	126 (15.3)		
Gynaecology	230 (16.1)	97 (16.2)	133 (16.1)		
Emergency	156 (10.9)	57 (9.5)	99 (12.0)		
Clinic	140 (9.8)	72 (12.0)	68 (8.2)		
Operating room	136 (9.5)	60 (10.0)	76 (9.2)		
Intensive care unit	274 (19.2)	100 (16.7)	174 (21.1)		
Pediatrics	145 (10.2)	63 (10.5)	82 (9.9)		
Professional rank				13.212	**0.004**
Junior nurse	584 (41.0)	273 (45.5)	311 (37.7)		
Senior nurse	604 (42.4)	228 (38.0)	376 (45.5)		
Assistant advanced nurse	204 (14.3)	80 (13.3)	124 (15.0)		
Associate advanced nurse or advanced nurse	34 (2.4)	19 (3.2)	15 (1.8)		
Employment type				3.943	**0.047**
Formal employees	474 (33.2)	182 (30.3)	292 (35.4)		

TABLE 1: Continued.

Variables	N (%)/$M \pm$ SD			t/x^2	p
	Overall ($n = 1426$)	Good sleep ($n = 600$)	Poor sleep ($n = 826$)		
Contract employees	952 (66.8)	418 (69.7)	534 (64.6)		
PSQI global score	7.90 ± 3.67	4.43 ± 1.87	10.42 ± 2.36	−53.43	**<0.001**
Subjective sleep quality	1.44 ± 0.71	0.96 ± 0.52	1.79 ± 0.63	−27.10	**<0.001**
Sleep latency	1.61 ± 0.96	0.90 ± 0.68	2.12 ± 0.79	−31.40	**<0.001**
Sleep duration	1.28 ± 0.83	0.79 ± 0.65	1.64 ± 0.76	−22.77	**<0.001**
Sleep efficiency	0.76 ± 0.93	0.32 ± 0.57	1.08 ± 1.01	−18.12	**<0.001**
Sleep disturbance	1.18 ± 0.66	0.78 ± 0.53	1.47 ± 0.60	−23.11	**<0.001**
Sleep medication	0.21 ± 0.57	0.01 ± 0.13	0.35 ± 0.71	−13.34	**<0.001**
Daytime dysfunction	1.43 ± 1.01	0.68 ± 0.70	1.98 ± 0.84	−30.75	**<0.001**

Bold values indicate that the p value is less than 0.05, indicating statistical significance.

3.2. Sleep Quality among MCH Nurses.

In the current study, good and poor sleep quality were noted in 600 (42.1%) and 826 (57.9%) MCH nurses, respectively. PSQI global scores ranged from 0 to 21, with a mean of 7.90 (SD = 3.67). Regarding the components of PSQI, 710 (49.8%) of the respondents reported that their subjective experience of sleep quality was fairly good. Regarding sleep latency, 487 (34.2%) participants had mild difficulties falling asleep. In terms of sleep duration, 604 (42.4%) of the respondents reported sleeping for 6–7 hours per night. For sleep efficiency, 733 (51.4%) participants scored higher than 85%. There were 860 (60.3%) respondents with mild sleep disturbance, and 1222 (85.7%) had not used sleep medication in the past month. Regarding daytime dysfunction, 475 (33.3%) of the respondents had mild dysfunction (Table 2). Across all seven components, the highest scores were observed for sleep latency, followed by subjective sleep quality and daytime dysfunction. Sleep medication had the lowest scores (Table 1).

3.3. Personal and Work-Related Factors Associated with Sleep Quality.

Regarding personal factors, sleep quality was significantly related to age, educational level, duration of mobile phone use before bedtime, frequency of irregular meals, and frequency of caffeine intake ($P < 0.05$). For work-related factors, sleep quality was significantly correlated with personal monthly income, department, professional rank, and employment type ($P < 0.05$; Table 1).

3.4. Chronotype and Night Shift Work Schedule Associated with Sleep Quality.

Anintermediate-evening chronotype ($n = 743$, 52.1%) was the most prevalent among participants, followed by an intermediate-morning chronotype ($n = 341$, 23.9%), evening chronotype ($n = 227$, 15.9%), and morning chronotype ($n = 115$, 8.1%). Participants with an evening chronotype ($n = 171$, 75.33%) were the most likely to experience poor sleep problems, followed by those with an intermediate-evening chronotype ($n = 462$, 62.2%), intermediate-morning chronotype ($n = 157$, 46.0%), and morning chronotype ($n = 36$, 31.3%). Significant differences were observed between poor sleep and chronotype ($P < 0.001$). When each component of sleep quality was divided into two categories, a chi-square test suggested that chronotype was associated with subjective sleep quality, sleep latency, sleep duration, sleep efficiency, and daytime dysfunction ($P < 0.05$; Figure 1(a)).

Among the participants, 376 (26.4%) worked non-night shifts, 110 (7.7%) worked forward-rotating night shifts, 704 (49.4%) worked backward-rotating night shifts (the largest proportion of MCH nurses), and 236 (16.5%) worked 12-hour rotating night shifts. Over 50% of participants reported poor sleep for each of the night shift work schedules. MCH nurses working 12-hour rotating night shifts had the highest rate of poor sleep ($n = 148$, 62.7%), followed by those working backward-rotating night shifts ($n = 420$, 59.7%), forward-rotating night shifts ($n = 62$, 56.4%), and non-night shifts ($n = 196$, 52.1%). Significant differences in poor sleep quality were observed between night shift work schedules ($P < 0.05$). According to the chi-square test, night shift work schedule was associated with subjective sleep quality, sleep latency, and sleep efficiency when a score of 2 was the cutoff point for each sleep quality component ($P < 0.05$; Figure 1(b)).

3.5. Associations between Quality of Work Life and Sleep Quality.

The mean (SD) WRQOL-2 scores for the good and poor sleep groups were 3.98 (SD = 0.56) and 3.70 (SD = 0.55), respectively. In terms of the seven parts of WRQOL-2, the highest scores were for homework interface, while the lowest were for stress at work. The independent samples t-test revealed that all dimensions, including working conditions, stress at work, control at work, home-work interface, evaluation at work, general well-being, and job career, were significantly different between the good and poor sleep groups ($P < 0.001$; Figure 2).

The Pearson correlation test revealed that quality of work life was negatively correlated with sleep quality ($r = -0.27$, $P < 0.01$). Specifically, the strongest negative association with quality of work life was found for daytime dysfunction ($r = -0.31$, $P < 0.01$), followed by subjective sleep quality ($r = -0.27$, $P < 0.01$) and sleep disturbance ($r = -0.24$, $P < 0.01$). Quality of work life was weakly correlated with sleep latency ($r = -0.15$, $P < 0.01$), sleep duration ($r = -0.15$, $P < 0.01$), and sleep medication ($r = -0.08$, $P < 0.01$). No significant correlation difference was observed between sleep efficiency and quality of work life ($r = -0.04$, $P = 0.181$). The correlation heat map is shown in Figure 3.

TABLE 2: PSQI and its component score among MCH nurses ($n = 1426$).

Components	Group	Scores	N (%)
Subjective sleep quality	Very good	0	91 (6.4)
	Fairly good	1	710 (49.8)
	Fairly bad	2	529 (37.1)
	Very bad	3	96 (6.7)
Sleep latency[†]	0	0	187 (13.1)
	1-2	1	487 (34.2)
	3-4	2	451 (31.6)
	5-6	3	301 (21.1)
Sleep duration	Greater than 7 h	0	256 (18.0)
	6-7 h	1	604 (42.4)
	5-6 h	2	476 (33.4)
	Less than 5 h	3	90 (6.3)
Sleep efficiency	Greater than 85%	0	733 (51.4)
	75%–85%	1	407 (28.5)
	65–74%	2	185 (13.0)
	Less than 65%	3	101 (7.1)
Sleep disturbance[‡]	0	0	175 (12.3)
	1–9	1	860 (60.3)
	10–18	2	356 (25.0)
	19–27	3	35 (2.5)
Sleep medication	Not during the past month	0	1222 (85.7)
	Less than once a week	1	133 (9.3)
	Once or twice a week	2	50 (3.5)
	Three or more times each week	3	21 (1.5)
Daytime dysfunction[§]	0	0	296 (20.8)
	1-2	1	475 (33.3)
	3-4	2	396 (27.8)
	5-6	3	259 (18.2)
PSQI global score	Good sleep	≤7	600 (42.1)
	Poor sleep	>7	826 (57.9)

[†]Sleep latency: scored on two items, including how long it takes to fall asleep each night and how often it is difficult falling asleep within 30 minutes. [‡]Sleep disturbance: scored on nine items, including waking up in the middle of the night or early morning, getting up to use the bathroom, breathing uncomfortably, coughing or snoring loudly, feeling cold, feeling hot, having bad dreams, having pain, and other reason of troubling sleep. [§]Daytime dysfunction: scored on two items including the frequency of having trouble staying awake and the frequency of keeping up enough enthusiasm.

3.6. Binary Logistic Regression Analysis for Poor Sleep Quality. The binary logistic regression analysis for sleep quality is presented in Table 3 (good sleep = 0; poor sleep = 1). The ORs (95% CI) for the intermediate-morning, intermediate-evening, and evening chronotypes (reference: morning chronotype) were 1.87 (1.20–2.93), 3.61 (2.37–5.50), and 6.70 (4.08–11.01), respectively, in the crude model. In the adjusted model (adjusted for age, educational level, duration of mobile phone use before bedtime, frequency of irregular meals, frequency of caffeine intake, personal monthly income, department, professional rank, and employment type), chronotype remained statistically associated with sleep quality. Regarding night shift work schedules, the ORs (95% CI) for the backward-rotating and 12-hour rotating shifts (reference: day shift) were 1.36 (1.06–1.75) and 1.54 (1.11–2.15), respectively, in the crude model. However, no statistically significant differences were observed based on night shift work schedule for sleep quality in the adjusted model. Significant differences were observed across all dimensions of quality of work life in the crude model; however, the adjusted factors modified the association between quality of work life and sleep quality. The adjusted ORs (95% CI) for stress at work, control at work, and general well-being were 0.53 (0.45–0.63), 2.00 (1.39–2.89), and 0.31 (0.21–0.48), respectively. Working conditions, home-work interface, employment evaluation of nurses, and job and career satisfaction were not significant factors in the adjusted model.

Among the adjusted factors, age, frequency of irregular meals, and frequency of caffeine intake were associated with poor sleep quality. The adjusted ORs (95% CI) for ages 36–45 and ≥46 (reference: age ≤25) were 2.31 (1.23–4.34) and 4.14 (1.56–10.97), respectively. The ORs (95% CI) for irregular meals sometimes, often, and always (reference: never) were 2.73 (1.87–3.98), 4.74 (3.03–7.42), and 7.02 (3.08–16.01), respectively. For caffeine intake frequency, the OR (95% CI) for always (reference: sometimes) was 1.65 (1.12–2.41). For more details, see Supplemental Table S1 (logistic regression analysis for poor sleep quality).
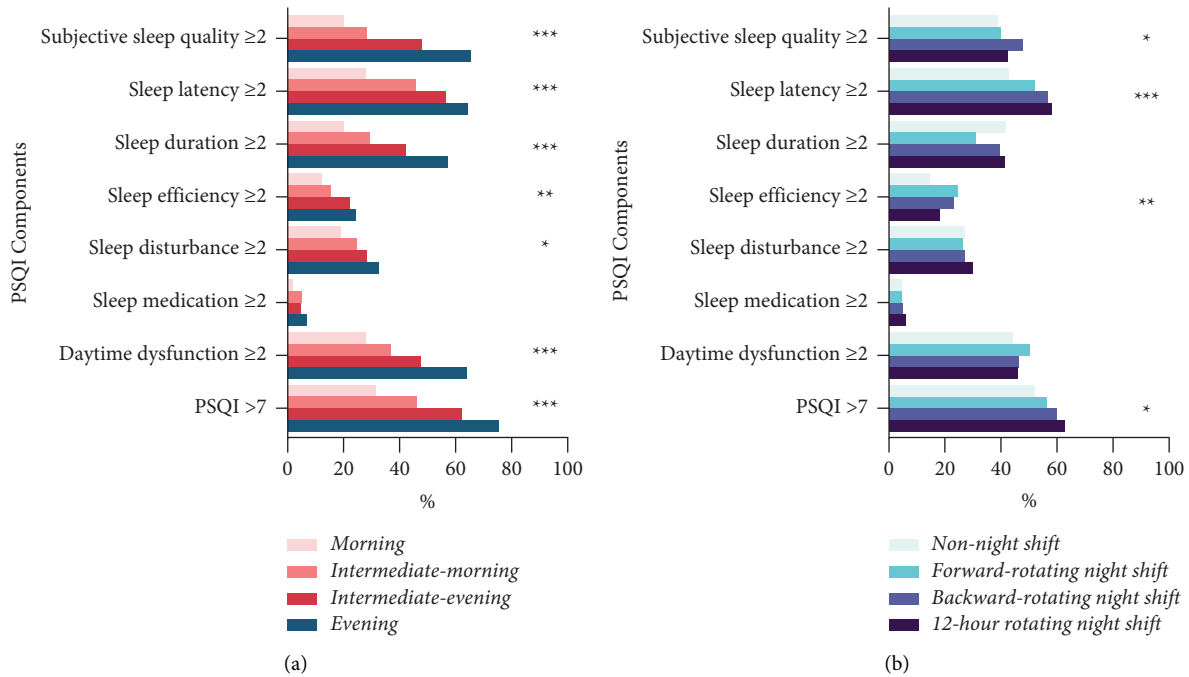
FIGURE 1: Rates of poor sleep components on each group classified by chronotype and night shift work schedule ($n = 1426$). $^{*}P < 0.05.$ $^{**}P < 0.01.$ $^{***}P < 0.001.$ (a) Rates of poor sleep components on each chronotype. (b) Rates of poor sleep components on each night shift work schedule.
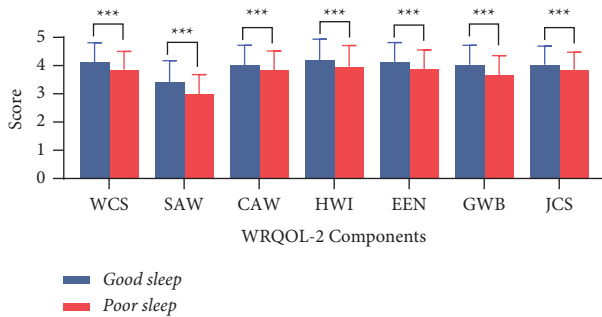

FIGURE 2: Quality of work life on good and poor sleep groups ($n = 1426$). Error bar: mean ± standard deviations. $^{***}P < 0.001.$ WSC: working conditions; SAW: stress at work; CAW: control at work; HWI: home-work interface; EEN: employment evaluation of nurse; GWB: general well-being; JCS: job and career satisfaction.

4. Discussion

This study revealed a concerningly high rate of poor sleep quality among MCH nurses (57.9%), which was higher than that of nurses in the community (46%) [35], psychiatric hospitals (38.1%) [36], and general hospitals (55%) [16]. This may be due to differences in workplaces and workflows between healthcare organisations, as MCH nurses have to deal with challenging situations such as inappropriate children, overbearing families, noisy workplaces, excessive workloads, a high risk of workplace violence, and emotionally traumatic events [19, 37–39]. Additionally, most of the MCH nurses in this study were female (98.2%). Due to their physiological characteristics, social struggles, and household responsibilities, female nurses experience more

psychological distress and sleep problems [40]. These factors may disrupt their circadian rhythms and produce stress that acts on the hypothalamus-pituitary-adrenal axis, increasing the likelihood of sleep problems [41]. In summary, evidence-based strategies for sleep optimisation should be adopted [42].

The current study demonstrated that chronotype may be related to MCH nurses' sleep quality. MCH nurses with evening chronotypes were approximately four times more likely to experience poor sleep than those with morning chronotypes, which is similar to the findings of previous studies [25, 43, 44]. Individuals with evening chronotypes reported chronic disruption of their circadian rhythms and were more susceptible to light-at-night disturbance of melatonin secretion [45]. MCH nurses with evening chronotypes tend to stay up and sleep late and find it difficult to naturally fall asleep early the night before a workday, resulting in sleep deprivation and exhaustion during the workday. Conversely, if they deliberately advance their bedtime to acclimate themselves to their work schedule, it will result in difficult sleep initiation and lower sleep efficiency. Moreover, people with evening chronotypes prefer having snacks at night, which may further delay bedtime and impair subjective sleep quality [46]. Therefore, managers should attempt to create shift schedules in accordance with the natural chronotypes of MCH nurses to increase their sleep quality and quantity.

Univariate analysis revealed an association between night shift work schedule and poor sleep quality. However, this effect was not significant after adjusting for related factors, which may be related to the uneven distribution of various shift types, with nearly half of the participants
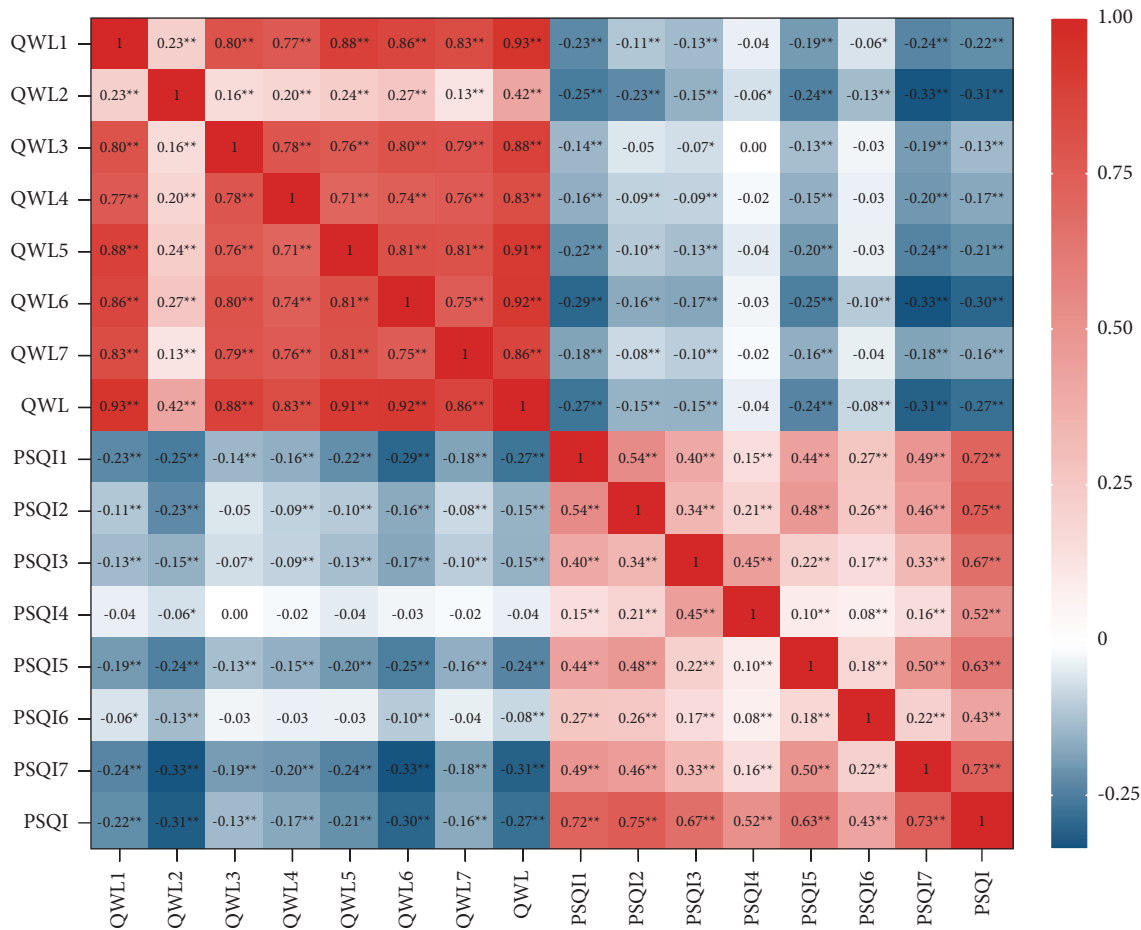
FIGURE 3: Heat map of Pearson correlation between quality of work life and sleep quality among MCH nurses ($n = 1426$). $^{*}P < 0.05$. $^{**}P < 0.01$. PSQI: the Pittsburgh Sleep Quality Index, PSQI1: subjective sleep quality, PSQI2: sleep latency, PSQI3: sleep duration, PSQI4: sleep efficiency, PSQI5: sleep disturbance, PSQI6: sleep medication, and PSQI7: daytime dysfunction; QWL: the Work-Related Quality of Life-2 scale, QWL1: working conditions (WCS), QWL2: stress at work (SAW), QWL3: control at work (CAW), QWL4: home-work interface (HWI), QWL5: employment evaluation of nurse (EEN), QWL6: general well-being (GWB), and QWL7: job and career satisfaction (JCS).

working backward-rotating night shifts. Nevertheless, shift work is a crucial component of nurses' work lives. Several studies have demonstrated that shift work causes a misalignment of circadian rhythms, and the body's sensitivity to the sleep-wake cycle is diminished, disrupting the rhythm of cortisol and melatonin and leading to sleep problems [47]. Similar to previous studies [48, 49], our study found that participants on a 12-hour rotating night shift showed the highest rates of poor sleep quality, and those on forward-rotating night shifts had better sleep quality than those on either 12-hour rotating or backward-rotating night shifts. As an ergonomic and health-promoting option, a forward-rotating night shift is better adapted to sleep because the human circadian sleep-wake cycle physiology tends to move forward [50, 51]. Consequently, a forward-rotating night shift is recommended to optimise the rotation.

The MCH nurses in this study reported a moderately high level of quality of work life. The stress at work dimension had the lowest score, indicating that MCH nurses typically work under severe stress. Excessive work stress is one contributor to sleep problems, which is consistent with our finding of a high rate of poor sleep. Furthermore, high

control at work is a risk factor for poor sleep. Control at work reflects the ability to be competent in nursing and decision-making latitude in the workplace [52]. MCH nurses with higher control at work have difficulty disengaging from the high level of work alertness and repeatedly think about today's work or worry about that of tomorrow even when off duty [53, 54]. This prevents them from fully relaxing and impairs their sleep. In contrast, MCH nurses' general well-being was a protective factor that supported healthy sleep. General well-being is an important component of quality of work life, reflecting satisfaction with overall work life. Good well-being promotes physical and mental health and helps individuals take action to cope with stress and enjoy good sleep [55]. Thus, these findings offer a new perspective on promoting good sleep quality through interventions (e.g., mindfulness and cognitive-behavioural therapy) to improve quality of life at work.

Older age, frequent caffeine consumption, and irregular meals were also associated with poor sleep quality in this study. MCH nurses over 35 years of age were more likely to experience poor sleep quality. With respect to biology, aging causes sleep to become fragmented, and older persons may

TABLE 3: Binary logistic regression analysis for poor sleep based on chronotype, night shift work schedule, and quality of work life.

	Crude ORs (95% CI)	P	Adjusted[†] ORs (95% CI)	P
Chronotype				
Morning (reference)	1		1	
Intermediate-morning	1.87 (1.20–2.93)	**0.006**	1.75 (1.05–2.91)	**0.033**
Intermediate-evening	3.61 (2.37–5.50)	**<0.001**	2.70 (1.66–4.40)	**<0.001**
Evening	6.70 (4.08–11.01)	**<0.001**	3.99 (2.24–7.10)	**<0.001**
Night shift work schedule				
Non-night shift (reference)	1		1	
Forward-rotating night shift	1.19 (0.77–1.82)	0.434	0.98 (0.54–1.75)	0.939
Backward-rotating night shift	1.36 (1.06–1.75)	**0.017**	1.08 (0.74–1.58)	0.685
12-hour rotating night shift	1.54 (1.11–2.15)	**0.01**	1.23 (0.74–2.02)	0.426
Quality of work life				
Working conditions	0.54 (0.45–0.64)	**<0.001**	1.03 (0.63–1.69)	0.893
Stress at work	0.44 (0.37–0.51)	**<0.001**	0.53 (0.45–0.63)	**<0.001**
Control at work	0.70 (0.60–0.82)	**<0.001**	2.00 (1.39–2.89)	**<0.001**
Home-work interface	0.66 (0.57–0.77)	**<0.001**	1.10 (0.81–1.48)	0.541
Employment evaluation of nurse	0.56 (0.47–0.66)	**<0.001**	1.23 (0.82–1.85)	0.307
General well-being	0.45 (0.38–0.53)	**<0.001**	0.31 (0.21–0.48)	**<0.001**
Job and career satisfaction	0.63 (0.53–0.75)	**<0.001**	0.75 (0.50–1.11)	0.152

[†]Adjusted for age, educational level, duration of mobile phone use before bedtime, frequency of irregular meals, frequency of caffeine intake, personal monthly income, department, professional rank, and employment type. ORs: odds ratios; CI: confidence interval. Bold values indicate that the p value is less than 0.05, indicating statistical significance.

awaken several times during the night [56]. In terms of work, older nurses with rich work experience take on greater responsibilities, take on heavier nursing workloads, face critical patients and emergencies, and supervise junior nurses, all of which expend more energy and lead to poor sleep. Notably, to induce wakefulness on duty and optimise alertness off duty, MCH nurses as shift worker may become dependent on caffeine because it increases alertness in a dose-dependent manner [57, 58]. Consequently, many of these nurses regularly consume caffeine and experience sleep disturbance. Consistent with previous research [23], irregular meal habits were found to be a risk factor for poor sleep quality. Dietary factors influence or modulate neurotransmitter mechanisms in the brain, which may have downstream effects on sleep [59]. Furthermore, poor diet quality and quantity may affect tryptophan availability and serotonin and melatonin synthesis, leading to poor sleep quality [60]. Thus, these factors are worth considering when in relation to altering sleep quality.

4.1. Limitations. The present study has a few limitations. First, the study was conducted among nurses working in four MCH hospitals in one province of China, which may not be representative of all Chinese MCH nurses. Second, owing to the cross-sectional design of this study, the analysis may explain the sleep quality level at a certain point in time. Third, the data were self-reported rather than objectively measured (e.g., actigraphy), which may have introduced subjectivity and bias.

5. Conclusions

This study showed that poor sleep quality was common among MCH nurses. The findings of this study also illustrated that sleep quality was associated with older age, frequent caffeine intake, irregular meals, chronotype, and quality of work life. These findings have substantial implications for future studies and policy interventions to enhance MCH nurses' sleep quality and well-being.

6. Implications for Nursing Management

This study provides new insights into improving sleep quality to enhance quality of work life and professional satisfaction in the nursing management sector of MCH hospitals. To target current modifiable factors, it is critical to establish a scientific shift work schedule that meets the physical and psychological needs of MCH nurses, ensures adequate rest, and maintains a balance between family and work. In addition, nursing managers can form psychological support teams to provide professional counselling and intervention services for MCH nurses. Accurate sleep information, such as maintaining a balanced diet, avoiding large meals before bedtime, and limiting caffeine to 6 h before sleep, can be conveyed to MCH nurses through brochures or lectures. However, to target nonmodifiable factors, nursing managers should allocate human resources appropriately according to chronotype and age. For example, nurses with morning chronotypes should be assigned to early shifts, whereas those with evening chronotypes

should have a delayed start time for their work. As older nurses' energy and fitness levels decline, their night shifts should be reduced and their supervisory and teaching responsibilities should be increased. Night shifts could be added for young nurses to help them develop their clinical skills while increasing their salaries.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

Jia-Ning Li and Xiao-Qian Chen are the co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Jia-Ning Li and Xiao-Qian Chen: Conceptualization, Data Curation, Methodology, Writing – Original Draft, and Writing – Review & Editing. Xiu-Min Jiang: Project Administration, Conceptualization, and Supervision. Qing-Xiang Zheng and Yu-Qing Pan: Formal Analysis, Visualization, and Writing – Review & Editing. Ling Huang: Visualization, Validation and, Investigation. Yu Zhu and Ru-Lin Liu: Supervision, Data Curation, and Investigation..

Acknowledgments

Supplementary Materials

Supplemental Table S1: logistic regression analysis for poor sleep quality. (*Supplementary Materials*)

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Research Article

Factors Affecting Mealtime Difficulties in Older Adults with Dementia Living in Long-Term Care Facilities: A Multilevel Model Analysis

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Aim(s). This study conducted a multilevel analysis of mealtime difficulties in older adults with dementia based on the social-ecological model. *Background*. Mealtime difficulty in this population should be examined from an extensive perspective, rather than approaching it as an individual problem. *Method(s)*. This was a cross-sectional study involving 342 participant dyads from 57 long-term care facilities; 114 direct care workers; and 342 older adults with dementia. A multilevel regression analysis was conducted using the MPlus 8.0 program. *Results*. Among intrapersonal factors, age, cognitive function, activities of daily living, and number of beds in the facility were identified as affecting mealtime difficulty. Environmental factors included meal assistant education experience and whether an environment suitable for eating had been established. *Conclusion(s)*. The results show that intrapersonal factors exert a large influence on the mealtime difficulties of older adults with dementia in long-term care facilities and support the need to improve environmental factors, which are modifiable. *Implications for Nursing Management*. This study provided useful information about the influence of leaders on mealtime difficulties in older adults with dementia. Leaders should establish an environment in the facility for reduced mealtime difficulties.

1. Introduction

Mealtime difficulties in older adults with dementia are defined as frustrations or problems that arise during mealtimes [1, 2] and generally occur in individuals in the middle or late stages of dementia [3]. They gradually experience difficulty picking up food with utensils, putting it in their mouth, chewing, and swallowing. Eventually, in the late stages of dementia, swallowing quality appears to fail [4]. Older adults with dementia and mealtime difficulties experience symptoms such as reduced nutritional intake, weight loss, dehydration, and aspiration [5]; secondary weight loss increases the incidence of myasthenia, bedsores, and immobility [4].

The social-ecological model helps to determine the complex interplay of factors affecting mealtime difficulties experienced by older adults with dementia [6, 7] in which it can be used to identify influences on eating performance from a multilevel perspective, encompassing their intrapersonal-, interpersonal-, environmental-, and policy-related aspects [8–10]. Intrapersonal factors affecting mealtime difficulty include age, cognitive function, physical ability, complications, behavioral and psychological symptoms of dementia, and the individual perspectives of older adults with dementia [11–14]. Interpersonal factors consist of the knowledge, attitudes, and behaviors contributing to direct care workers' interactions [7, 12, 15]. Environmental factors include aspects of the physical environment (e.g.,

type of meal, how food is served, and appropriate staffing levels) that might affect mealtime difficulties [11, 13, 16, 17] as well as care facility factors such as work-oriented policies and provision of appropriate accommodations [12, 18].

As such, the factors that influence mealtime difficulties in older adults with dementia can be multifaceted. Therefore, based on the social-ecological model, it is necessary to address older adults with dementia, caregivers, and environment levels to identify factors that may be associated with mealtime difficulties. Multilevel models allow for the examination of how individual characteristics, such as cognitive impairment and functional ability, interact with group level factors, such as staffing levels, and the care environment to predict the outcome of mealtime difficulties [19]. This type of analysis provides a more comprehensive understanding of the complex and dynamic factors that contribute to mealtime difficulties in older adults with dementia in long-term care facilities.

Multilevel model analysis is used to study mealtime difficulties in older adults with dementia living in long-term care facilities because it takes into account both individual and group level factors that may influence the outcome of interest [13, 20]. In previous studies [13, 20], the effects of individual and environmental characteristics on mealtime performance were confirmed by multilevel analysis, and the direct care worker factor was analyzed at the environmental level. However, care workers play an essential role in providing eating assistance for older adults with dementia, who depend highly on help from others to accomplish their activities of daily living [21]. The direct caregiver factor is important because it is a factor that can be more easily modified and adjusted than other factors to alleviate mealtime difficulties [12, 21]; therefore, it is necessary to analyze interpersonal factors independently when assessing the mealtime difficulties of older adults with dementia. In addition, the reflection of cultural factors in mealtime difficulties, including the influence of sociocultural contexts and care facility policies, is crucial; however, there is a lack of research that addresses this issue specifically in the Korean context.

2. Methods

2.1. Design.
This study used a multilevel cross-sectional design to determine the relationship between intrapersonal-, interpersonal-, and environmental-level factors and the mealtime difficulties of older adults with dementia in long-term care facilities and to identify which aspects of the factors are influential.

2.2. Participants.
Following Maas and Hox [22] criteria, as the group level sample size is statistically more important than the individual-level sample size, Schoeneberger [23] proposed recruiting over 30 groups of 10 or more individual subjects.

The long-term care facilities participating in this study were categorized based on the total number of beds (less than 30, more than 30 but less than 50, 50 to 100, and more than 100) and the results of regular evaluation scores (A, B, C, D, or E) by the Korean National Insurance Corporation. Sixty institutions that agreed to participate in the study were selected based on a dropout rate of 20%.

According to the literature review, the number of analysis levels was three. The number of participating long-term care facilities was 60 (Level 3); the number of participating direct care workers (care workers who provide hands-on assistance, support, and care to older adults with dementia in long-term care facilities) was 120 (Level 2), twice the number of long-term care facilities; and the number of older adults with dementia who participated was 360 (Level 1), three times the number of direct care workers. Direct care workers were matched with two older adults under their care so we could observe and record any mealtime difficulties encountered.

A preliminary survey was conducted to measure response time and check whether any questions were not understood after the survey. The participants in this preliminary survey comprised two long-term care facilities (Level 3), four direct care workers (Level 2), and 12 older adults with dementia (Level 3). The current study participants comprised 342 dyads from 57 long-term care facilities, 114 direct care workers, and 342 older adults with dementia. Data excluding attrition of 5% (insufficient response) were used for the final analysis.

2.3. Variables and Measures

2.3.1. Level 1: Intrapersonal Factor.
A 37-item tool related to cognitive impairment currently used in nursing homes was used to measure elements such as reduced orientation, judgment, attention, and concentration, with a higher score indicating lower cognitive function. The functional independence measure was used to measure seven items related to eating-related activities of daily living, with a higher score indicating more independence. The mealtime difficulty scale for older adults with dementia was used to measure mealtime difficulty [24], with higher scores indicating greater mealtime difficulty. In this study, we modified any negative words used that might have confused survey participants. At the time of development, Cronbach's α was 0.91; in this study, Cronbach's α was 0.92.

2.3.2. Level 2: Interpersonal Factor.
The survey of direct care workers included general characteristics of age, gender, level of education, work experience, duty, attitude, and knowledge about feeding. Attitudes toward feeding were measured using the Formal Direct Care Workers' Attitude toward Feeding Dementia Patients Questionnaire, developed by Chang and Roberts [11] and translated by Hong and Gu [25]; the higher the score, the more negative the attitude towards feeding. In Hong and Gu [25], Cronbach's α was 0.73; in this study, Cronbach's α was 0.83. In addition, knowledge about feeding was assessed using the Formal Direct Care Workers' Knowledge of Feeding Dementia Patients Questionnaire, developed by Chang and Roberts [11] and translated by Hong and Gu [25], which has a total of 21 questions. The

higher the value, the higher the level of knowledge. In a study by Hong and Gu [25], Kuder-Richardson (KR) was 20 = 0.63; in this study, KR-20 = 0.63.

2.3.3. Level 3: Environmental Factor.

Organizational-level variables were investigated for the head of the nursing facility, and characteristics related to mealtime difficulty at the facility (year of establishment, facility operator, certificate possessed by the facility manager, number of nurses in the facility, number of nursing assistants in the facility, number of direct care workers in the facility, facility residents, whether regular education was performed, facility size, need for food support education, and environmental factors related to difficulty in eating) were investigated.

2.4. Statistical Analysis.

The collected data were verified for statistical significance based on $p < 0.05$ using SPSS 25.0, Microsoft Office Excel, and MPlus 8.0 [26]. Descriptive statistical analysis was used to describe each variable, and Cronbach's α was used to assess the reliability of the research measurements. A three-level random intercept model was used to analyze the factors influencing mealtime difficulties experienced by older adults with dementia in long-term care facilities. The multilayer model estimation method of Mplus was used for estimation, and the full-information maximum likelihood (FIML) method, which is known to be robust even in violation of the statistical assumptions of the data, was used as well. The z-test, which is the Mplus estimation method, was performed for the parameter test.

2.5. Ethical Considerations.

This study was conducted after OOOO University's Institutional Review Board approved the research ethics (OOOO-202203-0007-01). All participants were provided with sufficient information about the study and instructed that they could withdraw from the study at any time. All data were kept confidential.

3. Results

3.1. Participants' Characteristics.

Table 1 shows the general characteristics of the participants in long-term care facilities. There was 342 Level 1 participants (older adults with dementia), with an average cognitive function of 15.25 ± 7.12 and activities of daily living of 4.64 (all within the middle range). The average mealtime difficulty in older adults with dementia was 34.49 ± 11.34. There were 114 Level 2 participants (direct care workers). The average attitude toward feeding was 7.46 ± 10.85, and the average knowledge of feeding was 11.14 ± 3.26. There were 57 Level 3 participants (the heads of the long-term care facilities). Twenty-two facilities had 25–50 beds (28.6%), accounting for the largest proportion. Forty-seven (82.5%) of the facilities had meal assistant education experience, and most facilities ($n = 56$, 98.3%) required meal assistant education experience.

3.2. Multilevel Analysis.

Level 1 (intrapersonal factors) and Level 3 (environmental factors) were statistically significant for mealtime difficulties in older adults with dementia, with the explanatory powers being 53.7% for Level 1 and 23.0% for Level 3. The explanatory power of the model incorporating Levels 1, 2, and 3 was 39.7%. Level 1 most significantly explained mealtime difficulties. As a result of the multilevel analysis, age, cognitive function, activities of daily living, the total number of beds in the facility, meal assistant education experience, and the number of suitable environments for meals were identified as factors affecting mealtime difficulties in older adults with dementia. The analysis results for each model are as follows.

3.2.1. Model 1.

Table 2 presents the results of the three-level multilevel regression model. There was a difference between intrapersonal and environmental factors in the mealtime difficulty score, which is the dependent variable. As the result of estimating the intraclass correlation coefficient (ICC), the Level 2 ICC estimate was found to be 0.008, which can be explained by the fact that only 0.8% had mealtime difficulties due to the interpersonal factor difference. The Level 3 ICC estimate was found to be 0.489, which means that 48.6% of mealtime difficulties occurred because of the difference in environmental factors. The degree of mealtime difficulty experienced differs depending on the environmental factors, a characteristic of the group; therefore, the necessity of multilayer analysis was confirmed.

3.2.2. Model 2.

Model 2 predicted that older adults with dementia, lower cognitive function, and activities of daily living would experience more mealtime difficulty. Moreover, it was predicted that males would experience more mealtime difficulty. The residual variance at Level 1 was 53.65, which was lower than that at 65.12, which means that the selected Level 1 predictors sufficiently explain the variability in the dependent variable (mealtime difficulty).

3.2.3. Model 3.

Among the Level 2 independent variables, gender, cognitive function, and activities of daily living were statistically predicted to significantly impact mealtime difficulties. While controlling for Level 1 predictors, no statistically significant predictors of mealtime difficulties were added among the Level 2 predictors. This may be because the Level 2 variance (r^2) was very small (0.987) and not statistically significant ($p = 0.871$), so there was little difference in mealtime difficulties due to variance in direct care workers.

3.2.4. Model 4.

Level 1 R^2 was 0.309, and the predictors explained 30.9% of the variability in the Level 1 dependent variable (mealtime difficulty). Among the Level 2 predictors, no statistically significant predictors of mealtime difficulties existed. At Level 2, R^2 was 0.368, and the predictors explained 36.8% of the variability in the Level 2 dependent variable (mealtime difficulty). In addition, this model confirmed the statistical significance of Level 3, Level 1, and Level 2 predictors in the final model of the study. It was predicted that a group with meal assistant education, a large facility size, and a few suitable environments for meals

TABLE 1: Participant characteristics.

Characteristics	Categories	Total n (%) or M ± SD	Range
Level 1 (older adults with dementia = 342)			
Intrapersonal factor			
Age		84.08 ± 7.12	60–104
Gender	Male	79 (23.1)	
	Female	263 (76.9)	
Cognitive function		15.25 ± 7.12	0–32
Activities of daily living		4.64 ± 1.82	1–7
Period of institutionalization		3.22 ± 2.58	0–21
Mealtime difficulty		34.49 ± 11.34	19–78
Level 2 (direct care workers = 114)			
Interpersonal factor			
Level of education	<Middle school	13 (11.41)	
	High school	78 (68.42)	
	≥University	23 (20.18)	
Duty	Fixed	20 (17.54)	
	8-hour shift	26 (22.81)	
	12-hour shift	65 (57.02)	
	24-hour	3 (2.63)	
Current work experience (years)		4.52 ± 4.27	
Attitude toward feeding		73.46 ± 10.85	43–100
Knowledge toward feeding		11.14 ± 3.26	4–19
Level 3 (long-term care facility = 57)			
Environmental factor			
Length of the facility establishment		12.09 ± 4.63	4–26
Facility type	Private	24 (42.1)	
	Corporate	33 (57.9)	
		55.88 ± 44.23	13–258
Facility size	≤25 beds	4 (7.0)	
	25–50 beds	22 (38.6)	
	50–75 beds	11 (19.3)	
	75–100 beds	14 (24.6)	
	≥100–200 beds	6 (10.5)	
Number of suitable environment for meals		4.68 ± 2.69	1–10
Meal assistant education experience	Yes	47 (82.5)	
	No	10 (17.5)	
Meal assistant education requirements	Very required	23 (40.4)	
	Required	33 (57.9)	
	Not required	1 (1.8)	
Number of nurses		0.56 ± 1.35	0–8
Number of nurse assistants		2.46 ± 1.81	0–10
Number of direct care workers (≥6 month)		15.96 ± 12.03	2–57

would have a higher likelihood of experiencing mealtime difficulty at Level 3 while controlling Level 1 and Level 2 predictors. By controlling for Level 1 and Level 2 predictors, at Level 3, the group with meal assistant education experienced more mealtime difficulties, and the larger the facility size, the smaller the number of suitable environments for meals and the more mealtime difficulty encountered. The predictors accounted for 30.9% of the variability in the Level 3 dependent variable (mealtime difficulty), with $R^2 = 0.309$ at Level 3. In addition, the multicorrelation square of the entire model integrating all levels was calculated [19], and the multicorrelation square R^2 of Model 4 was 0.397. This is larger than Model 1 (0%), Model 2 (29.1%), Model 3 (33.4%), and Model 4 (39.7%), which explains its largest variability in mealtime difficulties.

4. Discussion

This study aimed to conduct a multilevel analysis of mealtime difficulties in older adults with dementia based on the social-ecological model. According to this model, mealtime difficulty variables were classified into and analyzed as three levels: Level 1 (intrapersonal), Level 2 (interpersonal), and Level 3 (environment). Among these, the level that most affected the degree of mealtime difficulties experienced was Level 1. At Level 1, sex, cognitive function, and activities of daily living influenced mealtime difficulties. At Level 3, the degree of meal assistant education, the size of the facility, and the number of suitable environments for meals at the environmental level influenced mealtime difficulties. However, no variable predicted mealtime difficulties at Level 2.

TABLE 2: Multilevel analysis of the four fitted models on mealtime difficulties in older adults with dementia.

Parameters	Classifications	Model 1 Estimate	ρ	Model 2 Estimate	ρ	Model 3 Estimate	ρ	Model 4 Estimate	ρ
Fixed effect									
Intercept		34.49	<0.001	34.49	<0.001	34.49	<0.001	34.48	<0.001
Age				-0.04	0.492	-0.04	0.029	-0.02	0.037
Gender (ref = men)				2.23	0.024	2.13	0.563	2.08	0.705
Cognitive function	Level 1			0.44	<0.001	0.40	<0.001	0.38	<0.001
Activities of daily living				-1.93	<0.001	-1.94	<0.001	-1.91	<0.001
Period of institutionalization				0.21	0.178	0.20	0.192	0.21	0.178
Current work experience (years)						-0.08	0.569	-0.05	0.741
Attitude toward feeding	Level 2					-0.07	0.276	-0.04	0.548
Knowledge toward feeding						-0.36	0.124	-0.22	0.360
Duration of the facility establishment								-0.26	0.183
Facility type								-0.10	0.958
The total number of beds in facility								1.91	0.009
Nurse ratio to admission capacity	Level 3							-1.11	0.089
Care worker ratio to admission capacity								0.02	0.730
Meal assistant education experience (ref = no)								5.10	0.005
Number of suitable environments for meals								-0.74	0.010
Random effect									
Variance at level 1, σ^2		65.12	<0.001	53.65	<0.001	53.82	<0.001	52.73	<0.001
Variance at level 2 τ^2		0.99	0.871	0.03	0.994	0.29	0.925	1.83	0.613
Variance at level 3, ψ^2		34.49	<0.001	37.48	<0.001	31.48	<0.001	22.98	0.002
$R1^2$				0.334		0.316		0.309	
$R\,^2_2$						0.919		0.368	
$R\,^3_2$								0.309	
$R\,^2$		0		0.291		0.334		0.397	

The findings of this study suggest that cognitive function and activities of daily living play a significant role in mealtime difficulties. Individuals with lower cognitive function may find it more challenging to eat them, whereas those with higher abilities in performing activities of daily living may experience less challenges. The results are similar to those of previous studies [7, 27]. This may be because eating dependence increases as cognitive function and physical function decreases [28]. In addition, the study indicates that women may experience more mealtime difficulties than men and it is similar with some previous studies [29, 30]. This is because these results may occur due to changes in dental conditions according to gender [27]. However, since there was no difference in gender in most of the studies [7, 31], further studies are needed on the effect of additional intrapersonal factors, including dental characteristics, depression, and polymedications on mealtime difficulties [32, 33].

The lower the cognitive function is, the more difficult it is to eat independently, as shown in previous research [7, 28]. Because the older adults with dementia have difficulty describing their intentions, care workers should be trained to recognize and manage various expressions of mealtime difficulties. In a previous study on mealtime difficulties in older people, the lower the daily living activity is, the more difficult it was to eat. The same results were also found in this study [7, 28, 31]. This may be due to the deterioration of physical function as dementia progresses, thus limiting the range of movement needed to use eating utensils [11, 34]. A pre-emptive approach is needed to prevent the deterioration of physical function, including the eating function of older people with dementia. Direct care workers need to encourage and help residents to eat meals independently rather than providing unconditional mealtime assistance.

The mealtime difficulties of older adults with dementia were greater in the group in which direct care workers received mealtime difficulty education. This result differs from the general expectation that mealtime difficulty education would result in fewer difficulties experienced during mealtimes. In this study, however, it is notable that although the participating facility provided training, 47.4% of the direct care workers in the facility scored less than 50% in tests to demonstrate their feeding-related knowledge. Even though feeding training was conducted, the knowledge of direct care workers did not improve, and mealtime difficulties were subsequently not reduced. This result may be that direct care workers tend to rely on habit or experience rather than education [35]. Nevertheless, previous studies have proven that direct care workers' knowledge and attitudes affect mealtime difficulties experienced by those they assist [2, 11]. Thus, continuous education that improves the quality of care provision is necessary to reduce mealtime difficulties.

The current results showed that the larger the size of the facility is, the more mealtime difficulties were experienced. This is related to previous studies that the proportion of residents with high nursing demands is high in large-scale facilities [36]. The high nursing demand means that the ability to perform daily life is low [37], and the lower the ability to perform daily life, the more difficult it is to eat [12]. Therefore, mealtime difficulties might increase in large-size facilities with many people with low daily performance. In the previous study, the higher the nursing demand is, the more direct care workers are needed [38]. Therefore, proper staffing is necessary to adequately assist older adults with high nursing demands and difficulties in mealtime due to low ADL. Likewise, in a recent qualitative study of direct care workers, inadequate staffing was found to be a barrier to mealtime assistance [20].

Preparing an appropriate mealtime environment is essential to prevent or address eating difficulties. The appropriate environment presented in this study included providing adequate food and utensils regarding individual preference or eating abilities, proper space for dining (noise, light, odor, and furniture), and enough time to eat, and mealtime was taken together with other residents. Slaughter et al. [14] proposed that residents can eat without difficulty by using "finger food," no-spill cups, appropriate utensils, and plate guards as assistive eating devices and customizing mealtimes based on food preferences and swallowing function. A brighter and quieter dining environment might prevent residents with dementia from being distracted by environmental factors and alleviate their sundowning syndrome [11, 31]. In Korea, long-term care facilities are evaluated every 3 years. The evaluation only considers items related to "pleasant environments" and "falls prevention." Guidelines for the care environment that consider the needs of older adults with dementia, including those related to dining and meals, have not been presented. Therefore, developing guidelines to maintain an appropriate environment to reduce mealtime difficulties for residents with dementia is necessary.

Lastly, at Level 2, no variable was found that predicted mealtime difficulties. Direct care workers' knowledge and attitudes were reported as influential factors in mealtime difficulties [7, 12, 15]. In this study, however, only 0.8% of the total change was explained at the interpersonal level, perhaps because the knowledge and attributes of the direct care workers who participated were distributed with low variance in the low score range, and there were no significant results in the multilevel analysis; therefore, to confirm the effect of Level 2 factors on meal difficulties, direct care workers must be analyzed again after improving their knowledge and attitudes to some extent through continuing qualitative meal difficulty education.

5. Limitations

This study has several limitations. First, the cross-sectional nature of the data limits the interpretation of causality. Second, variables related to interpersonal and environmental factors are sensitive to sociocultural influences, so caution is required when generalizing to other countries. Third, the institutional-grade was not used as an environmental variable because a participating institution had not yet been officially graded at the time of the study due to severe acute respiratory syndrome coronavirus 2 restrictions. Hence, a study that considers the institutions'

quality grading is necessary. Finally, studies on other possible influencing factors are needed because we considered only a limited number of factors related to eating difficulties. In particular, interpersonal factors require consideration based on actual observations. A strength of this study is that quota sampling was performed that considered region, institution grade, and the number of beds. Theoretically, we identified factors related to eating difficulties in older people with dementia using robust sample size and at various levels.

6. Conclusions

Our study demonstrates the effects of intrapersonal, interpersonal, and environmental factors on eating difficulties in older people with dementia. Our findings confirm that intrapersonal factors significantly influence the eating difficulties experienced by older adults with dementia in long-term care facilities and support the need for an approach that considers the environmental factor, which is modifiable [39–42].

Data Availability

The [research] data used to support the findings of this study are restricted by the [Ewha Research Ethics and Compliance Online System] in order to protect [PATIENT PRIVACY]. Data are available from [Eunju Choi, celestial_@naver.com] for researchers who meet the criteria for access to confidential data.

Additional Points

Nurse managers should consider improving the quality of education and providing staff education to reduce mealtime difficulty in older adults with dementia. Furthermore, it is essential that different levels of adequate nursing staff be set according to facility size. Nurse managers must identify individual needs and preferences to create and implement an environment that can reduce mealtime difficulties. In addition, nursing managers should position more direct care workers so that residents can assist with meals adequately.

Conflicts of Interest

The authors declare that they have no known conflicts of interest or personal relationships that could have appeared to influence the work reported in this paper.

Authors' Contributions

Dukyoo Jung conceptualized the study, performed methodology, wrote and prepared the original draft, performed project administration, and provided funding acquisition. Jennie C. De Gagne conceptualized the study, wrote, reviewed, and edited the manuscript, and supervised the study. Eunju Choi conceptualized the study, wrote and prepared the original draft, and wrote, reviewed, and edited the manuscript. Hyesoon Lee conceptualized the study and wrote and prepared the original draft. Leeho Yoo conceptualized the study and wrote and prepared the original draft. Jisung Park conceptualized the study and wrote and prepared the original draft.

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Research Article

Factors Related to Nurses' Professional Autonomy When Caring for Patients with COVID-19 in a University Hospital: A Cross-Sectional Study

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Although individual factors play a vital role in determining professional autonomy, their specific impact during the coronavirus disease 2019 (COVID-19) pandemic has not been studied. This study aimed to compare nurses' professional autonomy when caring for patients with COVID-19 and for other patients and explore factors related to autonomy when caring for these patients. A paper-based questionnaire survey was conducted from June to August 2022 among nurses working at a university hospital in Japan. The survey included demographic factors (10 items, including, age, section, years of nursing experience, position, educational background, ladder level, and having certified nurse specialists or certified nurse qualifications) and individual experience factors (4 items: number of COVID-19 patients experienced, frequency and contents of searching for the latest information about COVID-19, frequency of using scientific sources, and frequency of training/study sessions on COVID-19 attended at the hospital). Additionally, basic knowledge of COVID-19 was evaluated. The scale for nurses' professional autonomy was developed based on a previous study. A paired t-test and stepwise multiple linear regression were used for the analyses. Overall, 241 nurses participated in the survey. The average length of nursing experience was 10.3 ± 9.2 years. The total scores for nurses' professional autonomy in all 5 factors 27 items were significantly lower ($t = -12.1$, $p < 0.001$) when caring for COVID-19 patients than when caring for other patients. Specifically, Factor 1 (Cognition) exhibited the most decreased scores when caring for COVID-19 patients than when caring for other patients. Factor 4 (Abstract judgment) differed the least between caring for COVID-19 and for other patients, but the average score was the lowest. More years of nursing experience ($\beta = 0.208$, $p = 0.001$) and a higher number of patients with COVID-19 cared for ($\beta = 0.140$, $p = 0.026$) were associated with higher autonomy scores. In conclusion, to enhance professional autonomy during an unprecedented pandemic, nurses must enhance cognition and abstract judgment. In the event of a future pandemic, nurses need to create an environment in which they routinely access and utilize the latest information and scientific evidence to provide high-quality nursing care based on their professional judgment and competence.

1. Introduction

The coronavirus disease 2019 (COVID-19) was caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and became a global pandemic [1]. The first cases of novel coronavirus were detected in China in December 2019,

and the virus has then spread rapidly to other countries worldwide. This led the World Health Organization to declare a Public Health Emergency of International Concern on January 30, 2020, and to characterize the outbreak as a pandemic on March 11, 2020 [1]. As of March 16, 2023, over 760 million confirmed cases and over 6.8 million deaths

have been reported globally since the COVID-19 pandemic started, with a large number of patients requiring medical treatment and intensive care in hospitals [1, 2]. However, this phenomenon occurs not only in hospitals but also in clinics, home nursing service stations, midwifery centers, and other facilities [3]. The COVID-19 pandemic has required nurses to provide quality nursing care for patients with COVID-19 even though they are not trained for this unprecedented situation.

Nurses' professional autonomy is defined as "having the authority to make decisions and freedom to act in accordance with one's professional knowledge" [4]. There are two main components of nurses' professional autonomy: independence in decision-making and the ability to utilize one's own competence. Nursing competence is defined as the ability of a nurse to effectively demonstrate a set of attributes, such as personal characteristics, values, attitudes, knowledge, and skills that are required for nurses to fulfill their professional responsibilities [5]. The utilization of personal competence has been recognized as necessary for nurses' autonomy, including deciding their approach to nursing care [6]. Nurses' professional autonomy is strongly related to job satisfaction, job stress, and psychological distress, which can affect their work engagement [7–10].

Factors that affect nurses' professional autonomy reported before COVID-19 can be classified into individual and environmental factors. Individual factors including sex, educational level, nursing experience, job position, critical thinking, professional skills, and clinical ladder level contribute to the utilization of nurses' professional autonomy [11, 12]. Male nurses have higher independence in decision-making than female nurses. Educational level, nursing experience, job position, critical thinking, and clinical ladder are strongly and positively associated with nurses' professional autonomy [10–12]. Furthermore, the number of patients experienced is also related to nurses' professional autonomy [13]. Meanwhile, environmental factors that can affect nurses' professional autonomy include supportive leadership [14], shared leadership, interprofessional and intraprofessional collaboration, and healthy work environments [6]. Supportive leadership can enhance nurses' professional autonomy, as it has a significant impact on decision-making in nursing care and fosters a positive workplace environment. In contrast, autocratic/non-supportive management may adversely affect nurses' autonomy [14]. Autocratic management is typically marked by a leader's inclination to centralize decision-making and consolidate power, often resulting in complete control over all aspects of their subordinates' activities, with little regard for input from the subordinates [15]. Nurse-physician collaboration and cooperation among nurses without authoritarian impositions could increase nurses' professional autonomy [16]. Meanwhile, poor nurse-physician relationships could reduce nurses' professional autonomy [14]. A healthy working environment promotes nurses' autonomy through good team spirit without conflict or teasing and a well-balanced workload [14].

The COVID-19 pandemic had a significant impact on nurses, with an increase in psychological distress and a decrease in job satisfaction [7, 17]. Nurses experienced significant stress and moral distress due to unfavorable job demands [17]. Common reasons for moral distress include a lack of decision-making autonomy, insufficient workplace respect, and inadequate psychosocial support mechanisms to help nurses cope with ethical dilemmas in both intensive care units [18] and general units [17, 19–21]. One study indicated that nurses' psychological stress during the COVID-19 pandemic could be related to their lower autonomy and competence [7]. However, it is unclear how the current pandemic has affected nurses' professional autonomy. Previous studies have investigated the relationship between environmental factors and professional autonomy during the pandemic. One study reported that the nurse-physician relationship improved because of the COVID-19 pandemic, and shared education and collaboration had a significantly positive influence on the nurses' professional autonomy [16]. Other studies reported that a high level of autonomy was associated with greater organizational citizenship behavior [22, 23] and low work-family conflict [24]. Organizational citizenship behavior is a type of cooperative behavior that increases a person's tendency toward helping and sharing information [22, 23]. However, no study has reported individual factors that can predict professional autonomy during the COVID-19 pandemic. One study reported that more younger nurses felt their professional autonomy increased than older nurses during the pandemic [25], but this study did not measure and compare professional autonomy using scores. Therefore, it was unknown whether age is related to increased autonomy.

Although individual factors play a vital role in determining professional autonomy, their specific impact in this particular scenario has not been studied. It is necessary to identify the individual factors that can affect professional autonomy during a pandemic, which can be used to develop individual training and educational programs. Therefore, this study specifically focused on investigating individual factors. This study aimed to (1) compare nurses' professional autonomy of the same nurses when caring for patients with COVID-19 and other patients and (2) explore individual factors related to nurses' autonomy when caring for patients with COVID-19.

2. Materials and Methods

2.1. Study Design. This cross-sectional study used the convenience sampling method as researchers' accessibility to participants. This study was approved by the Ethics Review Committee of the Institute of Education of Tokyo Medical and Dental University (Approval No.: C2022-01) and was conducted according to the tenets of the Declaration of Helsinki. Informed consent was obtained from all participants.

2.2. Participants and Setting. Participants were nurses who were employed at the 750-bed university hospital in an urban area of Japan during the study period. The study hospital had been actively contributing to measures against

COVID-19 since 2020. The inclusion criteria were working at the hospital for more than 1 year and having experience caring for COVID-19 patients. Nurses in the director's office were excluded. A paper-and-pencil questionnaire was provided to nurses. Data were collected between July and August 2022.

2.3. Data Collection. The first author explained the purpose, significance, and methods of the survey to the nurse managers of each section at their meeting after approval from the director of nursing. The informed consent included the explanation about voluntary participation with no rewards or demerits regardless of participation, anonymity, and not to be used for work evaluation. The first author provided a total of 997 survey forms in the director of the nursing office, which were divided into 30 sections according to the number of nurses in each section. The nurse manager in each section took the survey forms to his/her section and asked nurses to voluntarily collaborate on the survey at their convenience and return it after putting it into the sealed envelope to the designated collection bags provided in their respective sections. Nurse managers returned the bags containing the questionnaires in sealed envelopes, as well as any remaining survey forms, in 2-3 weeks to the director of the nursing office, and the survey materials were collected by the first author.

2.4. Variables and Instruments. The survey consisted of four main parts: (1) demographic factors (10 items), (2) individual experience factors (4 items), (3) basic knowledge of COVID-19 (20 items), and (4) professional autonomy questions (27 items). Items included demographic factors, individual experience factors, and basic knowledge of COVID-19 which were individual factors potentially related to professional autonomy based on previous research.

Demographic factors included sex [12], age [12], section, years of nursing experience [7, 12, 13], position [11], educational background [12], ladder level [24], and having certified nurse specialists (master level) or certified nurse (six-months training) qualifications. Individual experience factors included the number of COVID-19 patients experienced [13], frequency and contents of searching for the latest information about COVID-19, frequency they used scientific sources [26], and frequency of training/study sessions on COVID-19 attended at the hospital [19]. Basic knowledge of COVID-19 [4, 7] included coronavirus disease, infection period, polymerase chain reaction (PCR) test, nasopharyngeal antigen test, risk of complications, and infection control measures. These individual experience factors and basic knowledge are considered to be related to professional autonomy [4, 6, 27].

The questions for knowledge about COVID-19 were developed by researchers, including a middle-level nurse caring for patients with COVID-19 and a nurse manager of the COVID-19 ward who was not included in the research team based on her ward's COVID-19 guidelines. The ward's COVID-19 guidelines were previously created by external experts, and the head nurse confirmed the contents.

Participants responded right or wrong for each statement, and the number of correct answers was counted. The possible scores ranged from 0 (lowest) to 20 (highest). As the pilot test, five midlevel nurses with experience in caring for COVID-19 patients were asked to answer the 20 items for basic knowledge of COVID-19 twice with a 3-day interval [27]. We used the test-retest reliability to assess the total score stability with the intraclass correlation coefficient (ICC). The consistency was considered favorable if the ICC value was ≥0.70 [27], and the ICC in the current study was 0.833.

Contents of searching for the latest information about COVID-19 included general information about COVID-19 (the disease itself), the contagion of COVID-19, infection control measures, clinical studies results, treatment methods of COVID-19, nursing care for patients with COVID-19, nursing case study of the patients with COVID-19, others, and not searched. These items were also decided by researchers and the nurse manager of the COVID-19 ward based on the necessary knowledge to take care of patients with COVID-19 [4, 7, 26]. Participants were asked if they ever searched or not for each item.

Regarding nurses' professional autonomy, we modified the scale developed by Kikuchi and Harada published in 1997 after obtaining Kikuchi's permission [28]. Although there are several scales to measure nurses' professional autonomy, we selected the scale for the following reasons. One review [29] showed that 15 measures of nurses' autonomy were developed worldwide between 1974 and 2015, and 3 of them were developed by Japanese researchers. The scale developed by Kikuchi [28] was used in more nursing studies (eight) in Japan and had higher internal consistency than the scale developed by Tao in 1979 and the professional autonomy scale in nursing developed by Shijiki in 1999 [30]. Overall, 7 of the 12 professional autonomy scales outside of Japan are commonly used [29]. Among these 7 scales, 3 are validated in Japanese [31–33]. However, these scales may not necessarily be appropriate for the Japanese situation, including items such as "I consider I will gain the proper education and experience and begin working independently like a nurse practitioner" because there is no nurse practitioner who can work independently in Japan.

Kikuchi viewed nursing activities as cognition, judgment, and performance and developed their scale for Japanese nurses. Kikuchi original scale included 5 subscales with 47 items, namely, cognition (14 items), performance (14 items), concrete judgment (7 items), abstract judgment (7 items), and independent judgment (5 items) [28]. This scale covers the two main components of nurses' professional autonomy [6]: independence in decision-making including three types of judgments and the ability to utilize own competence of cognition and performance. During the COVID-19 pandemic, nurses were required to make decisions by themselves and work in unprecedented situations. Therefore, these scales were important in our study, which was conducted during the COVID-19 pandemic. However, Kikuchi's original scale was developed more than two decades ago and has some items that were not necessary in our study. Thus, researchers including the supervising professor

discussed with the head nurse of the COVID-19 ward and modified it to fit the current clinical situation. The number of items was reduced to 27 items to decrease the participant burden. The revised scale included cognition (9 items), performance (6 items), concrete judgment (4 items), abstract judgment (6 items), and basic nursing judgment (2 items). Each item was rated on the same 5-point Likert scale, with the scores ranging from 1 (strongly disagree) to 5 (strongly agree). The total score ranged from 27 to 135. Pilot testing using the revised scale was conducted among the same five middle-level nurses with nursing experience caring for COVID-19 patients, and face validity was confirmed. The internal consistency of the pilot study for the total score of nurses' professional autonomy when caring for COVID-19 patients was evaluated using Cronbach's α, with a value of ≥ 0.7 considered acceptable [34]. Cronbach's α in this was 0.952. We also used test-retest reliability to assess the score stability, with an ICC of 0.963 for the total score. The ICC values of the 5 factors were 0.960, 0.905, 0.860, 0.900, and 0.885, respectively.

2.5. Statistical Analyses. The target sample size for this study was calculated using G*Power (version 3.1.9.7). To detect a small effect size (d) of 0.2 with an α error of 0.05 (two-tailed) and a power of 0.8 by the paired t-test, 199 participants were required. Participant characteristics are described as descriptive statistics. The normality of data distribution was assessed using the skewness-kurtosis test, with a skewness of < -2 or >2 defined to indicate non-normally distributed data [35]. The total scores of the autonomy scale when caring for COVID-19 patients had a skewness value of -0.22 and a kurtosis value of 1.61; when caring for other patients, the values were -0.83 and 1.34, respectively. Therefore, the data were regarded to be normally distributed; hence, parametric tests were used. A paired t-test was used to compare the total score, average score of each factor, and each autonomy score between caring for COVID-19 patients and for other patients. The statistical significance level was set at $p < 0.01$ to decrease alpha error in the paired t-test for 27 individual items. Cohen's d was used to compare the effect size of the difference between caring for COVID-19 patients and for other patients among the factors and items of professional autonomy.

The total scores of professional autonomies when caring for COVID-19 patients were compared among three or more groups (sections) using an analysis of variance. Further, comparisons between two independent groups such as sex, age (20–40 years vs. 41–60 years), having a qualification of certified nurse specialist/certified nurse or not, and searching for the latest information about COVID-19 or not were performed using an independent t-test. Spearman's correlation coefficients (ρ) were used to analyze the association between nurses' professional autonomy when caring for patients with COVID-19 and non-normally distributed continuous variables such as age (four groups), years of nursing experience, and ordinal variables of educational level, position, ladder level, frequency of searching for the

latest information about COVID-19, frequency of using scientific sources, number of COVID-19 patients cared for, and frequency of attending training/study sessions at the hospital. Significant factors related to nurses' autonomy when caring for COVID-19 patients in the bivariate analyses ($p < 0.1$) were included in the stepwise multiple linear regression analysis to explore the independent factors related to nurses' professional autonomy. The normality of the residuals was confirmed using the Durbin–Watson ratio (between 1.5 and 2.5) [36]. Multicollinearity was checked using the variance inflation factor (VIF) (<10.0). An alpha level of 0.05 was set to indicate significance in the stepwise multiple linear regression. All statistical analyses were performed using SPSS version 22 (SPSS Inc., Chicago, IL, USA) software.

3. Results

3.1. Participant Demographics and Experiences. A total of 318 questionnaires were collected, yielding a response rate of 31.8%. Duplicate responses were checked using identified duplicate cases function in SPSS, and no duplicates were identified. Overall, 63 participants were excluded because they had not cared for COVID-19 patients. After excluding 14 questionnaires with missing values, data from 241 participants were used in the analysis (effective response rate, 94.5%). Table 1 presents the participants' characteristics. The average length of nursing experience was 10.3 ± 9.2 years. In total, 51.9% of the respondents were aged ≤ 30 years, and 93.4% were female. Most participants were staff nurses (87.6%) and had a Bachelor's degree (70.1%), with only 1.2% having a Master's degree. The most frequent educational backgrounds by age group were as follows: 92.0% of nurses aged 20–30 years and 76.8% of those aged 31–40 years completed a 4-year university nursing program, and 51.4% of those aged 41–50 years and 80% of those aged 51–60 years completed a 3 year vocational nursing school program. For the distribution according to station, 20.7% of nurses were from internal medicine; 30.7%, surgery; 11.6%, outpatient; and 36.9%, other stations. Over half (59.3%) of the participants did not attend any training sessions on COVID-19 at the hospital during the pandemic (Table 1). Approximately, 60% of the participants searched the information about COVID-19 (the disease itself), while less than 5% of them searched for the results of clinical studies and nursing case studies about patients with COVID-19 (Table 2).

3.2. Basic Knowledge of COVID-19. The average number of correct answers was 17.4 ± 1.4. Table 3 shows the questions ranked in order by the highest correct rates. Five items, such as the fatality rate of COVID-19 and utilization of N95 masks when caring for infectious patients, were responded to 100% correctly (nos. 1–5). Eight items, including risk factors of severe disease, personal protective equipment (PPE) usage when working with a deceased body, choosing rapid PCR testing for patients suspected of COVID-19,

Table 1: Participant characteristics and association with the total score of professional autonomy when caring for patients with COVID-19 ($n = 241$).

Characteristics	Categories	n (%)/M ± SD	Average professional autonomy score ± SD when caring for patients with COVID-19	ρ^a	p
Age, years (four groups)	20–30	125 (51.9)	90.1 ± 13.6	0.100	0.122[a]
	31–40	56 (23.2)	89.2 ± 15.8		
	41–50	35 (14.5)	92.7 ± 12.1		
	51–60	25 (10.4)	98.4 ± 16.9		
Age, years (two groups)	20–40	181 (75.1)	89.8 ± 14.3		0.015[b]
	41–60	60 (24.9)	95.1 ± 14.4		
Sex	Male	16 (6.6)	93.3 ± 6.7		0.534[b]
	Female	226 (93.4)	91.0 ± 14.9		
Years of nursing experience		10.3 ± 9.2		0.163	0.011[a]
Position	Staff nurse	211 (87.6)	90.6 ± 14.5	0.093	0.152[a]
	Assistant nurse manager	23 (9.5)	93.4 ± 11.4		
	Nurse manager	7 (2.9)	100.7 ± 19.6		
Educational background	High school nursing course, 5 years	7 (2.9)	97.0 ± 15.2	−0.096	0.136[a]
	Vocational nursing school, 3 years	51 (21.2)	95.1 ± 14.2		
	Junior college of nursing, 3 years	14 (5.8)	89.6 ± 13.9		
	University nursing course, 4 years	166 (68.9)	89.5 ± 14.2		
	Graduate school (Masters of Science)	3 (1.2)	106.0 ± 23.0		
Stations	Internal medicine	50 (20.7)	88.9 ± 14.3		0.618[c]
	Surgery	74 (30.7)	91.4 ± 11.4		
	Outpatient	28 (11.6)	90.9 ± 15.9		
	Other (including COVID-19 ward)	89 (36.9)	92.3 ± 16.4		
Clinical ladder level	0	17 (7.1)	96.0 ± 21.0	0.152	0.018[a]
	I	38 (15.8)	84.7 ± 12.5		
	II	66 (27.4)	90.3 ± 12.9		
	II	59 (24.5)	92.7 ± 15.7		
	IV	45 (18.7)	92.5 ± 12.2		
	V	16 (6.6)	95.5 ± 14.7		
Having a certified nurse specialist or certified nurse qualifications	Yes	11 (4.6)	95.2 ± 12.8		0.341[b]
	No	231 (95.4)	90.9 ± 14.6		
Number of COVID-19 patients experienced	1–10	103 (42.7)	88.3 ± 14.0	0.176	0.006[a]
	11–20	30 (12.4)	95.4 ± 13.6		
	21–30	16 (6.6)	88.1 ± 16.2		
	31–40	9 (3.7)	98.8 ± 12.6		
	41–50	13 (5.4)	95.1 ± 11.9		
	51–100	22 (9.1)	92.4 ± 11.5		
	≥101	37 (15.4)	93.8 ± 17.4		
	Missing data	11 (4.6)			

Table 1: Continued.

Characteristics	Categories	n (%)/M ± SD	Average professional autonomy score ± SD when caring for patients with COVID-19	ρ[a]	p
Frequency of using scientific sources	Never	77 (32.0)	89.4 ± 14.8		
	Once a year	12 (5.0)	90.3 ± 15.5		
	Once every 6 months	32 (13.3)	92.3 ± 12.7		
	Once every 3 months	31 (12.9)	90.2 ± 13.9	0.073	0.260[a]
	Once a month	42 (17.4)	92.7 ± 12.0		
	Once every 1–2 weeks	32 (13.3)	92.0 ± 19.0		
	More than once every 1–2 weeks	15 (6.2)	94.3 ± 13.9		
Frequency of searching for latest information about COVID-19	Never	18 (7.5)	87.3 ± 14.4		
	Once a year	4 (1.7)	93.2 ± 17.3		
	Once every 6 months	16 (6.6)	91.4 ± 13.3		
	Once every 3 months	28 (11.6)	87.7 ± 19.2	0.082	0.203[a]
	Once a month	58 (24.1)	91.6 ± 10.8		
	Once every 1–2 weeks	79 (32.8)	91.3 ± 12.9		
	More than once every 1–2 weeks	38 (15.8)	94.2 ± 19.4		
Frequency of attending training/study sessions about COVID-19 at the hospital	Never	143 (59.3)	89.1 ± 13.8		
	Once a year	55 (22.8)	95.1 ± 12.3		
	Once every 6 months	30 (12.4)	92.6 ± 18.3	0.150	0.020[a]
	Once every 3 months	8 (3.3)	99.3 ± 18.2		
	Once a month	4 (1.7)	82.7 ± 14.1		
	More than once every 1–2 weeks	1 (0.4)	84.0 ± 0.0		
Total score of the basic knowledge of COVID-19		17.4 ± 1.4		−0.014	0.831[a]

[a] The associations between the total score of nurses' professional autonomy when caring for patients with COVID-19 and ordinal and continuous variables are assessed using Spearman's correlation coefficients.
[b] Independent t-test. [c] Analysis of variance.

TABLE 2: Overview of recent information search on COVID-19 ($n = 241$).

	Factors	n	%
1	About COVID-19 (disease itself)	144	20.5
2	Spread situation of the infection	180	25.6
3	Infection control measures	136	19.3
4	Results of clinical studies	25	3.6
5	Treatment methods	105	14.9
6	How to care for patients with COVID-19	65	9.2
7	Nursing case studies about patients with COVID-19	27	3.8
8	Others	11	1.6
9	Not searched	11	1.6
	Total	241	100

TABLE 3: Basic knowledge of COVID-19 ($n = 241$).

	Items	Correct response (%)
1	The fatality rate remains constant regardless of age or underlying diseases	100.0
2	Wear an N95 mask when suctioning airway secretions from suspected or positive patients	100.0
3	Wear an N95 mask while performing endotracheal intubation on suspected or positive patients	100.0
4	Wear an N95 mask when applying noninvasive positive pressure ventilation (NPPV) to suspected or positive patients	100.0
5	Wear an N95 mask when performing bronchoscopy on suspected or positive patients	100.0
6	Chronic kidney disease, type 2 diabetes, and hypertension are not risk factors for severe disease	99.6
7	Personal protective equipment is not required when providing direct care to the dead body of an infected patient	99.2
8	If there is a suspicion of COVID-19, even if the antigen test was negative, one rapid PCR testing should be performed in the hospital	98.8
9	A surgical mask is sufficient when talking to suspected or positive patients at a distance	98.3
10	Wear an N95 mask when performing cardiopulmonary resuscitation (CPR) on suspected or positive patients	97.5
11	If the patient (positive) is not present, the staff member performing the environmental disinfection is not required to wear gloves and gowns	97.1
12	If you are only serving meals to suspected or positive patients in their hospital rooms, only surgical masks and gloves are required	96.3
13	The infectious period starts 2 days prior and lasts 7–10 days after the onset of symptoms	95.4
14	If a new COVID-19 infection is suspected after admission, even if the screening test result is negative, a nasopharyngeal antigen test should be performed promptly	87.1
15	Respiratory therapy options for critically ill patients are high-flow oxygen therapy and noninvasive positive pressure ventilation	71.8
16	The peak of viral shedding for COVID-19 is 2-3 days after onset	70.5
17	The incubation period of COVID-19 (omicron strain) is approximately 2-3 days	69.7
18	Alcohol is effective as a disinfectant against COVID-19, but hypochlorous acid water is not	66.0
19	Always wash and sanitize dishes used by patients (positive) separately from other patients	58.5
20	Order of removing personal protective equipment (PPE), in case of double gloving: hand disinfection ⟶ outer gloves ⟶ hand disinfection ⟶ remove gown and inner gloves while turning them inside out ⟶ hand disinfection ⟶ face shield and goggles ⟶ hand disinfection ⟶ cap ⟶ hand disinfection ⟶ mask ⟶ hand disinfection	33.6

surgical mask and N95 using situations, PPE usage when performing environmental disinfection, and infectious period of COVID-19 (nos. 6–13), had a correct response rate of over 90%. However, 4 items (nos. 17–20), including the peak viral shedding and the incubation period of COVID-19 and practices (alcohol disinfection and sanitizing patients'

dishes) for infection prevention and control, had a low correct response rate (<70%). The item with the lowest correct response rate (33.6%) pertained to the order of removing PPE (no. 20).

3.3. Differences in Autonomy Scores between Caring for COVID-19 and Other Patients. The total score for nurses' professional autonomy was significantly lower ($t = -12.1$, $p < 0.001$, Cohen's $d = 0.780$) when caring for COVID-19 patients than for other patients (Table 4). The scores for the five factors and all their items were significantly lower when caring for patients with COVID-19 than for other patients ($p < 0.001$). The highest mean score when caring for COVID-19 patients was for Factor 2 (performance), while the lowest mean score was for Factor 4 (abstract judgment). The highest Cohen's d was for Factor 1 (cognition), while the lowest Cohen's d was for Factor 5 (basic nursing judgment). Cohen's d of two items in Factor 1 was ≥0.7: "I can predict the physical effects of the treatment on the patient" and "I can predict future problems that may occur to the patient based on the course of events to date." Further, 7 items had Cohen's d of 0.6 to 0.5, and 18 items had Cohen's d of 0.4 to 0.3. The item with the lowest Cohen's d (0.314) was "I can use the latest scientific evidence including the nursing articles to decide appropriate nursing," which belonged to Factor 4 (Abstract judgment). Table 4 includes the overall Cronbach's alphas and the subscales for both caring situations.

3.4. Factors Influencing Nurses' Professional Autonomy When Caring for Patients with COVID-19. Table 1 shows the association between the total score for professional autonomy when caring for patients with COVID-19 and each variable. Participants aged ≥41 years had higher professional autonomy than those aged ≤40 years ($p = 0.015$). Years of nursing experience ($\rho = 0.163$, $p = 0.011$), number of COVID-19 patients experienced ($\rho = 0.176$, $p = 0.006$), and frequency of attending training/study sessions about COVID-19 at the hospital ($\rho = 0.150$, $p = 0.020$) were positively associated with professional autonomy. Although clinical ladder was positively associated with professional autonomy ($\rho = 0.152$, $p = 0.018$), the highest professional autonomy (96.0 ± 21.0) was observed among nurses with a clinical ladder level "0."

The total score of professional autonomy did not significantly differ according to four age groups, sex, stations, position, nursing certification, educational background, frequency, and contents searched for the latest information about COVID-19, and frequency of using scientific sources.

Based on the bivariate analyses, 2 age groups (20–40 and 41–60 years), years of nursing experience, clinical ladder level, frequency of attending training/study sessions at the hospital, and the number of COVID-19 patients cared for were entered into the stepwise multiple linear regression analysis. The results indicated that longer years of nursing experience ($\beta = 0.208$, $p = 0.001$, adjusted $R^2 = 0.040$) and a higher number of patients with COVID-19 experienced ($\beta = 0.140$, $p = 0.026$, adjusted $R^2 = 0.015$) were significantly related to higher autonomy scores. The explanatory variance of these two factors was 5.5% (Table 5).

4. Discussion

This study found that nurses' professional autonomy with all investigated five factors and 27 items was significantly lower when caring for COVID-19 patients than when caring for other patients. Specifically, Factor 1 (cognition) exhibited the most decreased scores when caring for COVID-19 patients than when caring for other patients. Factor 4 (abstract judgment) showed the smallest difference between caring for COVID-19 and for other patients, but the score was the lowest. On the other hand, Factor 5 (basic nursing Judgment) demonstrated relatively higher scores, even when caring for COVID-19 patients. Factors related to higher professional autonomy when caring for COVID-19 patients were longer years of nursing experience and experiencing more patients with COVID-19. To the best of our knowledge, this is the first study to compare the professional autonomy of the same nurses when caring for COVID-19 and for other patients and to report individual factors related to professional autonomy when caring for COVID-19 patients using a scale.

Among the five factors of professional autonomy, Factor 1 (cognition) exhibited the highest Cohen's d score, with 5 items greater than 0.5. The predictive items for patient outcomes were significantly lower when caring for COVID-19 patients than when caring for other patients. The items with the highest Cohen's d scores were to predict the effects of the treatment and future problems, to identify changes in a patient's condition, and to understand the relationship between test results and symptoms. These results may be attributed to a lack of sufficient information on COVID-19, limited experience in acquiring the necessary knowledge and skills to predict treatment responses, and provision of appropriate care for COVID-19 patients [37], resulting in an inability to effectively apply knowledge, skills, and judgment [5].

Factor 5 (basic nursing judgment) had the lowest Cohen's d, and the average score was relatively high with the items focused on choosing appropriate nursing methods considering a patient's needs. It is assumed that nurses gained the basic nursing skills required to work with COVID-19 patients, which can also be common with other patients. Additionally, the item about using the latest scientific evidence in nursing practice in Factor 4 (abstract judgment) showed the smallest difference between caring for COVID-19 and for other patients, but the average score was the lowest. Although it was important for the participants to obtain appropriate information about the unprecedented COVID-19 pandemic, very few participants searched for clinical studies and nursing practice cases, consistent with previous reports [38–40]. Collectively, these results support that most nurses may not use scientific evidence in their nursing practice, regardless of the current pandemic situation [38–40]. In Japan, approximately 12% of nurses working in hospitals had a university degree, and 1.3% had completed graduate education [41]. In our study, although the majority of the participants were university graduates (68.9%), only a similar proportion held Master's degree (1.2%). This indicates that undergraduate education alone is

TABLE 4: Differences in nurses' professional autonomy scores between caring for COVID-19 and other patients ($n = 241$).

Items	When caring for COVID-19 patients		When caring for other patients		Cohen's d	p
	Mean ± SD	α	Mean ± SD	α		
Factor 1: cognition	3.4 ± 0.5	0.85	3.8 ± 0.4	0.87	0.86	<0.001
I can predict the physical effects of the treatment on the patient	3.3 ± 0.8		3.9 ± 0.5		0.72	<0.001
I can predict future problems that may occur to the patient based on the course of events to date	3.2 ± 0.8		3.8 ± 0.6		0.70	<0.001
I can accurately identify changes in a patient's general condition	3.2 ± 0.8		3.6 ± 0.6		0.64	<0.001
I can understand the relationship between a patient's test results and symptoms	3.4 ± 0.7		3.8 ± 0.5		0.60	<0.001
I can fully understand the values of my patients	3.2 ± 0.8		3.5 ± 0.7		0.57	<0.001
I can understand the discrepancy between a patient's verbal and emotional behavior	3.3 ± 0.8		3.6 ± 0.6		0.48	<0.001
I can predict the psychological impact of hospitalization and treatment on the patient	3.5 ± 0.8		3.9 ± 0.6		0.47	<0.001
I am able to gather the information needed for nursing care (patient's personality, lifestyle, psychological problems he/she may have)	3.5 ± 0.8		3.9 ± 0.5		0.46	<0.001
I can show empathic understanding of the patient's words and actions	3.7 ± 0.8		4.0 ± 0.6		0.43	<0.001
Factor 2: performance	3.5 ± 0.6	0.85	3.8 ± 0.5	0.84	0.62	<0.001
I am able to provide nursing care based on the patient's distinctive characteristic of individual or social life	3.4 ± 0.7		3.8 ± 0.5		0.53	<0.001
I am able to prioritize and systematically carry out my nursing duties	3.7 ± 0.6		3.9 ± 0.5		0.52	<0.001
I can cooperate with other professionals	3.7 ± 0.7		4.2 ± 0.6		0.48	<0.001
I can allay a patient's distrust and anxiety about medical care by providing sufficient explanation	3.3 ± 0.7		3.6 ± 0.6		0.46	<0.001
I am able to provide nursing care calmly in an emergency	3.1 ± 0.9		3.4 ± 0.8		0.45	<0.001
I can handle a patient's emotions (anger, sadness)	3.4 ± 0.7		3.7 ± 0.6		0.38	<0.001
Factor 3: concrete judgment	3.4 ± 0.7	0.83	3.8 ± 0.6	0.85	0.61	<0.001
I can assess a patient's condition from various information and choose nursing care that is appropriate for the patient's needs	3.3 ± 0.7		3.7 ± 0.6		0.57	<0.001
I can perform nursing assessments and provide recommendations to achieve the highest quality of care	3.4 ± 0.7		3.8 ± 0.6		0.50	<0.001
I can respond to sudden physiological changes in the patient (hematemesis, loss of consciousness, hypotension, chills)	3.3 ± 0.9		3.6 ± 0.7		0.46	<0.001
I can prioritize a patient's problem and clarify the most important problem among the many problems	3.5 ± 0.7		3.7 ± 0.6		0.42	<0.001
Factor 4: abstract judgment	3.2 ± 0.7	0.89	3.4 ± 0.6	0.86	0.50	<0.001
I can proactively present patient's problems and lead to solve it at the medical meetings	3.2 ± 0.8		3.5 ± 0.7		0.46	<0.001
I can evaluate a patient's symptoms and test results and select appropriate nursing methods	3.4 ± 0.7		3.7 ± 0.6		0.45	<0.001
I can make nursing decisions based on the medical situation without sufficient information	2.9 ± 0.8		3.1 ± 0.9		0.39	<0.001
I can plan nursing care using the nursing model and introduce it to my coworkers	3.2 ± 0.8		3.4 ± 0.7		0.34	<0.001
The nursing plan that I developed can be approved by my coworkers	3.4 ± 0.7		3.6 ± 0.7		0.32	<0.001
I can use the latest scientific evidence including nursing articles to decide on appropriate nursing	2.7 ± 0.9		2.9 ± 1.0		0.31	<0.001
Factor 5: basic nursing judgment	3.5 ± 0.7	0.83	3.7 ± 0.6	0.75	0.43	<0.001
I can choose nursing methods considering the patient's needs	3.5 ± 0.7		3.8 ± 0.6		0.42	<0.001
I can choose appropriate nursing methods, regardless of the patient's words and actions	3.4 ± 0.7		3.6 ± 0.6		0.33	<0.001
Total scores	91.1 ± 14.5	0.95	99.9 ± 11.8	0.94	0.78	<0.001

Paired t-test, α: Cronbach's α coefficients. The items within each factor are arranged in descending order of Cohen's d.

inadequate to apply scientific evidence and achieve higher professional autonomy in pandemic situations.

Further, in our study, age, educational background, clinical ladder level, and using scientific sources were not related to nurses' professional autonomy when caring for COVID-19 patients. A previous study reported that years of experience, but not age, was significantly correlated to the nurses' professional autonomy [8], consistent with the current results. Regarding educational background, three nurses had Master's degrees and had the highest professional

Table 5: Factors related to nurses' professional autonomy when caring for patients with COVID-19 ($n = 241$).

Factors	β	T	p	VIF	Adjusted R^2
Years of nursing experience	0.208	3.311	0.001	1.000	0.040
Number of patients with COVID-19 experienced	0.140	2.233	0.026	1.000	0.015

Stepwise multiple linear regression. Dependent variable: total scores of nurses' professional autonomy when caring for COVID-19 patients. Final model: Durbin–Watson = 2.115, overall adjusted $R^2 = 0.055$. VIF: variance inflation factor of all variables.

autonomy score in this study. Despite having higher educational backgrounds, young nurses (i.e., those aged ≤40 years) had fewer years of nursing experience and tended to exhibit lower levels of professional autonomy compared with older nurses (i.e., those aged ≥41 years). Additionally, it should be noted that some older nurses who did not take the clinical ladder were on level 0 despite their longer nursing experience and higher professional autonomy. In our study, less than 5% of the participants searched for results of clinical studies and nursing case studies about patients with COVID-19. There was no obvious association between using scientific sources and professional nursing autonomy, although previous studies reported that using scientific sources increased critical thinking [26] and that critical thinking is strongly associated with professional nursing autonomy [26]. Previous studies reported that educational backgrounds were significantly related to the use of research results [42–46], in which over 15% of nurses had a Master's degree. In our study, only 1.2% of nurses had a Master's degree, which can be the reason that the educational levels were not significantly related to professional autonomy scores.

Basic knowledge of COVID-19 and attending training/study sessions on COVID-19 at the hospital were not related to nurses' professional autonomy, either. The correct response rates regarding the peak viral shedding and the incubation period of COVID-19 items (nos. 16–17) were lower than those of the standard precaution items of infection prevention and control (nos. 2–5), which were common infection control protocols and not specific for COVID-19. The item with the lowest correct response rate (33.6%) was the order of PPE removal. PPE removal is a complicated multistep task that requires not only knowledge but also multiple practice. A previous study reported no significant correlation between knowledge and nurse compliance with the use of level 2 PPE [47], and consistent findings were observed in the current study. This indicates that experience-based learning systems such as simulation and role play may be necessary for improving nurses' professional autonomy, in addition to acquiring knowledge.

4.1. Limitations. This current study has several limitations. First, the findings cannot be generalized to all hospital settings because the study was conducted at a university hospital in an urban area in Japan, where the educational level is relatively high. Nationwide surveys, not only in Japan but also in other countries, need to be conducted. Second, subjectivity and response bias are inherent challenges in self-reported questionnaires. The response rate (31.8%) was not high enough, which could have caused a participation bias,

in which nurses with higher professional autonomy could have been included. Third, because there were no rewards for participation and no duplicated answers were found, it was unlikely that the same person responded more than once; however, there is no guarantee that this was the case in this anonymous study. Fourth, the timings of working with COVID-19 patients or other patients were not specified, and some nurses might not have been working with other patients at the time of the investigation. Participants had to consider their previous experiences, which could have caused a memory bias. Fifth, the current study reported a low model fit ($R^2 = 0.055$); only approximately 6% of the variance related to professional autonomy was explained. More factors related to professional autonomy other than those measured in this study should be explored. As this study focused on individual, rather than environmental factors, it is also necessary to further investigate the environmental factors that may affect professional autonomy during the pandemic. Finally, it is not possible to establish causality among variables owing to the cross-sectional study design.

Regardless of these limitations, our study contributes by expanding the existing body of research and offering novel insights into nurses' autonomy. Although factors related to professional autonomy during the COVID-19 pandemic were similar to those before the pandemic, our findings indicate that "cognition" is vulnerable to decrease and "abstract judgment" is as low as during usual conditions among professional autonomy domains.

4.2. Practical Implications. To enhance professional autonomy during unprecedented pandemics, nurses must enhance cognition and abstract judgment. To enhance cognition and abstract judgment, it is necessary to promote the integration of up-to-date information and clinical evidence into their practice, and the following recommendations at the three levels are suggested.

At the individual level, for nurses to be able to predict patients' condition and mitigate the uncertainty experienced during the COVID-19 pandemic, it is crucial to actively obtain information about patients' progress. Nurses should attend the information-sharing meetings and training.

At the organizational level, it is necessary to guide nurses on how to access up-to-date clinical information and research evidence and effectively utilize it. Creating study groups sharing clinical cases and experiences among multiple professionals is crucial in fostering collaboration and knowledge exchange, which may promote nurses' professional growth and autonomy, empowering them to deliver high-quality care. Healthcare organizations should also

incorporate experience-based simulations and role-play practice into their training programs to allow nurses to practice and apply their skills in realistic scenarios. Hospital administrators also need to hire more nurses with graduate education, who play a role in connecting research and practice.

At the policy-making level, it is necessary to make accurate up-to-date information about the infectious disease available to healthcare professionals as soon as possible. In the long run, it is necessary to mandate more education in undergraduate nursing programs on how to use research evidence and to encourage and support more nurses to study in graduate programs. In addition, support may be needed for universities to strengthen research and measures to develop experience-based simulations, such as using virtual reality technology. Further studies are required to clarify the effects of experience-based learning systems in enhancing professional autonomy.

5. Conclusions

Nurses' professional autonomy in all 5 factors and 27 items was significantly lower when caring for COVID-19 patients than when caring for other patients. Specifically, Factor 1 (cognition) exhibited the most decreased scores when caring for COVID-19 patients than when caring for other patients. Factor 4 (abstract judgment) showed the smallest difference between them, but the average score was the lowest. Factors related to higher professional autonomy when caring for COVID-19 patients were longer years of nursing experience and experiencing more patients with COVID-19. To enhance professional autonomy during an unprecedented pandemic, it is necessary for nurses to enhance cognition and abstract judgment. In the event of a future pandemic, nurses need to create an environment in which they routinely access and utilize the latest information and scientific evidence so that they can provide high-quality nursing care based on their own professional judgment and competence. Experience-based learning systems may also be necessary to enhance professional autonomy.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

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Research Article

Factors Related to Nurses' Professional Autonomy When Caring for Patients with COVID-19 in a University Hospital: A Cross-Sectional Study

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Although individual factors play a vital role in determining professional autonomy, their specific impact during the coronavirus disease 2019 (COVID-19) pandemic has not been studied. This study aimed to compare nurses' professional autonomy when caring for patients with COVID-19 and for other patients and explore factors related to autonomy when caring for these patients. A paper-based questionnaire survey was conducted from June to August 2022 among nurses working at a university hospital in Japan. The survey included demographic factors (10 items, including, age, section, years of nursing experience, position, educational background, ladder level, and having certified nurse specialists or certified nurse qualifications) and individual experience factors (4 items: number of COVID-19 patients experienced, frequency and contents of searching for the latest information about COVID-19, frequency of using scientific sources, and frequency of training/study sessions on COVID-19 attended at the hospital). Additionally, basic knowledge of COVID-19 was evaluated. The scale for nurses' professional autonomy was developed based on a previous study. A paired t-test and stepwise multiple linear regression were used for the analyses. Overall, 241 nurses participated in the survey. The average length of nursing experience was 10.3 ± 9.2 years. The total scores for nurses' professional autonomy in all 5 factors 27 items were significantly lower ($t = -12.1$, $p < 0.001$) when caring for COVID-19 patients than when caring for other patients. Specifically, Factor 1 (Cognition) exhibited the most decreased scores when caring for COVID-19 patients than when caring for other patients. Factor 4 (Abstract judgment) differed the least between caring for COVID-19 and for other patients, but the average score was the lowest. More years of nursing experience ($\beta = 0.208$, $p = 0.001$) and a higher number of patients with COVID-19 cared for ($\beta = 0.140$, $p = 0.026$) were associated with higher autonomy scores. In conclusion, to enhance professional autonomy during an unprecedented pandemic, nurses must enhance cognition and abstract judgment. In the event of a future pandemic, nurses need to create an environment in which they routinely access and utilize the latest information and scientific evidence to provide high-quality nursing care based on their professional judgment and competence.

1. Introduction

The coronavirus disease 2019 (COVID-19) was caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) and became a global pandemic [1]. The first cases of novel coronavirus were detected in China in December 2019, and the virus has then spread rapidly to other countries worldwide. This led the World Health Organization to declare a Public Health Emergency of International Concern on January 30, 2020, and to characterize the outbreak as a pandemic on March 11, 2020 [1]. As of March 16, 2023, over 760 million confirmed cases and over 6.8 million deaths

have been reported globally since the COVID-19 pandemic started, with a large number of patients requiring medical treatment and intensive care in hospitals [1, 2]. However, this phenomenon occurs not only in hospitals but also in clinics, home nursing service stations, midwifery centers, and other facilities [3]. The COVID-19 pandemic has required nurses to provide quality nursing care for patients with COVID-19 even though they are not trained for this unprecedented situation.

Nurses' professional autonomy is defined as "having the authority to make decisions and freedom to act in accordance with one's professional knowledge" [4]. There are two main components of nurses' professional autonomy: independence in decision-making and the ability to utilize one's own competence. Nursing competence is defined as the ability of a nurse to effectively demonstrate a set of attributes, such as personal characteristics, values, attitudes, knowledge, and skills that are required for nurses to fulfill their professional responsibilities [5]. The utilization of personal competence has been recognized as necessary for nurses' autonomy, including deciding their approach to nursing care [6]. Nurses' professional autonomy is strongly related to job satisfaction, job stress, and psychological distress, which can affect their work engagement [7–10].

Factors that affect nurses' professional autonomy reported before COVID-19 can be classified into individual and environmental factors. Individual factors including sex, educational level, nursing experience, job position, critical thinking, professional skills, and clinical ladder level contribute to the utilization of nurses' professional autonomy [11, 12]. Male nurses have higher independence in decision-making than female nurses. Educational level, nursing experience, job position, critical thinking, and clinical ladder are strongly and positively associated with nurses' professional autonomy [10–12]. Furthermore, the number of patients experienced is also related to nurses' professional autonomy [13]. Meanwhile, environmental factors that can affect nurses' professional autonomy include supportive leadership [14], shared leadership, interprofessional and intraprofessional collaboration, and healthy work environments [6]. Supportive leadership can enhance nurses' professional autonomy, as it has a significant impact on decision-making in nursing care and fosters a positive workplace environment. In contrast, autocratic/non-supportive management may adversely affect nurses' autonomy [14]. Autocratic management is typically marked by a leader's inclination to centralize decision-making and consolidate power, often resulting in complete control over all aspects of their subordinates' activities, with little regard for input from the subordinates [15]. Nurse-physician collaboration and cooperation among nurses without authoritarian impositions could increase nurses' professional autonomy [16]. Meanwhile, poor nurse-physician relationships could reduce nurses' professional autonomy [14]. A healthy working environment promotes nurses' autonomy through good team spirit without conflict or teasing and a well-balanced workload [14].

The COVID-19 pandemic had a significant impact on nurses, with an increase in psychological distress and a decrease in job satisfaction [7, 17]. Nurses experienced significant stress and moral distress due to unfavorable job demands [17]. Common reasons for moral distress include a lack of decision-making autonomy, insufficient workplace respect, and inadequate psychosocial support mechanisms to help nurses cope with ethical dilemmas in both intensive care units [18] and general units [17, 19–21]. One study indicated that nurses' psychological stress during the COVID-19 pandemic could be related to their lower autonomy and competence [7]. However, it is unclear how the current pandemic has affected nurses' professional autonomy. Previous studies have investigated the relationship between environmental factors and professional autonomy during the pandemic. One study reported that the nurse-physician relationship improved because of the COVID-19 pandemic, and shared education and collaboration had a significantly positive influence on the nurses' professional autonomy [16]. Other studies reported that a high level of autonomy was associated with greater organizational citizenship behavior [22, 23] and low work-family conflict [24]. Organizational citizenship behavior is a type of cooperative behavior that increases a person's tendency toward helping and sharing information [22, 23]. However, no study has reported individual factors that can predict professional autonomy during the COVID-19 pandemic. One study reported that more younger nurses felt their professional autonomy increased than older nurses during the pandemic [25], but this study did not measure and compare professional autonomy using scores. Therefore, it was unknown whether age is related to increased autonomy.

Although individual factors play a vital role in determining professional autonomy, their specific impact in this particular scenario has not been studied. It is necessary to identify the individual factors that can affect professional autonomy during a pandemic, which can be used to develop individual training and educational programs. Therefore, this study specifically focused on investigating individual factors. This study aimed to (1) compare nurses' professional autonomy of the same nurses when caring for patients with COVID-19 and other patients and (2) explore individual factors related to nurses' autonomy when caring for patients with COVID-19.

2. Materials and Methods

2.1. Study Design. This cross-sectional study used the convenience sampling method as researchers' accessibility to participants. This study was approved by the Ethics Review Committee of the Institute of Education of Tokyo Medical and Dental University (Approval No.: C2022-01) and was conducted according to the tenets of the Declaration of Helsinki. Informed consent was obtained from all participants.

2.2. Participants and Setting. Participants were nurses who were employed at the 750-bed university hospital in an urban area of Japan during the study period. The study hospital had been actively contributing to measures against

COVID-19 since 2020. The inclusion criteria were working at the hospital for more than 1 year and having experience caring for COVID-19 patients. Nurses in the director's office were excluded. A paper-and-pencil questionnaire was provided to nurses. Data were collected between July and August 2022.

2.3. Data Collection. The first author explained the purpose, significance, and methods of the survey to the nurse managers of each section at their meeting after approval from the director of nursing. The informed consent included the explanation about voluntary participation with no rewards or demerits regardless of participation, anonymity, and not to be used for work evaluation. The first author provided a total of 997 survey forms in the director of the nursing office, which were divided into 30 sections according to the number of nurses in each section. The nurse manager in each section took the survey forms to his/her section and asked nurses to voluntarily collaborate on the survey at their convenience and return it after putting it into the sealed envelope to the designated collection bags provided in their respective sections. Nurse managers returned the bags containing the questionnaires in sealed envelopes, as well as any remaining survey forms, in 2-3 weeks to the director of the nursing office, and the survey materials were collected by the first author.

2.4. Variables and Instruments. The survey consisted of four main parts: (1) demographic factors (10 items), (2) individual experience factors (4 items), (3) basic knowledge of COVID-19 (20 items), and (4) professional autonomy questions (27 items). Items included demographic factors, individual experience factors, and basic knowledge of COVID-19 which were individual factors potentially related to professional autonomy based on previous research.

Demographic factors included sex [12], age [12], section, years of nursing experience [7, 12, 13], position [11], educational background [12], ladder level [24], and having certified nurse specialists (master level) or certified nurse (six-months training) qualifications. Individual experience factors included the number of COVID-19 patients experienced [13], frequency and contents of searching for the latest information about COVID-19, frequency they used scientific sources [26], and frequency of training/study sessions on COVID-19 attended at the hospital [19]. Basic knowledge of COVID-19 [4, 7] included coronavirus disease, infection period, polymerase chain reaction (PCR) test, nasopharyngeal antigen test, risk of complications, and infection control measures. These individual experience factors and basic knowledge are considered to be related to professional autonomy [4, 6, 27].

The questions for knowledge about COVID-19 were developed by researchers, including a middle-level nurse caring for patients with COVID-19 and a nurse manager of the COVID-19 ward who was not included in the research team based on her ward's COVID-19 guidelines. The ward's COVID-19 guidelines were previously created by external experts, and the head nurse confirmed the contents.

Participants responded right or wrong for each statement, and the number of correct answers was counted. The possible scores ranged from 0 (lowest) to 20 (highest). As the pilot test, five midlevel nurses with experience in caring for COVID-19 patients were asked to answer the 20 items for basic knowledge of COVID-19 twice with a 3-day interval [27]. We used the test-retest reliability to assess the total score stability with the intraclass correlation coefficient (ICC). The consistency was considered favorable if the ICC value was ≥0.70 [27], and the ICC in the current study was 0.833.

Contents of searching for the latest information about COVID-19 included general information about COVID-19 (the disease itself), the contagion of COVID-19, infection control measures, clinical studies results, treatment methods of COVID-19, nursing care for patients with COVID-19, nursing case study of the patients with COVID-19, others, and not searched. These items were also decided by researchers and the nurse manager of the COVID-19 ward based on the necessary knowledge to take care of patients with COVID-19 [4, 7, 26]. Participants were asked if they ever searched or not for each item.

Regarding nurses' professional autonomy, we modified the scale developed by Kikuchi and Harada published in 1997 after obtaining Kikuchi's permission [28]. Although there are several scales to measure nurses' professional autonomy, we selected the scale for the following reasons. One review [29] showed that 15 measures of nurses' autonomy were developed worldwide between 1974 and 2015, and 3 of them were developed by Japanese researchers. The scale developed by Kikuchi [28] was used in more nursing studies (eight) in Japan and had higher internal consistency than the scale developed by Tao in 1979 and the professional autonomy scale in nursing developed by Shijiki in 1999 [30]. Overall, 7 of the 12 professional autonomy scales outside of Japan are commonly used [29]. Among these 7 scales, 3 are validated in Japanese [31–33]. However, these scales may not necessarily be appropriate for the Japanese situation, including items such as "I consider I will gain the proper education and experience and begin working independently like a nurse practitioner" because there is no nurse practitioner who can work independently in Japan.

Kikuchi viewed nursing activities as cognition, judgment, and performance and developed their scale for Japanese nurses. Kikuchi original scale included 5 subscales with 47 items, namely, cognition (14 items), performance (14 items), concrete judgment (7 items), abstract judgment (7 items), and independent judgment (5 items) [28]. This scale covers the two main components of nurses' professional autonomy [6]: independence in decision-making including three types of judgments and the ability to utilize own competence of cognition and performance. During the COVID-19 pandemic, nurses were required to make decisions by themselves and work in unprecedented situations. Therefore, these scales were important in our study, which was conducted during the COVID-19 pandemic. However, Kikuchi's original scale was developed more than two decades ago and has some items that were not necessary in our study. Thus, researchers including the supervising professor

discussed with the head nurse of the COVID-19 ward and modified it to fit the current clinical situation. The number of items was reduced to 27 items to decrease the participant burden. The revised scale included cognition (9 items), performance (6 items), concrete judgment (4 items), abstract judgment (6 items), and basic nursing judgment (2 items). Each item was rated on the same 5-point Likert scale, with the scores ranging from 1 (strongly disagree) to 5 (strongly agree). The total score ranged from 27 to 135. Pilot testing using the revised scale was conducted among the same five middle-level nurses with nursing experience caring for COVID-19 patients, and face validity was confirmed. The internal consistency of the pilot study for the total score of nurses' professional autonomy when caring for COVID-19 patients was evaluated using Cronbach's α, with a value of ≥ 0.7 considered acceptable [34]. Cronbach's α in this was 0.952. We also used test-retest reliability to assess the score stability, with an ICC of 0.963 for the total score. The ICC values of the 5 factors were 0.960, 0.905, 0.860, 0.900, and 0.885, respectively.

2.5. Statistical Analyses. The target sample size for this study was calculated using G*Power (version 3.1.9.7). To detect a small effect size (d) of 0.2 with an α error of 0.05 (two-tailed) and a power of 0.8 by the paired t-test, 199 participants were required. Participant characteristics are described as descriptive statistics. The normality of data distribution was assessed using the skewness-kurtosis test, with a skewness of < -2 or > 2 defined to indicate non-normally distributed data [35]. The total scores of the autonomy scale when caring for COVID-19 patients had a skewness value of −0.22 and a kurtosis value of 1.61; when caring for other patients, the values were −0.83 and 1.34, respectively. Therefore, the data were regarded to be normally distributed; hence, parametric tests were used. A paired t-test was used to compare the total score, average score of each factor, and each autonomy score between caring for COVID-19 patients and for other patients. The statistical significance level was set at $p < 0.01$ to decrease alpha error in the paired t-test for 27 individual items. Cohen's d was used to compare the effect size of the difference between caring for COVID-19 patients and for other patients among the factors and items of professional autonomy.

The total scores of professional autonomies when caring for COVID-19 patients were compared among three or more groups (sections) using an analysis of variance. Further, comparisons between two independent groups such as sex, age (20–40 years vs. 41–60 years), having a qualification of certified nurse specialist/certified nurse or not, and searching for the latest information about COVID-19 or not were performed using an independent t-test. Spearman's correlation coefficients (ρ) were used to analyze the association between nurses' professional autonomy when caring for patients with COVID-19 and non-normally distributed continuous variables such as age (four groups), years of nursing experience, and ordinal variables of educational level, position, ladder level, frequency of searching for the

latest information about COVID-19, frequency of using scientific sources, number of COVID-19 patients cared for, and frequency of attending training/study sessions at the hospital. Significant factors related to nurses' autonomy when caring for COVID-19 patients in the bivariate analyses ($p < 0.1$) were included in the stepwise multiple linear regression analysis to explore the independent factors related to nurses' professional autonomy. The normality of the residuals was confirmed using the Durbin–Watson ratio (between 1.5 and 2.5) [36]. Multicollinearity was checked using the variance inflation factor (VIF) (<10.0). An alpha level of 0.05 was set to indicate significance in the stepwise multiple linear regression. All statistical analyses were performed using SPSS version 22 (SPSS Inc., Chicago, IL, USA) software.

3. Results

3.1. Participant Demographics and Experiences. A total of 318 questionnaires were collected, yielding a response rate of 31.8%. Duplicate responses were checked using identified duplicate cases function in SPSS, and no duplicates were identified. Overall, 63 participants were excluded because they had not cared for COVID-19 patients. After excluding 14 questionnaires with missing values, data from 241 participants were used in the analysis (effective response rate, 94.5%). Table 1 presents the participants' characteristics. The average length of nursing experience was 10.3 ± 9.2 years. In total, 51.9% of the respondents were aged ≤30 years, and 93.4% were female. Most participants were staff nurses (87.6%) and had a Bachelor's degree (70.1%), with only 1.2% having a Master's degree. The most frequent educational backgrounds by age group were as follows: 92.0% of nurses aged 20–30 years and 76.8% of those aged 31–40 years completed a 4-year university nursing program, and 51.4% of those aged 41–50 years and 80% of those aged 51–60 years completed a 3 year vocational nursing school program. For the distribution according to station, 20.7% of nurses were from internal medicine; 30.7%, surgery; 11.6%, outpatient; and 36.9%, other stations. Over half (59.3%) of the participants did not attend any training sessions on COVID-19 at the hospital during the pandemic (Table 1). Approximately, 60% of the participants searched the information about COVID-19 (the disease itself), while less than 5% of them searched for the results of clinical studies and nursing case studies about patients with COVID-19 (Table 2).

3.2. Basic Knowledge of COVID-19. The average number of correct answers was 17.4 ± 1.4. Table 3 shows the questions ranked in order by the highest correct rates. Five items, such as the fatality rate of COVID-19 and utilization of N95 masks when caring for infectious patients, were responded to 100% correctly (nos. 1–5). Eight items, including risk factors of severe disease, personal protective equipment (PPE) usage when working with a deceased body, choosing rapid PCR testing for patients suspected of COVID-19,

TABLE 1: Participant characteristics and association with the total score of professional autonomy when caring for patients with COVID-19 ($n = 241$).

Characteristics	Categories	n (%)/M ± SD	Average professional autonomy score ± SD when caring for patients with COVID-19	ρ^a	p
Age, years (four groups)	20–30	125 (51.9)	90.1 ± 13.6	0.100	0.122[a]
	31–40	56 (23.2)	89.2 ± 15.8		
	41–50	35 (14.5)	92.7 ± 12.1		
	51–60	25 (10.4)	98.4 ± 16.9		
Age, years (two groups)	20–40	181 (75.1)	89.8 ± 14.3		0.015[b]
	41–60	60 (24.9)	95.1 ± 14.4		
Sex	Male	16 (6.6)	93.3 ± 6.7		0.534[b]
	Female	226 (93.4)	91.0 ± 14.9		
Years of nursing experience		10.3 ± 9.2		0.163	0.011[a]
Position	Staff nurse	211 (87.6)	90.6 ± 14.5	0.093	0.152[a]
	Assistant nurse manager	23 (9.5)	93.4 ± 11.4		
	Nurse manager	7 (2.9)	100.7 ± 19.6		
Educational background	High school nursing course, 5 years	7 (2.9)	97.0 ± 15.2	−0.096	0.136[a]
	Vocational nursing school, 3 years	51 (21.2)	95.1 ± 14.2		
	Junior college of nursing, 3 years	14 (5.8)	89.6 ± 13.9		
	University nursing course, 4 years	166 (68.9)	89.5 ± 14.2		
	Graduate school (Masters of Science)	3 (1.2)	106.0 ± 23.0		
Stations	Internal medicine	50 (20.7)	88.9 ± 14.3		0.618[c]
	Surgery	74 (30.7)	91.4 ± 11.4		
	Outpatient	28 (11.6)	90.9 ± 15.9		
	Other (including COVID-19 ward)	89 (36.9)	92.3 ± 16.4		
Clinical ladder level	0	17 (7.1)	96.0 ± 21.0	0.152	0.018[a]
	I	38 (15.8)	84.7 ± 12.5		
	II	66 (27.4)	90.3 ± 12.9		
	II	59 (24.5)	92.7 ± 15.7		
	IV	45 (18.7)	92.5 ± 12.2		
	V	16 (6.6)	95.5 ± 14.7		
Having a certified nurse specialist or certified nurse qualifications	Yes	11 (4.6)	95.2 ± 12.8		0.341[b]
	No	231 (95.4)	90.9 ± 14.6		
Number of COVID-19 patients experienced	1–10	103 (42.7)	88.3 ± 14.0	0.176	0.006[a]
	11–20	30 (12.4)	95.4 ± 13.6		
	21–30	16 (6.6)	88.1 ± 16.2		
	31–40	9 (3.7)	98.8 ± 12.6		
	41–50	13 (5.4)	95.1 ± 11.9		
	51–100	22 (9.1)	92.4 ± 11.5		
	≥101	37 (15.4)	93.8 ± 17.4		
	Missing data	11 (4.6)			

Table 1: Continued.

Characteristics	Categories	n (%)/M ± SD	Average professional autonomy score ± SD when caring for patients with COVID-19	ρ^a	p
Frequency of using scientific sources	Never	77 (32.0)	89.4 ± 14.8		
	Once a year	12 (5.0)	90.3 ± 15.5		
	Once every 6 months	32 (13.3)	92.3 ± 12.7		
	Once every 3 months	31 (12.9)	90.2 ± 13.9	0.073	0.260[a]
	Once a month	42 (17.4)	92.7 ± 12.0		
	Once every 1–2 weeks	32 (13.3)	92.0 ± 19.0		
	More than once every 1–2 weeks	15 (6.2)	94.3 ± 13.9		
Frequency of searching for latest information about COVID-19	Never	18 (7.5)	87.3 ± 14.4		
	Once a year	4 (1.7)	93.2 ± 17.3		
	Once every 6 months	16 (6.6)	91.4 ± 13.3		
	Once every 3 months	28 (11.6)	87.7 ± 19.2	0.082	0.203[a]
	Once a month	58 (24.1)	91.6 ± 10.8		
	Once every 1–2 weeks	79 (32.8)	91.3 ± 12.9		
	More than once every 1–2 weeks	38 (15.8)	94.2 ± 19.4		
Frequency of attending training/study sessions about COVID-19 at the hospital	Never	143 (59.3)	89.1 ± 13.8		
	Once a year	55 (22.8)	95.1 ± 12.3		
	Once every 6 months	30 (12.4)	92.6 ± 18.3		
	Once every 3 months	8 (3.3)	99.3 ± 18.2	0.150	0.020[a]
	Once a month	4 (1.7)	82.7 ± 14.1		
	More than once every 1–2 weeks	1 (0.4)	84.0 ± 0.0		
Total score of the basic knowledge of COVID-19		17.4 ± 1.4		−0.014	0.831[a]

[a]The associations between the total score of nurses' professional autonomy when caring for patients with COVID-19 and ordinal and continuous variables are assessed using using Spearman's correlation coefficients.
[b]Independent t-test. [c]Analysis of variance.

Table 2: Overview of recent information search on COVID-19 ($n = 241$).

	Factors	n	%
1	About COVID-19 (disease itself)	144	20.5
2	Spread situation of the infection	180	25.6
3	Infection control measures	136	19.3
4	Results of clinical studies	25	3.6
5	Treatment methods	105	14.9
6	How to care for patients with COVID-19	65	9.2
7	Nursing case studies about patients with COVID-19	27	3.8
8	Others	11	1.6
9	Not searched	11	1.6
	Total	241	100

Table 3: Basic knowledge of COVID-19 ($n = 241$).

	Items	Correct response (%)
1	The fatality rate remains constant regardless of age or underlying diseases	100.0
2	Wear an N95 mask when suctioning airway secretions from suspected or positive patients	100.0
3	Wear an N95 mask while performing endotracheal intubation on suspected or positive patients	100.0
4	Wear an N95 mask when applying noninvasive positive pressure ventilation (NPPV) to suspected or positive patients	100.0
5	Wear an N95 mask when performing bronchoscopy on suspected or positive patients	100.0
6	Chronic kidney disease, type 2 diabetes, and hypertension are not risk factors for severe disease	99.6
7	Personal protective equipment is not required when providing direct care to the dead body of an infected patient	99.2
8	If there is a suspicion of COVID-19, even if the antigen test was negative, one rapid PCR testing should be performed in the hospital	98.8
9	A surgical mask is sufficient when talking to suspected or positive patients at a distance	98.3
10	Wear an N95 mask when performing cardiopulmonary resuscitation (CPR) on suspected or positive patients	97.5
11	If the patient (positive) is not present, the staff member performing the environmental disinfection is not required to wear gloves and gowns	97.1
12	If you are only serving meals to suspected or positive patients in their hospital rooms, only surgical masks and gloves are required	96.3
13	The infectious period starts 2 days prior and lasts 7–10 days after the onset of symptoms	95.4
14	If a new COVID-19 infection is suspected after admission, even if the screening test result is negative, a nasopharyngeal antigen test should be performed promptly	87.1
15	Respiratory therapy options for critically ill patients are high-flow oxygen therapy and noninvasive positive pressure ventilation	71.8
16	The peak of viral shedding for COVID-19 is 2-3 days after onset	70.5
17	The incubation period of COVID-19 (omicron strain) is approximately 2-3 days	69.7
18	Alcohol is effective as a disinfectant against COVID-19, but hypochlorous acid water is not	66.0
19	Always wash and sanitize dishes used by patients (positive) separately from other patients	58.5
20	Order of removing personal protective equipment (PPE), in case of double gloving: hand disinfection $\longrightarrow$ outer gloves $\longrightarrow$ hand disinfection $\longrightarrow$ remove gown and inner gloves while turning them inside out $\longrightarrow$ hand disinfection $\longrightarrow$ face shield and goggles $\longrightarrow$ hand disinfection $\longrightarrow$ cap $\longrightarrow$ hand disinfection $\longrightarrow$ mask $\longrightarrow$ hand disinfection	33.6

surgical mask and N95 using situations, PPE usage when performing environmental disinfection, and infectious period of COVID-19 (nos. 6–13), had a correct response rate of over 90%. However, 4 items (nos. 17–20), including the peak viral shedding and the incubation period of COVID-19 and practices (alcohol disinfection and sanitizing patients'

dishes) for infection prevention and control, had a low correct response rate (<70%). The item with the lowest correct response rate (33.6%) pertained to the order of removing PPE (no. 20).

3.3. Differences in Autonomy Scores between Caring for COVID-19 and Other Patients. The total score for nurses' professional autonomy was significantly lower ($t = -12.1$, $p < 0.001$, Cohen's $d = 0.780$) when caring for COVID-19 patients than for other patients (Table 4). The scores for the five factors and all their items were significantly lower when caring for patients with COVID-19 than for other patients ($p < 0.001$). The highest mean score when caring for COVID-19 patients was for Factor 2 (performance), while the lowest mean score was for Factor 4 (abstract judgment). The highest Cohen's d was for Factor 1 (cognition), while the lowest Cohen's d was for Factor 5 (basic nursing judgment). Cohen's d of two items in Factor 1 was ≥0.7: "I can predict the physical effects of the treatment on the patient" and "I can predict future problems that may occur to the patient based on the course of events to date." Further, 7 items had Cohen's d of 0.6 to 0.5, and 18 items had Cohen's d of 0.4 to 0.3. The item with the lowest Cohen's d (0.314) was "I can use the latest scientific evidence including the nursing articles to decide appropriate nursing," which belonged to Factor 4 (Abstract judgment). Table 4 includes the overall Cronbach's alphas and the subscales for both caring situations.

3.4. Factors Influencing Nurses' Professional Autonomy When Caring for Patients with COVID-19. Table 1 shows the association between the total score for professional autonomy when caring for patients with COVID-19 and each variable. Participants aged ≥41 years had higher professional autonomy than those aged ≤40 years ($p = 0.015$). Years of nursing experience ($\rho = 0.163$, $p = 0.011$), number of COVID-19 patients experienced ($\rho = 0.176$, $p = 0.006$), and frequency of attending training/study sessions about COVID-19 at the hospital ($\rho = 0.150$, $p = 0.020$) were positively associated with professional autonomy. Although clinical ladder was positively associated with professional autonomy ($\rho = 0.152$, $p = 0.018$), the highest professional autonomy (96.0 ± 21.0) was observed among nurses with a clinical ladder level "0."

The total score of professional autonomy did not significantly differ according to four age groups, sex, stations, position, nursing certification, educational background, frequency, and contents searched for the latest information about COVID-19, and frequency of using scientific sources.

Based on the bivariate analyses, 2 age groups (20–40 and 41–60 years), years of nursing experience, clinical ladder level, frequency of attending training/study sessions at the hospital, and the number of COVID-19 patients cared for were entered into the stepwise multiple linear regression analysis. The results indicated that longer years of nursing experience ($\beta = 0.208$, $p = 0.001$, adjusted $R^2 = 0.040$) and a higher number of patients with COVID-19 experienced ($\beta = 0.140$, $p = 0.026$, adjusted $R^2 = 0.015$) were significantly related to higher autonomy scores. The explanatory variance of these two factors was 5.5% (Table 5).

4. Discussion

This study found that nurses' professional autonomy with all investigated five factors and 27 items was significantly lower when caring for COVID-19 patients than when caring for other patients. Specifically, Factor 1 (cognition) exhibited the most decreased scores when caring for COVID-19 patients than when caring for other patients. Factor 4 (abstract judgment) showed the smallest difference between caring for COVID-19 and for other patients, but the score was the lowest. On the other hand, Factor 5 (basic nursing Judgment) demonstrated relatively higher scores, even when caring for COVID-19 patients. Factors related to higher professional autonomy when caring for COVID-19 patients were longer years of nursing experience and experiencing more patients with COVID-19. To the best of our knowledge, this is the first study to compare the professional autonomy of the same nurses when caring for COVID-19 and for other patients and to report individual factors related to professional autonomy when caring for COVID-19 patients using a scale.

Among the five factors of professional autonomy, Factor 1 (cognition) exhibited the highest Cohen's d score, with 5 items greater than 0.5. The predictive items for patient outcomes were significantly lower when caring for COVID-19 patients than when caring for other patients. The items with the highest Cohen's d scores were to predict the effects of the treatment and future problems, to identify changes in a patient's condition, and to understand the relationship between test results and symptoms. These results may be attributed to a lack of sufficient information on COVID-19, limited experience in acquiring the necessary knowledge and skills to predict treatment responses, and provision of appropriate care for COVID-19 patients [37], resulting in an inability to effectively apply knowledge, skills, and judgment [5].

Factor 5 (basic nursing judgment) had the lowest Cohen's d, and the average score was relatively high with the items focused on choosing appropriate nursing methods considering a patient's needs. It is assumed that nurses gained the basic nursing skills required to work with COVID-19 patients, which can also be common with other patients. Additionally, the item about using the latest scientific evidence in nursing practice in Factor 4 (abstract judgment) showed the smallest difference between caring for COVID-19 and for other patients, but the average score was the lowest. Although it was important for the participants to obtain appropriate information about the unprecedented COVID-19 pandemic, very few participants searched for clinical studies and nursing practice cases, consistent with previous reports [38–40]. Collectively, these results support that most nurses may not use scientific evidence in their nursing practice, regardless of the current pandemic situation [38–40]. In Japan, approximately 12% of nurses working in hospitals had a university degree, and 1.3% had completed graduate education [41]. In our study, although the majority of the participants were university graduates (68.9%), only a similar proportion held Master's degree (1.2%). This indicates that undergraduate education alone is

TABLE 4: Differences in nurses' professional autonomy scores between caring for COVID-19 and other patients ($n = 241$).

Items	When caring for COVID-19 patients		When caring for other patients		Cohen's d	p
	Mean ± SD	α	Mean ± SD	α		
Factor 1: cognition	3.4 ± 0.5	0.85	3.8 ± 0.4	0.87	0.86	<0.001
I can predict the physical effects of the treatment on the patient	3.3 ± 0.8		3.9 ± 0.5		0.72	<0.001
I can predict future problems that may occur to the patient based on the course of events to date	3.2 ± 0.8		3.8 ± 0.6		0.70	<0.001
I can accurately identify changes in a patient's general condition	3.2 ± 0.8		3.6 ± 0.6		0.64	<0.001
I can understand the relationship between a patient's test results and symptoms	3.4 ± 0.7		3.8 ± 0.5		0.60	<0.001
I can fully understand the values of my patients	3.2 ± 0.8		3.5 ± 0.7		0.57	<0.001
I can understand the discrepancy between a patient's verbal and emotional behavior	3.3 ± 0.8		3.6 ± 0.6		0.48	<0.001
I can predict the psychological impact of hospitalization and treatment on the patient	3.5 ± 0.8		3.9 ± 0.6		0.47	<0.001
I am able to gather the information needed for nursing care (patient's personality, lifestyle, psychological problems he/she may have)	3.5 ± 0.8		3.9 ± 0.5		0.46	<0.001
I can show empathic understanding of the patient's words and actions	3.7 ± 0.8		4.0 ± 0.6		0.43	<0.001
Factor 2: performance	3.5 ± 0.6	0.85	3.8 ± 0.5	0.84	0.62	<0.001
I am able to provide nursing care based on the patient's distinctive characteristic of individual or social life	3.4 ± 0.7		3.8 ± 0.5		0.53	<0.001
I am able to prioritize and systematically carry out my nursing duties	3.7 ± 0.6		3.9 ± 0.5		0.52	<0.001
I can cooperate with other professionals	3.7 ± 0.7		4.2 ± 0.6		0.48	<0.001
I can allay a patient's distrust and anxiety about medical care by providing sufficient explanation	3.3 ± 0.7		3.6 ± 0.6		0.46	<0.001
I am able to provide nursing care calmly in an emergency	3.1 ± 0.9		3.4 ± 0.8		0.45	<0.001
I can handle a patient's emotions (anger, sadness)	3.4 ± 0.7		3.7 ± 0.6		0.38	<0.001
Factor 3: concrete judgment	3.4 ± 0.7	0.83	3.8 ± 0.6	0.85	0.61	<0.001
I can assess a patient's condition from various information and choose nursing care that is appropriate for the patient's needs	3.3 ± 0.7		3.7 ± 0.6		0.57	<0.001
I can perform nursing assessments and provide recommendations to achieve the highest quality of care	3.4 ± 0.7		3.8 ± 0.6		0.50	<0.001
I can respond to sudden physiological changes in the patient (hematemesis, loss of consciousness, hypotension, chills)	3.3 ± 0.9		3.6 ± 0.7		0.46	<0.001
I can prioritize a patient's problem and clarify the most important problem among the many problems	3.5 ± 0.7		3.7 ± 0.6		0.42	<0.001
Factor 4: abstract judgment	3.2 ± 0.7	0.89	3.4 ± 0.6	0.86	0.50	<0.001
I can proactively present patient's problems and lead to solve it at the medical meetings	3.2 ± 0.8		3.5 ± 0.7		0.46	<0.001
I can evaluate a patient's symptoms and test results and select appropriate nursing methods	3.4 ± 0.7		3.7 ± 0.6		0.45	<0.001
I can make nursing decisions based on the medical situation without sufficient information	2.9 ± 0.8		3.1 ± 0.9		0.39	<0.001
I can plan nursing care using the nursing model and introduce it to my coworkers	3.2 ± 0.8		3.4 ± 0.7		0.34	<0.001
The nursing plan that I developed can be approved by my coworkers	3.4 ± 0.7		3.6 ± 0.7		0.32	<0.001
I can use the latest scientific evidence including nursing articles to decide on appropriate nursing	2.7 ± 0.9		2.9 ± 1.0		0.31	<0.001
Factor 5: basic nursing judgment	3.5 ± 0.7	0.83	3.7 ± 0.6	0.75	0.43	<0.001
I can choose nursing methods considering the patient's needs	3.5 ± 0.7		3.8 ± 0.6		0.42	<0.001
I can choose appropriate nursing methods, regardless of the patient's words and actions	3.4 ± 0.7		3.6 ± 0.6		0.33	<0.001
Total scores	91.1 ± 14.5	0.95	99.9 ± 11.8	0.94	0.78	<0.001

Paired t-test, α: Cronbach's α coefficients. The items within each factor are arranged in descending order of Cohen's d.

inadequate to apply scientific evidence and achieve higher professional autonomy in pandemic situations.

Further, in our study, age, educational background, clinical ladder level, and using scientific sources were not related to nurses' professional autonomy when caring for COVID-19 patients. A previous study reported that years of experience, but not age, was significantly correlated to the nurses' professional autonomy [8], consistent with the current results. Regarding educational background, three nurses had Master's degrees and had the highest professional

Table 5: Factors related to nurses' professional autonomy when caring for patients with COVID-19 ($n = 241$).

Factors	β	T	p	VIF	Adjusted R^2
Years of nursing experience	0.208	3.311	0.001	1.000	0.040
Number of patients with COVID-19 experienced	0.140	2.233	0.026	1.000	0.015

Stepwise multiple linear regression. Dependent variable: total scores of nurses' professional autonomy when caring for COVID-19 patients. Final model: Durbin–Watson = 2.115, overall adjusted $R^2 = 0.055$. VIF: variance inflation factor of all variables.

autonomy score in this study. Despite having higher educational backgrounds, young nurses (i.e., those aged ≤40 years) had fewer years of nursing experience and tended to exhibit lower levels of professional autonomy compared with older nurses (i.e., those aged ≥41 years). Additionally, it should be noted that some older nurses who did not take the clinical ladder were on level 0 despite their longer nursing experience and higher professional autonomy. In our study, less than 5% of the participants searched for results of clinical studies and nursing case studies about patients with COVID-19. There was no obvious association between using scientific sources and professional nursing autonomy, although previous studies reported that using scientific sources increased critical thinking [26] and that critical thinking is strongly associated with professional nursing autonomy [26]. Previous studies reported that educational backgrounds were significantly related to the use of research results [42–46], in which over 15% of nurses had a Master's degree. In our study, only 1.2% of nurses had a Master's degree, which can be the reason that the educational levels were not significantly related to professional autonomy scores.

Basic knowledge of COVID-19 and attending training/ study sessions on COVID-19 at the hospital were not related to nurses' professional autonomy, either. The correct response rates regarding the peak viral shedding and the incubation period of COVID-19 items (nos. 16–17) were lower than those of the standard precaution items of infection prevention and control (nos. 2–5), which were common infection control protocols and not specific for COVID-19. The item with the lowest correct response rate (33.6%) was the order of PPE removal. PPE removal is a complicated multistep task that requires not only knowledge but also multiple practice. A previous study reported no significant correlation between knowledge and nurse compliance with the use of level 2 PPE [47], and consistent findings were observed in the current study. This indicates that experience-based learning systems such as simulation and role play may be necessary for improving nurses' professional autonomy, in addition to acquiring knowledge.

4.1. Limitations. This current study has several limitations. First, the findings cannot be generalized to all hospital settings because the study was conducted at a university hospital in an urban area in Japan, where the educational level is relatively high. Nationwide surveys, not only in Japan but also in other countries, need to be conducted. Second, subjectivity and response bias are inherent challenges in self-reported questionnaires. The response rate (31.8%) was not high enough, which could have caused a participation bias,

in which nurses with higher professional autonomy could have been included. Third, because there were no rewards for participation and no duplicated answers were found, it was unlikely that the same person responded more than once; however, there is no guarantee that this was the case in this anonymous study. Fourth, the timings of working with COVID-19 patients or other patients were not specified, and some nurses might not have been working with other patients at the time of the investigation. Participants had to consider their previous experiences, which could have caused a memory bias. Fifth, the current study reported a low model fit ($R^2 = 0.055$); only approximately 6% of the variance related to professional autonomy was explained. More factors related to professional autonomy other than those measured in this study should be explored. As this study focused on individual, rather than environmental factors, it is also necessary to further investigate the environmental factors that may affect professional autonomy during the pandemic. Finally, it is not possible to establish causality among variables owing to the cross-sectional study design.

Regardless of these limitations, our study contributes by expanding the existing body of research and offering novel insights into nurses' autonomy. Although factors related to professional autonomy during the COVID-19 pandemic were similar to those before the pandemic, our findings indicate that "cognition" is vulnerable to decrease and "abstract judgment" is as low as during usual conditions among professional autonomy domains.

4.2. Practical Implications. To enhance professional autonomy during unprecedented pandemics, nurses must enhance cognition and abstract judgment. To enhance cognition and abstract judgment, it is necessary to promote the integration of up-to-date information and clinical evidence into their practice, and the following recommendations at the three levels are suggested.

At the individual level, for nurses to be able to predict patients' condition and mitigate the uncertainty experienced during the COVID-19 pandemic, it is crucial to actively obtain information about patients' progress. Nurses should attend the information-sharing meetings and training.

At the organizational level, it is necessary to guide nurses on how to access up-to-date clinical information and research evidence and effectively utilize it. Creating study groups sharing clinical cases and experiences among multiple professionals is crucial in fostering collaboration and knowledge exchange, which may promote nurses' professional growth and autonomy, empowering them to deliver high-quality care. Healthcare organizations should also

incorporate experience-based simulations and role-play practice into their training programs to allow nurses to practice and apply their skills in realistic scenarios. Hospital administrators also need to hire more nurses with graduate education, who play a role in connecting research and practice.

At the policy-making level, it is necessary to make accurate up-to-date information about the infectious disease available to healthcare professionals as soon as possible. In the long run, it is necessary to mandate more education in undergraduate nursing programs on how to use research evidence and to encourage and support more nurses to study in graduate programs. In addition, support may be needed for universities to strengthen research and measures to develop experience-based simulations, such as using virtual reality technology. Further studies are required to clarify the effects of experience-based learning systems in enhancing professional autonomy.

5. Conclusions

Nurses' professional autonomy in all 5 factors and 27 items was significantly lower when caring for COVID-19 patients than when caring for other patients. Specifically, Factor 1 (cognition) exhibited the most decreased scores when caring for COVID-19 patients than when caring for other patients. Factor 4 (abstract judgment) showed the smallest difference between them, but the average score was the lowest. Factors related to higher professional autonomy when caring for COVID-19 patients were longer years of nursing experience and experiencing more patients with COVID-19. To enhance professional autonomy during an unprecedented pandemic, it is necessary for nurses to enhance cognition and abstract judgment. In the event of a future pandemic, nurses need to create an environment in which they routinely access and utilize the latest information and scientific evidence so that they can provide high-quality nursing care based on their own professional judgment and competence. Experience-based learning systems may also be necessary to enhance professional autonomy.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

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Research Article

From Incivility to Turnover Intentions among Nurses: A Multifoci and Self-Determination Perspective

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Purpose. We investigate the associations between incivility from multiple sources (i.e., doctors, supervisors, fellow nurses, and patients/visitors) and nurse turnover intentions. We take a self-determination perspective to explore whether psychological needs for autonomy, belongingness, and competence explain the relationship between incivility and turnover intentions. Finally, we examine whether incivility from doctors, supervisors, fellow nurses, and patients/visitors may primarily relate to one of the three basic psychological needs and whether the autonomy need may have the strongest relationship with turnover intentions. *Design*. A three-wave time-lagged design was used. Each measurement point was separated by one workweek. New Zealand nurses were asked to evaluate their workplace incivility at Time 1, three basic psychological needs at Time 2, and turnover intentions at Time 3. *Findings*. Supervisor incivility directly related to turnover intentions. The autonomy need was the only significant mechanism underlying the relationships of incivility from doctors, supervisors, and fellow nurses with turnover intentions. In addition, doctor incivility related to the autonomy need, patient/visitor incivility was not significantly related to any psychological needs, and incivility from fellow nurses and supervisors related to psychological needs for belongingness and autonomy. *Originality*. This study takes a multifoci perspective to examine nurse incivility from multiple sources. The novelty lies in the introduction of self-determination theory to the understanding of workplace incivility. Finally, we turn the spotlight on the importance of examining whether incivility from different sources may be primarily related to different psychological needs and whether the autonomy need plays a key role in turnover intentions.

1. Introduction

Nurse turnover is a growing problem currently facing the health care sector worldwide [1]. Duffield et al. [2] reveals that New Zealand has an alarmingly high rate of nurse turnover at 44.3% [3], significantly higher than that of the U.S. (26.8%), and more than double that of Canada (19.9%) and Australia (15.1%). More recently, a New Zealand Nurses Organization survey [4] reveals that many nurse leaders had difficulty in retaining existing nurses or recruiting new ones. Not surprisingly, nurse turnover costs organizations significantly. For example, it can cost up to $23,800 per registered nurse turnover in New Zealand, which is about half of an annual registered nurse salary [3]. Nurse turnover also puts extra workload on fellow nurses and compromises patient care [5]. Given that turnover intentions represent one of the strongest predictors of actual turnover [6], this study aims to identify predictors of nurse turnover intentions.

The existing literature has summarized many antecedents of nurse turnover intentions, including organizational factors (e.g., organizational ethical climate), work-related factors (e.g., work overload), and employee factors (e.g., years of experience [7]). Building on this line of research, the recent literature has begun to explore how workplace incivility may contribute to nurse turnover intentions [8].

Workplace incivility can be defined as "low-intensity deviant behavior with ambiguous intent to harm the target, in violation of workplace norms for mutual respect. Uncivil behaviors are characteristically rude and discourteous,

displaying a lack of regard for others" ([9] p. 457). Unfortunately, the number of nurses who are victims of workplace incivility is staggeringly high. For example, Lewis and Malecha [10] reveal the prevalence rate of incivility among nurses over the previous year as 84.8%. Indeed, studies from various countries [11] have documented high levels of uncivil experiences among nurses. New Zealand is no exception. A recent survey documents that 63% of 1,436 nurse respondents experienced verbal abuse from patients/visitors in the previous year [12].

Given the prevalence of nurse experienced incivility, we focus on the relationship between workplace incivility and nurse turnover intentions. According to self-determination theory (SDT [13]), when the work environment frustrates people's needs for autonomy, belongingness, and competence, individual functioning suffers. Specifically, the need for autonomy represents a sense of volition, control, and choice over one's actions. The need for belongingness is a sense of connection or the need to belong to a larger group. Finally, the need for competence refers to a sense of self-efficacy and perceived ability to obtain desired outcomes.

Workplace incivility may frustrate these three basic human needs, which in turn, relate to subsequent turnover intentions. Specifically, incivility forces nurses into a situation that they do not initiate nor desire. As the targets of incivility, nurses have few possibilities to change the situation or prevent future incivility. Therefore, workplace incivility may affect nurses' sense of choice and volition, frustrating their need for autonomy [14]. Moreover, incivility deprives nurses of a sense of belonging with others. When individuals are "treated like air" or made to suffer the "silent treatment" at work [15], this may affect nurses' sense of communion and threaten their need to belong. An individual's inability to effectively deal with other difficulties in the workplace can affect their sense of mastery over their environment and their ability to achieve desired outcomes. Thus, being exposed to workplace incivility may threaten one's sense of being a capable individual [14]. On the other hand, frustrating the need for autonomy, belongingness, and competence has been found to relate to turnover intentions [16]. Together, it suggests that the needs for autonomy, belongingness, and competence may partially explain the relationship between incivility and turnover intentions.

Moreover, SDT suggests that each psychological need may *independently* explain the relationships between features of the work environment and outcomes [16]. However, the vast majority of studies on workplace incivility tend to lump incivility from different sources together, failing to differentiate the potentially different influences of each source [17]. Consequently, we have limited knowledge about whether incivility from different sources (e.g., supervisor, coworker, and customer) may have different relationships with outcomes of interest. However, given role differentials, nurses may react to uncivil behaviors from different sources via different mechanisms [18], that is, top-down (incivility from doctors and direct supervisors), lateral (incivility from nurse coworkers), and outside incivility (incivility from patients/visitors [19, 20]) may have differential relationships with psychological needs (cf. [18]). Specifically, because

doctors have high status according to the hierarchy within the health care systems and nurse supervisors are in direct control of rewards and punishment, both doctors and supervisors are in a position of power. Thus, nurses' need for autonomy may be frustrated when experiencing incivility from doctors and/or supervisors who have formal power over the target and have control over important resources (e.g., rewards and promotion) in the hospital setting, that is, when incivility comes from those in positions of power, it can create barriers for nurses, limit their choices and initiatives, and deny them a sense of volition and psychological freedom. Thus, top-down incivility can lead to frustration of the nurses' need for autonomy.

The need for belongingness is a fundamental human drive [21]. This need to be accepted, cared for, and loved by members of a group is especially salient when the group consists of those who are similar to oneself in key aspects (e.g., an ingroup), such as the coworker group [18]. For example, exclusion by an ingroup feels worse than exclusion by an outgroup, while inclusion from an ingroup is more fulfilling to one's belongingness need than inclusion from an outgroup member [22]. Thus, when fellow nurses display uncivil behaviors, it communicates to the target that they are not a well-respected member of the nursing group and do not belong, thereby especially thwarting their need for belongingness.

Finally, the need for competence is especially undermined when patients and visitors provide negative feedback (cf. [23]) via uncivil behaviors towards nurses, distrust information given by nurses, question nurses' abilities, and doubt their achievements. When patients and/or visitors show disrespect and act rudely with nurses, signaling ineffectiveness [24], nurses may feel that their work is ineffective and difficult and doubt their own abilities, thereby threatening their need for competence.

Finally, because each need represents an independent construct [23] and explains unique variance in outcomes of interest [16], the three psychological needs for autonomy, belongingness, and competence may have differential relationships with turnover intentions. Of the three needs for autonomy, belongingness, and competence, satisfying the need for autonomy by allowing nurses to volitionally carry out desired activities is the most crucial for experiencing intrinsic motivation, that is, fulfilling the need for autonomy enables nurses to grasp the importance of organizational values, fully integrate them, and transform organizational values and regulations into their own; thus, strongly relating to decreased turnover intentions. Together, we predict that

> Hypothesis 1: the relationship between exposure to incivility, including doctor incivility (H1a), supervisor incivility (H1b), coworker incivility (H1c), and patient/visitor incivility (H1d), and turnover intentions is partially mediated by psychological needs for autonomy, belongingness, and competence
>
> Hypotheses 2–4: sources of workplace incivility differentially predict psychological needs for autonomy, belongingness, and competence, that is, incivility from doctors (H2a) and supervisors (H2b) has the strongest

relationship with the autonomy need, coworker incivility has the strongest relationship with the belongingness need (H3), and patient/visitor incivility has the strongest relationship with the competence need (H4)

Hypothesis 5: among the three basic psychological needs, the autonomy need has the strongest relationship with turnover intentions

Together, we take a multifoci approach [17] and adopt SDT [13] to understand why and how incivility from different sources (i.e., doctors, supervisor, fellow nurses, and patients/visitors) may be related to nurse turnover intentions differently in a sample of NZ nurses (see Figure 1). By providing a comprehensive and fine-grained examination of nurse-experienced incivility, we extend past research on nurse incivility, that was based on stress-related (e.g., Conservation of Resources Theory in [25]; Job Demands-Resources Model in [26]; Affective Event Theory in [27]) and social exchange (e.g., [28]) related theoretical frameworks.

2. Methods

2.1. Participant and Procedures. We used a three-wave time-lagged design to examine our hypotheses. Power analysis for structural equation modelling (SEM) requires extensive priori information about the intercorrelations among variables as well as the exact patterns (e.g., effect sizes) of the paths. As a result, it is often challenging and unfeasible to conduct power analysis for SEM. Thus, the sample size calculation in SEM is typically determined based on the number of parameters. A widely accepted rule of thumb is 5 : 1 ratio of cases to free parameters [29] or more strictly 10 : 1 ratio of cases to free parameters [30]. In our SEM model, there were eight variables (i.e., four sources of incivility, three psychological needs, and one outcome), resulting in 30 free parameters in the path analysis model. Therefore, the corresponding sample size would be 150 based on the 5 : 1 ratio of cases to free parameters [29], or 300 based on the 10 : 1 ratio of cases to free parameters [30]. Following the strict standard, we aimed to have about 300 participants at Time 3. Because we expected to have 50% of attrition rates over time, we aimed to have over 600 nurses register their interest during the recruitment stage.

The study was approved by the human participants' Ethics Committee of the first author's university (reference number: 021691). Upon receiving ethical approval in July 2018, we started to recruit participants. We used several avenues to recruit New Zealand nurses where we approached the Directors of Nursing from three District Health Boards of New Zealand, posted the advertisements of this study on the bulletin boards in New Zealand hospitals, and had the NZNO post our study on their Facebook page and newsletters. NZNO is the leading professional body of nurses and nursing union in New Zealand, representing more than 55,000 nurses and health care workers.

If the nurses were interested in participating, they were directed to an anonymous recruitment survey where we asked them to provide their email address, confirm their eligibility for participation, and enter the end date of their current (or future) workweek shift, given that nurses did not work the common Monday–Friday weekly shift. To be eligible for participation, participants must be over 18 years, registered nurses, and have worked for the current organization more than six months. The first eligible participant who entered their email address was on 28th Sept 2018, while the last one was 30th Jan 2019.

Based on the end date of their workweek shift, we then sent participants survey invitations via their email addresses, which allowed us to match each survey across time. Because nurses had their own working schedules, we sent out each weekly survey at different time points to accommodate each nurse's schedule. The first survey to the first group of nurses was sent on 30th Sept 2018, while the last survey to the last group of nurses was sent on 15th Feb 2019. Notably, for the same nurse, each survey was separated by one workweek shift. For example, the first group of nurses completed their surveys on 30th Sept 2018, 4th Oct 2018, and 7th Oct 2018, whereas the last group of nurses completed their surveys on 12th Feb 2019, 18th Feb 2019, and 23rd Feb 2019.

We followed the same cohort of nurses across time. Surveys were hosted on Qualtrics. Workplace incivility was assessed at Time 1, three basic psychological needs at Time 2, and turnover intentions at Time 3.

2.2. Measures

2.2.1. Workplace Incivility. The Nursing Incivility Scale (NIS; [31]) was used to measure incivility from multiple sources. Specifically, NIS evaluated nurses' experiences of incivility from four sources, including doctors, direct supervisors, coworkers, and patients/visitors. Incivility from doctors was evaluated by seven items; a sample item was "Doctors are condescending to me;" the reliability of this dimension in our study was 0.89. Incivility from direct supervisors was assessed by seven items; a sample item was "My direct supervisor does not respond to my concerns in a timely manner;" the reliability of this dimension in our study was 0.87. Incivility from coworkers was evaluated by seven items; a sample item was "Other nurses on my unit claim credit for my work;" the reliability of this dimension in our study was 0.90. Finally, incivility from patients/visitors was evaluated by five items; a sample item was "Patients/visitors do not trust the information I give them and ask to speak with someone of higher authority;" the reliability of this dimension in our study was 0.87. These items were rated on a 5-point scale ranging from 1 (*Never*) to 5 (*A great deal*).

2.2.2. Basic Psychological Needs. The need satisfaction scale [32] was used to evaluate nurse basic psychological needs at work, including satisfaction of the belongingness need, the competence need, and the autonomy need. Specifically, satisfaction of the belongingness need was assessed by six items; a sample item was "At work, I feel part of a group;" the reliability of this dimension in this study was 0.85. Satisfaction of the competence need was measured by four items; a sample item was "I really master my tasks at my job;" the
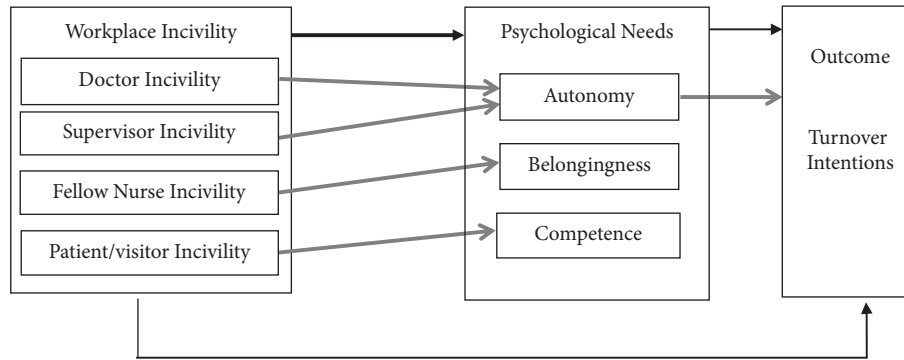
FIGURE 1: Hypothesized relationships among workplace incivility, psychological needs, and turnover intentions. Note. Lines in black indicate a partial mediation model from workplace incivility to turnover intentions via three psychological needs. Lines in grey indicate that each source of workplace incivility is primarily related to one of the psychological needs (e.g., fellow nurse incivility primarily frustrates the need for belonging), and the autonomy need is primarily related to turnover intentions.

reliability of this dimension in this study was 0.89. Satisfaction of the autonomy need was evaluated by six items; a sample item was "I feel like I can be myself at my job; " the reliability of this dimension in this study was 0.81. These items were assessed on a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

2.2.3. Turnover Intentions. Three items developed by Hanisch and Hulin [33] were used to measure turnover intentions ($\alpha = 0.94$). A sample item was "I have thought about leaving this job." The scale was rated on a 5-point scale ranging from 1 (*Never*) to 5 (*A great deal*).

2.3. Control Variables. We controlled for age, organizational tenure, gender, and permanent versus temporary employment status in our analyses.

2.4. Data Analysis. Path analysis was used to test our hypotheses with Mplus 8.4 with full information maximum likelihood (FIML) dealing with missing data [34]. We used FIML because scholars have recommended FIML to deal with missing data for more accurate estimates of standard errors and higher statistical power, resulting in more accurate hypothesis tests (e.g., [35, 36]).

We evaluated the models based on various fit indices, including the comparative fit index (CFI [37]), root mean square error of approximation (RMSEA [38]), and the standardized root mean square residual (SRMR [39]). Ideally, the model with adequate fit should be with CFI greater than 0.95, RMSEA less than 0.06, and SRMR less than 0.08 [39]. There has been much debate on the use of the goodness-of-fit indices, such as the cutoff values, to accept or reject a model. Although Hu and Bentler [39] provided general guidelines for assessing goodness-of-fit indices, they and other statisticians (e.g., [40, 41]) have cautioned against indiscriminately relying on these cutoff criteria. In addition, scholars have cautioned that it is not appropriate to use one single fit index to reject or accept a model [42]. Indeed, research suggests that fit indices can demonstrate substantial variability across different data conditions, indicating that

the cutoff values may be too strict or too lenient in some cases, and can be biased in certain situations. Different fit indices have varying sensitivity to external factors such as sample sizes and different statistical techniques, leading to increased variability across fit indices (e.g., [43–45]). For instance, some fit indices, such as CFI and RMSEA, are less subject to the impact of extraneous variables [46]. Because RMSEA can be determined by multiple factors, such as the complexity of the model and the sample size [47], researchers do not recommend a "fixed target" value for RMSEA [48, 49]. Given the debate on the criteria for assessing goodness-of-fit indices and substantial variation of each fit index across different conditions, it is advisable to view each fit index as merely suggesting a specific aspect of the model fit. Therefore, instead of relying solely on a single fit index, we evaluated our model using multiple fit indices, following the guidelines provided by Hu and Bentler [39], which are widely recognized as the standard criteria for assessing goodness-of-fit.

3. Results

3.1. Descriptive Statistics and Robustness Checks. In total, there were 674 qualified nurses who registered their interest. At time 1, we received valid responses from 413 eligible nurses; at Time 2, we contacted these 413 nurses and received valid responses from 339 nurses; and at Time 3, we contacted those 339 nurses and received valid responses from 294 nurses. All participants who provided valid responses at Time 1 ($N = 413$) were included in the analyses. Most of the sample were female (89.2%), permanent employees (94.5%), with a mean organizational tenure of 6.13 ($SD = 6.53$) and a mean age of 35.91 ($SD = 10.54$). Descriptive statistics, Pearson correlations, intercorrelation among latent constructs, skewness, and kurtosis are presented in Table 1.

We conducted several robustness checks. First, participants who completed all three waves were not significantly different from those who dropped out of Wave 2 in terms of doctoral incivility ($t (361) = 0.750$ and $p = 0.454$), supervisor incivility ($t (360) = 1.592$ and $p = 0.112$), coworker incivility ($t (361) = 0.344$ and $p = 0.731$), and patient/visitor incivility

Table 1: Descriptive statistics, Pearson correlations, and intercorrelations among the latent constructs in the confirmatory factor analysis with parcels.

	1	2	3	4	5	6	7	8
(1) Coworker incivility T1	(0.90)	0.63	0.59	0.49	−0.39	−0.18	−0.48	0.30
(2) Supervisor incivility T1	0.56	(0.87)	0.48	0.33	−0.35	−0.09	−0.44	0.37
(3) Doctor incivility T1	0.53	0.42	(0.89)	0.48	−0.20	−0.17	−0.41	0.32
(4) Patient/visitor incivility T1	0.42	0.29	0.43	(0.87)	−0.09	−0.26	−0.27	0.22
(5) Need for belongingness T2	−0.32	−0.27	−0.15	−0.05	(0.85)	0.18	0.60	−0.41
(6) Need for competence T2	−0.15	−0.07	−0.14	−0.19	0.17	(0.89)	0.31	−0.13
(7) Need for autonomy T2	−0.39	−0.34	−0.32	−0.20	0.49	0.26	(0.81)	−0.64
(8) Turnover intentions T3	0.26	0.30	0.26	0.18	−0.34	−0.09	−0.55	(0.94)
(9) Gender	−0.01	−0.06	−0.02	0.03	0.08	−0.08	−0.02	−0.03
Mean	1.92	1.40	1.80	1.90	5.11	5.83	4.33	2.59
SD	0.79	0.58	0.72	0.75	1.15	0.84	1.04	1.36
Skewness statistics	0.86	2.34	1.09	0.69	−0.57	−0.85	−0.17	0.41
Skewness std. error	0.12	0.12	0.12	0.12	0.13	0.13	0.13	0.14
Kurtosis statistics	0.09	6.63	1.31	−0.08	−0.19	1.13	0.42	−1.10
Kurtosis std. error	0.24	0.24	0.24	0.24	0.27	0.27	0.027	0.29

Note. Cronbach's alpha is on the diagonal. Pearson correlations are below the diagonal. The intercorrelations among the latent constructs are above the diagonal. T1 = time 1; T2 = time 2; T3 = time 3. Wave 1: $N = 413$; wave 2: $N = 339$; wave 3: $N = 294$. Absolute values great than 0.14 in the Pearson correlations are significant at 0.05 level.

($t (360) = −0.237$ and $p = 0.812$), and not significantly different from those who dropped out of Wave 3 in terms of doctoral incivility ($t (402) = 0.482$ and $p = 0.630$), supervisor incivility ($t (402) = 0.638$ and $p = 0.524$), coworker incivility ($t (402) = 0.326$ and $p = 0.744$), and patient/visitor incivility ($t (401) = 0.142$ and $p = 0.887$). These results suggested that missing data bias may not be a concern.

Second, we tested for potential gender differences in all study variables. The result indicated that there were no significant correlations between gender and any of the study variables (see Table 1), that is, there was no significant difference between women and men in all these study variables.

Finally, to use FIML, it requires continuous variables and normality. All the study variables (i.e., different sources of workplace incivility, the three basic psychological needs, and turnover intentions) were continuous variables. To ensure normality of the study variables, we examined their skewness and kurtosis. Statisticians (e.g., [50–52]) suggested that if the skewness (symmetry) range falls between −2 and +2 and the kurtosis (peakedness) range fails between −7 and +7, then the data distribution is considered normal. Except for the skewness of supervisor incivility, which was slightly above 2, the skewness and the kurtosis of all other study variables fell within the acceptable ranges, suggesting that these variables were normally distributed (e.g., [50–52]). Following previous research (e.g., [53, 54]), we conducted log-transformation for supervisor incivility and rerun our analyses. The results were the same with or without the log transformation. For the sake of easy interpretation, we kept the results without the log transformation of supervisor incivility. However, the results with log-transformation are available upon request.

3.2. Confirmatory Factor Analysis.
Before testing our hypotheses, we conducted confirmatory factor analysis (CFA) to examine the distinctiveness of the study variables. Because our sample size was small relative to the number of items, we created three item parcels for each of the constructs with more than three items. We sequentially assigned items per parcel based on the highest to lowest item-to-construct loadings/correlations [55]. As shown in Table 2, the results supported the distinctiveness of the study variables because the hypothesized eight-factor model ($\chi^2(224) = 350.60$, $p < 0.001$, CFI = 0.98, RMSEA = 0.04, and SRMR = 0.04) outperformed all other alternative models, including the model with all incivility items loading onto a single factor ($\chi^2(242) = 1606.01$, $p < 0.001$, CFI = 0.74, RMSEA = 0.12, and SRMR = 0.08), and the model with all psychological need items loading onto a single factor ($\chi^2(237) = 1351.43$, $p < 0.001$, CFI = 0.79, RMSEA = 0.11, and SRMR = 0.09).

3.3. Hypotheses Testing.
The results of the path analysis model without controls were mostly consistent with the results of the path analysis model with controls, except the path from patient incivility to the need for competence. Thus, following Becker's [56] recommendation, we reported the results with control variables (see Table 3). To examine our hypotheses, we compared two models: Model 1 with *free* estimates of the paths from each source of incivility to each psychological need and Model 2 with the paths from each source of incivility to each psychological need constrained to be equal. The comparison between Model 1 and Model 2 allowed us to test whether different sources of incivility would have differential relationships with the three psychological needs (hypotheses 2–4). The chi-square difference test indicated that the model with free estimates (a saturated model with perfect fit indices, $\chi^2(0) = 0.00$, $p < 0.001$, CFI = 1.00, RMSEA = 0.00 (90% CI (0.00 : 0.00)), and SRMR = 0.00) was better than the constrained model ($\chi^2(9) = 27.38$, $p < 0.01$, CFI = 0.95, RMSEA = 0.08 (90% CI (0.05 : 0.07)), and SRMR = 0.04).

We also tested Model 3 in which the paths from the three psychological needs to turnover intentions are constrained to be equal to compare with Model 1. The results indicated

TABLE 2: Standardized factor loadings of the confirmatory factor analysis with parcels.

Parcels	FL
Nurse incivility	
Parcel 1	0.87
Parcel 2	0.80
Parcel 3	0.89
Supervisor incivility	
Parcel 1	0.92
Parcel 2	0.82
Parcel 3	0.72
Doctor incivility	
Parcel 1	0.86
Parcel 2	0.94
Parcel 3	0.80
Patient incivility	
Parcel 1	0.86
Parcel 2	0.79
Parcel 3	0.84
Need for belongingness	
Parcel 1	0.78
Parcel 2	0.87
Parcel 3	0.84
Need for competence	
Parcel 1	0.96
Parcel 2	0.89
Parcel 3	0.84
Need for autonomy	
Parcel 1	0.73
Parcel 2	0.84
Parcel 3	0.77
Turnover intention	
Parcel 1	0.91
Parcel 2	0.92
Parcel 3	0.92

Note. FL = factor loading. All factor loadings are $p < 0.001$.

that Model 1 was significantly better than Model 3 ($\chi^2(2) = 30.10$, $p < 0.001$, CFI = 0.92, RMSEA = 0.21 (90% CI (0.15, 0.28)), and SRMR = 0.03). Therefore, the saturated model with the perfect model fit was retained as the final model. This model indicated that only supervisor incivility had a significant *direct* relationship with turnover intentions ($B = 0.28$, $SE = 0.14$, and $p < 0.05$), while other sources of incivility were not *directly* related to turnover intentions (see Table 2 and Figure 2).

Coworker incivility (indirect effect = 0.20, $SE = 0.06$, and $p < 0.001$), supervisor incivility (indirect effect = 0.20, $SE = 0.08$, and $p < 0.01$), and doctor incivility (indirect effect = 0.14, $SE = 0.06$, and $p < 0.05$) were negatively related to turnover intentions via reduced need for autonomy, thereby confirming hypothesis 1 regarding the mediating role of the psychological need for autonomy in the relationships of doctor incivility (H1a), supervisor incivility (H1b), and coworker incivility (H1c) with turnover intentions. However, no source of incivility influenced turnover intentions via psychological needs for belongingness or competence.

Doctor incivility was negatively related to the need for autonomy ($B = -0.22$, $SE = 0.09$, and $p < 0.05$) but not the need for belongingness ($B = 0.05$, $SE = 0.11$, and $p = 0.64$) or the need for competence ($B = 0.02$, $SE = 0.08$, and $p = 0.85$), supporting hypothesis 2a. Supervisor incivility was negatively related to the need for belongingness ($B = -0.34$, $SE = 0.13$, and $p < 0.01$) and the need for autonomy ($B = -0.32$, $SE = 0.11$, and $p < 0.01$) but not competence ($B = -0.03$, $SE = 0.09$, and $p = 0.74$). However, there was no significant difference in the coefficients for the relationships of supervisor incivility with the need for belongingness or the need for autonomy (difference = -0.02, $SE = 0.13$, and $p = 0.89$), thus failing to support hypothesis 2b.

Coworker incivility was negatively related to the need for belongingness ($B = -0.43$, $SE = 0.10$, and $p < 0.001$) and the need for autonomy ($B = -0.32$, $SE = 0.09$, and $p < 0.001$), but not the need for competence ($B = -0.08$, $SE = 0.07$, and $p = 0.28$). However, there was no significant difference in the coefficients for the relationships of coworker incivility with the need for belongingness or the need for autonomy (difference = -0.10, $SE = 0.10$, and $p = 0.31$), thus failing to support hypothesis 3.

Patient incivility was not significantly related to the need for belongingness ($B = 0.11$, $SE = 0.09$, and $p = 0.22$), the need for competence ($B = -0.10$, $SE = 0.07$, and $p = 0.13$), or the need for autonomy ($B = 0.04$, $SE = 0.08$, and $p = 0.62$), failing to support hypothesis 4.

Neither the need for belongingness ($B = -0.13$, $SE = 0.07$, and $p = 0.07$) nor the need for competence ($B = 0.11$, $SE = 0.09$, and $p = 0.22$) was related to turnover intentions. However, the need for autonomy was negatively related to turnover intentions ($B = -0.62$, $SE = 0.08$, and $p < 0.001$), supporting hypothesis 5.

4. Discussion

Our participants are New Zealand registered nurses, most of whom are women (consistent with the NZ nurse population [57]), permanent employees, with a mean organizational tenure of six years and a mean age of 36 years. Based on this sample, we have three main findings. First, when considering incivility from doctors, supervisors, fellow nurses, and patients/visitors, only supervisor incivility is directly related to nurse turnover intentions. Second, frustration of the autonomy need is the only significant mechanism explaining the relationships of incivility from doctors, direct supervisors, and fellow nurses with turnover intentions. Third, doctor incivility (i.e., top-down incivility) is related to the need for autonomy but not the need for belongingness nor the need for competence. Unexpectedly, the relationships of coworker incivility and supervisor incivility with the needs for belongingness and autonomy are equally significant, although neither coworker incivility nor supervisor incivility is significantly related to the need for competence. Finally, incivility from patients/visitors (i.e., outside incivility) is not significantly related to any psychological needs.

Table 3: Parameter estimates of the two models.

Paths	Model 1		Model 2		Model 3		Model 4	
	B (SE)	(β) SE	B	(β) SE	B (SE)	(β) SE	B	(β) SE
Coworker incivility ⟶ belongingness	−0.43 (0.10)***	−0.29 (0.07)***	−0.16 (0.03)***	−0.11 (0.02)***	−0.43 (0.10)***	−0.29 (0.07)***	−0.42 (0.10)***	−0.29 (0.07)***
Patient incivility ⟶ belongingness	0.11 (0.09)	0.07 (0.06)	−0.16 (0.03)***	−0.10 (0.02)***	0.11 (0.09)	0.07 (0.06)	0.13 (0.09)	0.08 (0.06)
Supervisor incivility ⟶ belongingness	−0.34 (0.13)**	−0.16 (0.06)***	−0.16 (0.03)***	−0.08 (0.01)***	−0.34 (0.13)**	−0.16 (0.06)***	−0.31 (0.13)*	−0.15 (0.06)*
Doctor incivility ⟶ belongingness	0.05 (0.11)	0.03 (0.07)	−0.16 (0.03)***	−0.10 (0.02)***	0.05 (0.11)	0.03 (0.07)	0.03 (0.10)	0.02 (0.06)
Coworker incivility ⟶ competence	−0.08 (0.07)	−0.08 (0.07)	−0.05 (0.02)*	−0.05 (0.02)*	−0.08 (0.07)	−0.08 (0.07)	−0.07 (0.08)	−0.07 (0.07)
Patient incivility ⟶ competence	−0.10 (0.07)	−0.09 (0.06)	−0.05 (0.02)*	−0.05 (0.02)*	−0.10 (0.07)	−0.09 (0.06)	−0.20 (0.07)**	−0.17 (0.06)**
Supervisor incivility ⟶ competence	−0.03 (0.09)	−0.02 (0.06)	−0.05 (0.02)*	−0.03 (0.01)*	−0.03 (0.09)	−0.02 (0.06)	0.04 (0.10)	0.03 (0.06)
Doctor incivility ⟶ competence	0.02 (0.08)	0.01 (0.07)	−0.05 (0.02)*	−0.04 (0.02)*	0.02 (0.08)	0.01 (0.07)	−0.05 (0.08)	−0.04 (0.07)
Coworker incivility ⟶ autonomy	−0.32 (0.09)***	−0.24 (0.07)***	−0.21 (0.03)***	−0.16 (0.02)***	−0.32 (0.09)***	−0.24 (0.07)***	−0.31 (0.09)***	−0.23 (0.06)***
Patient incivility ⟶ autonomy	0.04 (0.08)	0.03 (0.06)	−0.21 (0.03)***	−0.15 (0.02)***	0.04 (0.08)	0.03 (0.06)	0.02 (0.08)	0.02 (0.06)
Supervisor incivility ⟶ autonomy	−0.32 (0.11)**	−0.17 (0.06)**	−0.21 (0.03)***	−0.11 (0.01)***	−0.32 (0.11)**	−0.17 (0.06)**	−0.31 (0.11)**	−0.17 (0.06)**
Doctor incivility ⟶ autonomy	−0.22 (0.09)*	−0.15 (0.06)*	−0.21 (0.03)***	−0.14 (0.02)***	−0.22 (0.09)*	−0.15 (0.06)*	−0.22 (0.09)*	−0.15 (0.06)*
Coworker incivility ⟶ TI	−0.18 (0.12)	−0.10 (0.07)	−0.18 (0.12)	−0.10 (0.07)	−0.13 (0.12)	−0.08 (0.07)	−0.15 (0.11)	−0.09 (0.07)
Patient incivility ⟶ TI	0.17 (0.10)	0.09 (0.06)	0.17 (0.10)	0.09 (0.05)	0.13 (0.11)	0.07 (0.06)	0.14 (0.10)	0.08 (0.06)
Supervisor incivility ⟶ TI	0.28 (0.14)*	0.11 (0.06)*	0.28 (0.14)*	0.11 (0.06)*	0.34 (0.15)*	0.14 (0.06)*	0.30 (0.14)*	0.12 (0.06)*
Doctor incivility ⟶ TI	0.17 (0.12)	0.09 (0.06)	0.17 (0.12)	0.09 (0.06)	0.26 (0.13)*	0.13 (0.06)*	0.16 (0.12)	0.08 (0.06)
Belongingness ⟶ TI	−0.13 (0.07)	−0.11 (0.06)	−0.13 (0.07)	−0.11 (0.06)	−0.26 (0.04)***	−0.22 (0.03)***	−0.13 (0.07)	−0.11 (0.06)
Competence ⟶ TI	0.11 (0.09)	0.06 (0.05)	0.11 (0.09)	0.06 (0.05)	−0.26 (0.04)***	−0.15 (0.01)***	0.12 (0.08)	0.08 (0.05)
Autonomy ⟶ TI	−0.62 (0.08)***	−0.48 (0.06)***	−0.62 (0.08)***	−0.47 (0.06)***	−0.26 (0.04)***	−0.20 (0.03)***	−0.62 (0.08)***	−0.47 (0.06)***

Note. TI = turnover intentions. Model 1: the model with the links from different sources to each psychological need and the links from psychological needs to turnover intentions were freely estimated. Model 2: the model with the links from different sources to each psychological need was constrained to be equal. Model 3: the model with the links from different psychological needs to turnover intentions was constrained to be equal. Model 4: this model is same as model 1 but without controls (sex: 1 = male, 2 = female, and 3 = gender diverse). We retained model 1 and discussed our findings based on model 1. $^*p < 0.05$, $^{**}p < 0.01$, and $^{***}p < 0.001$.
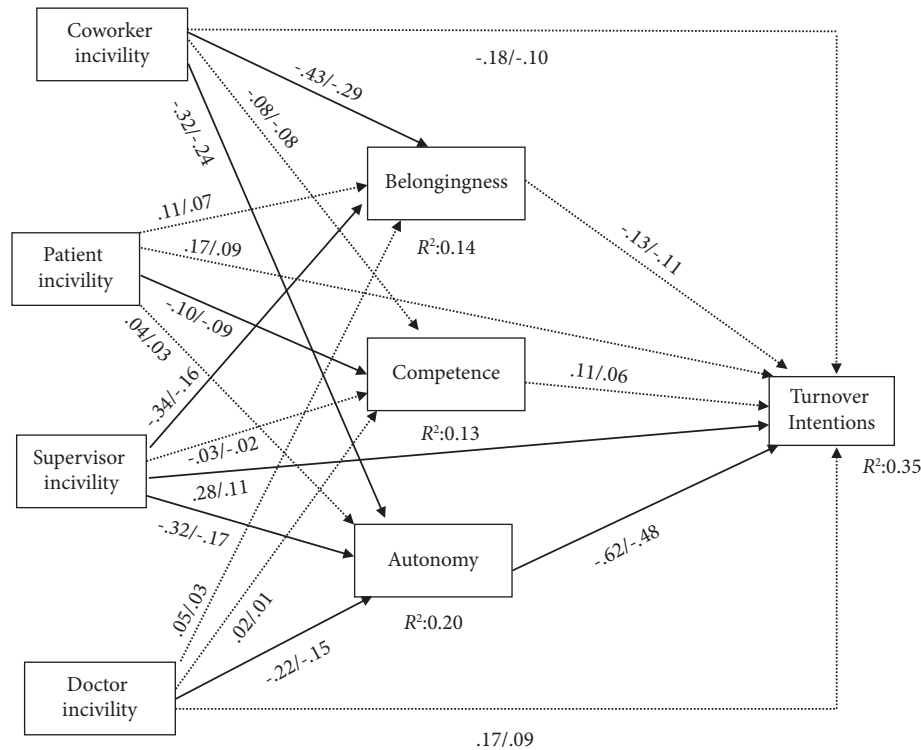
FIGURE 2: Relationships among workplace incivility, psychological needs, and turnover intentions. Note. Dash lines represent no significant paths, while solid lines represent significant paths. Values before the slash (/) are unstandardized coefficients, and values after the slash (/) are standardized coefficients.

4.1. *Theoretical Implications.* Our findings have several theoretical contributions. First, our study sets to examine the association between incivility from four divergent sources and turnover intentions. In doing so, we distinguish whether and how incivility from doctors, direct supervisors, fellow nurses, and patients/visitors may be differently related to nurse turnover intentions, thereby responding to the calls for empirical investigations of incivility from multiple sources [17]. Consistent with previous research emphasizing the negative influence of supervisor incivility (e.g., [58]), it is the only one that is significantly, directly associated with turnover intentions. Due to their unique position, supervisors control important organizational resources such as pay allocation, promotion, and work assignments [59]. Thus, when considering all sources of experienced incivility, the only factor significantly related to turnover intentions is incivility from a supervisor. Therefore, we contribute to the incivility literature by highlighting the unique association between supervisor incivility and turnover intentions.

Second, we extend prior research that has taken a stress- and social exchange-perspective to understand the relationship between incivility and turnover intentions. Based on SDT [23], our study provides an alternative perspective to explain the incivility-turnover intentions association. We find that the need for autonomy is the only significant mechanism underlying the workplace incivility-turnover intentions relationship. Surprisingly, frustration of the psychological needs for belongingness and competence does not mediate the association between incivility and turnover

intentions. However, this is consistent with the tenet of SDT that each basic psychological need can *independently* serve as an underlying mechanism explaining the relationships between work environments and outcomes [23]. Together, this result sheds light on the importance of the autonomy need in terms of nurses' intentions to stay or leave an organization.

Finally, our study is the first to provide evidence to support that incivility from different sources may be related to different basic psychological needs. Specifically, the results support the linkage between doctor incivility and the frustration of the autonomy need. Unanticipatedly, coworker and supervisor incivility are equally significantly related to the frustration of both belongingness and autonomy needs. Given that nursing tasks are primarily team-based and require interdependence among team members [60], it is possible that a nurse may not have the freedom to act with a sense of choice and volition when experiencing incivility from fellow nurses. As a result, the need for autonomy may be frustrated. It is also possible that nurse victims perceive their direct supervisor as an ingroup member, since the direct supervisor is essentially a nurse, such as the head of the nursing department. Moreover, according to the group value model [61], supervisor incivility signals that the victims are not valued group members [18]. Thus, incivility from one's direct supervisor also threatens the need for belongingness. In addition, patient/visitor incivility is not significantly related to any psychological need frustration. Since patients and visitors tend to have short-term relationships with nurses, it is

plausible that incivility from patients and visitors is not a significant predictor of nurses' psychological needs. Our results echo the theorizing that incivility from different sources may trigger different victim reactions and highlight the importance of taking a nuanced perspective when examining workplace incivility. This novel investigation opens new opportunities to move from lumping together incivility from different sources to examining the role of specific instigators. In doing so, our findings add to a more comprehensive theory of workplace incivility by providing a fine-grained perspective of workplace incivility from multiple sources and its outcomes.

4.2. Practical Implications. In an ideal workplace environment, incivility would be reduced or eliminated entirely. However, assuming that the ideal cannot always be achieved, from a practical perspective, knowledge gained in this study has the potential to identify fruitful points of intervention to mitigate the impact of workplace incivility and break the chain of events that translate incivility into turnover intentions. Specifically, because supervisor incivility has a direct relationship with turnover intentions, it suggests that training to develop the leadership skills of nurse supervisors is needed. For example, Gonzalez-Morales et al. [62] have developed a short supervisor training to provide subordinates with supervisor support and reduce mistreatment from supervisors. Moreover, organizations may also implement transformational leadership training [63], authentic leadership training [64], or servant leadership training [65], all of which have been found to reduce employee turnover intentions. In addition, implementing a zero-tolerance policy for workplace incivility from all sources could also be effective in mitigating incivility [66].

Moreover, the empirical evidence suggests that the primary mediating mechanism explaining the relationship between incivility and turnover intentions concerns the frustration of the autonomy need. Thus, organizations should strive to ensure victims to have other means to fulfil their needs for autonomy. For example, derived from the job characteristics model [67], organizations may redesign jobs to facilitate task variety, task identity, task significance, job autonomy, and feedback [68]. Providing additional resources to victims (e.g., autonomy to freely choose their working hours and enhanced empowerment [69]) may not only boost basic need satisfaction but also indirectly reduce their turnover intentions. To maximize employees' basic need satisfaction, organizations may enable career development, offer opportunities to enhance employability, allow employees to participate in decision-making, offer performance feedback, and assign mentors to provide guidance, support, and knowledge [70].

4.3. Limitations and Future Research Directions. Although our study provides important insights, some limitations should be noted. First, the causality among variables of interest is only theory driven. Future research may use experimental designs to increase internal validity of our study conclusions.

Second, our study uses self-report data, which may suffer from common method bias. However, self-report data may be the best method for measuring variables of interest [71]. For example, what constitutes incivility is subjective, and perceptions of incivility may vary across individuals. Nonetheless, since incivility concerns the violation of mutual respect, gathering additional reports from multiple sources could provide a more accurate picture of the extent and nature of incivility in the workplace. To mitigate common method biases, we follow Podsakoff et al.'s [72] recommendation by separately measuring the predictors, the mediators, and the outcome with one workweek shift in between measurement points. Given that there is no agreement regarding the most appropriate reference period when measuring incivility [17], the chosen one-workweek shift as the time lag was primarily driven by occupational demands (cf. [73]). For example, working a 12-hour shift prevents nurses from participating in a daily diary study. On the other hand, nurses may not be able to accurately recall experienced incivility if a longer time lag (e.g., one month in between) was used [72].

To recruit participants, we used convenience sampling, a type of nonprobability or nonrandom sampling approach. Thus, the conclusions drawn from our study may be biased or impacted by outliers [74]. However, all variables of interest were within the normal ranges. We did not collect information about why some respondents dropped out during the study period. Nevertheless, we compared those who completed the study with those who dropped out and found no significant differences in any of the study variables. Hence, this may not be a significant concern.

The small sample size also necessitated conducting CFAs with parcels. Although creating parcels may have disadvantages such as masking cross-loadings at the item level [75]; in the current study, our aim was to understand the relationships among the latent constructs rather than among items. Therefore, conducting CFAs with parcels was recommended [76]. However, it is important to note that our hypotheses were not tested by SEM with parcels, but by path analyses without parcels. In addition, the sample was limited to nurses from New Zealand, which may affect the generalizability of our findings as the dynamics of patient care may differ in other countries.

Future research should examine the unique effects of multifoci incivility, such as its impact on the quality of patient care. In addition, studies could investigate the effectiveness of interventions mentioned earlier, such as supervisor training. Identifying potential moderators at the individual, workgroup, and organizational levels would provide insights on how to best intervene. Researchers could consider workgroup and organizational demands and resources (e.g., supervisor support and work overload) from a multilevel perspective, which may result in cross-level interactions either exacerbating or attenuating the relationship between workplace incivility and turnover intentions.

4.4. Conclusion. Although researchers believe that victims may react to incivility from different sources differently, research in this area of investigation is limited. Our research

identifies that incivility from doctors is associated with the autonomy need, whereas incivility from patients/visitors is not associated with any psychological needs. Incivility from fellow nurses and supervisors is associated with the needs for belongingness and autonomy. Moreover, the psychological need for autonomy mediates the relationship of incivility from doctors, fellow nurses, and supervisors with turnover intentions. In doing so, our research takes a step toward addressing the important questions of how individuals may react differently to incivility from multiple sources.

Data Availability

Anonymous data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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Research Article

How Does Servant Leadership Nurture Nurses' Job Embeddedness? Uncovering Sequential Mediation of Psychological Contract Fulfillment and Psychological Ownership

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Aim. This research aimed to explore how servant leadership nurtures nurses' job embeddedness by uncovering the sequential mediation of psychological contract fulfillment and psychological ownership. *Background*. The healthcare of Pakistan is undergoing an acute shortage of 1.3 million nurses. The gap is widening due to unprecedented natural uncertainties (floods, earthquakes, COVID-19, dengue, polio, and monkeypox) and the large-scale brain drain of nurses. Therefore, exploring the underlying factors that could facilitate nurses' job embeddedness is imperative. *Methods*. A cross-sectional research design was employed, wherein data were gathered in three rounds, two months apart, from 587 nurses employed in public hospitals in Pakistan, and analysis was performed with Smart-PLS. *Results*. Servant leadership positively influences nurses' job embeddedness and psychological contract fulfillment. Besides, psychological contract fulfillment positively affects psychological ownership, and psychological ownership enhances nurses' job embeddedness. Finally, psychological contract fulfillment and psychological ownership sequentially mediate the relationship between servant leadership and job embeddedness. *Conclusions*. This research emphasized the vitality of servant leadership in nurturing nurses' job embeddedness. *Implications for Nursing Management*. Healthcare authorities should keenly focus on promoting servant leadership that shapes the positive perception of nurses about their psychological contract fulfillment and psychological ownership, which are essential resources to cherish nurses' job embeddedness.

1. Introduction

According to recent estimates by the World Health Organization (WHO), there will be a need for 36 million nurses practicing around the globe by 2030. The report highlighted that achieving the sustainable development goal of health and well-being would require 13 million additional nurses and midwives. Furthermore, a report titled "sustain and retain in 2022 and beyond" also revealed how the COVID-19 pandemic had worsened the fragile state of the global nursing workforce, putting the World Health Organization's

aim of Universal Health Coverage at serious risk. Healthcare experts anticipate a migration tsunami more than ever before. In addition, the preexisting unequal distribution of nurses worldwide will be exacerbated by large-scale international recruitment to high-income countries, which will only widen inequalities in access to healthcare globally. There is already a substantial scarcity of professional nurses in developing countries [1]. For instance, in Pakistan alone, there is a shortage of 1.3 million nurses, and the gap is widening due to unprecedented natural uncertainties (floods, earthquakes, COVID-19, dengue, polio, and

monkeypox) and the large-scale brain drain of nurses. Therefore, exploring the underlying factors that could facilitate the retention of nurses in developing countries is imperative to overcome these grave issues of shortage of nurses and their brain drain.

The scholarship on employee retention has shifted its focus to why employees want to stay with an organization instead of leaving [2]. Primarily, this shift is the outcome of job embeddedness theory [3], which describes three critical components of employees' job embeddedness, including links, fit, and sacrifices that shape their decisions to remain tied with an organization. In this context, employees' job embeddedness is a broader and more meaningful construct than employee turnover and has garnered scholarly interest in the organizational behavior literature owing to its vitality in shaping various positive outcomes and reducing negative impacts. Extant research establishes its instrumentality for reducing turnover, work performance, organizational citizenship behavior [4], career success [5], perceived self-leadership [6], affective commitment, and voice behavior [7]. However, healthcare, especially nursing, is a relatively nuanced research context in job embeddedness research and what leads to nurses' job embeddedness from the perspective of the conservation of resources theory (COR). The COR theory posits that individuals are always motivated toward resource generation and accumulation [8]. Resource investment is one of the basic principles of COR, which accentuate that individuals tend to exploit available resources, such as servant leadership, to protect against loss of resources, recover the lost resources, and gain more resources in the future [9]. This study intends to employ the COR theory as an overarching theoretical framework to unravel the underlying process that nurtures job embeddedness in healthcare.

Extant research has established the pivotal role of leadership in shaping employees' attitudes and behaviors [1, 10]. Among the value-based leadership styles, servant leadership has been considered more employee-centric, resulting in valuable employee outcomes. Greenleaf [11] coined the servant leadership approach that accentuates grooming followers to their fullest potential. Servant leadership believes in improving individuals' lives and focuses on creating better organizations and a caring world [12]. A recent literature review of leadership in healthcare by [13] considered the scarcity of empirical research exploring the effectiveness and benefits of servant leadership. In response to their research call, this study posits that servant leadership will positively influence nurses' job embeddedness.

From the employees' perspective, job embeddedness is regarded as the state of resource abundance, i.e., the desired state where employees accumulate affective and nonaffective job-related constraints (links, fit, and sacrifice), which enmesh employees in a specific job within a specific organization [14]. However, research is yet to unlock the underlying process of servant leadership, perceived as a resource, in realizing job embeddedness, i.e., the state of resource prosperity. Apropos of this interesting literature gap, drawing on COR theory, we advance that employees' psychological contract fulfillment and psychological ownership would be the mediating channel through which nurses realize job embeddedness. Employees' psychological contract fulfillment represents their perception of fairness in executing the agreed commitment, promises, and terms and conditions made in the employment relationship by the employer [15]. However, in an organizational context, employees' psychological ownership describes their psychological state wherein they feel possession of the organization's material or nonmaterial artifacts [16]. Servant leadership, an employee-focused leadership style, is believed to positively influence nurses' job embeddedness through employees' psychological contract fulfillment and psychological ownership.

Our study has primarily three objectives: (1) to explore the direct influence of servant leadership on nurses' job embeddedness through the lens of COR theory; (2) to offer nuanced theorizing of COR in explaining the underlying phenomenon of psychological contract fulfillment and psychological ownership in the relationship between servant leadership and nurses' job embeddedness; (3) to respond to the call for research to unravel the effectiveness of servant leadership in healthcare. This research contributes to the literature on servant leadership and job embeddedness in three distinctive ways: (1) It uniquely employs the underpinnings of the COR theory in explaining the nuanced relationship between servant leadership and nurses' job embeddedness through the sequential intervening mechanisms of psychological contract fulfillment and psychological ownership. Doing so offers the first empirical evidence to advance the COR theory in this domain. (2) It empirically supplements the rarely examined direct relationships between servant leadership and psychological contract fulfillment, psychological contract fulfillment and psychological ownership, and psychological ownership with job embeddedness. (3) It responds to calls for a scholarship to examine the effectiveness of servant leadership within healthcare (James et al., 2021) and to explore the intervening psychological mechanisms of servant leadership in predicting employees' outcomes [1].

2. Theoretical Background and Hypotheses

2.1. Servant Leadership and Job Embeddedness. Job embeddedness encompasses the perceptual and contextual factors that retain employees in location, jobs, colleagues, and the organization [17]. Mitchell et al. [3] refer to job embeddedness as a social web comprised of primarily three factors: (i) links, whether the formal or informal association of an employee with colleagues, (ii) fit, representing the degree to which employees' job aligns with other aspects of their lives, and (iii) sacrifice, referring to the anticipated cost of psychological or physical benefits given up by quitting a job. Primarily, job embeddedness focuses on the three earlier enlisted aspects that retain employees in their jobs. For instance, more links cultivated by employees will result in significant expenses, whether psychological, emotional, or financial [3]. Likewise, when employees' knowledge, skills, and abilities coincide with their jobs and find opportunities

for personal and professional growth, they will feel a greater sense of fit with the job [18]. Lastly, sacrifice may refer to material costs (cost of relocation) or psychological cost (perceived psychological contract fulfillment, and job security) or the cost of benefits associated with a particular job [18].

Greenleaf [11], who introduced the concept of servant leadership, argued that motivation to serve others and subsiding personal gains over followers' well-being must be servant leaders' core considerations [19]. He was concerned with making the world a better place, requiring organizations to fulfill the needs of their employees and the least privileged in society. He firmly believes that those being led should benefit from the leaders, or at least not further harm. Greenleaf accentuated that the decisive role of servant leadership is to equip the followers personally and professionally and inculcate servanthood in them to create a better world by serving others [11].

The concept of servant leadership as a value-based leadership style has garnered scholarly interest owing to its vitality in shaping employees' attitudinal and behavioral outcomes [20]. Extant research establishes its instrumentality over a wide range of outcomes, including employees' performance, organizational citizenship behavior, nurses' burnout, psychological well-being, and many more (for details, see the systematic literature review of Eva et al. [21]. Nevertheless, despite the vitality of servant leadership in healthcare, there is a scarcity of empirical research exploring its effectiveness (James et al., 2021). In response, this study posits that servant leadership would positively influence nurses' job embeddedness. Furthermore, though servant leadership and job embeddedness are prevalent areas of research interest among scholars and practitioners [4, 22], the linkage of these two concepts is inadequately investigated in the existing literature [21], especially since there is not a single study on this relationship in healthcare.

Servant leadership focuses on followers' personal and professional development, which aligns with the "fit" facet of job embeddedness. Servant leaders are determined to satisfy their staff's needs and leverage their full support to resolve personal and occupational problems. In addition, servant leaders' support and positive association with nurses create a close bond of trust and respect [1]. Similarly, servant leaders follow an open-door policy and establish close one-on-one relationships with their subordinates, thus creating a congenial working environment that facilitates the "link" dimension of job embeddedness. Besides, subordinates' formal and informal connections with leaders and peers uplift their sense of attachment and belongingness. Lastly, nurses would perceive a high value in the sacrifice of leaving a job in the presence of servant leaders because such leaders are considered as most concerned about the well-being of followers, trustworthy, and caring about the psychological contract fulfillment of employees.

From a theoretical perspective, the limited research on the relationship between servant leadership and job embeddedness primarily relied on social exchange theory and found a positive relationship [4]. However, for deeper insights, scholarship invites alternate theoretical frameworks, for instance, the conservation of resources (COR) theory [21], to unravel the underlying process of servant leadership in shaping nurses' job embeddedness.

Building on COR theory [8], we contend that the facets of servant leadership [19]: emotional healing, empowering, putting followers first, ethical behavior, relationship building, and servanthood supplement the essentials of the job embeddedness, i.e., links, fit, and sacrifice, and nurses' never want to lose these valuable resources that will presumably be further invested to gain more resources [9]. This discussion led us to postulate the following.

Hypothesis 1. Servant leadership has a positive influence on nurses' job embeddedness.

2.2. Servant Leadership and Psychological Contract Fulfillment. A psychological contract refers to "individual beliefs, shaped by the organization, regarding terms of an exchange agreement between individuals and their organization" [15]. Employees' psychological contract fulfillment reflects the extent to which their employers satisfy implied commitments made in the employment relationship [15]. Though a psychological contract comprises the supposed commitments of an employer (organization) with the employee, the employer is undoubtedly represented by someone, primarily the organizational leadership, in its relationship with the employee [23]. Certainly, immediate managers or supervisors are seen as the "chief agent for establishing and maintaining the psychological contract" [23].

Servant leadership emphasizes nurturing the well-being of all the stakeholders, and it would be interesting to unravel its influence towards employees' psychological contract fulfillment, which gauges the cognitive evaluation of well-being in the employment relationship. We contend that servant leadership is the most suited leadership style for fulfilling employees' psychological contracts because employees' needs, interests, and growth are at the core of this leadership philosophy. Servant leaders put employees first and are so concerned about their well-being that they prioritize employees above the organization's benefits. Such leaders convince the organization's decision-makers to invest resources in uplifting employees' knowledge, skills, and abilities. In addition, they act as a bridge between the organization and employees to abide by contractual promises.

Then, the distinguished characteristics of servant leadership [19] like sensitivity towards concerns of employees, facilitation in resolving their issues, building long-term relationships, demonstrating genuine concern for their career growth, and serving them even through self-sacrifice are all such pious traits that positively shape employees' perceptions of their psychological contract with the organization.

The limited empirical evidence [23], primarily employed social exchange theory, establishes a positive influence of servant leadership on employees' psychological contract fulfillment. Therefore, other theoretical explanations are

valuable to substantiate the existing findings to fill this void in the literature. Extending this line of thinking and grounding this discussion within the theoretical underpinnings of the COR theory [9], it is posited that servant leaders' investment in opportunities like offering training, leveraging operational skills, career growth, mentoring, and job security would be positively perceived as resource gain by the nurses, which strengthens psychological contract fulfillment. Thus, for the reasons mentioned earlier, the following is hypothesized.

Hypothesis 2. Servant leadership has a positive influence on nurses' psychological contract fulfillment.

2.3. Psychological Contract Fulfillment and Psychological Ownership. Psychological ownership, at its core, comprises a sense of possession or the feeling that an individual owns an object [24]. Generally, psychological ownership is viewed through the lens of the individual-physical object relationship. However, it is a broader concept that may include nonphysical objects like artistic creations, ideas, and organizations. Our operationalization of psychological ownership focuses on nonphysical psychological ownership, representing employees' attitudinal state where they become attached to and intentionally invest themselves in an organization.

Broadly speaking, there are two types of psychological contracts, namely, transactional psychological contracts and relational psychological contracts. First, transactional psychological contracts are temporary trade-offs that may subside the development of psychological ownership. In contrast, relational psychological contracts have the potential to foster long-term organizational psychological ownership. Such contracts are relationship-oriented and require a substantial emotional and social investment and attachment of the employee and employer [25].

Griep et al. [26] identified that little is known about psychological contract fulfillment's role in cultivating employees' psychological ownership. It is argued that when servant leadership strengthens employees' psychological contract fulfillment, the latter serves as the basis for realizing unconscious psychological affection for the organization, i.e., psychological ownership [27]. Servant leaders represent the face of the organization to employees and invest valued resources in employees to satisfy their unconscious needs. The fulfillment of psychological contracts builds a positive image of an organization among its employees, and they perceive it as a resource worth having. We advance that psychological contract fulfillment strengthens the employees' belief that their organization is reliable in fulfilling its promises [28]. In return, employees start forming stronger relationships with the organization. They start investing their time, ideas, resources, abilities, intellect, and physical and psychological energies into the organization. Anchoring the lens of COR theory, which accentuates that individuals invest resources for future gains [9], we advance that assurance of psychological contract fulfillment strengthens employees' belief that the organization is reliable

enough to invest resources in the long run. Empirical evidence supports our postulation. For instance, the study in [29] found a positive association between psychological contract fulfillment and psychological ownership. This discussion leads us to frame the following.

Hypothesis 3. Nurses' psychological contract fulfillment has a positive influence on their psychological ownership.

2.4. Psychological Ownership and Job Embeddedness. From a border perspective, psychological ownership and job embeddedness represent psychological states where employees own and desire to continue with an organization. According to COR theory, these psychological states of employees are considered to be the desired condition of resourcefulness and may act as a buffer against resource loss [9]. The process that nurtures psychological ownership in the organizational context would also elevate employees' job embeddedness. For instance, a better understanding of organizational culture, procedures, values, goals, and skills will develop a person's psychological ownership and increase his compatibility with the organization. The COR theory advances that people are motivated to accumulate resources [9] and invest their available resources to gain more. Considering job embeddedness as the target, employees will invest their time, effort, and energy or strengthen links within the organization to be compatible with the job. In either case, there is a strong likelihood of boosting job embeddedness. Job embeddedness, a state of resource abundance, would attract employees to invest their existing resources, such as psychological ownership, to multiply the valued resources. Backing these arguments empirically, the findings of a study by Mehmood et al. [14] revealed a positive association between psychological ownership towards organizational embeddedness. Thus, to advance this narrative, the following is posited:

Hypothesis 4. Nurses' psychological ownership has a positive influence on their job embeddedness.

2.5. Sequential Mediation of Psychological Contract Fulfillment and Psychological Ownership. The conceptualization of "resources" is central to the COR theory [8]. Halbesleben et al. [30] defined resources as anything perceived by an individual to hold value capable of helping to attain the desired objectives. Accordingly, the value of a resource increases when an individual perceives it as helpful to achieve a goal when he or she already possesses it and when there is a new resource that complements it [30]. In the preceding sections, passageways have been identified that lead to employees' job embeddedness, a state of resource abundance. Hobfoll et al. [9] conceived that resources do not exist in isolation but instead travel in caravans or packs for organizations and individuals. They further introduced the concept of resource caravan passageways that accentuated that individuals' resources exist in ecological conditions that either foster and nurture or limit and block resource creation and sustenance. For instance, servant leadership support,

psychological contract fulfillment, organizational ownership, and job embeddedness are highly interrelated and rooted in similar environmental conditions.

Consistent with Wheeler et al. [31], we conceptualized job embeddedness as a resource caravan representing diverse types of resources (i.e., fit, links, and sacrifices) with the potential to supplement each other. In advancing our propositions, servant leadership offers instrumental support in encouraging employees to realize the state of resourcefulness, in this case, job embeddedness. We contend our argument by proposing that servant leadership creates job embeddedness by triggering a resource gain spiral in the form of psychological contract fulfillment and psychological ownership. Precisely, servant leadership facilities psychological contract fulfillment that nourishes the roots (efficacy, self-identity, and belonging) and routes (control, investment of self, and intimate knowledge of the target) of psychological ownership [16], which boosts job embeddedness. Thus, grounding our contemplation in the underpinnings of the COR theory, it is advanced that employees' positive perception of servant leadership initiates the resource caravan that travels through psychological contract fulfillment, uplifting organizational ownership, and shaping job embeddedness, a milestone of resource abundance. Therefore, the following is hypothesized.

Hypothesis 5. Nurses' psychological contract fulfillment and psychological ownership sequentially mediate the positive influence of servant leadership on nurses' job embeddedness.

Figure 1 presents the theoretical model of this study.

3. Methods and Measures

3.1. Samples and Procedures. This study targeted the nurses employed in the public hospitals of Pakistan. A total of 10 hospitals were shortlisted, two operating in each provincial capital and the country's federal capital, having the maximum number of nurses and also serving as nursing schools/colleges. The number of beds in the selected hospitals ranged between 3000 and 4000, and the number of nurses was between 1023 and 1472. The HR department of the shortlisted hospitals was briefed about the objective of the research, explained that participation is voluntary where the anonymity of the participants will be ensured, and sought permission to approach the nurses about participating in the surveys. The lists containing information about nurse ID, name, and e-mail address were obtained from the HR departments of the selected hospitals. By employing systematic random sampling, 100 nurses from each hospital, accounting for 1000 nurses, were shortlisted for survey participation. The authors designed three survey forms on Google Docs to capture the independent variable, mediating variables, and dependent variable at three different time instances to establish causality and overcome the common method bias [32]. Multiwave online surveys, two months apart, were carried out from January to June 2022. During the first half of January 2022, an initial survey containing questions about demographics and immediate supervisors' servant leadership was administered

to 1000 nurses. The first wave yielded 762 responses. After two months, during the second half of March 2022, a questionnaire containing questions about psychological contract fulfillment and psychological ownership was administered to 762 nurses who had participated in the initial survey. The second wave yielded 649 responses. The third survey was performed in the first half of June 2022, wherein 649 nurses who had participated in the previous two waves were asked to respond to questions on job embeddedness. The outcome of the third wave was 587 complete responses. There were no missing values, as surveys were designed to restrict non-responsiveness. Table 1 summarizes the demographics of the participating nurses.

3.2. Measures. All measures employed in this research were adopted from reputable studies and have proven validity and reliability. The five-point Likert scale (five = "strongly agree" and one = "strongly disagree") was introduced to capture responses from the nurses. Responses about servant leadership were obtained through a 7-item global servant leadership measure designed by Liden et al. [19]. Researchers widely employ this measure, which has proven validity and reliability ($\alpha = 0.89$). The illustrative item contains "My leader puts my best interests ahead of his/her own." Psychological contract fulfillment was gauged by adopting 4-item measure from a recent study by Yu [33], who adapted these items from the original measure of psychological contract breach [25]. Cronbach's alpha of the revised measure was 0.89, and a sample item includes "So far, my employer has done an excellent job of fulfilling its promises to me." Then, the psychological ownership of nurses was evaluated by a 7-item measure advanced by Van Dyne and Pierce [34]. The reliability coefficient of the scale is 0.90, and one of the items narrates, "I sense that this is my company." Lastly, the study employed a 9-item measure to examine nurses' job embeddedness [35]. The measure comprised three dimensions, namely, links, fit, and sacrifice. The overall reliability of the measure was 0.88, and a sample item comprised "My job utilizes my skills and talents well."

4. Data Analysis

The data analysis was carried out using the partial least squares path modeling (PLS-PM) method through the Smart-PLS version 4.0.8.3 application. We prefer PLS-PM because of the following: (i) It is better suited for research having a prediction-oriented nature [36]. (ii) It eases analysis for research having many constructs with multiple indicators and hypothesized paths [37]. (iii) Specifically, it is the preferred technique for sequential mediation analysis [38]. (iv) In the recent decade, it has proven its dominance of application in research in the filed human resource management [37]. (v) It comprised advanced metrics and thresholds for the assessment of the measurement model and structural model and comparatively, offers improved statistical power [36]. The data analysis in PLS-PM is performed in two distinctive stages, which are presented in detail in the subsequent sections.
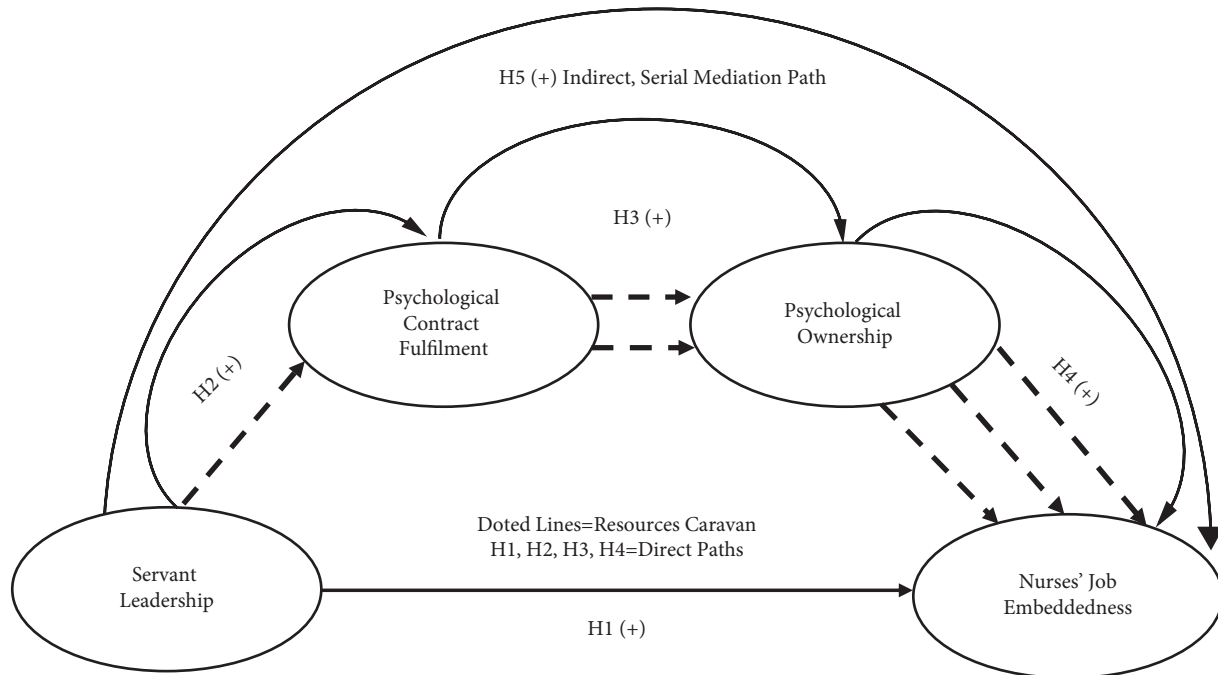
Figure 1: Theoretical model.

Table 1: Demographics of the participants.

Gender	Male 09% (53)	Female 91% (534)		
Age (in years)	18–30 34% (200)	31–40 27% (158)	41–50 23% (135)	Above 50 16% (94)
Years of experience	01–10 26% (153)	11–20 38% (223)	21–30 22% (129)	Above 30 14% (82)
Level of education	Diploma 16% (94)	Bachelors 53% (311)	Masters 25% (147)	Above masters 06% (35)

4.1. Evaluation of the Measurement Model. Confirmatory composite analysis (CCA) is an effective procedure for estimating the PLS-PM measurement model [39]. Job embeddedness is the only reflective-reflective second-order construct, while all the other variables in this study are reflective first-order constructs. The evaluation of the measurement model is performed through the following four phases.

During the first phase, the reliability of the individual items of constructs was evaluated through the items' loadings, ensuring that the loading values were greater than or equal to 0.708, the recommended threshold value [39]. Then, the second phase deals with establishing the reliability of all the variables at the construct level. The recommended metrics for gauging the construct's reliability are Cronbach's alpha and composite reliability, and the threshold range of these metrics is between 0.70 and 0.95 [36]. In the third phase, the potential issue of convergent validity is addressed by employing the commonly used statistic of average variance extracted (AVE) metric [36]. The recommended value

of the AVE metric should be greater than 0.50, describing that the individual items have explained 50% or more of the variance in the overall construct. The factor loadings of all the items, Cronbach's alpha, composite reliability, and average variance extracted are listed in Table 2, ensuring the evaluation of the measurement model as per the recommended thresholds.

The fourth phase of the measurement model evaluation revolves around confirming the discriminant validity among the constructs. In the PLS-PM technique, it is strongly suggested to employ the heterotrait-monotrait (HTMT) ratio of correlations whose desired threshold is less than 0.90 [36]. Statistics establishing the discriminant validity of constructs are presented in Table 3.

4.2. Evaluation of the Structural Model. The latest developments and guidelines on PLS-SEM are followed while assessing the structural model, and the steps carried out during that assessment are narrated in the subsequent paragraphs.

The first step of the structural model is to fix the potential issue of multicollinearity, where the variance inflation factor (VIF) is the most commonly used metric. Therefore, the VIF values of all the indicators of the constructs under consideration are listed in Table 2, which are within the recommended limit, i.e., below 03 [39].

The hypothesized relationships are evaluated in the second step through multiple metrics, including the path coefficient (β), standard error, t-values, p values, and bias-corrected confidence intervals. The bootstrapping procedure of the Smart-PLS was employed to obtain the values of the earlier said metrics. Hair et al. [36] recommended the use of percentile bootstrap confidence intervals for analyzing the

TABLE 2: Evaluation of the measurement model.

Constructs	Items	Loadings	VIF
First-order reflective constructs			
	SL1	0.805	2.623
	SL2	0.819	1.196
	SL3	0.798	1.564
Servant leadership ($\alpha = 0.913$, CR = 0.920, AVE = 0.623)	SL4	0.782	2.279
	SL5	0.818	2.904
	SL6	0.734	2.075
	SL7	0.764	2.376
	PSF1	0.812	1.524
Psychological contract fulfillment ($\alpha = 0.821$, CR = 0.892, AVE = 0.675)	PSF2	0.829	1.837
	PSF3	0.793	2.489
	PSF4	0.851	2.634
	PO1	0.803	2.482
	PO2	0.839	2.528
	PO3	0.817	2.347
Psychological ownership ($\alpha = 0.917$, CR = 0.933, AVE = 0.665)	PO4	0.791	2.367
	PO5	0.803	2.138
	PO6	0.814	2.851
	PO7	0.842	2.068
	JL1	0.793	2.020
Job links ($\alpha = 0.823$, CR = 0.835, AVE = 0.629)	JL2	0.826	2.332
	JL3	0.758	2.307
	JF1	0.815	2.138
Job fit ($\alpha = 0.847$, CR = 0.859, AVE = 0.670)	JF2	0.797	2.857
	JF3	0.843	1.062
	JS1	0.809	2.375
Job sacrifice ($\alpha = 0.825$, CR = 0.851, AVE = 0.656)	JS2	0.794	2.524
	JS3	0.826	2.830
Second-order reflective-reflective construct			
	Links	0.891	2.033
Nurses' job embeddedness ($\alpha = 0.919$, CR = 0.927, AVE = 0.808)	Fit	0.889	2.699
	Sacrifices	0.917	2.979

α = Cronbach's alpha; CR = composite reliability; AVE = average variance extracted; VIF = variance inflation factor.

TABLE 3: Discriminant validity through the HTMT approach.

	Mean	SD	JE	PO	PCF	SL
Nurses' job embeddedness	3.06	0.87				
Psychological ownership	3.58	1.02	0.811			
Psychological contract fulfillment	3.31	0.93	0.845	0.816		
Servant leadership	3.29	0.78	0.771	0.736	0.747	

SD = standard deviation.

significance of a specific hypothesized path. As a rule, the intervals should not contain a zero value for statistical significance. The results of the hypothesized relationships are presented in Table 4.

The final step of the structural model assessment offers an assessment of the coefficient of determination (R^2), values that predict the percentage variance explained for all the endogenous variables of the structural model. The threshold values of the coefficient of determination are 0.25, 0.50, and 0.77, which describe the variance predicted in the endogenous construct as weak, moderate, and substantial, respectively [36]. The values of the coefficient of determination (R^2) are listed in Table 4. Finally, Figure 2 presents the results of the assessment of the structural model.

5. Discussion and Implications

5.1. Discussion. Through this research, the authors intended to unravel the influence of servant leadership on nurturing nurses' job embeddedness and explore the sequential mediation of psychological contract fulfillment and psychological ownership. Building on the theoretical underpinnings of the COR theory [9], the present study has proposed resource caravans and passageways, which are crucial to embedding nurses in their jobs.

At first, it was contemplated that servant leadership has a direct positive influence on nurses' job embeddedness, which is endorsed by the findings of this study (H1: $\beta = 0.361$, t-value = 05.135, p value < 0.05, and confidence interval without having zero value). The rationale behind this finding is grounded in the COR theory [9], which emphasizes that individuals strive for valuable resources. Servant leaders offer followers a blend of resources, including social, positional, and organizational [1] which are essential to uplift the necessary components of links, fit, and sacrifice of job embeddedness. Servant leadership is built on compassionate love [40], wherein the well-being and care of the followers are of primary importance. Leaders with servant leadership value each individual and build cordial

TABLE 4: Evaluation of the structural model.

Hypothesized relationships	Path coefficient	SE	t-value	Confidence interval [LL, UL]	Conclusion
Direct paths					
H1: SL -> JE	0.361	0.069	05.135	[0.246, 0.479]	Supported
H2: SL -> PCF	0.694	0.057	15.621	[0.609, 0.758]	Supported
H3: PCF -> PO	0.766	0.048	20.456	[0.698, 0.822]	Supported
H4: PO -> JE	0.513	0.023	06.813	[0.387, 0.634]	Supported
Sequential mediation path					
H5: PSL -> PCF -> PO -> JE	0.272	0.011	05.452	[0.197, 0.359]	Supported
Quality criteria of the model (R-square adjusted)					
Psychological contract fulfillment = 0.479			Psychological ownership = 0.585		Job embeddedness = 0.646

$p < 0.05$; LL = lower limit; UL = upper limit; SE = standard error. The confidence intervals and t-values were obtained by 5000 bootstraps run at two-tailed significance at 5%.
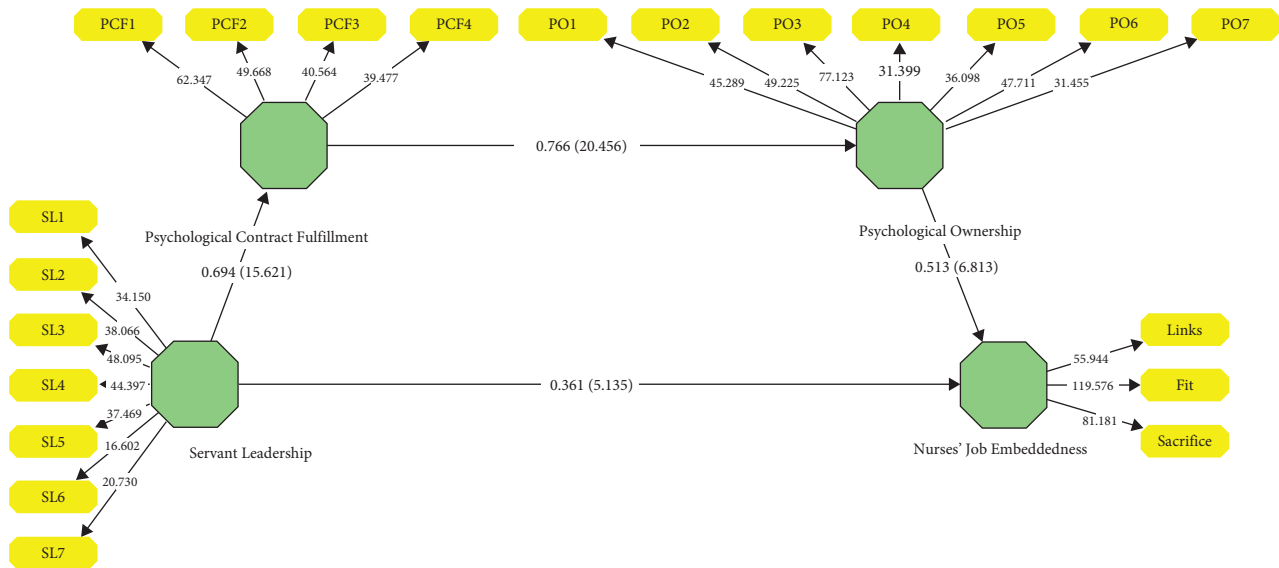

FIGURE 2: Structural model results.

working relationships with their subordinates. They actively listen to their problems and leave no stone unturned to excavate them from problems. All the pious characteristics of servant leadership work closely with the essentials of job embeddedness, i.e., links, fit, and sacrifice. Therefore, it can be claimed that nurses working under servant leaders never want to lose these valuable resources and embed them in their jobs. Extant empirical scholarship examining the influence of various leadership styles on job embeddedness is scarce, although emerging. Our finding is consistent with the limited research available on this discourse [4, 41, 42].

Secondly, it was postulated that servant leadership would uplift nurses' psychological contract fulfillment. Results have lent credence to this claim (H2: $\beta = 0.694$, t-value = 15.621, p value < 0.05, and confidence interval without having zero value) and are in line with the limited available research. Our literature review found two studies that examined the influence of servant leadership in strengthening employees' psychological contract fulfillment and their findings lent credence to this relationship [23, 43]. In addition, research

also establishes a negative association between servant leadership and psychological contract breach [44], a construct to some extent the opposite of contract fulfillment. Servant leadership pays special attention to each subordinate's unique potential and inspires trust, guides, offers feedback, and provides resources to realize his/her potential to grow and succeed [21]. Being very well aware of their followers' needs, servant leaders selflessly serve their followers and build close, trustworthy relationships [40]. Such leaders always put their subordinates first through their words and actions and always behave pretty, honestly, and transparently [19], reinforcing their credibility in front of nurses and thus satisfying their psychological contract fulfillment.

The third hypothesis that psychological contract fulfillment positively shapes psychological ownership has been proven (H3: $\beta = 0.766$, t-value = 20.456, p value < 0.05, and confidence interval without having zero value) and is consistent with existing research [29]. Contrary to psychological contract fulfillment, scholarship has identified

that employees' perception of psychological contract breach adversely impacts their psychological ownership and may lead to adverse behavioral outcomes [45, 46]. Assurance of psychological contract fulfillment gives a green signal to nurses about the organization's credibility, and they start owning the organization.

Fourth, psychological ownership was supposed to influence nurses' job embeddedness positively. The findings of this hypothesis (H4: $\beta = 0.513$, t-value = 06.813, p value < 0.05, and confidence interval without having zero value) support the extant research on this relationship [14]. Gardner et al. [29] did examine the positive influence of psychological contract fulfillment toward job-based psychological ownership in shaping citizenship behavior among employees in China. Nurses with psychological ownership see them with the organization for an extended time. They invest that ownership to gain more resources in the form of job embeddedness [9].

Lastly, results also support the sequential mediation of psychological contract fulfillment and psychological ownership in the relationship between servant leadership and nurses' job embeddedness. In the existing literature, few studies have attempted to explore the intervening role individually played by either psychological contract fulfillment or psychological ownership in predicting employees' outcomes [17, 47]. However, our study was one of the first attempts to unravel the sequential mediation of psychological contract fulfillment and psychological ownership. The results of sequential mediation (H5: $\beta = 0.272$, t-value = 05.452, p value < 0.05, and confidence interval without having zero value) can be explained through the conservation of resource theory lens [8]. It is argued that servant leaders' authentic and empathetic behavior strengthens nurses' perceived psychological contract fulfillment, which adds value by shaping nurses' psychological ownership, ultimately leading to enhanced job embeddedness.

5.2. Implications for Nursing Management. Numerous practical implications for nursing management can be derived from the results of this study. At first, it unravels a complete process of servant leadership, through which it nurtures nurses' job embeddedness. Unprecedented uncertainties (floods, earthquakes, COVID-19, dengue, polio, and monkeypox) have worsened the fragile state of the global nursing workforce, and the situation is even critical in developing countries. Our study highlighted the vitality of servant leadership in healthcare to cherish nurses' job embeddedness, a valued resource having the potential to deal with the prevailing chaotic situation in healthcare. It can be further inferred that servant leadership in healthcare would facilitate resolving the grave shortage of nurses and their brain drain through job embeddedness. In addition, healthcare should focus on attracting, developing, and retaining nurse supervisors who believe in and act in accordance with the servant leadership philosophy. Besides, the HR department should invest in training, workshops, and seminars to facilitate the workforce in building servant leadership characteristics.

Second, the findings of this study reaffirm the contention that financial incentives are not the only sources to invigorate nurses' perceived psychological contract fulfillment. Other nonfinancial resources, like supportive leadership, can also shape psychological contract fulfillment. Accordingly, authorities in healthcare should keenly focus on alternate intrinsic channels that uplift nurses' psychological contract fulfillment.

Third, our results endorsed that nurses' psychological contract fulfillment is vital in shaping their positive attitudes and behaviors. One of the positive outcomes is psychological ownership. Therefore, nursing management should draft policies and contracts by prioritizing the needs of nurses and should not promise things that could not be fulfilled later.

Last, our findings strengthen the applicability of the COR theory in healthcare. Health workers want to achieve a state of resourcefulness, like job embeddedness. Top management in healthcare is now responsible for providing nurses with a conducive environment, like servant leadership, which will shape their positive perception about psychological contract fulfillment, strengthening the feelings of ownership and resulting in job embeddedness.

5.3. Research Limitations and Future Directions. Perfection is usually hard to achieve, in line with scholarship in management science, and this research has a few shortcomings. First, at the outset, the cross-sectional design of this study restrains the possibility of drawing cause-effect predictions from these results. Although authors designed multivalve data collection to have limited causality among variables, it would be wise to have a longitudinal research design in the future for more profound casual predictions. Second, there was single-source data collection in this study more prone to socially desired responses by the participants. This social desirability issue can be addressed in future research by gathering data from diverse primary sources like managers and colleagues and secondary sources like annual turnover reports. Third, psychological contract fulfillment and psychological ownership were included as the sequential mediators in this research, whereas there are other potential mediators like psychological empowerment, psychological safety, organizational justice, and trust in the leader that can be explored in future investigations. Fourth, this research operationalized job embeddedness as a higher-order construct. Aspirant researchers should conceptualize job embeddedness as a lower-order construct for parsimonious findings. Last, we suggest examining whether the nurses, supervised by the servant leaders, have themselves grown as servant leaders or otherwise.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Ethical Approval

The researchers met the hospital administration to explain the academic nature of the study and obtained approval to proceed with this study. The questionnaires included a statement assuring participants of complete anonymity

and confidentiality, explaining they had the right to withdraw anytime during the study and that proceeding to fill in the questionnaire shall deem their informed consent. The study was not invasive, involved no intervention or manipulation of the human subjects, and participants were not vulnerable to any physical or psychological harm.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Identifying the Influencing Factors of Depressive Symptoms among Nurses in China by Machine Learning: A Multicentre Cross-Sectional Study

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Background. Nurses' high workload can result in depressive symptoms. However, the research has underexplored the internal and external variables, such as organisational support, career identity, and burnout, which may predict depressive symptoms among Chinese nurses via machine learning (ML). *Aim.* To predict nurses' depressive symptoms and identify the relevant factors by machine learning (ML) algorithms. *Methods.* A self-administered smartphone questionnaire was delivered to nurses to evaluate their depressive symptoms; 1,431 questionnaires and 28 internal and external features were collected. In the training set, the use of maximum relevance minimum redundancy ranked the features' importance. Five ML algorithms were used to establish models to identify nurses' depressive symptoms using different feature subsets, and the area under the curve (AUC) determined the optimal feature subset. Demographic characteristics were added to the optimal feature subset to establish the combined models. Each model's performance was evaluated using the test set. *Results.* The prevalence rate of depressive symptoms among Chinese nurses was 31.86%. The optimal feature subset comprised of sleep disturbance, chronic fatigue, physical fatigue, exhaustion, and perceived organisation support. The five models based on the optimal feature subset had good prediction performance on the test set (AUC: 0.871–0.895 and accuracy: 0.798–0.815). After adding the significant demographic characteristics, the performance of the five combined models slightly improved; the AUC and accuracy increased to 0.904 and 0.826 on the test set, respectively. The logistic regression analysis results showed the best and most stable performance while the univariate analysis results showed that external and internal personal features (AUC: 0.739–0.841) were more effective than demographic characteristics (AUC: 0.572–0.588) for predicting nurses' depressive symptoms. *Conclusions.* ML could effectively predict nurses' depressive symptoms. Interventions to manage physical fatigue, sleep disorders, burnout, and organisational support may prevent depressive symptoms.

1. Introduction

As a result of the COVID-19 pandemic phase, there is a growing concern about the health of healthcare professionals, such as nurses, who are immersed in stressors including overloaded clinical tasks and nursing assignment. Nurses play an essential role in the healthcare system but are often exposed to high workloads and stressful environments, such as those that place them in proximity to dying patients [1]. Nursing work traits have created a greater need for

nursing professionals on the frontline, leading to high levels of overwork, detrimental psychological consequences, and the deterioration of mental health [2], including increased depressive symptoms.

Depressive symptoms not only affect nurses' health but also negatively affect their work performance and the quality of the care provided [3–5]. Depressive symptoms substantially reduce an individual's quality of life and life satisfaction. Nurses are highly prone to psychological health problems, such as depression [6]. According to a meta-analysis,

approximately 30% of nurses working during the COVID-19 pandemic outbreak suffered from psychological symptoms, including anxiety, stress, and depression, with prevalence rates of 37%, 43%, and 35%, respectively [7]. In China, nurses had low mental health statuses during the COVID-19 pandemic phase, with prevalence rates for anxiety and depression estimated at 18.1% and 34.4%, respectively. Meanwhile, nurses who cared for COVID-19 patients had an extremely high prevalence rate of depression, at 47.1% [8].

Most of the current studies on nurses' depressive symptoms have mainly emphasised the association between depressive symptoms and negative physical and psychological outcomes, such as perceived stress [9], burnout [10], chronic fatigue [11], sleep quality [12], medication error [13], and decreased quality of care received by patients [13]. In China, there is a lack of an efficient supervision system and organisational institution to help nurses to cope with negative psychological health; instead, there is a larger focus on the improvement of nurses' professional skills and abilities. Recently, more attention has been paid to nurses' career identity and organisational support to help nurses combat occupational stress, ease their burden, and prevent them from experiencing depression [14, 15]. Moreover, positive psychology theory has gained traction, with an emphasis on positive personal resources, such as recovery experience and resilience [16, 17]. Based on the NAM model [18], the identifying factors that affect nurses' well-being can be categorised into external factors (i.e., sociocultural, regulatory, business, and payer environment, organisational factors, and learning/practice environment) and internal (individual) factors (i.e., healthcare role, personal factors, and skills and abilities). Therefore, this study explores the influence of the following related factors on nurses' depressive symptoms: (1) internal (individual) features, including demographic characteristics (i.e., age, sex, and economic status) and internal personal features (i.e., recovery experience, resilience, and chronic fatigue); and (2) external features (i.e., environmental and organisation resources and work-demand related factors), such as organisational support, career identity, and burnout.

Machine learning (ML) has a strong data training ability and obvious advantages in building prediction models, which may be helpful for identifying nurses' depressive symptoms. Most of the previous studies have employed traditional linear regression methods to analyse the relationship between independent variables and depressive symptoms [9–11]. ML can solve the problem of multiple related factors and multicollinearity between variables. Furthermore, ML can ascertain the contribution ranks of the predictors and the comparative effects of independent factors on the dependent variables [19]. Some studies have confirmed that ML models can effectively predict depression-related problems [20–22]. However, few studies have used ML methods to identify the influencing factors of depressive symptoms among nurses [23]; thus, it is necessary to conduct a more detailed analysis. To develop evidence-based interventions that can reduce the impact of depressive symptoms among nurses, it is necessary to determine the specific contributions of external variables, such as work-

related factors, and internal personal factors, such as positive psychological resources, as well as demographic characteristics.

Consequently, the purpose of this study was to (1) detect nurses' depressive symptoms by applying ML and (2) identify the predictors of nurses' depressive symptoms and provide a research basis for reducing nurses' negative psychological outcomes, so as to improve their quality of life and well-being.

2. Materials and Methods

2.1. Design and Sample. This study employed a multicentre cross-sectional design in Liaoning Province, Northeast China, from January 2022 to April 2022 during the phase of normalization of COVID-19 prevention and control. This study used multistage proportional random sampling to collect information from nurses. It randomly selected two general hospitals from each city (Shenyang, Fushun, Fuxin, and Liaoyang) in Liaoning Province; around 30.0% of the nurses in clinical departments were selected from each hospital. Approximately 1,500 clinical nurses were finally selected from 8 hospitals. A self-administered anonymous smartphone questionnaire (via the Wenjuanxing platform) was delivered to the nurses to evaluate their depressive symptoms and related factors. After excluding illogical answers and invalid responses, the response rate was 95.4%.

2.2. Participants. This study included 1,500 clinical nurses aged 18 years and above who were working in the 8 selected general hospitals in Shenyang, Fushun, Fuxin, and Liaoyang and could complete the online questionnaire via the Wenjuanxing platform. Nurses who had been diagnosed with or treated for a severe mental illness (e.g., bipolar disorder, schizoaffective psychosis, and paranoid psychosis) were excluded from this study.

In this study, the sample size was calculated based on the following formula:

$$N = \frac{Z^2 P(1-P)}{d^2} = 2.582 * 0.3 * \frac{0.3}{0}, 0352 \tag{1}$$
$$= 1141, \frac{N}{0.8} = 1369.$$

The prevalence rate of depressive symptoms among the nurses after the epidemic is around 30%, and $\Pi = 30\%$ was used as the basis to estimate the sample size. "d" is the allowable error. To ensure accuracy, $d = 3.5\%$, for 95% confidence interval, $\alpha = 0.01$ and $Z = 2.58$. The estimated sample size was 1,369, taking into account a 20% loss of follow-up rate. In the final draft of this study, about 1,500 questionnaires were collected, excluding unqualified questionnaires, and 1,431 valid questionnaires remained, resulting in a valid response rate of 95.4% (1431/1500).

2.3. Data Preparation. This study excluded survey responses that were logically inconsistent. A total of 1,431 survey responses were obtained. The data were randomly divided into

a training set ($n = 1,144$) and test set ($n = 287$) in an $8 : 2$ proportion. Figure 1 presents the detailed flowchart of this study.

2.4. Variables.

This study used the Patient Health Questionnaire-9 (PHQ-9) [24] to measure nurses' depressive symptoms. The PHQ-9 is commonly used to measure depressive symptoms based on the Diagnostic and Statistical Manual of Mental Disorders. The scale is comparably sensitive and specific and includes nine items. A cut-off value score of ≥ 10 on the PHQ-9 indicates the existence of depressive symptoms. In this study, Cronbach's α coefficient of the PHQ-9 was 0.924. A detailed description of the questionnaire is provided in supplementary materials. This study categorised the predictors affecting the nurses' psychological health as internal and external features. Internal features included demographic characteristics (i.e., age, sex, marital status, income, and chronic disease) and internal personal features (i.e., coping styles, recovery experience, resilience, sleep quality, chronic fatigue, and perceived stress); external features included organisational support, career identity, and burnout.

Chronic fatigue had three dimensions: physical, affective, and cognitive [25]. Recovery experience had four dimensions: psychological detachment, relaxation, mastery, and control [26]. Coping had three dimensions: problem-focused coping, emotion-focused coping, and avoidant coping [27]. Burnout had three dimensions: exhaustion, cynicism, and professional efficacy [28]. Professional identity had seven dimensions: grasp, consistency, significance, self-efficacy, self-decision, organisational influence, and individual influence [29]. The remaining features contained only one dimension. In addition to these subfeatures, a total score was calculated for each class, yielding a total of 28 features.

This study simultaneously considered the sum score of these scales and their dimensions in analytic models to accurately explore the influencing factors of depressive symptoms among nurses.

2.5. Model Establishment and Performance Evaluation.

This study implemented the following three steps to identify the important features of depressive symptoms among nurses. First, the variables describing demographic characteristics were analysed by using the chi-square test. It then used maximum relevance minimum redundancy (mRMR) to initially screen for the internal personal and external factors on the training set. mRMR combines two indicators to evaluate the importance of features: one maximises the correlation between features and variable classifications, the other minimises the redundancy between the features. In this study, the chi-square test calculated the correlation between the internal personal and external features and depressive symptoms. This study used Pearson's correlation coefficient to calculate the redundancy between the internal personal and external features. All internal personal and external features were sorted by importance.

Subsequently, this study conducted five ML algorithms using a five-fold cross-validation strategy to establish the models on the training set. This study used five ML algorithms: k-nearest neighbours (KNN), Gaussian Naive Bayes (GNB), support vector machine (SVM), random forest (RF), and logistic regression (LR). To discover the appropriate feature dimensions, this study gradually included the internal personal and external features according to the importance ranking to locate the optimal feature subset and identify whether there were depressive symptoms. By considering the five ML model results, this study obtained the smallest feature subset with the largest area under the curve (AUC) of the models. Then, this study evaluated the performance of the test set. Finally, the significant demographic features on the training set were added to the optimal internal personal and external features subset to establish combined models. Similarly, it evaluated the combined models' performance on the test set. Furthermore, this study used a univariate LR to further compare the predictive abilities of the important demographic characteristics and optimal internal personal and external features to determine the depressive symptoms and validate the abilities on the test set. This study compared the receiver operating characteristics (ROCS) of the demographic characteristics and internal personal and external features using the DeLong test.

To obtain the best model prediction performance, some interacting hyperparameters need to be tuned. The radial basis function was used as a kernel function of the SVM model, and a cross-validation grid search method was applied to find the best hyperparameters of the SVM model γ (from $1e - 03$ to $1e + 03$, number $= 12$) and C (from $1e - 04$ to $1e + 04$, number $= 12$). The random search method was used to find the best hyperparameter of the RF model and avoid overfitting, including the number of estimators (from 80 to 120, number $= 5$), the maximum depth of the tree (from 2 to 8, number $= 3$), minimum number of samples required to segment nodes (3, 5, or 10), and minimum number of samples per leaf node (5, 10, or 15). Stepwise LR was used to analyse depressive symptoms related features. The number of neighbours selected in the KNN model was 3, 5, 7, and 9. The GNB classifier used the default parameters to build the model. Hyperparameters adjustment results are provided in supplementary materials, Table S1.

2.6. Data Analysis.

All statistical analyses were performed using Python (Version 3.7.3). The level of statistical significance was set at $P < 0.05$. In addition to the stepwise LR using the Statsmodels package, other ML methods used the scikit-learn package. The basic configuration of the computer for statistical analysis is as follows: CPU, Intel (R) Core (TM) i7-9700; RAM, 32 GB; and Operating system, Windows 10.

2.7. Ethical Statement.

This study was implemented in accordance with the Helsinki Declaration (1989) and was approved by the Ethics Committee of China Medical University (ID: 2020048). The participants were voluntary and
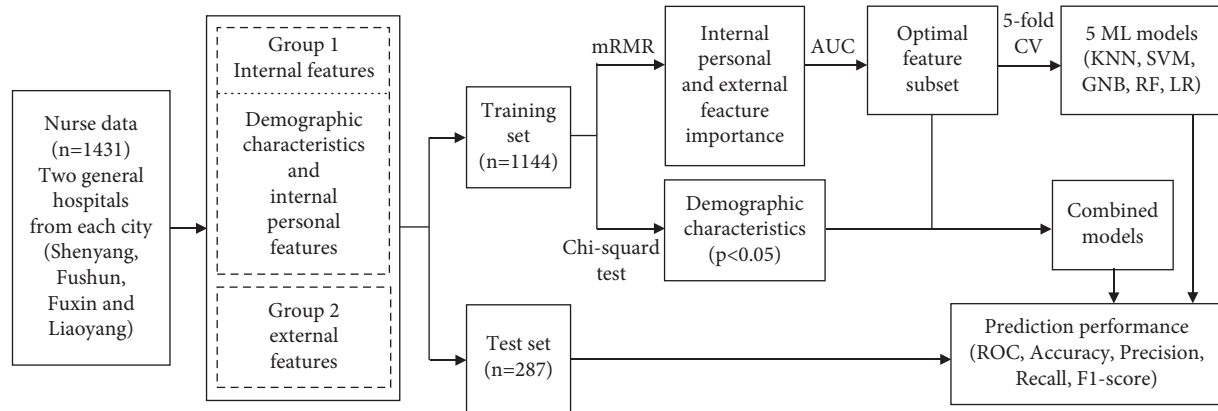
Figure 1: Flowchart of this study. CV: cross-validation and ML: machine learning.

anonymous. They were well-informed of the aims and contents of this study and provided signed informed consent before the survey.

3. Results

3.1. Demographics Characteristics. Table 1 shows that out of the 1,431 nurses, 456 (31.9%) have depressive symptoms. The ages of the nurses range from 18 to 57 years. The majority are female (97.8%) and married (78.1%). Approximately, 64.5% receive an income of 3,000–6,000 yuan, and 23.5% suffer from a chronic disease.

In the training set, when compared with nurses who have no depressive symptoms, depressive symptoms demonstrate statistically significant differences in prevalence rates based on income, marital status, and chronic disease, which may indicate that unmarried nurses with low incomes and chronic diseases tend to suffer more often from depressive symptoms.

3.2. Construction of Optimal Feature Subset. Table 2 shows the importance of ranking of the internal personal and external features obtained from the mRMR. When the features dimension is five, the AUC of each model has the largest value. Ultimately, sleep quality, chronic fatigue, exhaustion, physical fatigue, and organisational support comprise the optimal feature subset that distinguishes depressive symptoms from no depressive symptoms.

Table 3 shows the evaluation indicators of the five models based on the optimal internal personal and external features. Each model has a good prediction performance based on the test set. This indicates that internal personal and external features can predict nurses' depressive symptoms.

3.3. Combined Models Establishment. After adding income, chronic disease, and marital status to the optimal feature subset, the performance of the five combined models slightly improves. The AUC and accuracy increase to 0.904 and 0.826 on the test set, respectively. Compared with the other models, the LR model is more stable. Notably, only six

features are included in the LR model; marital status and physical fatigue are excluded. These results suggest that sleep quality, chronic fatigue, exhaustion, organisational support, income, and chronic disease are the most important features for identifying nurses' depressive symptoms. For the LR model, the P values of the included variables are shown in supplementary material Table S2. Table 4 shows the evaluation indicators of the five combined models on the training and test sets, and Figure 2 shows the ROCs of the combined models.

Figure 3 shows the ROCs of the univariate analysis of the test set. The AUCs of the optimal internal personal and external features are much higher than those of the demographic characteristics, and chronic fatigue has the best prediction performance. According to the DeLong test results, there are no significant differences in ROC between organisational support and the demographic characteristics ($P = 0.068$–0.237); however, the ROCs of the other features were significantly different ($P < 0.001$–$P = 0.016$). These results suggest that internal personal and external features are more effective than demographic characteristics for predicting nurses' depressive symptoms.

4. Discussion

To the best of our knowledge, this study is the first to use ML to predict the risk factors of depressive symptoms among nurses in Northeast China. This study found that nurses had severe depressive symptoms, with a prevalence rate of 31.9%. This prevalence rate was much higher than that of a study conducted in Iran (17.8%) [30] and Li's study, which found that 26.2% of the nurses suffered from depression during COVID-19 isolation [31]. However, the current study's results were slightly lower than those of a study conducted in Sichuan Province and Wuhan City [8], which revealed that depressive symptoms had a 34.3% prevalence rate among nurses at the outbreak of COVID-19 and a 55.0% rate among frontline nurses at the beginning of the COVID-19 pandemic [32]. As a high-stress group, nurses are prone to negative emotions, such as depression, due to the specificities and limitations of their work environment, which, in turn, affect nurses' mental health and work quality. During

TABLE 1: Analysis of no depressive symptoms and depressive symptoms on the training and test sets according to the patient demographic characteristics.

Demographic characteristics	Total (%)	Train set			Test set		
		No depressive symptoms (%)	Depressive symptoms (%)	P value*	No depressive symptoms (%)	Depressive symptoms (%)	P value*
Age (years)				0.2874			0.9027
≤36	867 (60.6)	460 (59.3)	231 (62.8)		123 (61.8)	53 (60.2)	
>36	564 (39.4)	316 (40.7)	137 (37.2)		76 (38.2)	35 (39.8)	
Gender				0.4287			0.3121
Man	31 (2.1)	20 (2.6)	6 (1.6)		5 (2.5)	0 (0.0)	
Woman	1400 (97.8)	756 (97.4)	362 (98.4)		194 (97.5)	88 (100.0)	
Marital status				**0.0113** *			0.0722
Married	1118 (78.1)	630 (81.2)	274 (74.5)		155 (77.9)	59 (67.1)	
Others	313 (21.9)	146 (18.8)	94 (25.5)		44 (22.1)	29 (32.9)	
Income				**<0.0001** **			**0.0272** *
<3000	113 (7.90)	55 (7.1)	37 (10.1)		14 (7.0)	7 (7.9)	
3000–6000	923 (64.50)	465 (59.9)	264 (71.7)		126 (63.3)	68 (77.3)	
>6000	395 (27.60)	256 (33.0)	67 (18.2)		59 (29.7)	13 (14.8)	
Chronic disease				**<0.0001** **			**0.0032** **
Yes	337 (23.5)	124 (16.0)	134 (36.4)		44 (22.1)	35 (39.8)	
No	1094 (76.5)	652 (84.0)	234 (63.6)		155 (77.9)	53 (60.2)	

Note:*Chi-squared test for all demographics characteristics. *$P < 0.05$, **$P < 0.01$. Bold values indicate significant differences.

TABLE 2: The ranking of internal personal and external features importance obtained by the mRMR method.

Work-related and internal personal feature	Importance ranking
Organizational support	**5**
Sleep quality	**1**
Resilience	11
Physical fatigue	**4**
Affective fatigue	14
Cognitive fatigue	7
Chronic fatigue	**2**
Psychological detachment	27
Relaxation	16
Mastery	19
Control	8
Recovery experience	22
Problem-focused coping	24
Emotion-focused coping	28
Avoidant coping	17
Perceived stress	10
Exhaustion	**3**
Cynicism	6
Professional efficacy	21
Job burnout	12
Sense of grasp	20
Sense of consistency	9
Sense of significance	18
Sense of self-efficacy	23
Sense of self-decision	13
Sense of organisational influence	25
Sense of individual influence	26
Career identity	15

Bold values indicate important features of mRMR selection.

the COVID-19 pandemic phase, nurses not only undertook heavy work tasks due to unprecedented workloads, but also faced the risk of infection, which could have triggered complex psychological stress responses and resulted in the development of depressive symptoms [32].

This study used five ML methods to identify the most important predictors of depressive symptoms among nurses. It achieved good predictive results: the LR model was the best predictor, with an AUC of 0.904 on the test set, while the KNN model was the worst predictor, but the AUC was also 0.871. The ML model results exceeded those of Zhou et al., who used four ML models to predict nurses' depressive symptoms during COVID-19 phase in China (AUCs: 0.785–0.829) [23]. Therefore, ML methods are feasible for predicting depressive symptoms among nurses, and the proposed predictive factors are reliable. Most of the previous research on predicting nurses' mental health using ML has focused on clinical characteristics or workplace factors and has highlighted health-related predictors and the importance of optimising workplaces [23, 33]. This study examined nurses' positive psychology resources, coping styles, organisational supportive resources, and career identity to predict depressive symptoms; these predictors can be conceptualised to improve nurses' psychological health. Overall, more attention should be paid to nurses' depressive symptoms, and effective measures should be taken to optimise their mental health status.

This study found that ML was an effective tool for predicting the most meaningful and distinctive features of depressive symptoms among Chinese nurses. A previous study by Havaei et al. used ML algorithms to predict the impact of work-related factors on nurses' mental health with significant beneficial results [33]. In the current study, the nurses' demographic characteristics, including marital status, income, and chronic disease were associated with their depressive symptoms, which concurs with the results of the previous studies [34]. More importantly, in the current study's ML models, the internal personal and external

TABLE 3: The results of five models based on optimal internal personal and external features for depressive symptoms on the training and test sets.

Data sets	Model	Accuracy	Precision	Recall	F1-score	AUC
	KNN	0.785 ± 0.03	0.779 ± 0.03	0.785 ± 0.03	0.777 ± 0.03	0.851 ± 0.03
	GNB	0.795 ± 0.02	0.802 ± 0.01	0.795 ± 0.02	0.797 ± 0.02	0.871 ± 0.02
Training set	SVM	0.803 ± 0.02	0.799 ± 0.02	0.803 ± 0.02	0.792 ± 0.02	0.874 ± 0.02
	RF	0.787 ± 0.01	0.781 ± 0.01	0.787 ± 0.01	0.780 ± 0.01	0.870 ± 0.02
	LR	0.798 ± 0.01	0.794 ± 0.01	0.798 ± 0.01	0.790 ± 0.01	0.875 ± 0.02
	KNN	0.798	0.791	0.798	0.788	0.871
	GNB	0.791	0.803	0.791	0.794	0.893
Test set	SVM	0.808	0.803	0.808	0.799	0.894
	RF	0.815	0.810	0.815	0.810	0.892
	LR	0.801	0.795	0.801	0.803	0.895

TABLE 4: The results of five combined models for depressive symptoms on the training and test sets.

Data sets	Model	Accuracy	Precision	Recall	F1-score	AUC
	KNN	0.796 ± 0.01	0.791 ± 0.01	0.796 ± 0.01	0.787 ± 0.01	0.851 ± 0.02
	GNB	0.807 ± 0.02	0.816 ± 0.02	0.807 ± 0.02	0.810 ± 0.02	0.879 ± 0.02
Training set	SVM	0.798 ± 0.01	0.796 ± 0.01	0.798 ± 0.01	0.785 ± 0.01	0.881 ± 0.02
	RF	0.803 ± 0.01	0.798 ± 0.01	0.803 ± 0.01	0.795 ± 0.01	0.873 ± 0.02
	LR	0.811 ± 0.01	0.807 ± 0.01	0.811 ± 0.01	0.803 ± 0.01	0.881 ± 0.01
	KNN	0.798	0.792	0.798	0.793	0.875
	GNB	0.824	0.831	0.824	0.825	0.904
Test set	SVM	0.822	0.820	0.822	0.818	0.902
	RF	0.819	0.819	0.819	0.819	0.901
	LR	0.826	0.822	0.826	0.823	0.904

KNN: 0.851±0.02   RF: 0.873±0.02
GNB: 0.879±0.02   LR: 0.881±0.01
SVM: 0.881±0.02

(a)

KNN: 0.875   RF: 0.901
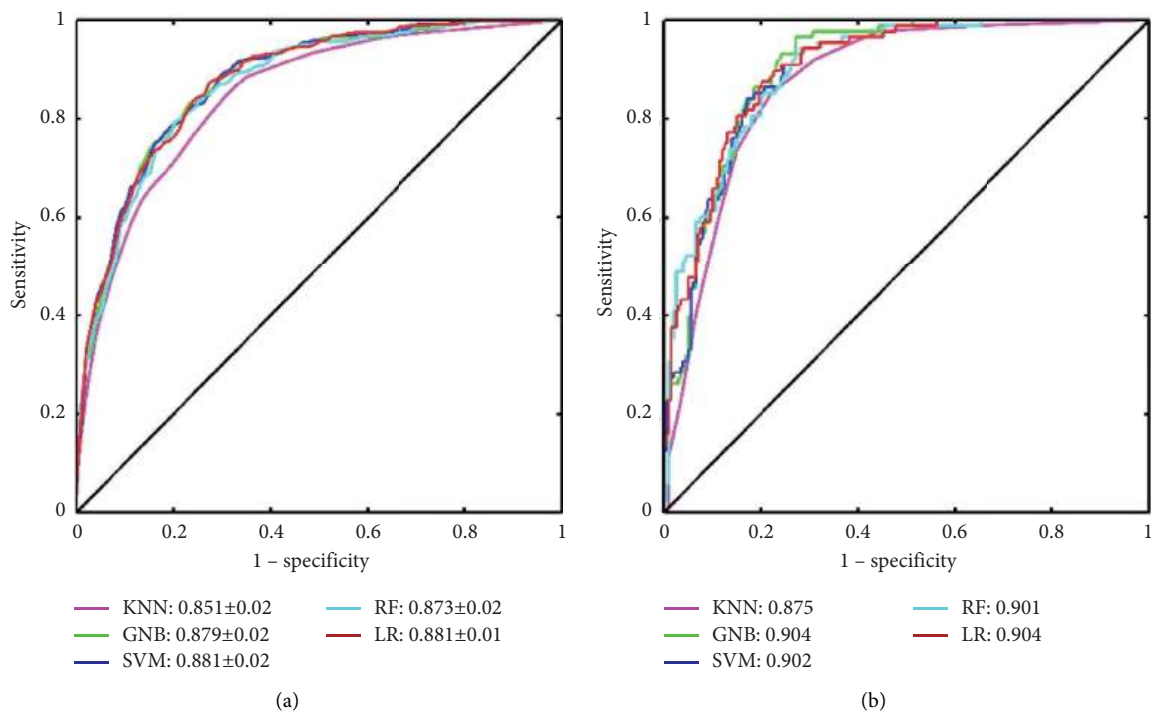GNB: 0.904   LR: 0.904
SVM: 0.902

(b)

FIGURE 2: ROC curves of five combined models for nurses' depressive symptoms. (a) ROC curves for the model in the 5-fold cross-validation on the training set and (b) ROC curves for the model on the test set.
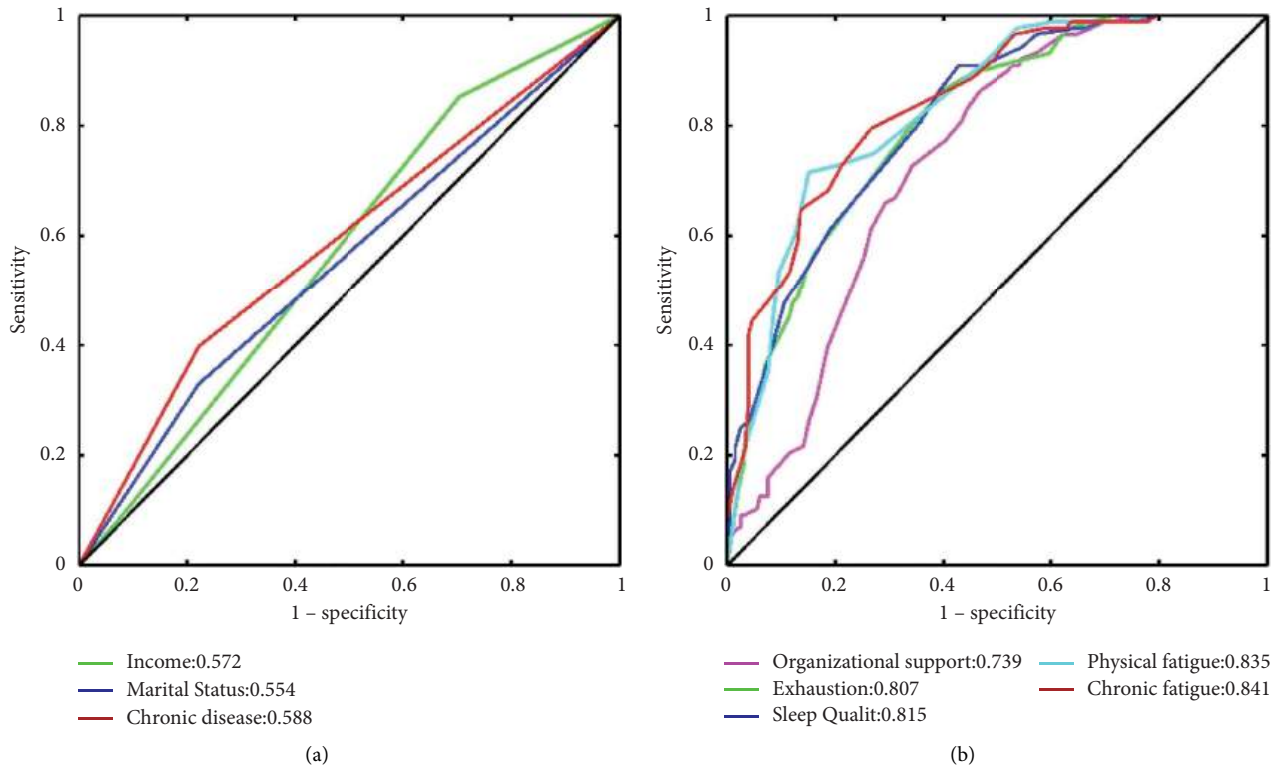
Figure 3: ROC curves of each feature for nurses' depressive symptoms on the test set. (a) ROC curves for the significant demographic features and (b) ROC curves for the optimal work-related and internal personal features.

features could better explain most of the depressive symptoms among nurses than the demographic characteristics. Moreover, five key external and internal personal features could significantly predict depressive symptoms, including sleep disturbance, exhaustion due to burnout, chronic fatigue, physical fatigue, and perceived organisation support. By comparing the five depression prediction models, this study found that the LR model had the best performance for predicting depressive symptoms, and the strongest predictor was sleep quality. However, physical fatigue was excluded.

The results also showed that sleep quality, exhaustion due to burnout, chronic fatigue, and physical fatigue were positively associated with depressive symptoms. Perceived organisational support, as a protective factor, was associated with depressive symptoms, which was consistent with the previous studies [12, 35–37]. Compared with traditional LR, the multicollinearity problem between variables can be solved using ML algorithms, and more effective predictors can be screened out [38]. This study differs from the previous studies that have employed ML algorithms as it incorporates the total score of the scales into the prediction model simultaneously with each scale dimension to effectively understand the distinctive contributions of each dimension and the total effect of the overall factor [33, 39]. Thus, the fractional dimension and the total effect of the feature are not interchangeable, meaning that if you obtain a high-dimensional score of the feature, you can simultaneously obtain a high total score of the feature. Therefore, this study

simultaneously considered both the fractional dimension and the total effect of the feature on depressive symptoms.

Sleep quality was a critical predictor of nurses' depressive symptoms; this is in agreement with the previous studies that have shown that sleep disorders impact an individual's ability to tackle work tasks, which, in turn, negatively impacts job performance, reduces work productivity, and ultimately affects quality of care, thereby increasing the risk of depression [12]. The research has also confirmed that there is a strong association between sleep quality and depression [40]. Sleep disturbances may cause changes in epigenetic characteristics, personality, and neurobiological functioning, which are typical risk factors of depression. Moreover, sleep disorders are accompanied with fatigue; therefore, subsequent mental impairments, such as depressive symptoms, may occur.

In this study, both the chronic and physical fatigue dimensions were crucial predictors of depressive symptoms. Fatigue is a common problem that affects healthcare professionals, especially during the COVID-19 pandemic phase in China. The consequences of chronic and physical fatigue can impair an individual's recovery functioning and vigour at different levels and can interrupt harmonious relations between family members and work [41]. Chronic fatigue caused by a depleted ability to restore and recover physical and mental health could increase an individual's susceptibility towards developing depressive symptoms [42]. Moreover, the longer fatigue lasts and the greater its

intensity, the more it can impact performance in terms of daily activities and duties inherent to various professionals in social roles. Depressive symptoms could be further aggravated by chronic fatigue or physical exhaustion in stressful work surroundings. Some scholars have argued that fatigue and depressive symptoms have a high degree of overlap, while recent studies have suggested that chronic fatigue could be treated as an independent predictor of depressive symptoms. Therefore, fatigue should be managed to optimise nurses' mental health status [43].

This study found a strong association between exhaustion and depressive symptoms and revealed that the greater the level of burnout experienced, the more depressive symptoms reported by the nurses. There has been much attention on burnout among nurses, which has subsequently been identified as one of the occupational risks for nurses due to its high morbidity [44]. Many studies have found that all three dimensions of burnout are significantly associated with depression [45], while the current study found that only exhaustion due to burnout was a powerful predictor of depressive symptoms. Meanwhile, a study conducted in a Brazilian hospital noted that too many work tasks assigned to a nurse could lead to faster work rhythms and less time off work. Moreover, nurses must deal with many patients and their family members, which could enhance their vulnerability to stress-related disorders [46] and exacerbate depressive symptoms.

In addition, perceived organisational support was conversely correlated with depressive symptoms, as found in other studies [14, 15]. Nurses with a high level of perceived organisational support were less likely to experience depressive symptoms. This might be because nurses who perceive organisational support and feel that their work contributions are valued may be more likely to adopt an optimistic working attitude, which would positively impact their mental health [47, 48]. It has also been previously studied that perceived organisational support could relieve depressive symptoms in different populations, such as policemen [37, 49]. The less support perceived from organisations, the more severe depressive symptoms the nurses exerted. Supportive organisations can help nurses combat stressful work tasks, reducing the incidence of depressive symptoms. Organisational support has a beneficial effect on depressive symptoms, which helps nurses cope appropriately when confronting their working environment and thus can prevent depressive symptoms [50]. Nowadays, most hospitals underestimate the mental health demands put on nurses and the requisite supportive strategies to foster psychological health, resulting in widely varying levels of organisational support in various healthcare settings [51]. Organisational support interventions should help the nurses facilitate communication with the supervisors and leaders of the hospital and increase the nurses' participation in decision-making to improve the social support to combat depressive symptoms. At the organisational level, hospitals should decrease the working pace and workloads of nursing and increase the number of staff to ease work overloads and burnout. Medical institutions should develop strategies to incentivise enhanced organisational support, which will prevent depressive symptoms in the nursing population and ultimately improve the quality of care for patients.

The limitations of the study should be made an explanation. First, this study did not comprehensively consider other associated factors of depressive symptoms among nurses, such as fear of COVID-19, the time of COVID-19 phase, the work organisation, and work conditions including work climate. However, this study's results may have reference value for the future research on psychological interventions at the individual and organisational level. Second, this study's design was a cross-sectional survey so the causal relationship between variables could not be confirmed; therefore, further longitudinal studies should be conducted in this regard. Third, this study's results could be optimised through other various and efficient ML methods. Finally, the study was conducted in Northeast China, which may limit the generalisability of the results in different national and organisational contexts.

5. Conclusion

This study found that Chinese nurses in clinical settings suffered from severe depressive symptoms, and ML constituted a feasible approach to identify the predictors of depressive symptoms. Specifically, the LR model could successfully capture high-dimensional information on the risk factors of depression among nurses. Sleep disturbance, exhaustion due to burnout, chronic fatigue, and physical fatigue were important predictors of depressive symptoms. Furthermore, organisational support could relieve depressive symptoms. To prevent depressive symptoms among nurses, this study suggests to prioritise interventions to improve the management of fatigue, sleep quality, and exhaustion due to burnout, and emphasise organisational support to enhance nurses' work–life balance.

6. Implications for Nursing Management

By using ML to predict depressive symptoms in nurses, this multicentre cross-sectional study can help nursing managers identify psychological problems in nurses. ML prediction is a promising strategy for predicting depressive symptoms in Chinese nurses, and it provides evidence-based recommendations for preventing depressive symptoms. For internal personal features and external variables, the ML prediction model has high validity and effectiveness. This study supports the identification of nurses' mental health problems. Moreover, improving nurses' mental health contributes to the quality of care and patient satisfaction with healthcare services as well as playing an important role in strengthening nursing care and creating value for the healthcare system.

Data Availability

The datasets used during the study are available upon reasonable request from the corresponding author.

Additional Points

Implications for Nursing Management. ML is a promising strategy that can predict depressive symptoms and make evidence-based recommendations for interventions to prevent depressive symptoms among Chinese nurses.

Ethical Approval

This study was approved by the Ethics Committee of China Medical University (Ref no. 2020048) and conducted in line with the Helsinki Declaration principles.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Shu Li contributed to the acquisition and analysis of data, drafting, and the revision of the manuscript. Kristin K. Sznajder contributed to revision of the manuscript and provided English edits. Lingfang Ning, Hong Gao, Xinyue Xie, Shuo Liu, Chunyu Shao, and Xinru Li contributed to the acquisition and analysis of data. Xiaoshi Yang was responsible for the conception, design, drafting, and the revision of the manuscript.

Acknowledgments

Supplementary Materials

S (detailed descriptions of the questionnaire), Table S1 (the results of tuned hyperparameters), and Table S2 (LR model for nurses' depressive symptoms). (*Supplementary Materials*)

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Review Article

Impact of Nurse Manager Leadership Styles on Work Engagement: A Systematic Literature Review

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Aims. This systematic review aimed to identify, evaluate, and synthesise the results of the studies that examine the relationship between nurse managers' leadership practices and staff nurses' work engagement in hospital settings and to provide recommendations for improvement and further research. *Background.* A lack of supportive leadership is identified as one of the most common reasons nurses leave employment. To meet the global shortage of nurses, nurse managers need to maximise staff retention and work engagement. *Evaluation.* A systematic review was conducted to identify research published between 2010 and 2021 and registered in PubMed, CINAHL, PsycINFO, Embase, EMCare, and Eric databases. The methodology guidelines outlined in the Joanna Briggs Institute (JBI) Methodology for Systematic Reviews were followed, and the results were reported using the PRISMA 2020 guidelines. The review protocol was registered with PROSPERO (ID CRD42021277463). *Key Issue.* Eleven (11) studies from 12 articles were included in this review. Three main leadership style themes were identified, and these showed statistically significant direct and indirect relationships with nurses' work engagement: relationally focused, task-focused, and lack of leadership. Work engagement was mainly assessed in terms of dedication, absorption, and vigour. The effects of leadership styles on work engagement were found to be mediated by trust in the leader, environmental resources such as structural empowerment, six work-life areas (workload, control, values, community, rewards, and fairness), person-job fit, organisational support, leader-member exchange, and personal resources such as self-efficacy and decision authority. *Conclusion.* This review found a significant correlation between positive nurse manager leadership style and the work engagement of registered nurses. *Implications for Nursing Management.* The results of this review suggest that nursing work engagement can be improved by implementing relational leadership behaviours. The findings of this review will be useful for developing appropriate nurse leaders' leadership styles, improving their workplace environments, and planning leadership training. It is essential to acknowledge the indirect effects of nurse leaders' leadership styles and their mediating factors on work engagement while developing interventions for staff nurses.

1. Introduction

Nurses account for 59% of the global healthcare workforce (World Health Organization [1]). However, there is now a shortage of around six million nurses worldwide [1], significantly affecting global healthcare systems' overall functioning [2]. Nurse shortages also result in increased burden and stress for nurses remaining in the workforce due to the greater need for overtime and poor patient/staff ratios [3–5]. These demanding work conditions may, particularly over an extended period, lead to a reduced sense of belonging and low personal satisfaction among nurses, which may result in burnout and a reduction in morale [4–6]. Feelings of disengagement and disempowerment may also lead to higher nursing staff turnover, which is again linked to poor patient outcomes and compounds existing shortages [7]. Poor patient outcomes linked to disengagement include increased incidence rates of nosocomial infections [8], rehospitalisation, medication errors, and increased mortality [3, 9, 10].

Work engagement is a positive and fulfilling state of mind concerning an individual's work. It is often characterised by the employee's vigour towards, dedication to, and absorption in their work [11], where vigour refers to the desire and ability to transfer effort into work and dedication to commitment, and absorption denotes a certain concentration and preoccupation with work [11, 12]. Work engagement in nursing is linked to better patient experiences, lower absenteeism, higher performance, and higher patient satisfaction ratings [13, 14].

Higher levels of work engagement are generally observed in healthcare organisations where managers create positive environments that allow staff to feel involved with and care for their coworkers [15]. Nurse managers play an essential role in fostering satisfaction, increasing performance among nursing staff, and creating an environment that supports professional practice [16, 17]. Nurse managers are also responsible for guiding healthcare delivery to ensure that organisational goals are met and that the best possible outcomes are attained for patients and staff [18].

Leadership is essential in shaping the general work environment and employees' perceptions of their work [19–21]. Individual leadership styles are defined by leaders' behavioural patterns in encouraging others to accomplish the common goal [22, 23]. Effective leadership styles can enhance staff motivation by encouraging autonomy, building relationships, offering resources, and employing strategies to guide, mentor, and coach staff.

Although different leadership styles are generally recognised as contributing factors to work engagement, it is unclear which styles are more effective in enhancing engagement. This systematic review aims to synthesise existing empirical research on the relationships between nurse leaders' leadership styles and nurses' work engagement.

2. Methods

2.1. Aims. This systematic review aimed to identify, evaluate, and synthesise studies that examined the relationship between nurse managers "leadership practices and staff nurse" work engagement in hospital settings and to provide recommendations for improvement of practice and further research.

2.2. Design. This systematic literature review was conducted in accordance with the methodology guidelines outlined in the Joanna Briggs Institute (JBI) Methodology for Systematic Reviews [24]. It was reported following the PRISMA 2020 guidelines [25]. The review protocol was registered with PROSPERO (ID CRD42021277463).

The guiding question was formulated using the PEO (population, exposure, and outcome) format, with "P" representing the staff nurses, "E," the nurse manager's different leadership styles, and "O," "the outcome regarding staff nurses" work engagement.

2.3. Search Strategy. A literature search was conducted in September 2021 using the Cochrane Library, JBI Database of Systematic Reviews, and PROSPERO to identify any previously published reviews on the relationship between nurse leadership and nursing staff nurses' work engagement. No published or ongoing reviews were found. A three-step search strategy was employed: (1) an initial, limited search using the EBSCO and OVID hosts, followed by an analysis of words from titles and abstracts and indexed terms used to describe articles; (2) a search of all identified keywords and index terms in all databases (PsycINFO, CINAHL PubMed, Embase, EMCare, and Eric); and (3) a search for additional studies in the reference lists of all identified reports and articles.

The keywords used for the search across all databases were as follows: "leadership styles OR leadership OR transformational leadership OR authentic leadership OR servant leadership OR humble leadership OR visionary leadership OR relational leadership OR resonant leadership OR supportive leadership OR transactional leadership OR laissez-faire leadership" AND "nurse manager OR nurse administrator OR supervisor * OR nurse supervisor OR nurse leader OR leader * OR head nurse" AND "Work engagement OR engagement * OR work involvement" AND "Registered nurse OR staff nurse OR (nurse or nurses or nursing)."

2.3.1. Inclusion and Exclusion Criteria. Original empirical (quantitative, qualitative, and mixed-method) research examining leadership styles of nurses in management positions and registered nurses' work engagement published in peer-reviewed journals between 2010 and 2021 was included. Studies addressing leadership development programmes, leadership instruments, leadership practices, or work engagement in professions other than nursing that did not report nursing data separately were excluded from the review. In addition, discursive papers, opinion papers, or editorials were excluded.

2.4. Study Selection and Outcome. A total of 1224 papers were identified from the database searches, and two additional manuscripts were identified at the manual search stage. All citations were imported into the citation management tool EndNote X9 (2020), and 331 duplicates were identified and removed. The abstracts and titles were then screened independently by AM and JD using JBI SUMARI. The second reviewer, JD, checked 26% of the titles and abstracts. Then, AM and JD independently screened 31 full-text studies based on the eligibility criteria for inclusion. Of the 31 articles, 19 were excluded during the full-text screening because they did not meet the inclusion criteria. AM and JD met on three occasions to discuss and resolve any conflicts. A total of 12 articles were included in the final review. The selection process is outlined in the PRISMA flowchart shown in Figure 1.
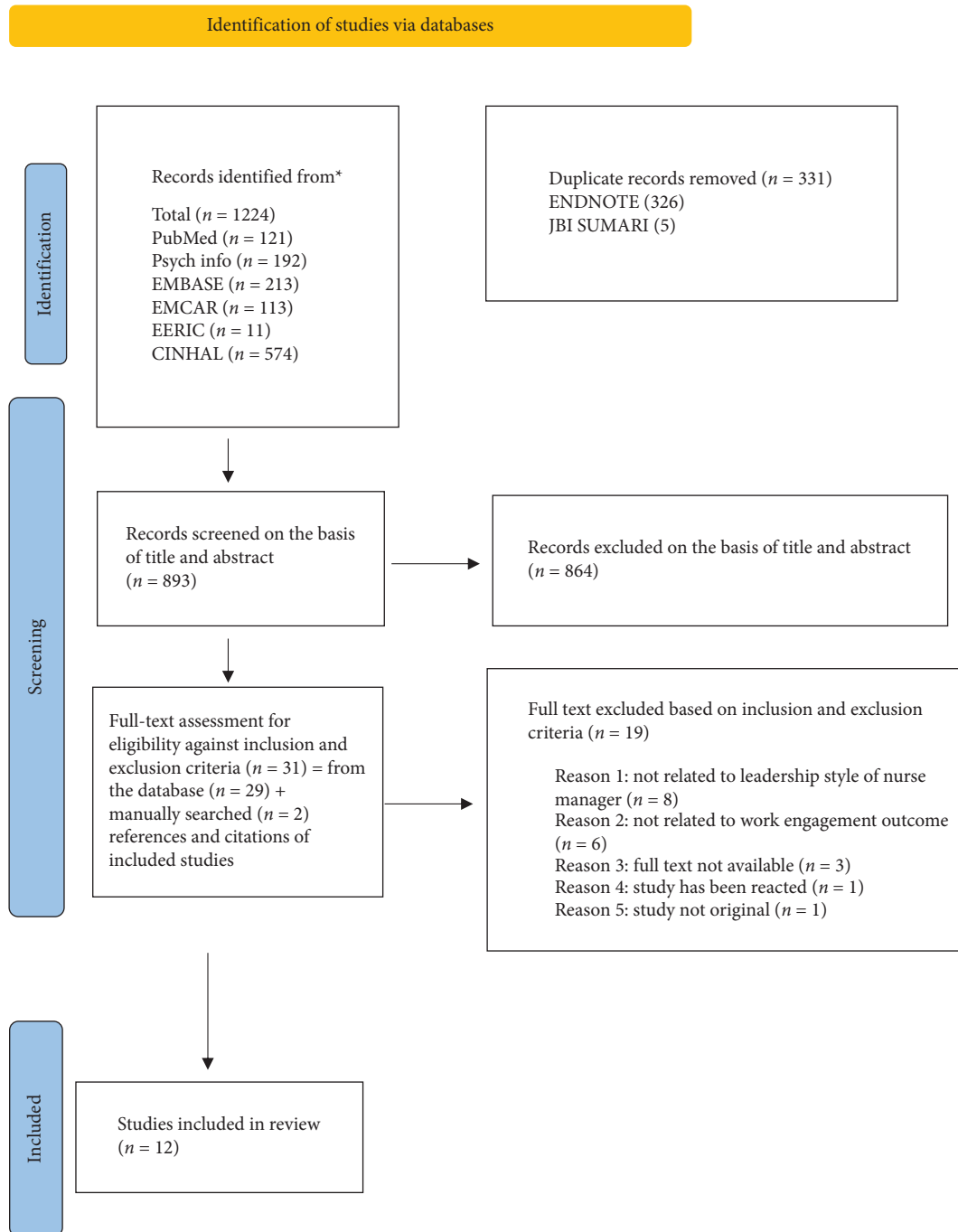
Figure 1: PRISMA flow chart 2020.

2.5. Quality Appraisal. Two independent reviewers (AM and AW) evaluated the methodological quality of the 12 articles using the two-strand JBI appraisal tools. The first tool was an analytical cross-sectional for quantitative studies, and the second tool was the qualitative JBI checklist for qualitative studies. The JBI Critical Appraisal Checklist for Analytical Cross-Sectional Studies is a validated and widely used tool for appraising the quality of cross-sectional research [26]. The tool includes eight research components and a rating scale with the following response options: "yes," "no," "unsure," and "not applicable" or assessing quality standards

[26]. A qualitative JBI checklist assesses the congruence among the stated philosophical perspectives, methodology, objectives, data representation methods, and analysis. In addition to assessing the researcher's position on the participants and vice versa, the JBI checklist determines whether the participants' voices were represented, ensuring that ethical approvals were observed during the study. It also determines how the interpretation and results were analysed. The tools include ten research components and a rating scale with "yes," "no," "unsure," and "not applicable" response options for assessing the quality standards. Reviewer

disagreements regarding the bias risk were resolved three times through face-to-face and Zoom meetings.

Study quality was assessed for each study included in the review. Answers indicating "yes" scored 1 point, while answers indicating "no" or an unclear answer scored 0 points. "The Not applicable" answer was not counted. The quality rating was determined based on the sum of the points scored by each study and the total points each could earn, the quality rating was determined. These surveys were categorised as excellent (over 75%), some limitations (between 50% and 75%), and several limitations (below 50%). The articles were included in the study despite the methodological quality assessment.

In addition, AM contacted nine primary authors from the included studies to ask for additional data, specifically details about the inclusion and exclusion criteria of study participants and the confounding factors identified during the study. Four of the nine authors provided more details about their study. The critical appraisal results are reported in Tables 1 and 2.

2.6. Data Extraction.
The data were extracted from included studies using a self-developed form. One author (AM) extracted all data relevant to the review question and piloted them in consultation with the other authors (JD, AW, and KU). One author (AM) completed the extraction with ongoing consultation with the other authors. The extracted data and study characteristics are included in Appendix 1, which can be found in the supplementary file (available here).

2.7. Data Analysis and Synthesis.
A meta-analysis was not possible due to the heterogeneity of the instruments used to assess leadership styles and work engagement and study research design. Instead, a decision was made to use the appropriate items from the Synthesis without Meta-analysis (SWiM) [37]. The SWiM items enable studies to be grouped and guide the reporting of the standardised metrics for synthesising the study findings. Specifically, we

(1) summarised each study's characteristics, results, and methodological quality

(2) identified which studies were similar enough to be grouped for comparison with other study groups

(3) determined which data were available for synthesis, and

(4) synthesised the characteristics of the studies

3. Results

3.1. Key Characteristics of the Included Studies.
This review included 12 articles comprised of 11 individual studies, of which ten used quantitative and one qualitative methodology. Two articles were considered as one study as secondary analysis [27] was published based on one article [34]. All studies included in this review were published between 2010 and 2021. Most studies (8/11) were conducted in Western countries (the United States, Ireland, New Zealand,

Spain, Portugal, Canada, and Finland), while the remaining studies were conducted in Taiwan [32], Nigeria [28], and Iran [35]. The number of participants ranged from 13 to 3466 nurses. Most studies (9/11) were conducted in multiple sites, whereas two were conducted at only one site [27, 32, 34]. The participants' demographics (age, gender, educational level, and years of experience) were described in all studies with mostly female participants (97–100%), accurately reflecting gender bias in the nursing workforce globally.

3.2. Results of the Quality Appraisal.
The quality of the included studies ranged from moderate to low. The major methodological weaknesses of the ten quantitative studies were linked to sampling methods and study design. All the quantitative studies used nonexperimental, cross-sectional data, which limited the causal findings. Most studies (7/10) did not provide details of their inclusion and exclusion criteria for study participants and/or the settings (unit context) from which the participants were recruited (8/10). All investigations used valid and reliable instruments that were criteria or psychometrically validated.

Only one study [36] used qualitative research methods. The quality of the study was rated as moderate because the article did not clearly articulate the participants' voices, but sample quotes were included as appendices. The researchers' cultural and theoretical positions in the study influence on the research and ethical considerations which were not addressed.

3.3. Methodology and Measurement Scales.
Ten studies used quantitative methodologies with a cross-sectional design and self-reported surveys for data collection. A wide range of valid tools was used to measure leadership, including the multifactor leadership questionnaire ($n = 5$), transformational leadership behaviour inventory ($n = 1$), authentic leadership questionnaire ($n = 1$), global transformational leadership scale ($n = 1$), resonant leadership questionnaire ($n = 1$), and ethical leadership questionnaire ($n = 1$). All these studies measured work engagement using a version of the Utrecht Work Engagement Scale developed by Hu et al. [6]. The scale has three items for each of the three underlying dimensions of work engagement: vigour, dedication, and absorption. The anchors on the scale ranged from 0 (never) to 6 (always). The qualitative study by Blok et al. [36] used individual, semi-structured interviews for data collection and framework analysis.

3.4. Leadership Styles and Nurse Work Engagement.
Eight leadership styles were identified and analysed: transformational, ethical, authentic, resonant, servant, transactional, laissez-faire, and passive avoidant.

The transformational leadership style positively correlated with work engagement in 7 out of 11 cases. The authentic, ethical, resonant, and servant styles also demonstrated a 1 : 1 positive correlation. Conversely, passive-avoidant

TABLE 1: Analytical cross-sectional study.

Citations	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Total score	Share of answers yes (%)
Bamford et al. [27]	U	U	Y	Y	Y	Y	Y	U	5/8	62.5
Enwereuzor et al. [28]	Y	U	Y	Y	Y	Y	Y	Y	7/8	87.5
Garcia-Sierra and Fernandez-Castro [12]	N	N	Y	Y	Y	Y	Y	Y	6/8	75
Manning [29]	Y	U	Y	Y	Y	U	Y	Y	6/8	75
Mauno et al. [30]	N	N	Y	Y	U	U	Y	Y	4/8	50
McKenna and Jeske [4]	Y	N	Y	Y	Y	N/A	Y	Y	7/8	87.5
Parr et al. [31]	N	Y	U	U	N	N	N	U	4/8	50
Peng and Tseng [32]	N	Y	Y	Y	Y	Y	Y	Y	7/8	87.5
Salanova et al. [33]	N	N	Y	Y	N	N	Y	Y	4/8	50
Wong et al. [34]	Y	Y	Y	Y	Y	N/A	Y	Y	8/8	100
Hayati et al. [35]	N	N	Y	Y	N	N	Y	Y	4/8	50

Y = yes; N = no; U = unclear; (1) were the criteria for inclusion in the sample clearly defined?, (2) were the study subjects and the setting described in detail?, (3) was the exposure measured in a valid and reliable way?, (4) were objective, standard criteria used for measurement of the condition?, (5) were confounding factors identified?, (6) were strategies to deal with confounding factors stated?, (7) were the outcomes measured in a valid and reliable way?, (8) was appropriate statistical analysis used?.

TABLE 2: Qualitative study.

Citation	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Total score	
Blok et al. [36]	U	Y	Y	Y	Y	N	N	N	Y	Y	6/10	60%

and laissez-faire styles negatively correlated with work engagement in all cases.

3.4.1. Relationally Focused Leadership Styles and Nurse Work Engagement. Five leadership models, namely, transformational, authentic, resonate, ethical, and servant leadership, were analysed and described in terms of positive relational leadership behaviour and their link to improved work engagement (dedication, absorption, and vigour) in the nursing workforce. Most studies (7/11) evaluated transformational leadership [28–30, 32, 33, 35, 38], while others focused on authentic [27, 34], resonate [31], and ethical leadership [4]. Blok et al. [36] compared units with high staff engagement with those with low staff engagement in nurse leadership practice. They found that leaders' adherence to servant leadership approaches, where leaders provide help and resources to the staff to assist them in completing their work, was more frequently observed in highly engaged units. By contrast, authoritarian management styles that impose direction were more frequently found in low-engagement units [36].

3.4.2. Task-Focused Leadership Styles and Nurse Work Engagement. Of the 11 studies, two showed that the transactional leadership style had a negative relationship with work engagement outcomes [29, 38]. Task-focused approaches were characterised by negotiating, supervising, and controlling; establishing goals and motivating individuals to achieve them; recognising and correcting mistakes [29, 38].

3.4.3. Lack of Leadership. Two studies found that leaders with laissez-faire and passive-avoidant leadership styles negatively impacted nurse work engagement [29, 38].

3.5. Mediating Factor between Leadership Style and Work Engagement. A positive direct relationship between transformational leadership and staff engagement was found in two studies [29, 35]. By contrast, other studies found that leadership by nurse managers indirectly influenced work engagement outcomes through various mediating factors [4, 28, 30–33, 36, 38] specifically: staff trust in their manager [34], the six work-life areas (workload, control, values, community, rewards, and fairness) [27], structural empowerment behaviours [38], person-job fit [28], self-efficacy [33], decision authority [4], organisational support, and leader-member exchange [31].

4. Discussion

This review aimed to examine nurse managers' leadership styles in healthcare settings and their correlation with nurses' work engagement outcomes. Nurse managers who lead by sharing a common vision while trusting, inspiring, and advocating for their staff are perceived as more effective than those employing task-focused approaches, and a lack of clear leadership negatively impacts nurse work engagement. These findings expand on the understanding that relational-oriented leadership, which emphasises developing professional relationships with staff and maintaining high levels of interaction and trust, positively influences nursing practice outcomes. These outcomes, such as intention to stay and job satisfaction [21, 39, 40], ultimately promote quality care by improving patients' experiences and overall healthcare service satisfaction [40]. Leadership that provides a meaningful and inspiring vision motivates employees to work for a worthwhile cause despite a heavy workload [11]. Conversely, management without competent leadership (lack of accountability and poor attitude) is adverse to

nurses' professional development [20, 41], leading to counterproductive work practices and facilitating factors for workplace bullying [42], which impairs patient satisfaction [43].

While effective leadership approaches had different names and frameworks, there were several common themes, including possessing ethical consideration, espousing positive behaviours, encouraging equality, and promoting healthy employee relationships. This finding is consistent with contemporary research that reveals a substantial overlap between leadership models and frameworks [38, 44–46]. The proliferation of constructs may impede organisational theory development [47]. Further research is needed to understand the impact, not just to rename models but to evaluate whether the leaders display ethical considerations, positive behaviour, and equality.

Supportive workplace environments enhance the relationship between nurse managers' leadership style and work engagement. Relational leadership contributes significantly to creating a supportive and empowering workplace. When nurses can access information and resources efficiently and have the appropriate support and autonomy to complete exemplary professional tasks, staff feel valued and more emotionally and physically connected to their work [48]. This finding builds on the understanding that a thriving and empowering working environment is critical to maximising professional nursing practice and employee turnover [3, 49–51]. Specifically, positive environments are associated with reduced adverse event reports and greater nurse-assessed quality levels, increasing the likelihood of retaining staff [3, 52–54]. However, insufficient work resources, poor communication, abusive behaviour, disrespect, and a lack of vision or leadership result in poor outcomes, such as burnout and job dissatisfaction [51]. This emphasises the significance of understanding the work context when considering both applied leadership styles and work engagement.

This review did not consider factors such as workplace culture or the nature of work that constituted the context in which leadership was exercised. When researching nursing leadership, cultural, social, and institutional contexts should be considered [19, 55, 56], failing to examine key aspects of the workplace context where patients are located, and nursing work takes place which makes it difficult to understand and analyse leadership within the nursing profession [57]. A recent realist review of healthcare leadership has shown that collaborative and transformational leadership approaches are often regarded more positively than transactional leadership practices; different practices and traits differ based on their specific contexts [58]. Furthermore, appropriate leadership behaviour depends on the circumstances and environment. Both supportively and directly, the ability to tailor leadership approaches appropriately to fit different situations is a hallmark of successful leaders [55, 59]. To develop better strategies that increase effective nurse leadership, healthcare systems should examine how context affects leadership practices and vice versa [19]. Moreover, personal and experience perspectives and expertise in context are essential, and further research

should explore such contexts in greater detail. The strength of the studies included in this review is that the majority used samples from multiple sites, which increases the credibility and generalizability of findings. Weaknesses were associated with design, sampling, and low response rates. Only three of the 11 studies reported a response rate greater than 60%, limiting representativeness and introducing possible bias. There is a need for more studies using nonprobability sampling, and qualitative/mixed-method approaches to improve the overall quality of research in this field.

4.1. Limitations. Only peer-reviewed articles written in English were included. The samples and settings of the studies included in this review lacked heterogeneity, and most studies were conducted in Western countries, limiting the findings' generalizability. In addition, the quality of the studies included in the review ranged from moderate to low. The primary weaknesses are sampling methods and study design. Most studies featured cross-sectional, self-reported data, which may introduce response bias and limit the overall objectivity of the findings. The fact that most study participants were female might also have introduced potential gender bias; however, this reflects the inherent gender imbalance in nursing, making it less likely to be problematic. Despite these limitations, this is the first systematic review to synthesise evidence on the relationship between nursing leadership styles and registered nurse work engagement.

4.2. Recommendations. Future longitudinal studies are recommended to test the relationships between nurse manager leadership and staff nurses' work engagement. Various contextual and confounding factors mediating these relationships also require further examination. As most previous empirical studies that have examined nurse leadership styles and work engagement used quantitative methods, specifically cross-sectional surveys, qualitative studies focused on listening to nurses' voices to explore their experiences more deeply would be worthwhile to develop an understanding of the complexity of the phenomena investigated. Further studies in this line are recommended to further examine nurses' perceptions of work engagement.

5. Conclusion

There is a significant correlation between positive managers' leadership styles and the working engagement of registered nurses. Effective leadership styles share common behavioural traits that overlap with the characteristics of a positive leadership framework, such as ethical considerations, positive behaviours, equality promotion, and healthy employee relationships. The review's findings can inform the development of leadership style education and training for nursing leaders. It is important to acknowledge the indirect effects of nurse managers' leadership styles and their mediating factors when creating interventions for staff nurses.

Data Availability

Supporting data for this study are available in the article and its supplementary materials.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

Supplementary Materials

Appendix 1: Table 1 includes a study with key characteristics. (*Supplementary Materials*)

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Research Article

The Impact of the Workload and Traumatic Stress on the Presenteeism of Midwives: The Mediating Effect of Psychological Detachment

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Objectives. Midwives are at high risk of presenteeism, which may impact the quality of midwifery and maternal and infant health outcomes. However, no research has been conducted to investigate the relationship between workload, traumatic stress, psychological detachment, and presenteeism among midwives. This study, therefore, aimed at exploring the mediating effects of psychological detachment on workload, traumatic stress, and presenteeism among midwives. *Method*. A multicenter cross-sectional study was conducted among 547 midwives in Jiangsu Province. Participants completed the National Aeronautics and Space Administration task load index, traumatic stress impact subscale for midwives, psychological detachment scale, and Stanford presenteeism scale and provided sociodemographic information. The mediating effects of psychological detachment were assessed using Mplus. *Results*. The mean score of midwives' presenteeism was 17.09 ± 3.56. Presenteeism was positively associated with both workload and traumatic stress (both $P < 0.01$) and negatively associated with psychological detachment ($P < 0.01$) among midwives. Psychological detachment partially mediated the relationships between (a) workload and presenteeism ($\beta = 0.005$, $P < 0.05$) and (b) traumatic stress and presenteeism ($\beta = 0.006$, $P < 0.05$), with mediating effects of 11.90% and 10.00%, respectively. *Conclusions*. Presenteeism among midwives is at moderately high levels and requires attention from nursing managers. Psychological detachment is a mediating variable of the relationship between workload, traumatic stress, and presenteeism among midwives. *Implications for Nursing Management*. This study has implications for decreasing midwives' presenteeism in practical terms. Specifically, it is crucial that care managers attempt to adjust midwives' work patterns, reduce their workload, and provide organizational support for work-related traumatic stress. Moreover, our findings also indicate that psychological detachment is probably an essential element that is worthy of attention.

1. Background

Presenteeism is typically defined as an employee's perseverance to go to work when they are ill. With the evolution of its conceptualization, the definition has been extended to behaviours that result in the loss of productivity or work capability caused by physical and/or psychological (i.e., cognitive or emotional) issues [1]. In a previous study, approximately 88% of employees and 85% of healthcare workers reported that they had worked while sick [2]. It is estimated that presenteeism costs the United States economy between \$150 billion and \$250 billion annually [3]. In comparison with absenteeism, presenteeism is more prevalent and potentially has a more devastating impact on employee health and economic business costs [1, 3].

Evidence that the situation of presenteeism is particularly grave in the nursing profession is mounting [4, 5]. In Switzerland, for example, the presenteeism rate for nurses is 36.5% [6], in the United States, it is 78.4% [7], whilst in China, it is as high as 94.3% [8]. The chronic work overload,

lack of organizational resources, work-family imbalance, high burnout rate, and lower career satisfaction [9, 10] experienced by nurses make them more susceptible to presenteeism. In addition to increasing the likelihood of poor patient prognosis such as medication errors and patient falls, nurse presenteeism has also been proven to place a financial burden on healthcare organizations worldwide [3]. However, a recent study in which a mental health survey was conducted for different healthcare professionals revealed that presenteeism was more prevalent among midwives (55.3%) compared to nurses and doctors (49.3% and 30.3%, respectively) [11]. Midwives are a vital cornerstone in reducing maternal fatalities by providing quality care to women, effectively preserving the safety of birth [12]. The quality of midwifery care is closely associated with the birth experience and maternal and infant safety, whereas the presenteeism of midwives has a crucial impact on the quality of clinical midwifery. Understanding midwives' presenteeism is a critical step in promoting increased and stable births and maximizing midwifery productivity and the scope of practice. There is, however, a dearth of research on presenteeism in the midwifery profession, both in China and in other countries. Therefore, it is important to investigate the factors influencing the presenteeism of midwives in China to maintain a healthy and motivated midwifery workforce.

A key predictor of nurses' presenteeism is work-related stress. Currently, the world's population is expanding rapidly, while the number of midwives is substantially declining [13]. In comparison with the WHO standard of six midwives per 1,000 births, the ratio of midwives to the number of women in labour in China is only one in four thousand, revealing a severe workforce shortage for midwifery [14]. High workloads and time constraints brought on by a lack of human resources demonstrate the high level of quantifiable job demands that midwives need to undertake [15], while frequent invasive operations and shift work further aggravate the mental workload of midwives [13]. Previous studies showed that an overloaded work status played an important role in the occurrence of presenteeism among employees [16, 17]. When employees are exposed to excessive workloads, work-family imbalance and low occupational well-being may lead to role overload and internal role conflicts, which subsequently affect employees' physical and mental health (e.g., occupational fatigue, emotional burnout, and presenteeism). Therefore, we propose Hypothesis 1: workload positively affects presenteeism among midwives.

In addition, delivery room as a special medical unit, maternal or foetal death, neonatal resuscitation, postpartum haemorrhage, and other traumatic workplace events have become major causes of job stress for midwives [18, 19]. Traumatic stress in midwives usually refers to the psychological stress response to an adverse birth event directly experienced or witnessed in the workplace [20, 21]. Traumatic stress symptoms, in contrast to secondary traumatic stress (STS), are less severe and may be an early warning indicator of psychiatric disorders such as STS [18, 21, 22]. A systematic review [21] indicated that approximately 71%–96.9% of midwives had directly or indirectly experienced a traumatic birth event while working, and such experiences

had varying degrees of negative consequences on the physical and mental health of midwives, with 12.6%–38.7% presenting with symptoms of STS and 35%–66% presenting with subclinical symptoms of posttraumatic stress disorder (PTSD). Dunbar et al. [23] reported that US military personnel who experienced anxiety, depression, and PTSD after a traumatic event had a significantly higher incidence of presenteeism. Similarly, after experiencing or witnessing traumatic events, midwives often experience negative feelings, including sadness, dreadfulness, empathic fatigue, and even physical symptoms such as insomnia and weight loss [24, 25]. The negative outcomes contradict the public perception of childbirth, and the risk-filled work atmosphere often leads to exhaustion, preventing midwives from realizing the full potential and effectiveness of the art of childbirth care. Therefore, we propose Hypothesis 2: traumatic stress positively affects presenteeism among midwives.

As the effects of work stress on mental health and behaviour at work have received attention, the experience of recovery has been recognized as one of the crucial mechanisms that may constitute these interactions. Previous studies have shown that the experience of recovery is inversely correlated with presenteeism [16, 17]. Psychological detachment, as a core experience of work recovery, means that individuals are physically and mentally detached from jobs during nonworking hours [26, 27], which has an equally important impact on employees' presenteeism. Specifically, Huyghebaert-Zouaghi et al. [28] reported that employees' psychological detachment was negatively associated with presenteeism. Employees' mental and physical functions are constantly activated when they are frequently exposed to high work demands [29, 30]. Prolonged low relaxation experiences and high emotional burnout can lead to negative outcomes (e.g., sleep disorders, low work engagement, and presenteeism) if there is no complete detachment from work to bring physical and mental stress back to baseline levels [31].

However, this critical recovery process can also be compromised by work-related traumatic stress. According to the effort-recovery theory, continuing psychological activation (such as prolonged exposure to intense work demands like overtime and shift work) and cognitively related stress processes (e.g., rumination) are two situations that can impede the recovery process [31]. Newman et al. [32] noted that prolonged direct or indirect experiences of traumatic events in the workplace can potentially contribute to increased mental distress (e.g., anxiety, distress, and depression) and physical symptoms (e.g., insomnia and panic disorder) in forensic mental health nurses, which in turn influence their work efficacy. Multiple qualitative studies [33–35] have similarly noted that, in response to immutable distressing birth outcomes, midwives may suffer self-doubt, rumination, and professional alienation, while repeated flashbacks to traumatic scenarios keep them from separating from the traumatic event. As mentioned above, psychological detachment can be considered a mediator to explain the potential mechanisms of how exposure to high workloads and traumatic stress affects presenteeism among midwives. However, although such potential mediating
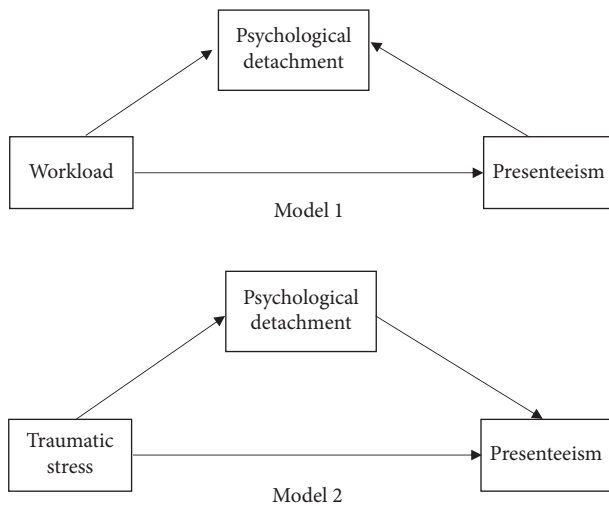
Figure 1: Conceptual framework.

mechanisms may exist, few studies have explored them. Therefore, we propose the last two hypotheses: psychological detachment mediates the relationship between workload and presenteeism among midwives (Hypothesis 3), and psychological detachment mediates the relationship between traumatic stress and midwives' presenteeism (Hypothesis 4). The hypotheses of Model 1 and Model 2 for this study are shown in Figure 1.

2. Methods

2.1. Study Design and Participants. A multicenter, cross-sectional survey was conducted in Jiangsu Province, China. From August 2022 to September 2022, a convenience sample of 32 hospitals in Northern Jiangsu (Xuzhou, Suqian, and Huai'an), Central Jiangsu (Nantong and Yangzhou), and Southern Jiangsu (Nanjing, Suzhou, and Wuxi) was used. These hospitals were selected because they are long-term partners in our research project and they provide midwifery services with a high level of medicine, which is useful for investigating presenteeism among midwives in Jiangsu. Finally, eligible midwives from the selected hospitals were conveniently selected for inclusion. Midwives with a Chinese Practicing Nurse certificate, a Certificate of Maternal and Child Health Care, and a minimum of three months of experience as a midwife were selected for the study. Those who were not present during the survey period (due to long-term leave or additional training, for example) were excluded. According to Kendall's principle of sample estimation, the sample size was 5–10 times the number of variables, and 40 variables were included in this study. Considering an invalid response rate of 10%, the sample size was equal to 220~440 in the current study. A total of 587 questionnaires were collected, and after excluding 40 invalid questionnaires (e.g., with options that all provided the same score), 547 valid questionnaires were included in the final analysis (93.2% validity rate). To ensure adequate and complete reporting of this research, we used the Strengthening the Reporting of

Observational Studies in Epidemiology (STROBE) guideline [36] for cross-sectional studies (File S1).

2.2. Measurements

2.2.1. Participants' General Characteristics. Ten questions on sociodemographic and professional features were included in the self-designed questionnaire, including gender, age, years of work, education level, monthly income, hospital level, marital status, number of children, number of overtime hours, and professional title.

2.2.2. National Aeronautics and Space Administration Task Load Index (NASA-TLX). The Chinese version of the NASA-TLX scale was adapted by Liang et al. [37] and originally developed by Hart and Staveland [38] to measure the mental workload of nurses. It was divided into two dimensions, load perception and self-evaluation, which contained the following six items: mental demand, physical demand, temporal demand, performance, effort, and frustration. Each item was represented by a straight line that had been divided into 20 equal scores ranging from 0 to 20, indicating low to heavy load. The scores of all items were totalled to determine the overall score, and a higher total score indicated a higher workload for a nurse. Cronbach's alpha coefficient of the Chinese version of the NASA-TLX was 0.714. In this study, Cronbach's alpha coefficient for this scale was 0.792.

2.2.3. Traumatic Stress Impact Subscale for Midwives. The Traumatic Stress Scale for Midwives was developed by Kubota and Horiuchi [22]. After obtaining authorization from the authors of the original scale, this research team first translated the scale into Chinese according to the Brislin translation model and evaluated the reliability and validity of the scale by surveying 385 midwives. The Chinese version of the Traumatic Stress Scale for Midwives included 15 items, divided into two subscales (the frequency of occurrence and degree of impact subscales), and Cronbach's alpha coefficient of the Chinese version of the scale was 0.888~0.953, the retest reliability was 0.824~0.884, and the content validity index was 0.700. In this study, the Traumatic Stress Impact Subscale for Midwives was measured using a 4-point Likert scale, with each item scored from 0 (completely unaffected) to 3 (very affected) and a total score of 0 to 45, with higher scores representing a higher degree of impact of a traumatic stress event on a midwife. Cronbach's alpha for this subscale was 0.963.

2.2.4. Psychological Detachment from Work. The Chinese version of the psychological detachment scale was adapted by Lu et al. [39] and originally developed by Sonnentag and Fritz [29] to measure the state in which employees were mentally isolated from their work and avoided thinking about work-related issues. This scale included four items, such as "I distance myself from my work." A 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree)

was used to indicate the level of psychological detachment in midwives. Lower scores indicated that midwives were less able to disconnect well from work. Cronbach's alpha coefficient for the Chinese version of this scale was 0.844. Cronbach's alpha for this scale in this study was 0.852.

2.2.5. Presenteeism.
The Chinese version of the Stanford Presenteeism Scale was adapted by Zhao et al. [40] and originally developed by Koopman et al. [41] to assess presenteeism and estimate health-related productivity loss. This scale consisted of six items with two dimensions as follows: finishing work (four items) and avoiding distractions (two items). All items were rated on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated higher presenteeism or significant productivity loss. Cronbach's alpha coefficient for the Chinese version of this scale was 0.862. In this study, Cronbach's alpha coefficient for this scale was 0.765.

2.3. Ethical Considerations.
The study was approved by the Ethics Committee of Nanjing Maternity and Child Health Care Hospital (2022KY-090-01). All participants provided informed consent for this study.

2.4. Data Collection.
All data were collected through the online questionnaire platform "Wenjuanxing." With the permission of the person in charge of the surveyed hospital, the nurse managers of each hospital delivery room were set up as investigators and trained online by the research team. The trained nurse managers informed midwives of the purpose, significance, and content of the study. When a midwife was willing to participate, the nurse manager verified that they met the inclusion criteria and then sent a link to the questionnaire separately via the WeChat app. The informed consent form and instructions for completion appeared on the first page of the electronic questionnaire again, and consent was deemed to have been obtained if participants clicked on the link and completed the survey. The study was anonymous and could only be submitted successfully if all options were completed. A survey setting option that allowed only one response per participant was selected to avoid duplicate responses.

2.5. Data Analysis.
Statistical analyses were conducted using IBM SPSS Statistics 26.0 software. Participant demographic characteristics were analysed using descriptive statistics, including frequencies, percentages, and means $\pm$ SDs, and independent t tests, one-way ANOVA tests, and nonparametric tests were applied to determine the differences in midwives' presenteeism under varying demographic characteristics. Based on a two-tailed test, a result of $P < 0.05$ was deemed statistically significant. Workload, traumatic stress, psychological detachment, and presenteeism among midwives were tested for bivariate association coefficients using Pearson correlation coefficients. The mediating effects were analysed using Mplus version 7.0. In this study, workload and traumatic stress were posited as independent variables,

presenteeism was posited as the dependent variable, psychological detachment was posited as the mediating variable, and statistically significant sociodemographic variables were set as covariates. With 5,000 bootstrapping resamples, a 95% confidence interval (CI) was obtained. The indirect impact was considered significant if the 95% CI for the mediation path did not contain zero. The following criteria were used to appraise the model fit: $\chi^2/\text{DF} \leq 5.00$, comparative fit index (CFI) ≥ 0.90, Tucker–Lewis index (TLI) ≥ 0.90, standardized root mean square residual (SRMR) ≤ 0.08, and root mean square error of approximation (RMSEA) ≤ 0.08 [42].

3. Results

3.1. Characteristics of Midwives.
A total of 547 midwives were included in the analytical sample listed in Table 1. Among the participants, all of whom were female, 76.78% were under the age of forty, and more than half (63.80%) had been working as midwives for over ten years. The majority of them (90.31%) held a bachelor's degree or above. Moreover, 76.42% of the respondents were married, and 70.93% had at least one child. The participants' demographic details are displayed in Table 1.

3.2. Single-Variable Analysis of Presenteeism with Different Demographic Variables.
The differences in midwives' presenteeism according to demographic characteristics are shown in Table 1. There were significant differences in presenteeism among midwives depending on age ($F = 4.606$, $P = 0.003$), monthly income ($H = 7.277$, $P = 0.026$), and hospital level ($F = 5.412$, $P = 0.001$), but not in other factors such as years of work, education level, marital status, or professional title.

3.3. Descriptions and Correlations of Variables.
Table 2 displays the descriptive statistics and correlations of workload, traumatic stress, psychological detachment, and presenteeism among midwives. The average presenteeism score was 17.09 $\pm$ 3.56, with a score range of 6 to 30, which indicated a medium to high level. High workload (85.45 $\pm$ 18.20) and traumatic stress levels (21.90 $\pm$ 11.69) as well as somewhat moderately low levels of psychological detachment (9.51 $\pm$ 3.61) were perceived by the midwives. In addition, Pearson's correction analysis showed that workload and traumatic stress were negatively correlated with psychological detachment and positively correlated with presenteeism among midwives, respectively, while psychological detachment was negatively correlated with presenteeism, as shown in Table 2.

3.4. Testing the Hypothesized Model.
After controlling for age, monthly income, and hospital level, the model fits for both Model 1 and Model 2 were acceptable ($\chi^2/\text{DF} = 1.110$, CFI = 0.997, TLI = 0.991, RMSEA = 0.014, and SRMR = 0.024 and $\chi^2/\text{DF} = 1.206$, CFI = 0.998, TLI = 0.995, RMSEA = 0.010, and SRMR = 0.019), respectively. The findings of the hypothesis test after controlling for covariates are listed in

TABLE 1: Demographic characteristics of different participants and univariate analysis of presenteeism ($n = 547$).

Variable	Group	n	%	Score (mean $\pm$ SD)	Test value	P
Years of work	≤ 3	38	6.95	18.05 ± 3.73	1.965[†]	0.098
	4~6	66	12.07	17.06 ± 3.08		
	7~9	94	17.18	16.38 ± 3.66		
	10~14	173	31.62	17.38 ± 3.65		
	≥ 15	176	32.18	13.52 ± 3.52		
Age (years)	18~29	171	31.26	16.26 ± 3.04	4.606[†]	0.003
	30~39	249	45.52	17.47 ± 3.68		
	40~49	100	18.28	17.52 ± 3.74		
	≥ 50	27	4.94	17.15 ± 4.12		
Education level	Technical secondary school	7	1.28	15.86 ± 2.41	0.320[†]	0.811
	Junior college	46	8.41	17.13 ± 2.87		
	Bachelor's degree	490	89.58	17.11 ± 3.65		
	Master's degree or above	4	0.73	16.50 ± 1.91		
Monthly income (RMB)	<5000	93	17.00	18.02 ± 4.14	7.277[‡]	0.026
	5000~10000	375	68.56	17.02 ± 3.47		
	>10000	79	14.44	16.33 ± 3.05		
Hospital level	Level A tertiary hospital	251	45.88	17.39 ± 3.48	5.412[†]	0.001
	Level B tertiary hospital	162	29.62	17.41 ± 3.89		
	Level A secondary hospital	114	20.84	16.33 ± 2.92		
	Level B secondary hospital	20	3.66	14.90 ± 4.10		
Marital status	Single	115	21.02	16.72 ± 3.20	0.768[†]	0.464
	Married	418	76.42	17.19 ± 3.65		
	Widowed or separated	14	2.56	17.14 ± 3.76		
Number of children	0	159	29.07	16.77 ± 3.17	2.633[†]	0.073
	1	293	53.56	17.02 ± 3.59		
	≥ 2	95	17.37	17.81 ± 4.03		
Overtime hours (weekly)	>5	172	31.44	17.27 ± 3.59	0.824[§]	0.410
	≤ 5	375	68.56	17.00 ± 3.56		
Professional title	Junior	247	45.16	16.92 ± 3.33	0.862[†]	0.423
	Intermediate	213	38.94	17.34 ± 3.57		
	Senior	87	15.90	16.95 ± 4.17		

Note. [†]indicates a one-way ANOVA test. [§]indicates an independent t tests. [‡]indicates a Kruskal–Wallis H test.

TABLE 2: Variables' descriptive statistics and correlation analysis ($n = 547$).

Variable	Score range	Mean	SD	1	2	3	4
(1) Workload	0~120	85.45	18.20	1			
(2) Traumatic stress	0~45	21.90	11.69	0.139**	1		
(3) Psychological detachment	4~20	9.51	3.61	−0.190**	−0.126**	1	
(4) Presenteeism	6~30	17.09	3.56	0.249**	0.218**	−0.188**	1

SD: standard deviation. **$P < 0.01$.

Table 3. The total effects of workload and traumatic stress on presenteeism were significant ($\beta = 0.042$ and 0.060, respectively, $ps < 0.001$). Moreover, psychological detachment accounted for 11.90% and 10.00% of the combined effects of workload and traumatic stress on presenteeism, serving as a partial mediator of the relationship between workload, traumatic stress, and presenteeism. Since neither CI contained zero, we deduced that psychological detachment had a significant impact on the link between presenteeism, traumatic stress, and mental workload. The mediating role of psychological detachment in the relationship between workload, traumatic stress, and presenteeism is shown in Figure 2.

4. Discussion

Given the distinct occupational nature of midwifery and in contrast to the previous studies that focused on nurses' presenteeism, this study also took into account the close relationship between occupational stress caused by traumatic events during childbirth and midwives' presenteeism. To the best of our knowledge, this study, which links workload, traumatic stress, psychological detachment, and presenteeism for the first time, sheds important light on the working behaviours of Chinese midwives and how they relate to stressful psychological work characteristics and recovery experiences.

TABLE 3: Estimates of the hypothesized model's effects ($n = 547$).

Structural paths	Effect	SE	t	P	95% CI	
					LLCI	ULCI
Total effects						
Workload ⟶ presenteeism	0.042	0.008	5.086	<0.001	0.026	0.058
Traumatic stress ⟶ presenteeism	0.060	0.013	4.802	<0.001	0.036	0.085
Direct effects						
Workload ⟶ psychological detachment	−0.009	0.002	−4.190	<0.001	−0.014	−0.005
Psychological detachment ⟶ presenteeism	−0.529	0.164	−3.231	0.001	−0.835	−0.199
Workload ⟶ presenteeism	0.037	0.008	4.554	<0.001	0.021	0.053
Traumatic stress ⟶ psychological detachment	−0.010	0.004	−2.762	0.006	−0.017	−0.003
Psychological detachment ⟶ presenteeism	−0.582	0.163	−3.584	<0.001	−0.885	−0.259
Traumatic stress ⟶ presenteeism	0.054	0.013	4.340	<0.001	0.031	0.080
Indirect effects						
Workload ⟶ psychological detachment ⟶ presenteeism	0.005	0.002[a]	2.498	0.012	0.002	0.010
Traumatic stress ⟶ psychological detachment ⟶ presenteeism	0.006	0.003[a]	2.079	0.038	0.002	0.012
Proportion mediated (workload ⟶ psychological detachment ⟶ presenteeism)*	11.90%					
Proportion mediated (traumatic stress ⟶ psychological detachment ⟶ presenteeism)*	10.00%					

[a]Bootstrapped standard error; *proportional mediation is the ratio of the indirect effect to the total effect, e.g., indirect effect/total effect 100%. CI, confidence interval; LLCI, lower limit confidence interval; SE, standard error; ULCL, upper limit confidence limit interval.

Midwives who participated in this study reported a moderately high level of presenteeism, which was higher than the results of other research on presenteeism among Chinese nurses [43, 44], suggesting that the phenomenon of midwives' presenteeism is relatively serious in the Chinese nursing population. The possible reasons are as follows: (1) midwives attend to vulnerable groups such as expectant mothers and newborns, which calls for more humanistic care and emotional commitment and are prone to behavioural and psychological overload, leading to fatigue and presenteeism behaviours [45]. (2) Given that the midwifery system in China is still developing, the functional boundaries between midwives and obstetric nurses remain unclear, and midwives continue to perform a lot of basic tasks while providing specialized services [46]. Professional fatigue and emotional burnout lead to role overload, which prevents them from being fully engaged in their work. (3) Teams of midwives include members with distinct roles and duties. Absence will increase the workload of other members and affect teamwork; owing to the sense of teamwork and responsibility, the majority of midwives opt for presenteeism [4]. Therefore, Chinese nursing managers should pay attention to the phenomenon of midwives' presenteeism and be concerned about their work experiences and health status. Meanwhile, providing organizational support and a harmonious working environment safeguards a good physical and mental status and reduces midwives' presenteeism.

Based on the results of the mediation model, workload and traumatic stress directly and positively influenced midwives' presenteeism, supporting Hypothesis 1 and Hypothesis 2. Similar results were obtained by Baek et al. [16], who found that workload was positively associated with presenteeism. The workload of the midwives in this study was at a moderately high level, meaning they were under heavy psychological work stress. Cull et al. [15] reported that the increasing number of nonclinical roles such as emotional
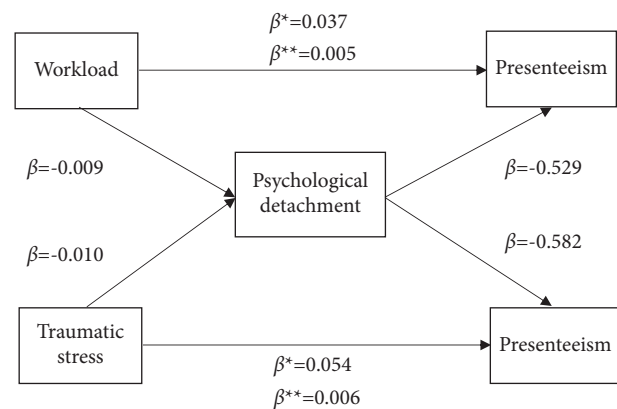

FIGURE 2: Mediating effects of psychological detachment on the association between workload, traumatic stress, and presenteeism. Note: β^* = direct effect and β^{**} = indirect effect.

effort, physical effort, and professional skill requirements placed a heavy burden on midwives and gradually diminished their motivation for their jobs, resulting in burnout and decreased productivity. Moreover, the COVID-19 pandemic exacerbated the shortage of midwives, which further added to their work burden. Trying to cope with the changes and challenges of a pandemic along with the fear of infection increased midwives' burnout and diminished job satisfaction and security [47, 48]. According to the job demand-control (JDC) model, employees in high-demand jobs are inclined to exert more physical and psychological effort to maintain a high level of performance [49]. These common load reactions can develop into more severe chronic load reactions over time, which worsen job fatigue and may increase presenteeism. In addition, presenteeism is also attributed to the traumatic stress of midwives, and the more traumatic stress they experience, the more likely presenteeism is to occur. This result is consistent

with a previous study of US military personnel [23]. A mixed-methods study [35] reported that, as secondary victims, midwives were vulnerable to physical and emotional pain such as sadness, guilt, self-blame, and empathic fatigue after witnessing or experiencing traumatic events. Owing to their professional role, the midwives had to keep working, but their inability to devote themselves to their work caused a decrease in their productivity.

The more important finding of this study was that psychological detachment partially mediated the role of workload and traumatic stress in relation to midwives' presenteeism, which confirmed Hypotheses 3 and 4. This means that when midwives are subjected to high workloads and traumatic stress, their level of psychological detachment is reduced, which in turn increases presenteeism. As reported in the studies [15, 35, 50], midwives were under heavy workloads and inevitably feared that their work mistakes would endanger the health of mothers and children even after birth, which made it impossible for them to truly detach from their work. Additionally, after experiencing traumatic events, midwives might suspect or even lose confidence in their midwifery skills and career, resulting in fear of childbirth and midwifery, as well as fear that their care decisions might negatively affect mothers and babies or even aggravate the traumatic event, which caused their psychological burden to increase and hindered their psychological detachment [35, 50]. According to the effort-recovery model, a high level of psychological detachment, as a positive emotional-motivational state, and resilience allows nurses to recover experiences and emotional resources that have been depleted in the workplace, which is an important ability to improve patient safety and work focus [51]. When midwives have higher levels of psychological detachment, they are in a better position to adjust themselves in the face of high workload and traumatic stress levels, which in turn supports reduced negative emotions at work, increased job engagement and professional confidence, and lessened presenteeism [17, 18]. This result suggests that nursing managers can reduce midwives' presenteeism not only by relieving their workload and providing support programs such as counselling and stress management training to moderate their traumatic stress levels but also by implementing different interventions to improve their psychological detachment to improve performance and in turn reduce presenteeism.

5. Limitations

When interpreting these results, it should be considered that the study has several limitations. First, as the sampling method used in this study was convenience sampling rather than stratified sampling, a relatively large sampling error could not be avoided. Second, we only collected data from Jiangsu Province, China, to test our hypothesis, which may be geographically limited and cannot be widely generalized. Thus, the regional sample should be expanded in the future to improve the universality of the study results. Third, this study used a cross-sectional design, which may bias the results and fail to provide

a specific causal relationship between workload, traumatic stress, and presenteeism. It would be worthwhile to validate this model using a longitudinal study to see if the negative outcomes of high workload and traumatic stress increase over time. Finally, this study only considered psychological detachment as a potential mechanism between workload, traumatic stress, and presenteeism, while other factors such as empathic fatigue, emotional exhaustion, and work alienation could be considered as mediators in future studies. Despite these limitations, we report meaningful information on midwives' workloads, traumatic stress, psychological detachment, and the correlation with presenteeism.

6. Conclusion

The results showed that presenteeism among midwives was serious. Workload and traumatic stress can affect midwives' presenteeism either via direct pathways or through mediators of psychological detachment. Assessing and relieving midwives' workloads and traumatic stress may therefore be crucial in lessening midwives' presenteeism and improving their psychological detachment. Stress management and work recovery experience-oriented interventions ought to be provided to midwives by nurse managers to help them cope positively with frustration or stress and to detach and recover from high work stress. Further research should continue to explore the modifiable risks and protective factors associated with midwives' presenteeism to enhance their work engagement.

7. Relevance to Clinical Practice

This study provides several insights for nurse managers. First, nurse managers should be fully aware of the key role of midwives in maternal and child health services, further strengthen the midwifery system, and stratify the job functions of senior midwives and obstetric nurses to reduce the workload of midwives, which is essential for reducing the incidence of presenteeism among midwives. Second, teaching methods such as role-playing and scenario-based simulation are effective in enhancing midwives' decision-making and clinical management skills in labour [52]. These measures serve to encourage midwives to rebuild their cognition of traumatic events and develop positive coping mechanisms and to lessen the mental and physical impact of traumatic events on midwives, which in turn reduces the incidence of presenteeism [52]. Finally, nurse managers could implement practical strategies such as mindfulness, boundary management, and sleep cognitive therapy to reduce rumination on work-related stress and improve mental detachment among midwives to facilitate work recovery experiences, which ultimately reduces presenteeism [53].

Data Availability

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Ethical Approval

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Weiwei Jiang contributed to the study design, analysis and interpretation of the data, and writing of the original draft manuscript. Yiting Wang, Jiahua Zhang, and Danni Song contributed to the distribution and collection of questionnaires and the compilation and analysis of data. Chunjian Shan and Congshan Pu supervised the project and contributed to the design of the study, the revision, and the review of the final manuscript.

Acknowledgments

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Review Article

The Influence of Care Home Managers' Leadership on the Delivery of Person-Centred Care for People Living with Dementia: A Systematic Review

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Background. Care home managers' leadership is recognised as directly influencing the care received by people living with dementia. What enables care home managers to promote and sustain person-centred care for residents is less well understood. *Method.* A mixed-methods systematic review synthesised evidence on care home managers' leadership on the delivery of person-centred care for people living with dementia. Electronic databases (PubMed, Scopus, Cochrane Library, CINAHL, and Google Scholar) were searched between 2009-2021. Thematic synthesis identified commonalities, facilitators, and barriers to managers enabling person-centred care. *Results.* Twenty-one studies met the inclusion criteria. Approaches demonstrated by care home managers that enabled person-centred care for people living with dementia included valuing and recognising staffs' work; involving residents and relatives in decision making; providing feedback to staff; promoting a positive work environment and care culture; and involving staff in organisational changes. Barriers to person-centred care were a lack of organisational support for care home managers; staff shortages; managers not having time to work with staff; manager-staff turnover; limited access to dementia training; and a lack of leadership education and training for care home managers. *Conclusion.* Care home managers are central to the delivery of person-centred care for people living with dementia. The review identified key resources and activities that support this work. The wide variation in leadership approach and a persistent lack of detail about the frequency of educational and organisational support demonstrate a need to explore what enables care home managers to support their staff to deliver person-centred care.

1. Introduction

Care homes play a vital role in providing care for older people living with complex health conditions and care needs. In the UK, there are 420,000 care home residents, 80% of whom are living with dementia or cognitive impairment [1]. For this population, person-centred care is integral. There is not a single definition of person-centred care, but it describes an approach to care where people living with dementia are not defined by their condition [2]. This assumes that the person living with dementia is involved in decision making about their care and that their personal history, preferences, and priorities directly inform their care [3, 4].

Person-centred interventions can enhance the psychosocial care environment and encourage social stimulation and interaction for people living with dementia [5, 6]. To achieve this requires care home managers enabling staff to meet the individual needs of people living with dementia [7]. While guidance and theoretical frameworks set out person-centred approaches, less is clear about what care home managers need to sustain the practice [8, 9].

Care home managers are central to the effectiveness of care home services, but their work has often been overlooked in research [10]. Leadership influences not only the retention of skilled staff [11, 12], but also the quality of care that is being delivered to care home residents [13]. Studies report leadership

as "impactful" to person-centred care for people living with dementia in care homes [14–16]. However, the kind of support required to improve the delivery of person-centred care for people living with dementia lacks detail [17, 18].

Studies that have explored how to improve care home leadership argue that training and education are essential for person-centred care practices [19–23]. Supporting person-centred care requires care home staff to develop a complex set of qualities or skills which go beyond providing personal care [24]. Brooker [25] argues that care homes with a person-centred culture "value" the rights of the person living with dementia, provide "individualised" care based on the person's "perspective" of what matters and meet the person's "social" environmental needs. How care home managers' leadership directly influences person-centred care delivery is the focus of this review.

1.1. Aims and Objectives. The aim of the review was to understand how care home managers enable the delivery of person-centred care for people living with dementia. The objectives were:

(1) To review the evidence on how care home managers' leadership influences the delivery of care for people living with dementia or cognitive impairment;

(2) To understand how different leadership strategies or styles support care staffs' roles and responsibilities to provide person-centred care; and

(3) To describe what care home managers need to be effective leaders when enabling staff to deliver person-centred care for people living with dementia.

2. Methods

We conducted a mixed-methods review [26] to synthesise quantitative and qualitative evidence on diverse aspects of care home leadership and how leadership influenced the delivery of person-centred care. This review followed the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) guidelines and checklist [27]. The review protocol was registered on PROSPERO (CRD42021237930).

2.1. Search Strategy. A systematic search of five databases (PubMed, Scopus, Cochrane Library, CINAHL, and Google Scholar) was completed for research published between 2009-2021. The start date reflects changes in care home regulation in England which included the assessment of care home leadership by the Care Quality Commission (CQC) (1st April 2009). Forward and backward citation searches were completed for included studies and excluded reviews. Examples of electronic databases searched and terms used are given in Table 1.

2.2. Inclusion and Exclusion Criteria. All types of primary research were eligible for inclusion. Studies were included if they were published in English language and reported on

leadership in care homes (with and without onsite nursing) for people living with dementia or older people with cognitive impairment in countries with similar healthcare systems to the UK. The similarity of healthcare systems and for this paper long-term care was decided on the basis that the two systems were linked but separately funded and organised [28]. Studies that focused on palliative care for people living with dementia in care homes were excluded due to the specific responsibilities and requirements of such care.

2.3. Screening. Results of electronic searches were downloaded into bibliographic software, and duplicates were removed. One reviewer (LM) screened titles and abstracts for eligibility against the inclusion criteria, with 20% screened by a second reviewer (MH). All full-texts of potentially eligible studies were reviewed by LM, with 20% double-screened by MH. Disagreements were resolved through discussion with all reviewers (LM, MH, and CG).

2.4. Data Extraction. A bespoke data extraction form was developed for use across all studies. One reviewer (LM) extracted data from all studies, with 10% checked for accuracy by a second reviewer (MH). Data were extracted on publication characteristics, study design, setting, data collection method, participant characteristics, study outcomes, leadership styles, and organisational culture.

2.5. Synthesis. Narrative synthesis was used to summarise findings across studies [29]. The heterogeneity of research designs and diversity in outcome measures meant meta-analysis was not feasible [30]. Findings were tabulated and presented as descriptive accounts. The synthesis then followed thematic analysis [31] to familiarise data, generate codes, and identify themes. Each code described the statements and responses reported in the included studies. Patterns were identified within and across the codes, generating three analytical themes.

2.6. Appraisal of the Included Studies. Studies were assessed by one reviewer (LM) using appraisal tools appropriate to the study design to assess the risk of bias in the included studies. Tools used were as follows: Appraisal tool for Cross-sectional Studies (AXIS) for quantitative studies [32]; Critical Appraisal Skill Programme (CASP) for qualitative studies [33], and Mixed Methods Appraisal Tool (MMAT) for mixed-methods studies [34]. Details of the appraisal tools and scoring criteria used to assess studies for risk of bias are provided in the full version (Supporting Information 1).

3. Findings

Searches identified 8,633 potentially relevant documents. After deduplication, 6,907 were screened by title and abstract, with 178 records taken forward to the full-text screening. A total of 158 records were excluded as follows

TABLE 1: Examples of electronic databases searched and terms used.

PubMed
(((((("leadership" [All Fields]) OR ("leader" [All Fields])) OR ("manager" [All Fields])) OR ("management" [All Fields])) AND (((("care home" [All Fields]) OR ("residential home" [All Fields])) OR (residential care)) OR ("nursing home" [All Fields])) AND ((((((((("practice development" [All Fields]) OR ("action learning" [All Fields])) OR (education)) OR (training)) OR (staff support)) OR ("leadership support" [All Fields])) OR ("leadership skills" [All Fields]) OR person centred care OR quality of care OR culture change OR organizational culture OR organizational culture AND [Filter])))
Cochrane library
#1 MeSH descriptor: [Leadership] explode all trees #2 MeSH descriptor: [Residential facilities] explode all trees #3 MeSH descriptor: [Nursing homes] explode all trees

reviews ($n = 30$); not research ($n = 4$); not related to care home managers' leadership ($n = 3$); not related to person-centred care for people living with dementia in care homes ($n = 119$); and countries with different healthcare systems to the UK ($n = 2$). The two studies that were excluded originated from South Africa and China. The decision to exclude the studies was on the basis that the systems of care were immensely different and the findings did not offer transferable learning. Two additional papers were identified by manual searches, resulting in 22 included papers reporting findings from 21 studies. The search strategy and study selection process are illustrated in the PRISMA flowchart [27] (Figure 1).

3.1. Quality Assessment.
Overall, 55% of the included studies scored low and 45% scored medium for risks of bias.

3.2. Characteristics of the Included Studies.
The study designs were qualitative ($n = 12$), quantitative ($n = 8$), and mixed-methods ($n = 1$). Data collection methods used were observations and interviews ($n = 2$), focus groups ($n = 5$), interviews ($n = 5$), and questionnaires ($n = 9$). Six studies were conducted in the UK [35–41], five in Norway [42–46], three in Sweden [47–49], two in Australia [50, 51], two in the Netherlands [52, 53], one in the USA [54], one in Canada [55], and one in Germany [56]. Studies in care home settings identified as nursing homes, residential aged care facilities, and long-term care facilities. The participant groups in the studies were care home assistants [38, 43, 45–48, 53, 55], care home managers [36, 37, 40, 51, 56], combination of care home assistants and managers [39, 41, 44, 49], and care home assistants and residents [52]. Three studies included a wider mix of participants including directors, managers, care home assistants and relatives ($n = 2$) [42, 54], managers, relatives and care home assistants [35], managers, care home assistants, and nondirect care staff [50]. An overview of twenty-one included studies' characteristics, primary focus and assessment tools and scores are provided in Table 2.

Three main themes were identified on how care home managers influence the delivery of person-centred care for people living with dementia: (1) leadership performance and approach; (2) impact of dementia care education and training; and (3) characteristics of effective (and ineffective) leadership and management (Table 3, Figure 2).

3.3. Theme 1: Leadership Performance and Approach.
This theme encompasses what type of leadership approach enables staff to implement person-centred practices. It highlights how different care home organisational structures affect managers' ability to enable person-centred care for people living with dementia.

3.3.1. Impact of Organisational Structure on Leadership.
The ownership and organisational structure of a care homes affected how care home managers were able to prioritise person-centred approaches to residents' care. Policies and procedures that supported work-life balance (i.e., human resources recognition of staffs' commitments outside the care home and manageable shift patterns) were described as key to the delivery of person-centred care [55]. The majority of papers reviewed, however, identified how policies and procedures that did not prioritise residents' care needs affected the ways that staff were supported to deliver person-centred care ([37, 38, 40, 41, 45, 50, 51, 55, 56]).

When care home managers were visible and regularly affirmed staffs' approach to residents' care, this was reported as improving staff satisfaction and motivation to personalise residents' care [47]. Excess paperwork and administrative duties limited care home managers' capacity to engage with staff and reinforce a good care practice [36, 37]. Changes in care home ownership and management, structural reorganisations, and staff turnover destabilised leadership and caused uncertainties and staff frustration around providing person-centred care for people living with dementia [38, 40, 41].

3.3.2. Impact of Leadership Characteristics.
Four studies identified that staff relied on care home managers being affirming and supportive [35, 47, 52, 55]. Where this did not happen, staff reported feelings of low self-esteem and a lack of confidence in their role. Low staff morale, absence at work, and stress compounded reported difficulties in providing person-centred care to people living with dementia [45, 47, 48, 50, 55]. Two UK studies evaluated care home managers implementing a mindful leadership approach [36, 37]. The My Home Life (MHL) leadership programme focused on enabling managers to create extra time outside their administrative duties to develop relationships with staff
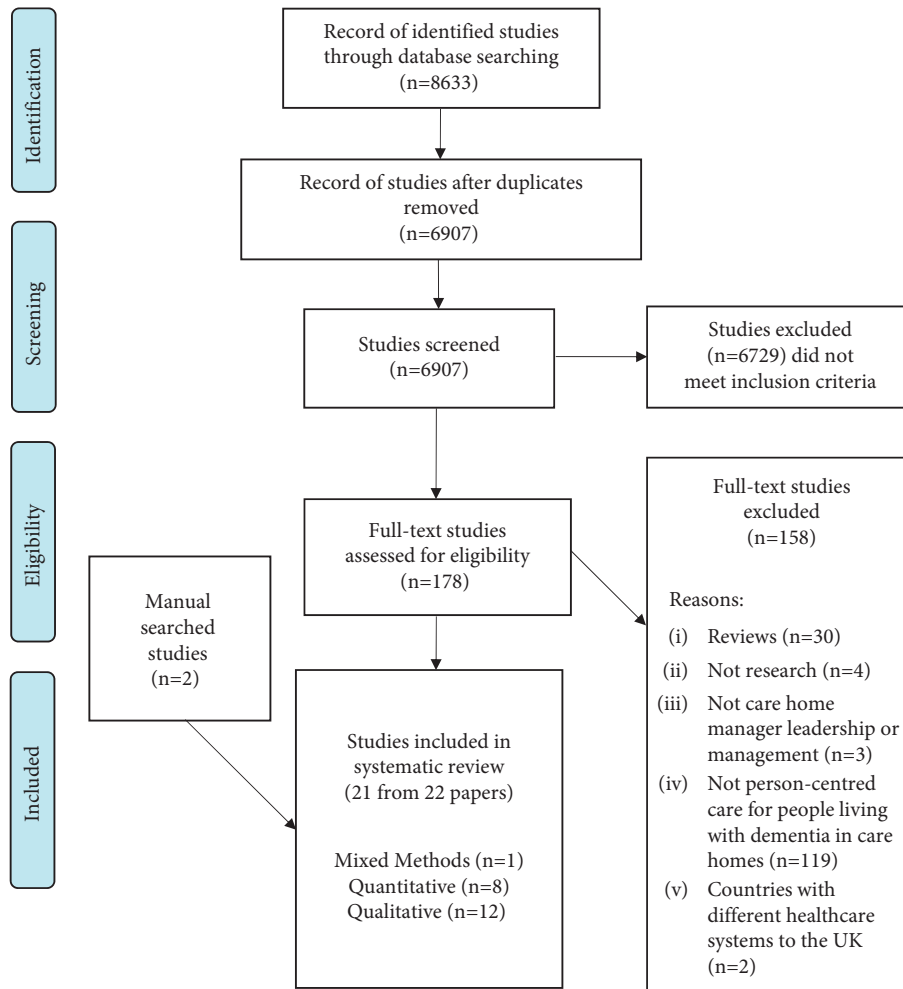
Figure 1: PRISMA flowchart illustrating the search strategy and study selection process.

and work closely as a team. This was observed to be essential for improving person-centred care [36, 37]. As part of this process, care home managers used regular staff supervisions to address specific instances of ageism and depersonalised language towards people living with dementia. For example, prior to the changes, staff were observed using inappropriate language such as the term "feeders" to describe residents that required assistance with feeding and "doubles" for residents that required assistance with mobility by two staff members. The MHL leadership support programme enabled care home managers to reflect closely on their day-to-day responsibility and recognise what practices they needed to change to develop their leadership skills [36, 37]. This approach of listening to staff, involving them in organisational changes, and maintaining relationships and interaction with residents and relatives was found to improve staff morale and productivity to improve care quality [36, 37, 51]. Where these skills were lacking due to an absence of teamwork and limited regular and reliable support from care home

managers, staffs' confidence to provide good care to residents could be affected [51].

3.4. Theme 2: Importance of Dementia Training and Education.
This theme explains how the knowledge acquired through dementia care training and education influences the way person-centred care is delivered to people living with dementia in care homes.

3.4.1. Dementia Training for Care Home Staff and Managers.
Where there was access to dementia training for staff and care home managers, this informed the leadership work of care home managers and affected staff confidence and motivation to provide care to residents with dignity and empathy [39, 43, 48]. In two Scandinavian studies, the delivery of person-centred care was positively associated with national leadership education for care home managers [49], and health-related continuing education of three years

TABLE 2: An overview of twenty-one included studies' characteristics, primary focus and assessment tools and scores.

Study number	Author and year	Country	Design and data collection methods	Setting	Participants	Primary focus	Assessment tool and score
1	Backman et al. (2021)	Sweden	Quantitative cross-sectional study (questionnaires)	Nursing home	Managers/staff ($N = 2429$)	Leadership education and qualifications and person-centred care practices	AXIS Low
2	Cooke (2018)	Canada	Qualitative-focused ethnography study (observations and interviews)	Care home	Staff ($N = 20$)	Person-centred care practices	CASP Low
3	Dewar et al. (2019)	UK	Mixed methods (questionnaires and focus groups)	Nursing home	Managers ($N = 119$)	MHL leadership support programme	MMAT Low
4	Du Toit et al. (2020)	Australia	Qualitative study (delphi method/questionnaires)	Residential and nursing care home	Managers ($N = 17$) including; non-direct care staff	Person-centred care practices	CASP Low
5	Ericson-Lidman et al. (2014)	Sweden	Qualitative study (interviews)	Care home	Staff ($N = 9$)	Person-centred care practice	CASP Medium
6	Fossey et al. (2019)	UK	Qualitative study (focus groups)	Care home	Staff ($N = 47$)	WHELD programme	CASP Low
7	Havig et al. (2011)	Norway	Quantitative cross-sectional study (questionnaires)	Nursing home	Directors ($N = 13$) Managers ($N = 40$) Staff ($N = 444$) Relatives ($N = 378$)	Leadership style	AXIS Low
8	Hawkins et al. (2018)	UK	Qualitative ethnography study (observations and interviews)	Care home	Managers ($N = 22$) Relatives ($N = 17$) Staff ($N = 444$)	Staff training and supervision	CASP Medium
9	Hegelsen et al. (2014)	Norway	Qualitative study (interviews)	Nursing home	Staff ($N = 11$)	Dementia care training and education	CASP Medium
10	Kelley et al. (2020)	UK	Qualitative study (interviews)	Care home	Managers ($N = 48$)	DCM implementation	CASP Medium
	Griffiths et al. (2021)	UK	Qualitative study (interviews)	Care home	Managers ($N = 2$) Staff ($N = 18$)	DCM implementation	CASP Low
11	O'Toole et al. (2021)	Australia	Qualitative study (interviews)	Care home	Managers ($N = 18$)	Leadership skills	CASP Low
12	Penney and Ryan (2018)	UK	Qualitative study (focus groups and interviews)	Care home	Managers ($N = 15$)	MHL leadership support programme	CASP Low
13	Poels et al. (2020)	USA	Quantitative cross-sectional study (questionnaires)	Nursing home	Directors ($N = 9$) Managers ($N = 20$) Staff ($N = 235$)	Leadership style	AXIS Medium
14	Quarsdorf & Bartholomeyczik (2019)	Germany	Qualitative case study (interviews)	Nursing home	Managers ($N = 24$)	DCM implementation	CASP Low

TABLE 2: Continued.

Study number	Author and year	Country	Design and data collection methods	Setting	Participants	Primary focus	Assessment tool and score
15	Ree (2020)	Norway	Quantitative cross-sectional study (questionnaires)	Nursing home and home care services	Staff ($N = 165$)	Leadership style	AXIS Low
16	Reon et al. (2018)	Norway	Quantitative cross-sectional study (questionnaires)	Nursing home and home care services	Staff ($N = 1161$)	Person-centred care practice	AXIS Low
17	Rokstad et al. (2015)	Norway	Qualitative study (focus groups and interviews)	Nursing home	Managers ($N = 3$) Staff ($N = 18$)	DCM implementation	CASP Medium
18	Rutten et al. (2021)	Netherlands	Quantitative cross-sectional study (questionnaires)	Nursing home	Staff/nurses ($N = 552$)	Work environment, person-centred care and leadership style	AXIS Medium
19	Sjogren et al. (2015)	Sweden	Quantitative cross-sectional study (questionnaires)	Nursing home and care home	Staff ($N = 1169$)	Person-centred care practice	AXIS Medium
20	Smit et al. (2017)	Netherlands	Quantitative cross-sectional study (questionnaires)	Care home	Staff ($N = 1389$) Residents ($N = 1218$)	Leadership style	AXIS Low
21	Surr et al. (2020)	UK	Qualitative collective case study (focus groups and interviews)	Care home	Managers and staff (no numbers given)	Dementia care training	CASP Medium

AXIS[1] CASP[2] DCM[3] MMAT[4] MHL[5] WHELD[6]. [1]Appraisal tool for cross-sectional studies. [2]Critical appraisal skill programme. [3]Dementia care mapping. [4]Mixed methods appraisal tool. [5]My Home Life. [6]Well-being and health for people living with dementia.

TABLE 3: Contribution of included studies to three main themes.

Authors	Leadership performance and approach	Importance of dementia training and education	Characteristics of effective and ineffective leadership and management
Backman et al. (2021)	X		X
Cooke (2018)	X		X
Dewar et al. (2019)	X		X
Du Toit et al. (2020)	X	X	
Ericson-Lidman et al. (2014)	X	X	
Fossey et al. (2019)	X	X	
Griffiths et al. (2021)	X	X	
Havig et al. (2011)			X
Hawkins et al. (2018)		X	X
Hegelsen et al. (2014)	X	X	
Kelley et al. (2020)	X	X	X
O'Toole et al. (2020)	X		X
Penney & Ryan (2018)	X		
Poels et al. (2020)			X
Quarsdorf & Bartholomeyczik (2019)	X	X	X
Ree (2020)			X
Reon et al. (2018)	X		X
Rokstad et al. (2015)	X	X	X
Rutten et al. (2021)			X
Sjogren et al. (2015)	X	X	X
Smit et al. (2017)		X	X
Surr et al. (2019)	X	X	X

or more for staff [45]. Shared training involving both staff and managers built a common understanding of care priorities and person-centred care home culture. This quote summarises how staff reported what was important in how they provided care. It also illustrates the tensions of being person-centred, managing risk, and caring in communal environments:

"*The residents are to be allowed to decide by themselves, as long as their own or other people's security or health are not under threat.*" [43].

Care home managers who attended dementia training reported how they adopted new activities and psychosocial approaches into residents' care. The activities included supporting staff to deliver one-to-one sessions, hand massages, cookery classes, group dance, and music sessions [39]. Practical solutions and examples of care included in the training appeared to be particularly valued. One care home manager observed how person-centred care, when done well, could reduce the use of antipsychotic medication:

Dementia training improved staffs' communication skills such as keeping language simple, asking short questions, and using pictorial communication methods. Despite positive staff feedback on how their care practice changed, minimal improvements were observed in one study on residents' agitation and well-being following dementia training. This increased opportunities for interactive learning activities for staff; however, they were not sufficient to achieve measurable change [39]. It raised care home managers' awareness about address how information about residents was used to provide person-centred care. For

example, making sure that staff incorporate residents' biographical information to maintain individualised care plans [50]. These changes were constrained by residents' life histories not being known or becoming routinised in their day-to-day care [47, 50]. How dementia training was delivered affected learning and uptake. Face-to-face dementia training was more appropriate than handouts, but removed staff from providing care. It was an ongoing challenge for care home managers to assign staff for dementia training despite staff shortages [39].

3.4.2. Training and Learning in Dementia Care. Three studies investigated the use of Dementia Care Mapping (DCM) for improving person-centred care [41, 44, 56]. Dementia Care Mapping, a psychosocial intervention that looks at the frequency and quality of staff-resident interactions, assesses care through observations that are reviewed with staff to inform practice and care planning [41, 44, 56]. In these studies, care home managers trained as "mappers" used DCM to encourage staff to see things from their residents' perspective. Leadership was a key factor in supporting DCM implementation. It required sufficient staff on duty and the allocation of extra time for staff to prioritise activities that deliver person-centred care. Conducting regular staff supervisions was also important for continuity of DCM implementation in care homes [40, 41, 44, 56]. Staff described a positive experience with DCM implementation (i.e., improved communication skills, and increased knowledge of person-centred care) when managers were involved. There were, however, unintended consequences if care home managers were only sporadically available to
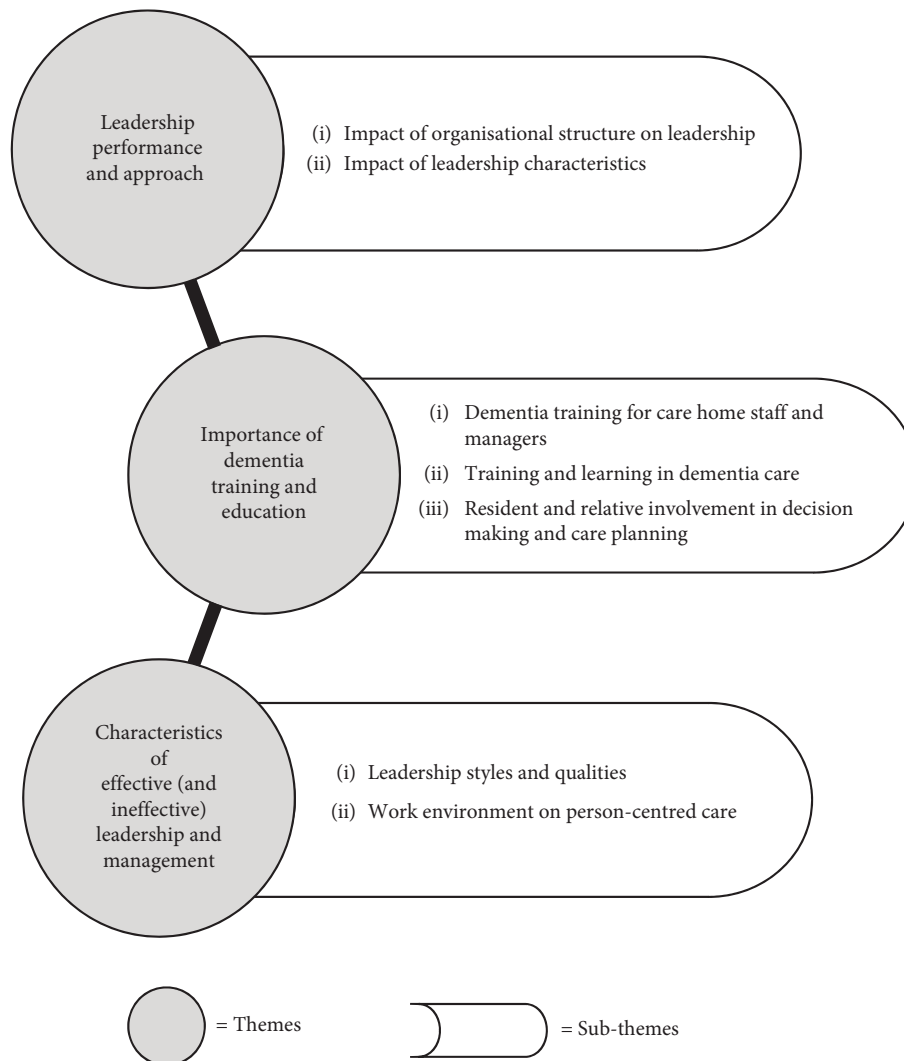
FIGURE 2: Three themes and nine subthemes from the results of the review.

supervise and support staff or did not understand before-hand the purpose and commitment required. A care home manager explained:

Furthermore, some care home managers misused the DCM to identify the poor job performance of their staff, undermining its purpose [56]. When managers understood the importance of their participation in DCM activities and engaged in the intervention with staff, this motivated them to participate in care activities, and consciously acting as role models [40]. This reinforced teamwork and created opportunities for care home managers to provide constructive feedback to staff [41, 56]. The interventions were not cost neutral, and the need for more staffing resources following DCM intervention became evident as staff became more motivated, confident, and fulfilled in their roles. Successful DCM implementation meant that staff were spending more time with residents. Staff shortages could result in conflicts between care home managers and staff due to staffs' frequent remarks about feeling demoralised and overstretched, and unable to provide person-centred care for people living with dementia [56].

3.4.3. Residents and Relatives Involvement in Decision Making and Care Planning. To embed person-centred care values, people living with dementia should be involved in decision making regarding their care needs in ways that are dementia sensitive [35, 43, 52]. One study identified that for care home managers to enable decision making for people living with dementia, they needed to carry out regular staff observations, resolve daily issues, conduct regular staff meetings, and provide staff supervisions [35]. This increased residents' self-esteem and satisfaction, and reduced agita-tion. Interactions which facilitate person-centred care be-tween staff and residents also improved shared decision making. If care home managers' participation in residents' care routine was minimal, this could result in little to no involvement of residents and relatives in decision making, and ignoring the use of person-centred care [35, 52]. When staff imposed their own ideas on the residents' wishes and preferences, they were observed to not involve residents in decision making regarding their care [43]. Care home managers who optimised person-centred care were involved in residents' routines, and proactive in encouraging relatives

to share information about residents and identify their care needs and preferences. This was particularly important for residents with limited capacity [43, 52].

3.5. Theme 3: Characteristics of Effective (and Ineffective) Leadership and Management. This theme describes how the managers' leadership styles which are associated with a supportive work environment for staff and the use of person-centred care.

3.5.1. Leadership Styles and Qualities. A transformational leadership style characterised by how care home managers communicated a vision for improvement, developed staffs' competence, provided support, empowered and motivated staff, led by example, and showed understanding was a predictor of person-centred care [46]. Four studies in the review collected data on how care home managers worked with staff and identified a transformational leadership style as key to enabling the use of person-centred care [46, 52–54]. The ability to solve problems, handle conflicts in a positive way, empower staff, show compassion, and create a positive team were identified as qualities that care home managers drew on to sustain person-centred care [37, 40, 42, 46, 49, 52, 54–56].

A transactional leadership approach which relies on rewards to achieve a goal was considered ineffective for person-centred care delivery [54]. Similarly, care home managers who adopted an authoritative leadership approach (i.e., imposing instructions and top-down decision making) were associated with managers being rarely involved in solving everyday care issues or working alongside staff. This adversely affected how person-centred care was achieved for people living with dementia in care homes [56]. In one study, participants (staff and relatives) reported task-oriented leadership as leading to positive outcomes for staff levels and care quality [42]. Although this was not supported in most of the papers reviewed.

3.5.2. Work Environment for Person-Centred Care. The care home manager influences the organisation of the care home environment. A supportive psychosocial environment characterised by low job strain and increased job satisfaction was associated with higher levels of person-centred care [48]. In contrast to Sjogren et al. [48], other studies described how "high" demands and "low" control in care homes were associated with negative psychosocial environments, leading to stress and lower staff satisfaction [52, 53]. Rutten et al. [53] found that work environment characteristics (i.e., unity between staff, residents and relatives; teamwork and three job characteristics [social support from managers; job satisfaction; and varied roles and development opportunities]) are associated with staff-reported person-centred care. These findings are consistent with previous findings in Ericson-Lidman et al. [47]. Based on this evidence, how care home managers promote a positive work environment (i.e., low job strain and demands, and feelings of job satisfaction for staff) seems to

play a crucial role in the use of person-centred care for people living with dementia.

4. Discussion

The review asked what kind of leadership is likely to facilitate person-centred care for people living with dementia in care homes. Twenty-one studies were included with six from the UK. Most of the studies were observational with seven studies reporting interventions to promote the delivery of person-centred care. The findings emphasised that how person-centred care is provided to people living with dementia is related to care home managers' leadership approach, dementia care knowledge, involvement in staffs' work and residents' care, staffing levels, and opportunities for manager-staff collaboration. Evidence on how care home managers could be supported was limited to two studies [36, 37]. The literature focused on what care home managers needed to do, but not how care home managers could be supported to improve their leadership skills. None of the studies reviewed explored how care home managers had developed their leadership styles, views about enabling person-centred care, and the impact of prior experiences and educational background. The absence of targeted support for care home managers is likely to be linked to difficulties in maintaining residents' needs [10, 57, 58]. The evidence strongly asserts links between the behaviours of effective managers and the delivery of person-centred care. Less clear was the kind of support and resources that care home managers drew on to enable person-centred care. The association between job satisfaction and person-centred care was only linked to staff and not care home managers. This was despite all the aspects of how care home managers worked being documented as influential in the way that staff provided care to people living with dementia [45, 48, 53].

Care home managers' job satisfaction may be as important as that of their staff. Determinants of care home managers' job satisfaction are: working with constructive and collaborative senior management, having decisional authority, and being provided with resources that support care delivery, such as appropriate IT systems [59]. Future research is needed to explore these different aspects of job satisfaction and preparation that may sustain care home managers' leadership capacity to promote person-centred care for people living with dementia. The review findings supported intervention programmes aimed at assisting care home managers and staff to work together to deliver person-centred dementia care. However, it is unknown whether the frequency of the programme affects and sustains outcomes on care quality. Only one study in the review explored the positive relationship between care home managers' education and person-centred care [49]. The context-sensitive nature of care home managers' work and the multiple pressures on how they work identified in this review also suggest that any leadership education or training programmes should be co-designed, co-produced, and possibly provided in-house to optimise learning and uptake.

Care home managers in the studies reviewed often struggled to maintain care quality for people living with

dementia because of workloads, limiting their participation in residents' care within care homes. This resonates with findings from Haunch et al.'s [60] realist review of care home managers' experience of balancing responsibilities across the stakeholders (i.e., residents, relatives, staff, the organisation, the regulator). Future research on providing person-centred care for people living with dementia in care homes could focus on how care home managers' experiences of enabling staff to use person-centred approaches are linked to their professional development, access to dementia education, and organisational support.

4.1. Limitations. Only studies published in English were included. The search was limited to publications from 2009-2021. To ensure relevance to the UK care home sector, eligibility was limited to countries whose healthcare systems were similar to those of the UK. No study was excluded from the review based on quality. The papers included were of a variable standard which limits the interpretation and conclusions in this review.

5. Conclusions

Care home managers play an integral role in the delivery of person-centred care for people living with dementia in care homes. There is evidence of the characteristics of leadership that support the provision of person-centred dementia care within care homes. Less well understood is how leadership training interventions, and the hierarchy and organisation of the setting improve care home managers' leadership skills and competence to support staff to provide person-centred dementia care. Understanding what sustains and supports effective leadership over time to promote person-centred care for people living with dementia is less clear.

6. Implications for Practice

Care home managers who demonstrate that they value their staff and the involvement of residents and relatives in decision making can create a positive work environment and care culture. However, the care home environment can be challenging as staff shortages and time constraints limit care home managers' capacity to work closely with staff to promote person-centred approaches for care. Care home managers can be supported by their organisations and through training focused on developing their leadership in dementia care to acquire the skills to sustain quality care for people living with dementia.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors have no conflicts of interest to disclose.

Authors' Contributions

LM led the design and prepared the review as part of her PhD under the supervision of MH and CG. LM and MH conducted screening, data extraction, and quality assessment supported by CG. All authors contributed to the data analysis and synthesis of the findings. MH and CG critically appraised the drafts and final version of the manuscript. All authors have read and agreed the final version of the paper.

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Supplementary Materials

Supporting Information 1: Appraisal tools and scoring criteria used to assess studies for risk of bias. (*Supplementary Materials*)

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Research Article

Influences of Structural Empowerment and Demographic Factors on Nurses' Psychological Empowerment

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Aim. The objective was to investigate the impact of structural empowerment and demographic factors on the psychological empowerment of nurses. *Background.* The empowerment of nurses plays a crucial role in improving patient care and achieving successful healthcare outcomes. When nurses feel empowered in their work environment, they tend to remain dedicated to their jobs and experience higher levels of job satisfaction and engagement. *Methods.* This cross-sectional study utilized a convenience sample of 287 nurses recruited from various hospital units, resulting in a response rate of 94.7%. Data were collected through a paper survey consisting of three sections: structural empowerment, psychological empowerment, and demographics. *Results.* The first hierarchical regression explains 57.0% variance in nurses' psychological empowerment ($F = 78.52$, $p < 0.001$). Age ($\beta = 0.37$, $p < 0.01$) and structural empowerment ($\beta = 0.69$, $p < 0.001$) have a positive influence on nurses' psychological empowerment. Conversely, having a bachelor's degree ($\beta = -0.16$, $p < 0.01$) had a negative impact psychological empowerment. The second hierarchical regression clarifies the specific aspects of structural empowerment that influences positively on nurses' psychological empowerment: access to opportunities ($\beta = 0.13$, $p < 0.01$), support ($\beta = 0.13$, $p < 0.01$), resources ($\beta = 0.35$, $p < 0.001$), and informal power ($\beta = 0.12$, $p < 0.01$). *Conclusion.* This study emphasizes the importance of considering demographic variables, such as age and education, in conjunction with structural empowerment to effectively enhance nurses' psychological empowerment. *Implications for Nursing Management.* Nursing managers should tailor their empowerment strategies based on the demographic characteristics of their nurses. It is essential to focus on providing nurses with access to opportunities, support, resources, and informal power. These insights provide valuable guidance for nursing managers to enhance nurses' psychological well-being, job satisfaction, and overall quality of life. Ultimately, this contributes to positive outcomes for patients, nursing staff, and healthcare organizations.

1. Introduction

The concept of empowerment holds significant importance within contemporary healthcare organizations, serving as a strategy to improve employees' satisfaction with their jobs, motivation, and general well-being [1–3]. The concept of empowerment is multifaceted, encompassing various facets, including structural and psychological empowerment. The notion of structural empowerment refers to the extent to which employees are furnished with resources, knowledge, and support systems that enhance their capacity to effectively fulfill their job duties and exert influence over

decision-making processes within the organizational setting [4]. In contrast, psychological empowerment pertains to the subjective perception of individuals in terms of their sense of competence, autonomy, and capacity to exert influence within their work and work environment [5].

Gaining insight into the determinants that impact the nurses' psychological empowerment is of utmost importance, given its significant implications not only on their welfare but also on the quality of patient care delivered [6–9]. Several scholarly investigations were undertaken to evaluate the correlation between structural and psychological empowerment in the healthcare industry. These studies

consistently demonstrate the favorable impact of structural empowerment on the psychological empowerment of individuals [2, 10–13]. However, it is imperative to acknowledge that various demographic factors have the potential to impact the psychological empowerment of nurses. Demographic characteristics, such as age, gender, educational level, and years of experience in the nursing profession, have the potential to influence individuals' perceptions of empowerment and their adoption of structural empowerment mechanisms [5, 14, 15].

Despite the growing acknowledgment of the significance of empowerment within the nursing profession, there exists a dearth of scholarly inquiry on the precise ramifications of structural empowerment and demographic factors on Egyptian nurses' psychological empowerment. The existence of this research gap underscores the significance of conducting additional studies to investigate the impact of these factors on the psychological empowerment of hospital nurses in Egypt. By comprehending this correlation, healthcare institutions can enhance their assistance to nursing personnel and foster favorable psychological consequences. Hence, the objective of this research is to investigate the tangible impacts of structural empowerment and demographic factors on Egyptian nurses' psychological empowerment.

2. Theoretical Framework

Kanter's theory of empowerment emerges as the most pertinent theory to serve as a guiding framework for this study. According to this theory, four essential conditions facilitate structural empowerment: (1) the provision of opportunities to enhance awareness and skills, (2) access to information regarding the organization's goal or policy, (3) availability of support coupled with gratitude and rewards for proficient tasks, and (4) availability of resources necessary for the effective completion of tasks. This theory posits that structural empowerment materializes when individuals are granted an approach to information, resources, support, and opportunities for learning and development. Consequently, when nurses have access to these invaluable resources and opportunities, they are more likely to experience feelings of competence, autonomy, and control over their work, which, in turn, can foster heightened psychological empowerment [16, 17].

3. Literature Review and Hypothesis Development

The role of nurses in the healthcare system is of paramount importance, as they are instrumental in delivering exemplary patient care and facilitating positive healthcare system outcomes. Therefore, the empowerment of clinical nurses, both in terms of structural and psychological aspects, has garnered substantial attention in recent years. This focus stems from the recognition that empowering nurses has the potential to yield far-reaching benefits such as enhanced job satisfaction, improved retention rates, and an overall elevation in the quality of healthcare services [1–3].

3.1. Structural Empowerment in Nursing. Structural empowerment is described as the capacity to get things done within the work environment by mobilizing resources, accessing information, and obtaining support to meet organizational goals [16]. Structural empowerment in nursing involves providing nurses with access to information about organization its policies, and procedures, and the work that needs to be carried out, access to the necessary tools, equipment, and other resources to perform job effectively, access to support from supervisor, colleagues, and other members of the organization, and access to opportunities for growth and development to learn new skills to take on new challenge and advance one's career. While informal power is the authority and influence nurses enjoy within the organization, derived from personal ties, competence, reputation, and informal networks. Formal power is bestowed through job designations and hierarchical structures [16].

Structural empowerment holds significant prominence within the nursing profession as it profoundly influences the quality of nurses' work life [6]. Structural empowerment also plays a pivotal role in shaping various facets of nursing practice including the work engagement, psychological empowerment, organizational commitment, and mitigating risk of burnout [4, 5, 11–13, 18–20].

3.2. Psychological Empowerment in Nursing. Psychological empowerment is labeled by a motivational condition that comprises four dimensions, namely, meaning, competence, self-determination, and influence [21]. The concept of meaning pertains to the degree to which nurses regard their profession as having significance and being imbued with purpose. Competence refers to the collection of abilities, skills, and aptitudes possessed by nurses, which enable them to carry out their duties and obligations in an effective manner. Self-determination pertains to the nurse's notion of possessing autonomy and liberty in their approach to their professional responsibilities. The notion of impact refers to the perceived degree of influence that the work of nurses exerts on the hospital or department. Spreitzer [21] asserts that management has the potential to significantly contribute to the improvement of the four aspects of psychological empowerment by implementing strategic work design strategies that promote empowerment within the workforce.

Psychological empowerment in the field of nursing is evident through the perception of professionals regarding the worth and recognition attributed to their work, as well as their contributions to the care process. This view gives rise to a feeling of proficiency and autonomy. Hence, it is evident

that structural empowerment plays a fundamental role in fostering the psychological empowerment of nurses. Multiple research investigations in nursing have demonstrated the existence of significant associations between structural and psychological empowerment [2, 10–13]. Consequently, the subsequent hypothesis was formulated:

> H1: structural empowerment relates positively to psychological empowerment

The establishment of empowering work conditions is widely acknowledged as a crucial organizational strategy that fosters psychological empowerment, thereby cultivating positive work behaviors and attitudes [22, 23]. Nurses who are affiliated with a specific organization and are bestowed with the necessary information, support, and resources to execute their duties, along with continuous opportunities for growth, are prone to experience an amplified sense of autonomy and job self-efficacy. These elements are pivotal in nurturing psychological empowerment [2]. The ability of an organization to create a framework that allows employees to effectively carry out their tasks by providing them with access to information, support, resources, and opportunities can potentially influence how individuals or groups perceive their psychological empowerment, which includes feelings of meaning, competence, self-determination, and impact [11]. Numerous studies have discovered the interrelations between structural empowerment components and psychological empowerment [5, 7, 12, 24, 25]. Therefore, the following hypotheses were developed:

> H1a: access to opportunities relates positively to psychological empowerment
>
> H1b: access to information relates positively to psychological empowerment
>
> H1c: access to support relates positively to psychological empowerment
>
> H1d: access to resources relates positively to psychological empowerment
>
> H1e: the formal power of nurses relates positively to psychological empowerment
>
> H1f: the informal power of nurses relates positively to psychological empowerment

3.3. Relationship between Demographic Characteristics and Psychological Empowerment.
Demographic factors, such as age, gender, marital status, educational degrees, and experience years, possess the capacity to exert an influence on the perceptions of empowerment among nurses. Previous studies have illuminated that nurses with a greater number of years of experience tend to perceive a heightened sense of empowerment owing to their accumulated knowledge and increased confidence. Similarly, the level of education attained can significantly impact empowerment, as higher levels of education often correlate with greater job autonomy [5, 14, 15]. Consequently, the following hypothesis has been formulated:

> H2: nurses' demographic characteristics relate to psychological empowerment

According to previous literature and theoretical framework, the overall research model of the present study is shown in Figure 1.

4. Materials and Methods

4.1. Research Design.
The study employed a cross-sectional approach using self-reported questionnaires for data collection.

4.2. Setting.
The study was carried out at a public hospital that is affiliated with the Egyptian Ministry of Health and Population. The hospital provides medical services to a catchment area encompassing an estimated population of 439,000 residents. The hospital provides a comprehensive array of medical treatments encompassing general and specialist surgical procedures, emergency care, cancer treatment, physical therapy and rehabilitation, radiography, and medical laboratory examinations, as well as intensive care.

4.3. Participants.
This study employed a convenience sampling method whereby participants were selected based on their accessibility and availability within a public hospital affiliated with the Egyptian Ministry of Health and Population. The study included clinical nurses who served in their present nursing role for a minimum of one year, were employed on a full-time basis, and actively engaged in providing direct care to patients. The exclusion criteria encompassed nurses who had been hired for a duration of less than one year, held managerial roles, or served as shift leaders. During work shifts, the participants were approached and invited to partake in the study after a comprehensive explanation of the research objectives. The response rate was an impressive 94.7%, with a total of 287 dedicated male and female clinical nurses willingly participating in the study. The research adhered to the STROBE guidelines.

4.4. Instruments of Data Collection

4.4.1. Independent Variable (Structural Empowerment).
The Conditions of Work Effectiveness Questionnaire II (CWEQ-II) was utilized to assess participants' structural empowerment [26]. The instrument utilized in this study comprises six distinct subscales, each measuring a different aspect. These subscales are as follows: access to opportunity (3 items), access to information (3 items), access to support (3 items), access to resources (3 items), formal power (3 items), and informal power (4 items). The participants were tasked with assessing their perceptions of structural empowerment by utilizing a 5-point Likert scale that spanned from 1 (none) to 5 (a lot). The study determined that the internal consistency reliability of the CWEQ-II subscales was deemed satisfactory. The subscales exhibited Cronbach's alpha coefficients ranging from 0.76 to 0.86, while the overall measure of structural empowerment demonstrated Cronbach's alpha coefficient of 0.95.
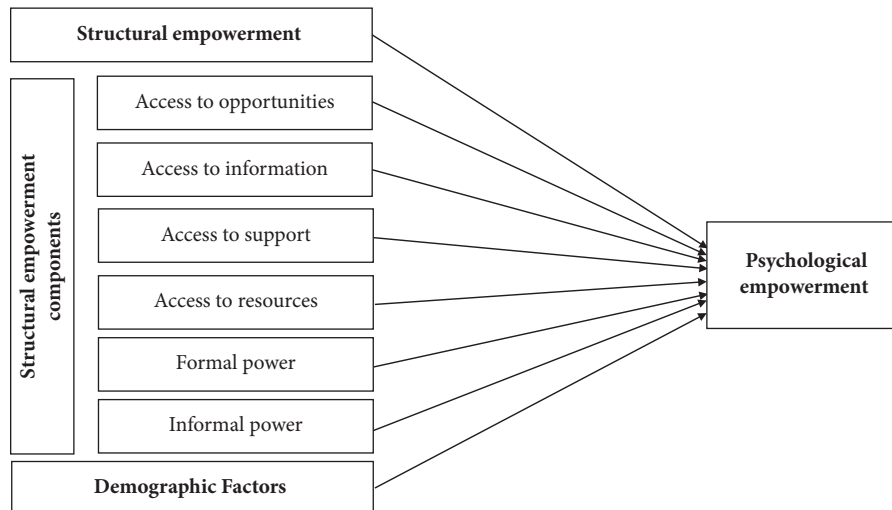
FIGURE 1: The proposed model of the study.

4.4.2. Dependent Variable (Psychological Empowerment). The study utilized the 12-item psychological empowerment scale, first established by Spreitzer [21], to evaluate the four distinct components of psychological empowerment. The dimensions encompassed within this framework consist of four key elements: meaning, competence, self-determination, and impact. The psychological empowerment scale comprises three items for each subscale. The respondents provided their responses to the items using a Likert scale with five points, ranging from strongly disagree (1) to strongly agree (5). The subscales of psychological empowerment demonstrated acceptable levels of internal consistency reliability. The presence of Cronbach's alpha coefficients, ranging from 0.72 to 0.83 for the subscales and 0.93 for the overall measure of psychological empowerment, serves as proof for this assertion.

4.4.3. Control Variables (Demographic Variables). The demographic questionnaire encompasses inquiries concerning age, gender, marital status, experience, education, and the specific unit in which the participants were appointed.

A panel comprising five esteemed experts with diverse backgrounds and experiences was graciously invited to assess the face and content validity of the scales employed in the study. This panel included three professors specializing in nursing management, as well as two experienced clinical nurses. With their meticulous review, minor modifications were thoughtfully incorporated into the scale. For instance, certain questions underwent careful rewording, and explanatory notes were thoughtfully added to specific sections of the questionnaire, thereby enhancing the clarity and comprehensibility of the survey questions.

The pilot study was conducted to refine the scales, thereby yielding more robust measurement instruments that align with the research objectives and target population. Prior research has already established and confirmed the validity and reliability of the CWEQ-II and psychological empowerment scale, demonstrating its effective utilization in nursing populations [2, 9, 11, 27].

4.5. Data Collection and Ethical Considerations. The data for this study were acquired through the administration of paper questionnaires to clinical nurses stationed at the research site. The utilization of paper questionnaires was chosen to promote convenience and accessibility for the participants. Several measures were implemented to motivate nurses to diligently complete the survey. Initially, the researcher provided a comprehensive and articulated explanation of the study's aims, emphasizing the potential implications for nursing practice and the enhancement of patient care. Informed consent, signifying the voluntary nature of their involvement, was diligently obtained from each nurse before administrating the questionnaires. Participants were explicitly informed that they had right to withdraw from the study at any time without any consequences or detriment to their employment or participation in future research activities. This process ensured their understanding and willingness to contribute meaningfully to the research endeavor.

Moreover, the participants were assured of the utmost confidentiality regarding their responses. Their invaluable involvement was emphasized, underscoring the significance of their contribution to the study. Importantly, they were informed that their data would be treated with utmost respect for privacy, ensuring that all information provided would be anonymized and kept confidential. The data collection period encompassed the months of February through August 2022, allowing for comprehensive and representative sampling of the clinical nurses' perspectives. Prior to the initiation of data collection, the present study obtained ethical permission from the Ethical Research Committee affiliated with the nursing faculty at Mansoura University, with reference number (Ref.No.P.0449).

4.6. *Data Analysis.* Descriptive statistics were employed to provide a concise summary of the sample characteristics as well as the variables under investigation. Furthermore, independent *t*-tests and ANOVA were utilized to explore potential variations in empowerment levels based on participants' demographic variables. The Pearson product-moment correlation analysis was conducted to assess the relationship between structural and psychological empowerment.

The data analysis employed two instances of regression analysis. The first hierarchical regression analysis aimed to assess the effects of total structural empowerment scores on psychological empowerment (first model). The second hierarchical regression analysis examined the impact of the six constructs of structural empowerment on psychological empowerment (second model). Before conducting these analyses, the demographic variables that demonstrated significant differences in psychological empowerment were considered in the first step of regression analysis. The significance level was set at $p < 0.05$ to ensure rigorous evaluation of the data and precise interpretation of the results. The data analysis was performed using SPSS V23, a widely recognized statistical software package.

5. Results

5.1. *Characteristics of the Studied Clinical Nurses and Differences in Structural and Psychological Empowerment.* The majority of clinical nurses were female (92.7%) and married (84.0%). A significant proportion of nurses held technical degrees (56.8%) and worked in inpatient units (68.6%). The participant had a mean age of 31.94 years (SD = 6.54) and a mean of 10.68 years of experience (SD = 7.13). Notably, there were significant differences in both structural and psychological empowerment among different age groups as indicated by the *F*-values of 6.95 ($p < 0.01$) and 11 and 18 ($p < 0.01$) for structural and psychological empowerment, respectively. The age group above 40 years exhibited the highest mean score in structural empowerment (mean = 72.29; SD = 10.69) compared to the age group 31–40 years (mean = 65.95; SD = 14.44) and age group 20–30 years (mean = 61.40; SD = 14.61). The age group above 40 years exhibited the highest mean score in psychological empowerment (mean = 52.38; SD = 5.46) compared to the age group 31–40 years (mean = 48.07; SD = 7.98) and age group 20–30 years (mean = 44.86; SD = 8.02). There were significant differences in psychological empowerment observed between the educational levels of nurses (*F* = 4.50; $p < 0.05$). Nurses with technical education, including those with a diploma or institute nursing degree (referred to as technical nurses), demonstrated significantly higher levels of psychological empowerment (mean = 48.09; SD = 7.44) compared to those with a bachelor's degree (mean = 45.18; SD = 8.80) and postgraduate degree (mean = 46.40; SD = 6.22). Notably, there were significant variations in both structural and psychological empowerment based on diverse levels of experience as indicated by the *F*-values of 6.73 ($p < 0.01$) and 10.86 ($p < 0.01$) for structural and psychological empowerment, respectively. Nurses' with more than

10 years of experience exhibited the highest mean score in structural empowerment (mean = 67.40; SD = 14.39) compared those with 6–10 years of experience (mean = 62.54; SD = 12.73) and 1–5 years of experience (mean = 60.41; SD = 15.42). Nurses' with more than 10 years of experience exhibited the highest mean score in psychological empowerment (mean = 48.91; SD = 7.70) compared those with 6–10 years of experience (mean = 46.37; SD = 7.50) and 1–5 years of experience (mean = 43.81; SD = 8.40) (Table 1).

5.2. *The Levels of Structural and Psychological Empowerment of Clinical Nurses.* The mean score for structural empowerment was 64.24 out of 95 (SD = 14.59), indicating a moderate level of structural empowerment. Among the subscales of structural empowerment, informal power received the highest rating (mean = 2.21, SD = 3.59), while access to information received the lowest rating (mean = 9.44, SD = 3.28). In terms of psychological empowerment, the mean score was 46.85 out of 60 (SD = 8.12), indicating a moderate level of psychological empowerment. Among the dimensions of psychological empowerment, meaning received the highest rating (mean = 12.3, SD = 2.31), while self-determination received the lowest rating (mean = 11.37, SD = 2.50) (Table 2).

5.3. *Relationship between Structural and Psychological Empowerment of Clinical Nurses.* There was a positive and strong relationship between structural and psychological empowerment of clinical nurses ($r = 0.73$, $p < 0.001$), indicating that nurses' perception of structural empowerment increased and their psychological empowerment also increased. In addition, the dimensions of structural empowerment were found to have a positive correlation with psychological empowerment (Table 2).

5.4. *Influences of Structural Empowerment and Demographic Factors on Nurses' Psychological Empowerment.* The first hierarchical regression model accounted for 57.0% of the variance in psychological empowerment ($F = 78.52$, $p < 0.001$). The results revealed that age ($\beta = 0.37$, $p < 0.01$) and structural empowerment ($\beta = 0.69$, $p < 0.001$) were positively affecting nurses' psychological empowerment, suggesting that as nurses' age and structural empowerment increase, their psychological empowerment increase. In contrast, the possession of a bachelor's degree ($\beta = -0.16$, $p < 0.001$) showed a negative association with psychological empowerment, indicating that nurses holding a bachelor's degree exhibited lower psychological empowerment in comparison to their counterparts with technical degrees and postgraduate studies (Table 3 and Figure 2).

The second hierarchical regression model accounted for 60.0% of the variance in psychological empowerment ($F = 44.38$, $p < 0.001$). In terms of demographics, age ($\beta = 0.40$, $p < 0.01$) and education (bachelor) ($\beta = -0.14$, $p < 0.01$) were found to be a significant positive factor affecting psychological empowerment. Regarding structural empowerment dimensions, access to opportunities ($\beta = 0.13$,

TABLE 1: Demographic characteristics of the studied clinical nurses and differences in structural and psychological empowerment.

Characteristics	N (%)	Structural empowerment Mean ± SD	t or f	Psychological empowerment Mean ± SD	t or f
Age years					
20–30	137 (47.7)	61.40 ± 14.61	6.95**	44.86 ± 8.02	11.18**
31–40	129 (44.9)	65.95 ± 14.44		48.07 ± 7.98	
>40	21 (7.3)	72.29 ± 10.69		52.38 ± 5.46	
Mean ± SD	31.92 ± 6.54				
Gender					
Male	21 (7.3)	67.95 ± 11.51	1.21	49.43 ± 6.00	1.51
Female	266 (92.7)	63.95 ± 14.78		46.65 ± 8.24	
Marital status					
Unmarried	46 (16.0)	64.78 ± 13.11	0.27	45.98 ± 7.64	
Married	241 (84.0)	64.14 ± 14.88		47.02 ± 8.21	0.80
Levels of education					
Technical degree	163 (56.8)	65.65 ± 13.16		48.09 ± 7.44	
Bachelor's degree	119 (41.5)	62.54 ± 16.00	1.91	45.18 ± 8.80	4.50*
Postgraduate degree	5 (1.7)	59.00 ± 21.19		46.40 ± 6.22	
Experience years					
1–5	81 (28.2)	60.41 ± 15.42		43.81 ± 8.40	
6–10	70 (24.4)	62.54 ± 12.73	6.73**	46.37 ± 7.50	10.86**
>10	136 (47.4)	67.40 ± 14.39		48.91 ± 7.70	
Mean ± SD	10.68 ± 7.13				
Unit					
Inpatient units	197 (68.6)	64.63 ± 14.65	0.66	47.33 ± 8.19	1.47
ICUs	90 (31.4)	63.40 ± 14.50		45.81 ± 7.92	

$^*p < 0.05$, $^{**}p < 0.01$. ICUs: intensive care units.

$p < 0.01$), access to support ($\beta = 0.13$, $p < 0.05$), access to resources ($\beta = 0.35$, $p < 0.001$), and informal power ($\beta = 0.12$, $p < 0.05$) were identified as significant factors affecting nurses' psychological empowerment (Table 4 and Figure 2).

6. Discussion

The objective of the study was to examine the influences of structural empowerment and demographic factors on nurses' psychological empowerment, as well as nurses' evaluation of their structural and psychological empowerment.

6.1. Nurses' Perceptions of Structural and Psychological Empowerment.
The findings revealed a moderate level of both structural and psychological empowerment among nurses, suggesting that they possess partial developmental opportunities, support systems, and resources that contribute to their competence and job satisfaction. These outcomes align with previous research conducted in diverse countries. For instance, Tan and Conde [15] conducted a study on Filipino nurses and reported moderate levels of empowerment in both their qualities and performances. Moura et al. [28] found a moderate level of empowerment among nurses working in a teaching hospital located in southern Brazil. In a cross-sectional study by Yu et al. [29], Chinese nurses in tertiary hospitals were found to have moderate levels of psychological empowerment. Khrais and Nashwan [27] investigated emergency nurses in three large hospitals in Jordan and observed a moderate level of perceived structural empowerment and a high-moderate level of perceived

psychological empowerment. Similarly, a study by Walden [30] revealed moderate levels of structural empowerment, psychological empowerment, clinical nurse educator leadership, and work engagement among new graduate nurses in acute care settings. Saleh et al. [3] explored the experiences of nurses in two hospitals in Jordan and found a moderate level of structural empowerment reported by the participants. Furthermore, a study by Di Napoli et al. [31] showcased high levels of both structural and psychological empowerment among nurses attending the National Association of Orthopedic Nursing annual conference. In contrast, Saleh et al. [3] reported a low degree of psychological empowerment among nurses in two hospitals in Jordan.

Within the realm of structural empowerment, the study identified that informal power received the highest rating among various constructs. This finding suggests that nurses place immense value on personal relationships, considering them to be more influential than other aspects of structural empowerment. Conversely, access to information was rated the lowest, indicating that nurses perceive limited availability of pertinent information. Prior research conducted in Iran, Saudi Arabia, and Bangladesh has yielded equivalent results regarding nurses' perception of access to opportunities and support being the highest-rated components, while formal power tends to receive the lowest ratings [28, 32]. In a study by Orgambídez-Ramos et al. [18], access to opportunities and informal power were also ranked highest, while access to resources received the lowest rating among the components of structural empowerment.

TABLE 2: Descriptive statistics and correlations between structural and psychological empowerment among the studied clinical nurses.

	Min-max	Mean ± SD	1	2	3	4	5	6	7	8	9	10	11
(1) Structure empowerment	24–95	64.24 ± 14.59											
(2) Access to opportunities	3–15	11.01 ± 2.67	0.78***										
(3) Access to information	3–15	9.44 ± 3.28	0.79***	0.51***									
(4) Access to support	3–15	10.56 ± 2.72	0.83***	0.66***	0.59***								
(5) Access to resources	3–15	11.20 ± 2.93	0.80***	0.59***	0.51***	0.60***							
(6) Formal power	3–15	9.83 ± 2.62	0.84***	0.58***	0.64***	0.61***	0.61***						
(7) Informal power	4–20	12.21 ± 3.59	0.85***	0.56***	0.56***	0.66***	0.61***	0.71***					
(8) Psychological empowerment	16–60	46.85 ± 8.12	0.73***	0.59***	0.50***	0.62***	0.69***	0.60***	0.61***				
(9) Meaning	5–15	12.31 ± 2.31	0.61***	0.53***	0.35***	0.54***	0.62***	0.47***	0.49***	0.85***			
(10) Competence	5–15	12.00 ± 2.16	0.52***	0.49***	0.32***	0.46***	0.53***	0.37***	0.43***	0.84***	0.68***		
(11) Self-determination	3–15	11.37 ± 2.50	0.68***	0.50***	0.51***	0.54***	0.61***	0.58***	0.59***	0.87***	0.61***	0.65***	
(12) Impact	3–15	11.17 ± 2.52	0.69***	0.51***	0.51***	0.58***	0.60***	0.61***	0.56***	0.85***	0.62***	0.59***	0.69***

*** $p < 0.001$.

TABLE 3: Influence of structural empowerment on psychological empowerment of the studied clinical nurses.

	Unstandardized coefficients		Standardized coefficients	t
	B	Std. error	β	
Constant	11.45	3.70		3.10**
Age	0.46	0.17	0.37	2.76**
Education[a]				
Education (bachelor)	−2.61	0.81	−0.16	−3.21**
Education (postgraduates)	−0.06	2.44	0.00	−0.03
Experience	−0.26	0.15	−0.23	−1.69
Structure empowerment	0.38	0.02	0.69	17.17***
R, R^2, adj. R^2, F			0.76, 0.58, 0.57, 78.52***	

**$p < 0.01$, ***$p < 0.001$. [a]: dummy reference group, technical education degree.
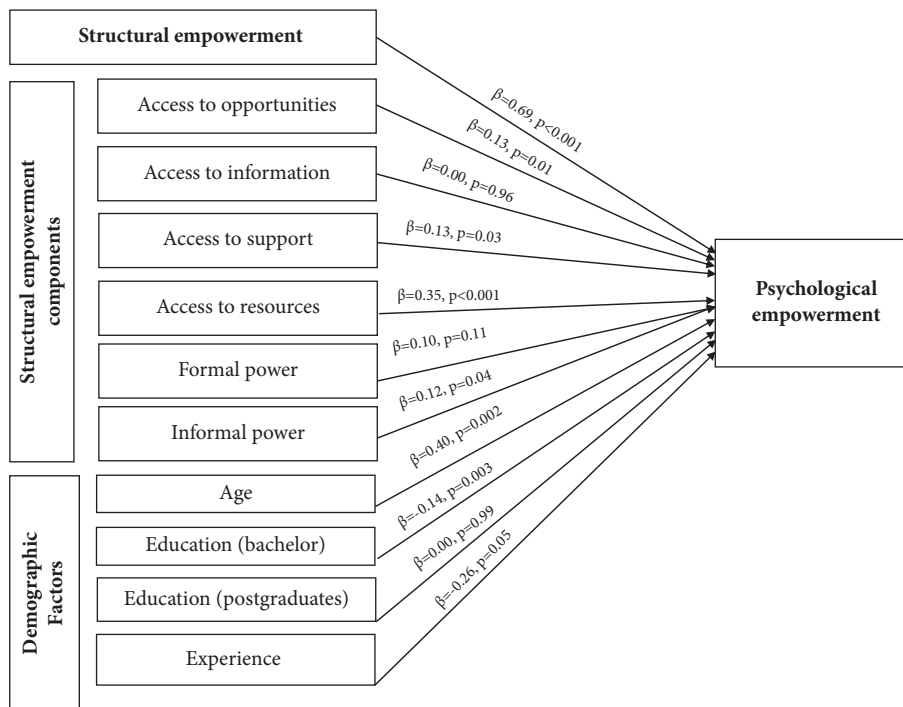
FIGURE 2: The proposed model of the study with standardized coefficients. Standardized coefficients and actual p values of structural empowerment in the first hierarchical regression analysis. Standardized coefficients and actual p values of structural empowerment components and demographic factors in the second hierarchical regression analysis.

TABLE 4: Influence of structural empowerment factors on psychological empowerment of the studied clinical nurses.

	Unstandardized coefficients		Standardized coefficients	t
	B	Std. error	β	
Constant	8.96	3.68		2.43*
Age	0.50	0.16	0.40	3.08**
Education[a]				
Education (bachelor)	−2.37	0.79	−0.14	−3.01**
Education (postgraduates)	0.04	2.37	0.00	0.02
Experience	−0.30	0.15	−0.26	−1.98
Access to opportunities	0.41	0.16	0.13	2.50*
Access to information	0.01	0.13	0.00	0.05
Access to support	0.40	0.18	0.13	2.21*
Access to resources	0.98	0.15	0.35	6.61***
Formal power	0.31	0.19	0.10	1.63
Informal power	0.28	0.13	0.12	2.08*
R, R^2, adj. R^2, F			0.79, 0.62, 0.60, 44.38***	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$. [a]: dummy reference group, technical education degree.

Regarding the components of psychological empowerment, the nurses in this study ranked meaning as the most significant factor. This finding suggests that nurses derive a sense of purpose and fulfillment from their work, recognizing the value and significance of their roles. On the other hand, the impact was deemed the least significant, indicating that nurses perceive themselves as having less influence over their work environment and decision-making processes. These findings align with previous studies conducted by Di Napoli et al. [31] and Kebriaei et al. [33], which also highlighted the importance of meaning in nurses' psychological empowerment. However, it is worth noting that Saleh et al. [3] found that competency ranked the highest among the psychological empowerment factors, followed by meaning, self-determination, and impact. In addition, Moosavi et al. [34] reported that competence was perceived as the most significant factor, while self-determination and trust were rated the lowest.

6.2. Influences of Structural Empowerment and Demographic Factors on Nurses' Psychological Empowerment. The study findings revealed a positive influence of structural empowerment and older age on nurses' psychological empowerment, supporting hypothesis 1 (H1) and partially hypothesis 2 (H2). Structural empowerment particularly in terms of access to opportunities, support, resources, and informal power had positive influences on nurses' psychological empowerment, thereby providing support for hypotheses 1 (H1), H1a, H1c, H1d, and H1f. These findings can be justified through various mechanisms. First, access to opportunities allows nurses to participate in professional development programs and acquire new skills contributing to their sense of competence and the confidence in their rules. Second, support they received from colleagues and supervisors fosters a supportive work environment, where their contributions are valued leading to increased empowerment. Certainly, having access to essential resources such as information and the tools enhances necessary efficiency and effectiveness, reducing potential sources of frustration and disempowerment. Lastly, informal power enables nurses to have a voice in a decision-making process, giving him a sense of influence and autonomy over their work. These combined factors illustrate multifaceted nature of structure empowerment in positively impacting nursing psychological empowerment which in turn can enhance their job satisfaction and well-being. However, it was observed that nurses with a bachelor's degree showed a negative association with psychological empowerment, indicating that they may experience lower levels of empowerment compared to those with different educational backgrounds (partially support H2). This negative association between nurses holding a bachelor's degree and psychological empowerment may be due to transition shock and discrepancies in role expectations. Nurses with higher educational qualifications may have higher expectations of their roles and responsibilities, which can lead to feelings with disempowerment if these expectations are not met in practice. The study by Karkkola et al. [35] revealed that there exists a positive relationship between role clarity and subjective vitality in the workplace, which can be attributed to increased levels of autonomy and competence. Conversely, a negative association was observed between role conflict and subjective vitality at work, which can be attributed to decreased levels of autonomy and relatedness.

These findings align with previous research conducted by Aggarwal et al. [36], which demonstrated a positive correlation between structural empowerment and its constructs with psychological empowerment, except for access to resources, which showed a negative correlation. Similarly, Di Napoli et al. [31] reported a positive correlation between structural and psychological empowerment. Stewart et al. [19] also found consistent results, confirming a positive correlation between access to opportunities and support and nurses' psychological empowerment. Furthermore, meta-analysis research conducted by Zhang et al. [5] supported a positive correlation between structural and psychological empowerment in nurses. Orlowska and Laguna [2] conducted a research study that indicated a positive relationship between structural empowerment at the hospital department level and nurses' sense of competence and autonomy, which is referred to as psychological empowerment. Empirical studies examining the mediating role of psychological empowerment in the presence of structural empowerment as an independent variable also supported the positive relationship between structural and psychological empowerment [1, 6, 10, 13]. In addition, Zeb et al. [37] identified three main themes that influence nurse educators' psychological empowerment: poor organizational structure, dynamics of educators-academic administrators' relations, and educational tools and physical environment.

The relationship between structural empowerment and psychological empowerment yields numerous benefits for individuals and organizations alike. When employees feel empowered, they are more likely to experience increased job satisfaction, motivation, and engagement [3, 22]. They also tend to exhibit greater creativity, productivity, and innovation. By investing in structural empowerment initiatives, organizations can create a positive work culture that fosters psychological well-being and drives overall success [4, 8, 14, 27]. In this line, the study by He et al. [38] reported that nurses' work engagement serves as an important mechanism through which their psychological capital influences the satisfaction of elderly cancer patients. The relationship between nurses' psychological capital and work engagement is also positively moderated by job resources, indicating that the presence of these employment resources amplifies the influence of nurses' psychological capital on their level of work engagement. This finding suggests that workplace resources serve as enhancers, intensifying the relationship between nurses' positive psychological perspective and their level of work engagement [38]. Recent mediation studies revealed that structural empowerment had a positive effect on psychological empowerment that ultimately led to positive consequences. In other words, psychological empowerment is an underlying mechanism that explains why structural empowerment is positively related to positive outcomes. For instance, the study by Yu

et al. [29] found that psychological empowerment plays a mediating role in the relationship between nurses' perceptions of decent work and work immersion. The study by Şenol Çelik et al. [9] found that both structural and psychological empowerment can reduce burnout among nurses and improve patient care quality. Psychological empowerment played a partially mediating role in the relationship between transformational leadership and burnout [39].

The present study is in the same line with Ouyang et al. [40], who reported that psychological empowerment was significantly different concerning age and length of service among nurses. Also, Browning [41] showed a positive connection between psychological empowerment and age, experience, collaboration in end-of-life care conferences, and education. Empirical research studies confirmed that there were no significant relationships found between age, gender, marital status, educational level, hospital-employed (community, academic, or other), type of employment (permanent or temporary), years in the profession, years worked in present facility, or type of unit worked on (medical, surgical, intensive care, obstetrics, pediatrics, operating room, postanesthetic care, psychiatry, emergency, ambulatory care, or other) and structural and psychological empowerment [11, 42, 43]. The Filipino study by Tan and Conde [15] revealed that a nurse's level of empowerment increases as the nurse grows older who becomes tenured at work and embodies higher empowerment qualities and performances.

6.3. Limitations and Future Research. While this study provides valuable insights, it is essential to acknowledge its limitations. The utilization of a cross-sectional design imposes limitations on our capacity to demonstrate causal linkages over an extended period. The utilization of a convenience sample derived exclusively from hospital units may impose constraints on the extent to which the findings can be extrapolated to a more comprehensive healthcare setting. Moreover, the utilization of self-reported data entails the possibility of encountering response and social desirability biases. Therefore, longitudinal studies can provide insights into nurse empowerment over time, identifying key points in their careers for effective interventions. Comparative research across different healthcare settings can uncover variations in the relationships between empowerment, demographics, and psychological empowerment, informing targeted interventions. Qualitative studies can explore the experiences of empowered nurses, offering nuanced insights for organizational improvements. Intervention studies can evaluate the impact of empowerment initiatives on nurses' psychological empowerment and patient care outcomes, providing evidence-based interventions. Multinational studies can explore how cultural factors influence empowerment and demographics, contributing to a comprehensive understanding. Lastly, researching the direct impact of nurse empowerment on healthcare outcomes can provide compelling evidence of the connection between empowerment and enhanced delivery of healthcare services.

6.4. Implications of the Study. The insights from this study offer valuable information for policymakers and clinical managers. They shed light on the significance of addressing clinical nurses' needs for access to opportunities, resources, support, and informal power, as satisfying these needs will enhance nurses' psychological empowerment and job performance. This understanding can inform policy decisions and managerial strategies aimed at improving job satisfaction, motivation, and nurses' sense of meaning and competence, all of which contribute to better patient outcomes.

Furthermore, the study underscores the importance of considering investments in structural initiatives such as the development of clear career paths and professional development opportunities as means to support nursing staff effectively. Also, the negative impact of holding bachelor's degrees on nurses' psychological empowerment can be addressed. These findings suggest that healthcare organizations may need to align job roles and responsibilities with qualifications of their nursing staff. Healthcare managers should implement mentorship program and leadership development initiatives that may help bridge this gap and foster psychological empowerment, regardless of their educational qualifications. Nursing programs should incorporate elements that enhance psychological empowerment such as resilience, coping strategies, problem solving, self-reflection, and self-efficacy.

7. Conclusions

In this study, we examined the influences of structural empowerment and demographic factors on nurses' psychological empowerment. Our findings shed light on the complex interplay of these variables within the context of healthcare settings. The key conclusions drawn from our research are as follows: (1) This study found a significant positive association between structural empowerment and psychological empowerment among clinical nurses. These findings suggest that nurses who perceive themselves as structurally empowered are more likely to experience higher levels of psychological empowerment. (2) The current study highlighted the impact of demographic factors on psychological empowerment. Age emerged as a positive predictor, indicating that older nurses tend to report higher psychological empowerment. Conversely, having a bachelor's degree was associated with lower psychological empowerment. These findings underscore the importance of considering demographic variables in understanding nurses' empowerment. (3) This study also revealed that access to opportunities, access to support, access to resources, and informal power dimensions of structure empowerment were identified as significant predictors of psychological empowerment. These dimensions represent critical aspects of the work environment that influence nurses' sense of empowerment. (4) The study found that clinical nurses reported moderate levels of both structural and psychological empowerment. (5) Access to resources received the highest rating among structural empowerment dimensions, while meaning was the highest-rated dimension of psychological empowerment. These insights can inform interventions aimed at enhancing empowerment levels.

Data Availability

The data used to support the study are available from the corresponding author upon request.

Conflicts of Interest

The author declares that there are no conflicts of interest regarding the publication of this paper.

Authors' Contributions

Ibrahim Abdullatif Ibrahim is the only author of this study and was responsible for the conception, design, execution, and interpretation of the research. Thus, Ibrahim Abdullatif Ibrahim was the corresponding author and was responsible for drafting and revising the manuscript and approving the last version of the manuscript.

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Research Article

Intensive Care Managers' Experiences of the COVID-19 Pandemic: A Dramatic Change of the Intensive Care Landscape

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Aim. To describe intensive care managers' experiences of premises and resources of care in intensive care units during the COVID-19 pandemic. *Background.* Intensive care units (ICUs) were enormously pressured during the COVID-19 pandemic from many ill patients, requiring advanced care. Hospital and community volunteers increased staff strength. Obligatorily, recruitments were also conducted using transfer of staff from different hospital departments. However, there is little knowledge about intensive care managers' (ICMs) experiences of leadership during the COVID-19 pandemic. *Methods.* A qualitative descriptive study was conducted from March to April 2022. Semistructured interviews were held with 12 ICMs who were purposively sampled from the ICU in ten Swedish hospitals. Data were analysed using qualitative content analysis. *Results.* Two themes emerged: a dramatic change of the intensive care landscape and we could handle more than we thought, but at a steep price. Participants described that the ICUs had to perform extraordinary changes at a very fast pace, which initially created a sense of cohesion. Training and introduction to war-like conditions associated with uncertainty meant that ICMs had to support ICU staff in prioritising interventions. Participants described how ICUs stood strong against a pandemic, but stress, worries, and anxiety took a heavy toll on ICU staff and ICMs. The pandemic eroded the resilience in ICUs. Participants described a deterioration in health and said that sick leaves and resignations occurred. *Conclusion.* Our findings show ICMs' experiences as a field of tension between resources and demands, whereby the changes created a heavy burden that left intensive care weakened. *Implications for Nursing Management.* Findings emphasised the importance of creating working conditions using human resources and materials in order to rebuild resilience in intensive care with the ability to conduct safe patient care.

1. Introduction

During the COVID-19 pandemic crisis, healthcare systems worldwide were enormously pressured by the millions of people who became ill, requiring advanced care in intensive care units (ICUs) [1–3]. ICUs faced challenges that had rarely been seen, such as increasing the physical and clinical capacity for care of highly contagious patients [4], which created unique demands for intensive care managers (ICMs) [5] in a way most had never experienced.

The clinical team providing care in an ICU is specially qualified, interdisciplinary, and interprofessional [6]. However, to meet demands, caused by the COVID-19

pandemic, healthcare organisations transferred and paired general care nurses and postgraduate nurses from specialties' such as anesthesia, operating theaters, and emergency rooms together with intensive and critical care nurses (ICNs) to increase the numbers of patients that could be treated in ICUs [7–9]. ICMs' coordination of large interdisciplinary teams requires administrative structure with designated medical responsibility, coordination of staffing, care needs, and establishing policies and priorities for ongoing patient care [6]. During the COVID-19 pandemic, the staffing coordination had to be organised in a new way. For example, the nurse-to-patient ratio in Swedish ICUs increased from 1 : 1-2 to 1 : 3 and was sometimes even higher [10]. At the same

time, ICMs and healthcare managers feared the safety and risk for infection for their own staff, as well as anxiety and overload in the work situation, and support from higher organisational levels became significant [11].

According to the National Corona Commission [12], Sweden's pandemic preparedness was marked by a slowness of response. The first patient with a COVID-19 diagnosis admitted to a Swedish intensive care unit (ICU) was on March 6, 2020, and during the year, a total of 4222 COVID-19-diagnosed patients were cared for in the ICU [13]. Before the pandemic, ICU capacity in Sweden was around 5 ICU beds per 100,000 inhabitants, one of the Western world's lowest numbers of ICU beds. During the first wave of the pandemic, Sweden doubled its ICU capacity by setting up temporary ICU beds (OECD/European Observatory) [4].

Preparedness, decision-making ability, and actions taken by organisational leadership in crisis situations are essential for managing resources and might affect patient outcomes [14, 15]. Adaptations in ICUs have been achieved at the cost of extreme pressure on staff and cancelled and postponed care [12]. The leadership has a crucial role in crisis situations, and important attributes are clear and fast communication, decision-making and fair prioritisations, building trust, and the leader competence [16].

In summary, the COVID-19 pandemic generated a worldwide sudden change in human health and healthcare, especially in intensive care. While several studies have focused on the critical care nurses' experiences and highlighted the need of good leadership and resilient organisations, there is a lack of studies focusing on the perspective of ICMs' experiences of leadership during the different surges of the COVID-19 pandemic. Therefore, the aim of this study was to describe intensive care managers' experiences of premises and resources of care in intensive care units during the COVID-19 pandemic.

2. Methods and Design

The conducted research is methodologically positioned within the interpretative qualitative research paradigm. The phenomena under study were explored and interpreted inductively in order to capture ICMs' first-hand experiences.

The inductive, qualitative study design included semistructured interviews that were conducted using an interview guide. The design provided the opportunity to access the ICMs' experiences. The data collected were thereafter analysed through qualitative content analysis [17]. The study method was compliant with the Consolidated Criteria for Reporting Qualitative Research (COREQ) checklist [18].

2.1. Setting.
Using the Swedish Intensive Care Registry, Swedish hospitals whose ICUs had at least 40 COVID-19 care sessions in the middle of 2020 were located. Prior to the pandemic, the ICUs in Sweden had one of the lowest capacities in the EU. Due to the high number of COVID-19 patients, the Swedish ICUs were at 80% capacity, a percentage that could have been even higher if there had been

more ICU specialist staff available [4]. In addition, there was initially no medical treatment or vaccine against the disease in Sweden or in all of Europe [19]. A shortage of qualified staff meant that anyone with an interest and opportunity could sign up voluntarily for work in ICUs, particularly in the big city areas. The ICUs faced shortages of personal protective equipment (PPE) for ICU staff, and some hospitals were forced to recycle disposable PPE after sanitation [4].

2.2. Participants.
Executive managers in intensive care departments in hospitals in the middle and north of Sweden were asked to give their consent to allow their organisations to participate in a study aimed towards ICMs experiences during the COVID-19 pandemic. Twelve managers with strategic and operative responsibility for ICUs at ten hospitals participated in the study. The participant group consisted of those who had worked as active ICMs during the COVID-19 pandemic. Among them were first-line managers with an operative role; others had strategic roles, such as hospital managers and managers for specific professional groups. Both male and female ICMs participated. All managers had an active background as a specialist physician or specialist nurse in intensive care, and all were cohabitating or married with children and between 40 and 64 years old. All managers had had the experience of introducing new intensive care staff, including anesthesiologists as colleagues and postgraduate nurses as managers.

2.3. Data Collection.
Thirteen ICMs at ten hospitals were identified via purposive sampling and approached via e-mail to participate in the study. One ICM who was approached did not respond to the e-mail invitation to the study. Data were collected remotely between March and April 2022 via digitally recorded interviews. This enabled compliance with Swedish social distancing requirements [20], while data collection from geographically distant participants could be arranged. The ICMs (Table 1) chose the time and location for the interview. Seven preferred the workplace and five chose their homes for their interview. The interviews were conducted separately by two of the authors (AN, $n = 6$ and AF, $n = 6$).

Data were collected through individual semistructured interviews, which lasted from 45 to 65 minutes, and these were voice-recorded and transcribed verbatim. Field notes were used and considered during the interpretation of each interview as a whole. The interview guide was constructed with open-ended questions to provide an opportunity for the ICMs to describe their own experiences (Table 2). The questions revolved around their management experience in intensive care units during the COVID-19 pandemic with special focus on critical care organisation in crisis, introduction of ICU staff with no previous experience in healthcare, as well as the introduction of ICU staff with experience in healthcare in general and intensive care in particular. Questions also revolved around priorities during the pandemic, supervision of students during a chaotic phase

Table 1: Characteristics of participating Swedish ICMs and workplace during COVID-19 pandemic.

Variables	n (%)
Sex	
Female	8 (67)
Male	4 (33)
Age in years	
40–50	6 (50)
51–60	2 (17)
61–	4 (33)
Spouse at home	12 (100%)
Children	11 (91%)
Experience as manager in years	
–5	6 (50)
6–10	5 (42)
15–	1 (8)
Profession	
Postgraduate nurse intensive care	9 (75)
Anesthesiologist	3 (25)
Participated in patient care themselves	
Yes	7 (58)
No	5 (42)
Intensive care accepted students	
Yes	8 (67)
No	4 (33)
ICU size during COVID-19, beds	
–10	4 (33)
11–20	5 (42)
21–	3 (25)

Table 2: Questions asked to ICMs ($n = 12$) about their experiences of care during the COVID-19 pandemic.

Can you please tell us about how reorganisations have affected your leadership during the pandemic?
How has the organisation handled supervision of students and new staff? What has that meant for you as a manager in terms of learning, introduction and continuing education?
Can you please tell us about the impact of the protective equipment on the work situation, learning and leadership?
Can you please tell us about priorities that have been made during the pandemic?
Can you please tell us about the support you have received as a manager?

in healthcare, and their personal experience of organisational support. Follow-up questions were asked to deepen the dialogue and enable reflection.

2.4. Data Analysis. The authors applied qualitative content analysis, as described by Graneheim and Lundman [17], to the interview text. Each interview was read through several times in order to gain a sense of the content as a whole. The entire text was then read in order to identify meaning units, guided by the aim of the study. The meaning units were condensed and sorted into subthemes related by content, constituting an expression of the manifest content of the text. The subthemes were related to each other and were then subsumed into two

themes, i.e., threads of meaning that emerged in the categories. The authors checked the analysis independently and then discussed their findings before reaching a final agreement.

2.5. Ethical Considerations. The study was conducted according to the Code of Ethics of the Declaration of Helsinki and adhered to the principles of confidentiality, integrity, right to self-determination, and privacy, as well as transparency and secure data processing. The study was given ethical approval by the Swedish Ethical Review Authority (Dnr 2020-04428). Along with a request for participation in the study, the participants received an information letter describing the aim and context of the study, principles for confidentiality, and the right to abort the study at any given moment. The researchers who conducted the interviews were not involved in any work at any of the ICUs where the ICMs were employed.

3. Results

The results showed that there is a dynamic force between a dramatic change of the landscape in intensive care and a personal and organisational cost that the change entailed. The result is structured as a field of tension with the two themes: a dramatic change of the intensive care landscape and we could handle more than we thought, but at a steep price, and their respective subthemes. Both the themes and the subthemes are two-sided, that is to say, all show some of the dramatic change in the intensive care landscape as well as the significant cost of these results (Figure 1). What is consistently reflected is not only the ICMs' experiences and perceptions but also their narratives and interpretations regarding what happened in the organisation, within staff groups, and to themselves personally. Each of the subthemes within its overarching theme is described with examples of quotes from the participants' transcripts. In order to not reveal the 12 participants, none of the reported quotes include demographic descriptors, such as the age or unit assignment of the participants.

4. A Dramatic Change of the Intensive Care Landscape

The COVID-19 pandemic constituted an unprecedented change in intensive care for ICMs and ICU staff. This change was distinguished by how quickly everything had to be done. Initially, the scale-up was characterised by a sense of cohesion and job satisfaction that stemmed from the fact that everyone understood that now was the time to stick together and take action. The somewhat war-like state could also, according to ICMs, trigger those trained in emergency medical care and intensive care to be allowed to use their knowledge. In this theme, a very large organisational change and its accompanying problems with prioritisation of resources are depicted.
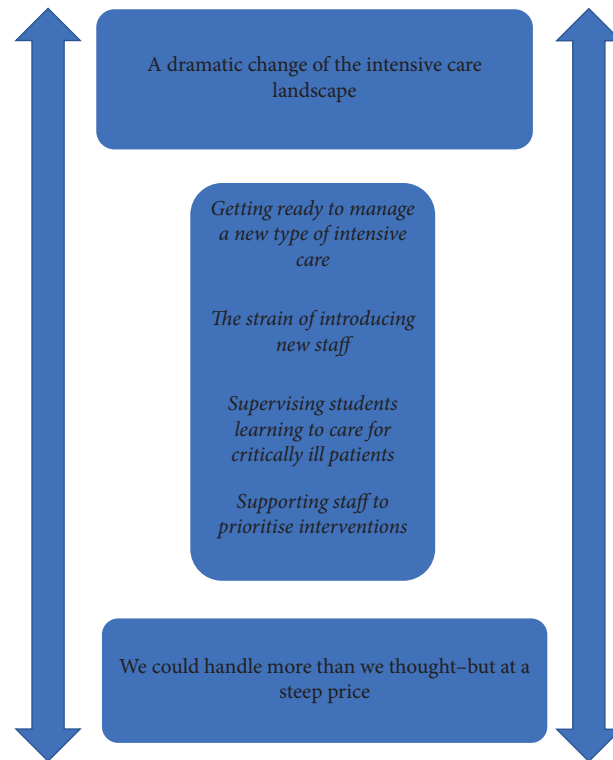
Figure 1: Findings on how the subthemes relate to the field of tension.

4.1. Getting Ready to Manage a New Type of Intensive Care.
The ICMs indicated that in order to manage intensive care with a sharply increasing number of patients, they were forced to quickly rearrange the premises and installations, since the modern ICUs with single rooms were too demanding of staff. Although the work had to be carried out under great time pressure amid much uncertainty, the ICMs describe that they as well as the ICU staff felt that the healthcare system was put to the test.

> Because it was, I mean, both the situation with the intensive care was completely different from any other intensive care we have ever conducted. . .and then you were worried about yourself. You were worried about your family at home. How would we keep from infecting each other? We would not infect each other, but there were—there were so many levels of that worry. ICM 1.

ICMs depicted how patients and ICU staff had to be moved to large open areas and open care floors such as postoperative units and recovery units where ICU staff could monitor several patients simultaneously, which meant that ICNs could move rather unhindered between different patients and communication was easy.

ICMs reported that the acquisition of medical equipment occupied a large part of the work. When the number of patients in need of critical care exceeded the ICU's capacity, managers described how they had to use anesthesia devices, old ventilators, and materials from storage. As the disease was new and unknown, the ICMs described a fear that the ICU staff would get sick and possibly die. Availability of,

trust in, and use of personal protective equipment (PPE) occupied a lot of ICMs' work. Communication with patients, relatives, and colleagues was affected by the PPE despite large name tags, and the staff had to raise their voices and even shout, making it very hard to have personal dialogue and confidential conversations even though they could not arrange it in a better way.

> But you can understand this afterwards. Of course, you're used to being able to sit quite close and have a dialogue with people and stuff like that; suddenly, it was impossible. ICM 2.

Since the ICU staff's fear, according to ICMs, partly evolved from being able to protect themselves from infected patients and colleagues, information to ICU staff and lot of cooperation with the hospital's own unit for healthcare hygiene was necessary. The educational challenges meant that ICMs had to inform the ICU staff and to create acceptance and trust for PPE. The ICU staff became worried when instructions and practical performance were contradictory, making them often refrain from battles when ICU staff used PPE in ways that were not recommended, regardless of whether involved in overuse or underuse of PPE. ICMs articulated that they had to choose their battles.

> I can still see that, because they discovered that if you wore a cap of some kind, the visor fit better. Then I thought, "I'll take on the necessary battles. That wasn't essential," period. ICM 3.

ICMs expressed that due to a lack of sufficient equipment and PPE at the hospitals, they had to introduce restrictions in use. The restrictions were difficult to implement since terrified staff took more equipment than necessary. In order not to waste equipment, ICMs had to instruct ICU staff not to go to the bathroom and almost force ICU staff to stay in the patients' rooms so as not to have unnecessary changes. Some ICUs had equipment for only single upcoming shifts, and ICMs describe how they calculated that PPE would last for only four more hours.

And it was hard to disguise so that the staff would not notice it, this with, well, partly the way they were sent in and partly the fact that we didn't have protective equipment. When they asked, I said, "Yes, it's no problem," but inside my stomach was a big pit. ICM 5.

The work of informing the staff was demanding for the ICMs, as there was constantly new information about the virus, treatments, and protective equipment. They provided a lot of information to ICU staff during the first wave, both in writing and verbally, and had to be very consistent in their information. They explained that there would be changes and there would be new procedures. At the same time, they had to be clear about the importance of following guidelines.

4.2. The Strain of Introducing New Staff. When the healthcare system had to mobilise to face the pandemic, ICMs started to recruit ICU staff. The ICMs, whose managers had contacts at European and Chinese hospitals, realised the seriousness of the situation and understood that a quick and powerful mobilisation was required. This clear set of demands was described as somewhat shocking, but with gratitude in hindsight, one ICM stated

I'm very happy that my boss was so determined, and "Now we have to." Because man, I can say that I myself was like this. Is it so urgent really? Will there be this many patients? ICM 6.

Advertising on social media sites such as Facebook was also used for recruitment. In order to match the need for ICU staff to monitor patients, anybody who applied and wanted to offer service was accepted. It was enough to have someone who could monitor the patients, ICMs said. The broad recruitment resulted in civilians with background from restaurants, theaters, shops, entertainment, and from the military, some ICMs reported. ICU staff close to patients, such as assistant nurses and nurses, were recruited from other units in the region, and ICMs indicated that they had to retain staff with adequate training but who had chosen other jobs because of staffing needs.

According to ICMs, internal recruitment of graduate nurses with an interest in critical care took place, and postgraduate nurses with experience in critical care in a broad sense were recruited internally and more or less forcibly relocated to the ICUs, causing some to be horrified and cry. It was common for nurses from emergency care, anesthesia, and operation rooms to be relocated to the ICUs. Postgraduate nurses in anesthesia (PGA), who were familiar with ventilators, were deemed suitable, as they were confident in handling patients in need of intubation, and thus, they were prioritised to perform those important interventions. Difficulties later arose when the patients were in need of intensive care nursing skills, since PGA skills primarily evolved around short-term care in anesthesia. ICMs reasoned that this was understandable since PGAs had chosen to not work in ICU. There were also ICU staff from other departments who did a fine job.

Then we also had...we also actually hired the new staff. Some came from the other hospital units and then thought that it was so nice here and it was so very good (laughs). So, we actually hired them...at ICU, yes. So, some... Absolutely, there were several who were unbelievably sort of... very able... They, got in this quickly and yeah, they adapted very well. ICM 7.

Experienced and retired ICNs or those who had left intensive care for other types of care were real assets, since they were able to move into the job quickly. ICMs said that it was obvious that special qualities were required from nurses to work in the ICUs. Some were unsuitable and did not cope with the tasks despite a long introduction. They were sorted out because the regular staff discovered shortcomings.

One realised quite quickly that it wasn't really possible to come in as..."nurse anyone" and manage this. It required some kind of...yes...knowledge in the area. ICM 2.

In order to prepare new ICU staff for the assignment, the ICMs had to arrange introductory training for new staff both centrally within the organisation and in their own critical care department. ICMs assigned student managers or experienced ICNs with pedagogical abilities to run the education. Initially, the introduction consisted of ICU staff just being put in patient rooms and having to stick to working the same shift ICMs indicated, but after a while, they had more time to structure the introduction.

To be able to organise the training of a large number of ICU staff, ICMs said they used both analogous aids, such as manuals and checklists, as well as digital aids, such as interactive digital training, recorded lectures, and films with technical equipment and approaches to various interventions. The ICMs described that the introductory training for unexperienced ICU staff started with limited values of importance and was shown how to monitor ICU patients and how to fill in information on an ICU curve. This was followed by bedside training, such as patient care, patient bedding, and changing the patient's position in bed. Several ICMs pointed out that a commonly occurring scope for training was three days and that graduate nurses received longer introductory training than the nurses with postgraduate education. Graduate nurses were introduced to arterial blood gas sampling and care of indwelling urinary catheters. Introductory programs in medical equipment and

overviews of various procedures, such as PDM systems, nursing records, lists for drug prescriptions, and documentation systems, were also common.

> We had to begin with that, so they couldn't do anything. Then it was because things calmed down a bit, or we had a bit more time to structure it, so we had small internal trainings. ICM 1.

ICMs described how unexperienced physicians were relocated to the ICU, and in order to learn ventilator treatment, they worked alongside an experienced anesthesiologist or intensive care physician. Due to the burden of care, double staffing was required, whereby physicians who worked in anesthesiology were relocated to intensive care units. Physicians without specialist training in intensive care but with experience in orthopedics and surgery were allowed to make rounds, write referrals, keep daily journal entries, and contact relatives.

4.3. Supervising Student Learning to Care for Critically Ill Patients. The ICMs disclosed that during the pandemic, both graduate and postgraduate students were conducting hospital-based education, as well as internships, but to a very small extent compared to before the COVID-19 pandemic. Due to the initial lack of PPE and fear that students would become infected, ICMs had to cancel all student activities. That may have also contributed to their disappearing from internships at the beginning of the pandemic, ICMs reported. When restrictions on PPE were eased and students and internships were allowed, masks affected the supervision.

> It was difficult to hear what they said. We had those Sundström masks, so you had to shout through them, and if you turned your head away, you couldn't hear what they were saying. So that only that made the supervision. . . the situation tough. ICM 1.

The multi-ill and complex patients constituted a patient group that was very suitable, especially for postgraduate nursing students, according to the ICMs, and the complexity and multiorgan failures created opportunities to learn a great deal. The ICMs also stated that they were careful to investigate whether any students did not want to care for these patients, but no students made that demand. Where students were allowed, the ICMs described an eagerness to care for patients and to arrange hospital-based education and internships. The students, together with their supervisors, had to care for patients with COVID-19 because no other patients were in the ICUs, and they had to take on the same responsibilities and carry out the same actions as students did before the pandemic.

> As they have been with us during the pandemic and seen so many seriously ill intensive care patients, you can say that they are full-fledged ICU nurses when they, uh, in practical terms, when they leave. They have learned an incredible amount. It has, after all. . . other staff did also. ICM 5.

4.4. Supporting Staff to Prioritise Interventions. The absolute majority of ICMs said that both medical and nursing priorities had to be made, as the volume of patients and their needs were far greater than the availability of beds and staff to perform all the procedures. ICMs described that their managers showed little understanding that the staff was exhausted and that general prioritisation regarding the transition to normal mode was necessary.

The medical priorities concerned when and if to end treatment and ICMs reported discussions about the indication for intubation. Initially, treatment was interrupted because there was a lack of knowledge as to whether the patient would be able to recover at all. Once effective treatment for COVID-19 evolved, there was a need for discussions among ICU staff regarding decisions as to when treatment should be terminated. According to ICMs, ICU staff reported ethical stress because of the patients who had been unsuccessfully treated earlier during the pandemic. They shared a fear that priorities made during the COVID-19 pandemic would seep out into the organisation and become the standard level for tomorrow's staff.

In order to balance ICU staff levels and patient needs for ICU nursing interventions, ICMs said that interventions such as change of body position in bed, bedding, bed washing, oral care, showering, and hair washing as well as mobilisation were not prioritised and at times omitted. Central IV-line bandage changing, cleaning, and changing equipment, such as ventilator hoses and infusion lines, were also thinned out due to the need for prioritisation. The ICUs management of medical equipment and drugs were also affected; monitoring of intravenous infusions and injections was carried out with less accuracy.

> We had to give up a lot of replacement routines and hoses would sit longer and so on. ICM 1.

The ICMs explained that lower prioritisation of interventions demanded ICU staff to lower their ambition because it was impossible to provide the same level of care as had previously been given. The ICMs indicated little or no ethical difficulties themselves in this—the important thing was that the patients would survive. Some ICMs tried to clearly communicate their responsibility for the down prioritisations and believed that staff doing their best possible was enough. However, it was challenging to motivate employees to perform care perceived as subpar, and staff needed reassurance that it was okay to prioritise other things; otherwise, conflicts could arise. According to one ICM,

> In this type of situation, when it was at its worst, it was about saving lives. And I know it caused ethical stress for both employees and managers, and that's what I said before. Maybe you didn't feel proud in every given situation, but it was actually lifesaving. And, of course, sometimes you felt that you were pushing the staff to the breaking point because you didn't really have a choice. ICM 9

The ICMs prepared lists to make it clear to ICNs that they did not have to provide all services that were typically performed in normal circumstances. ICMs also received help from staff to determine the three absolutely most important measures. In addition to supporting the staff in determining which nursing measures were most important, ICMs created opportunities for debriefings with psychologists, occupational healthcare, and other crisis support. The reflection sessions were described by ICMs as urgent, and staff relayed that they were able to persevere in relation to priorities.

5. We Could Handle More than We Thought, but at a Steep Price

No, but I would not ever want to be without it really, but I. . .but I don't want to be part of it again either. I can say that (laughs). ICM 8

The ICMs depicted the COVID-19 pandemic as a period that encompassed efforts that put intensive care at its peak of both shortcomings and strengths. Intensive care had the power to gather and stand against a pandemic, but the activities came with an economic cost and caused stress, worry, and anxiety among people working in the ICUs. Higher prioritisations and care below the perceived lowest level took a toll on ICNs and sick leaves followed. Confidentiality and patient safety were subjected to severe tests as resources to uphold the same level of care as before were not available. In this theme, lessons and insights from a very stressful period in intensive care and its effects on individuals and the organisation are depicted.

5.1. Getting Ready to Manage a New Type of Intensive Care. ICMs described a situation where the first intensive period of upscaling of resources demanded an enormous amount of their capacity and their stress tolerance was put to the test as available PPE was insufficient for critical care in Sweden, both in the amount and to meet the requirement level. ICMs indicated that they worked many hours and that spending time with family, training, and social activities became deprioritised. ICMs also talked about their fear of infecting family and loved ones. They were forced to make decisions loosely due to a lack of resources. The systematic quality of personnel work was deprioritised and their work was instead characterised by "putting out fires." The experience of persuading ICU staff to prioritise which interventions should be carried out and maintaining care for so many seriously ill and infectious patients was described as extremely difficult.

I think that this [caused]ethical stress from our employees as well. They felt that they could not always do as good a job as they would like to do. This obviously transferred to the management so we had to harbor the ethical stress and then we're also expected to maybe come up with solutions that we, that we didn't have. ICM 9

The lack of resources and the insufficient number of experienced ICNs and ICU staff led to the work being carried out unreflectively and thoughtlessly. ICMs also stated that monitoring of the drug supply could not be carried out with the same accuracy as previously, and the initial lack of drugs with Swedish instructions resulted in medical injuries and impaired patient safety. The initial limitation of the ICU staff's access to PPE was perceived as very burdensome, and it caused strong concern. They were not able to inform the staff, even though the managers understood that secrecy was maintained with the best of intentions.

But I think many of us felt that no matter how much you work, it's not enough. We didn't have enough resources to handle this. Many decisions were made on bad grounds. ICM 2.

To manage the increasing number of patients, open care floors in postoperative units were used, and these meant that confidentiality was breached.

They were, you know. . .old men with their bums in the air. One of them was alert enough to hear what everyone else was saying and then sort of asked: "Yes, but how is Gunnar?" "Yes, do you know him?" "No, but I heard what you're saying." Just like that, ethics was "pfft." Yes, we had to do everything that was in one's power, but premises and shielding were not available. ICM 10.

Emotionally, ICMs expressed a feeling of inadequacy in working with their staff, and some indicated that they distanced and isolated themselves from staff at times in order to cope with the situation. This could manifest itself in their not being able to participate in activities with several people in the unit, or choosing to eat lunch in privacy, or leaving the workplace on breaks just to be left alone. The ICMs also said that the heavy workload led to their being short-tempered with each other and that they were forced to shut down their emotions in order to be able to manage and motivate the staff, and that they sometimes experienced tunnel vision and irritability. When surrounding departments were able to carry out personnel work, ICMs described feelings of jealousy and irritation by the situation because they chose not to come and help.

But maybe I've left (the unit) at certain moments of the day, just left. I've gone with my lunch bag to get away for a while. I've closed the door to my office more. I've been working from home more. ICM 8.

5.2. The Strain of Introducing New Staff. According to the ICMs, the ICNs were heavily burdened, partly with the introduction of ICU staff in patient care and partly when their own ambition for good care failed due to staff shortages. Various attempts were made to organise responsibility for the patients, where ICNs would have overall nursing responsibility and work together with experienced ICU assisting nurses and ICU staff to care for from one to six

patients. The attempts were described by ICMs as organised chaos and often resulted in the ICN's attention being fragmented. It was apparent to those concerned that introduced ICU staff did not administer care that they felt was sufficient.

And again, I return to the fact that our usual staff of nurses and assistant nurses were very heavily employed, because they were supposed to both manage intensive care in a good way, which is in line with the…the feeling that "I'm doing something good." And then you have to introduce, and then you still had to face that things did not work, because sometimes they didn't…so, I think that many in that group and also among the physicians felt this. Well, you could call it ethical stress or whatever you want to say. ICM 2.

The leadership and responsibilities were sometimes unclear to the ICMs. The introduced ICU staff were caught in limbo as their ordinary managers were unaware of what they did or how they felt, despite their wish for their managers' commitment. Some ICMs expressed that it was nice to avoid responsibility for certain personnel issues with the ICU staff you did not know. At the first wave of COVID-19, newly introduced staff from other nearby units, such as anesthesia, ER, and surgery, were easy to recruit, but interest dropped sharply over time.

It turned out in retrospect that those who had a manager elsewhere actually had NO manager. We tried to bring them into our groups, but it didn't work. I have to say that it wasn't optimal; no one really had time or could do it. Their managers had no idea what they were doing in our unit, how it was like. I don't think I saw anyone's manager who came and checked: "How are my girls and boys doing? how are they being cared for?" They became ours and afterwards they just returned back. It also meant that almost no one wanted to come back [to the ICU] - no one came back in the other waves either. And when we reflected with them, this is what they experienced as the absolute most burdensome thing, [they] had no one…their managers did not see them when they were struggling the most. ICM 1.

5.3. Supervising Students Learning to Care for Critically Ill Patients. The ICMs narrated that there was great fatigue among the ICU staff, which meant that staff were unable to supervise students in the same way as usual. The students were able to experience and learn a lot, but the ICU staff had to forego the calm pedagogical, reflective guidance due to lack of time. Those ICUs that had used peer learning as a method had difficulties maintaining this way of working and supervision became scattered. ICMs expressed that supervising postgraduate students could not be done with the same controlled pedagogy as previously.

What has been difficult with supervising, it was most of all, that everyone was so terribly tired. Maybe they couldn't quite cope in the same way…and…I think we had to give up calm pedagogical, reflective supervising (sigh). ICM 1

5.4. Supporting Staff to Prioritise Interventions. The ICMs expressed that due to the strained situation for the staff, the resources only permitted short-term essential nursing and medical interventions; other interventions were deprioritised. Patient safety measures, such as overlapping time for reports and nursing documentation, were deprioritised. Not prioritising routines for safe care, lowering the level of nursing, and deprioritising patient-related nursing interventions were major challenges for the ICU staff, and above all, for ICNs and enrolled nurses who were used to structure and control. It worked well for some, while many ICNs had great difficulties with the deprioritisation and called in sick as a result. When ICMs clearly sanctioned deprioritisations, conflicts subsided.

The newly recruited staff were described by ICMs as experienced and skilled graduate nurses, but they did not comprehend the situation for the patients. They had had enough, as it was with their task and the care could not be as thorough as usual. ICMs also said that the ICU staff were tired and worn out from long-term heavy workloads, where holidays could not be granted and emotional outbursts and tears were common.

ICMs said that their ICU staff described how they felt that their work effort was subpar and that they did not have the opportunity to supervise and support newly introduced staff, something that caused them anxiety. Further along, ICU staff expressed feelings of being interchangeable checkers in a game, and pandemic-related sick leave and dismissal occurred in all ICUs. ICMs described the staff's reactions as signs of moral stress.

I think that is one of the reasons why there was quite a lot of sick leave among the nurses back then. That you are used to being able to give almost everything to the patients when it comes to the nursing part, the medical part. But here we had to make a concession due to the number of patients. ICM 11

The prioritisations led to health issues according to ICMs. During health checks, ICU staff were in need of psychological help and support. ICU staff were diagnosed with hypertension, diabetes, abnormal thyroid function, and abnormal weight gain. Difficulty sleeping or having an unreasonable need for sleep also took a heavy toll on ICMs, who described deteriorating health with memory problems, hypertension, diabetes, and prediabetes as an effect of critical care leadership during the pandemic.

But there were many people who, before I went on holiday, thought that I was sick. […] They have told me that now. The price has been too high. I feel as if I have aged five, ten years in these two years. ICM 12

6. Discussion

This study focuses on ICMs' experiences during the COVID-19 pandemic in several Swedish hospitals. The main findings indicate that intensive care experienced a period of challenges unlike any other in modern times. Specifically, the findings offer explanations of these experiences as constant change due to new guidelines, imbalance of patients and resources, and the pressure to persuade the ICU staff to continue working even when they could not see any improvement. The main findings were related to the heavy process of change that swept over the intensive care units and how that burden left behind both an individual and organisational fragility regarding human resources. The result is structured as a field of tension with the two themes: a dramatic change of the intensive care landscape and we could handle more than we thought, but at a steep price, and their respective subthemes (Figure 1). The subtheme getting ready to manage a new type of intensive care is expressed as adaptation to rapid changes needed in ICUs. ICMs stressed that initially it was a titillating experience, which offered something new and challenging where their problem-solving skills were put to the test. During crises, they found that adaptation must be developed continuously and diligently. In the findings, ICMs' roles in allocating resources were expressed clearly. Such resources included suitable premises, ICU staff with adequate competence, and obtaining equipment and drugs appropriate for the unknown during this intensive care crisis [21]. This has also been described in earlier studies [22–24], showing the strain on managers in critical care during the COVID-19 pandemic as the need for resources was shared by healthcare organisations internationally.

From the ICNs' point of view, this has been described, for instance, by Cadge et al. [8] as presenting the following themes: challenges of working with new coworkers and teams, challenges of maintaining existing working relationships, the role of nursing leadership in proving information and maintaining morale, and the importance of institutional-level acknowledgement of their work. These results show many similarities with the findings of the current study from the ICU managers' perspective. Results show that both the ICNs and ICMs were in a demanding new situation where the leadership and support were of great importance for all involved staff. In addition, the care environment and organisation in the ICUs have been highlighted in studies as being of importance in performing satisfying work during the COVID-19 pandemic [7, 24].

In the subtheme, the strain of introducing new staff as a challenge was depicted both for the ICMs as well as for the staff who were responsible for the close patient training. ICMs indicated that having colleagues who could not manage the work took its toll on the staff, mainly ICNs and intensive care assisting nurses. The challenges faced by ICMs overlapped with previous studies [25–27], but from the perspective of ICU staff. In Vera San Juan et al.' [27] study, the support from the work environment and more experienced colleagues appeared as one key principle for redeployed ICU staff. In Poortaghi et al.' [28] study, managers

with a strong presence in the field were good role models for staff. According to Poortaghi et al.' [28] study, management of nursing staff during the COVID-19 pandemic included the appropriate recruitment, employment, replacement, and relocation of staff. To increase the quality of nursing care and patient safety, it is necessary to first examine the newcomers in terms of scientific and practical competencies and capabilities and then place them appropriately in combination with other staff in different departments [28].

White [24] showed the need for managers to focus on the well-being of the staff, especially in a means of reducing their anxiety and fears. The managers described ICU staff, especially ICNs, as having a need for constant communication about changing protocols for patient care and the need to reduce nurses' uncertainty about these changing interventions. Earlier studies [29, 30] also showed that managers' presence and availability were essential for their ability to support their staff. Managers who experienced high organisational stressors or high role stressors spent less time being present and available to their staff during the pandemic. In the current study, many ICMs could not be as present for staff as they desired due to their heavy administrative workload. As a consequence, this sometimes left ICMs feeling emotionally drained and wanting to be left alone. Considering the occurrence of burnout during the COVID-19 pandemic in ICNs and intensive care physicians [7, 31, 32], the feeling of wanting to be left alone expressed by ICMs' needs to be taken seriously by healthcare organisations or the ICMs may be the next group at risk for burnout.

The present study highlighted that supervising students learning to care for critically ill patients was an important, yet challenging issue. Consistent with previous studies that considered this issue [33], the present findings suggested ICMs need to balance demands for ICU staff supply during the pandemic and the risks for having students become infected due to lack of PPE. The present study underlined that allowing interns and postgraduate students to provide care during the COVID-19 offered them suitable patients who, in their severe illness, presented real-life challenges that are not always present in such quantity under such conditions and for such a long time.

Fredholm et al. [34] showed that postgraduate critical care nursing students learning in the ICU during the COVID-19 pandemic was a positive experience, as there were opportunities to care for many severely ill patients in need of mechanical ventilation, which allowed the students to connect to the patients and to experience authenticity in the ICU context. This shows that if students are given opportunities to form relationships in practice, even if the circumstances are not optimal, the general experience may work out positively.

Another crucial experience in supporting staff was to prioritise interventions, which ICMs had to face during the COVID-19. They had to support and impel ICU staff to deprioritise interventions such as oral care, pressure ulcer prevention, and change of dressing around intravenous access, which can be viewed as nonlife support interventions, yet very much connected to patient safety and high-quality care. Diminished patient safety and quality of care during

the COVID-19 pandemic were described from an ICU staff perspective [35]. Patient safety risks and patient safety infringement were stressed, and these were Swedish ICU measures that had to be taken during COVID-19.

In the present study findings, the ICMs indicated that they took responsibility for certain actions in order to relieve the burden of moral distress from the shoulders of ICU staff in general and ICNs specifically. They also had to downplay their own worries as managers and stand up and give the appearance of security and strength in order to encourage staff to provide care that could be described as subpar. This result is in line with findings from other studies [23, 24], although managers in the former did not describe a striving for consensus as the ICMs did in the present study.

Nicola et al. [36] found strategies to curb COVID-19 were brought to fruition as a result of combining strong leadership and coordinated, intersectoral responses. These strategies included being prepared and acting quickly, testing, tracing, triage, and transparent communication. During COVID-19, leaders have adopted numerous best practice models and leadership strategies. Compassionate, open, and highly communicative leaders can strengthen people around them [36].

ICMs expressed that they had been part of an unparalleled healthcare crisis, yet they learned a great deal much during the pandemic. This is in line with Broome's observation [37] of nurse leaders revealing that although the pandemic created challenges and pressure beyond their comprehension, they made it through with new strength. Our study confirms the experience of nurses involved in the care of severely ill COVID-19 patients as previously reported. Silverman [38] underlined the difficulties expressed by ICMs as uncertainty of how to response to a new illness by which they were overwhelmed, fear of being infected, and the effects different policies and models had on nursing. The findings in other studies [7, 39, 40] further emphasised that ICNs also experienced insecurities, fears, worries, and moral distress due to the effects the pandemic had on critical care. Worth considering is what effect would the pandemic have had on a Swedish well-staffed intensive care unit with sufficient resources to receive more patients.

As depicted in this study, intensive care has experienced a period of challenges unlike any other in modern times. Findings show the effects of the dramatic changes brought about by the COVID-19 pandemic.

The pandemic is viewed as a crisis, and this term was also mentioned by the ICMs. Some of their actions and interventions can be viewed according to Burnison [41], who described leadership in a crisis with the purpose of accelerating through it. The crisis management actions in the current study are in line with the steps outlined by Kane et al. (2012) as *anticipate, navigate, communicate, listen, learn*, and *grow*. These were strategies whose *pearls and pitfalls* mirrored the actions taken by managers in another healthcare crisis prior to the COVID-19 pandemic (Kane et al., 2021). In the present study, those *pearls* could be described as the truly commendable actions in the themes. The pearls of *anticipate* and *navigate* can be described as the agile efforts made by ICMs to get ready for the unknown.

The iterative upscaling of premises and resources would make it possible to remodel or build ICUs to manage the influx of patients. In *communicate* and *listen*, the pearls can be depicted as the clarity and honesty ICMs showed in the communication with the ICU staff, as they meant what they said but did not say everything they knew. They listened to the troubles reported by the ICU staff and strengthened the staff to provide care even when they were in doubt. Finally, *learn* and *grow* stand for the elevated insight acquired during the enormous pressure on the intensive care organisations during COVID-19. They managed it, even if the price was high.

6.1. Strengths and Limitations. The present study presents a sought after perspective regarding ICMs' experiences during the COVID-19 pandemic. Our study has managed to capture and describe the experiences of ICMs on different organisational levels, providing a varying and comprehensive assessment. The number of participants, given the total number of ICUs of the studied size in Sweden, is also a strength and contributes to trustworthiness and the transferability of findings. However, the interviews of the ICMs presented a challenge in regard to gaining access to in-depth personal experiences, as ICMs were eager to relate actual events more than their feelings emerging from these events. This was, however, detected early on during the interviews and allowed the two interviewers to respond by letting the ICMs first account for actual events, enabling more personal and deeper interviews later in the sessions. Such considerations contribute to the reflexivity in the study. The data analysis involved an open and lively discussion between authors, ultimately leading to consensus regarding findings. The latent two-sided structure of findings was a result of the independent analysis performed by the interviewing authors and, as such, considered a sign of both interpretative precision and rigor of findings.

7. Conclusion

The focus of this research was to draw attention to the heavy burden of managers responsible for ICUs during the COVID-19 pandemic. The pandemic constituted an extraordinary crisis in intensive care, characterised resulting from the expansive number of patients requiring advanced care. An extensive organisational change and its accompanying problems with prioritisation of resources have been depicted. Findings clearly show a field of tension between resources and demands, where premises and resources have been a rapid-changing entity of both material quality as well as in form of human resources. The prioritisation of resources has presented a heavy burden for the ICMs, who unreservedly all stated that they were able to handle more than they ever thought possible. However, the organisational, psychological, and physiological toll is evident. Research regarding the intensive care nurse shortages, workplace climate, sick leave, and intention to leave, moral distress, high workload, and burnout is suggested. Nevertheless, there were also examples of positive actions in the

crisis situation. Further research illuminating the reasons for staff retention and successful crisis management is needed.

Data Availability

Access to data is restricted due to promises of confidentiality for participants.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

AN, ÅE, MA, and AF designed the study, performed data analysis, and prepared the manuscript. AN and AF collected the data.

Acknowledgments

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Research Article

Job Satisfaction and Negative Coping Style Affect the Relationship between Transition Shock and Intent to Stay among Newly Graduated Nurses during the COVID-19 Pandemic

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Aim. The study is aimed at exploring the relationship between newly graduated nurses' transition shock, negative coping, job satisfaction, and intent to stay during the time of COVID-19. *Background*. The shortage of nurses is a global dilemma aggravated by the COVID-19 pandemic. It has been a hot topic in recent years to help newly graduated nurses transition smoothly. Transition shock is one of the essential indicators to describe the transition state of newly graduated nurses, which has a far-reaching impact on the intention of newly graduated nurses to stay in their posts. However, few studies have studied the mechanism behind this relationship, which may affect the effectiveness of retention strategies. *Methods*. A descriptive cross-sectional study was conducted from July to August 2021 in 31 tertiary hospitals in Shanghai, China. Participants comprised a convenience sample of 759 newly graduated nurses for surveys. Structural equation models were used to examine the study's hypothetical model. *Results*. The results showed that transition shock had a significant direct effect on job satisfaction ($b = -0.412$, $p < 0.001$) and intent to stay ($b = -0.145$, $p < 0.001$). Job satisfaction had a significant direct effect on intent to stay ($b = 0.702$, $p < 0.001$). The indirect effect of transition shock on intent to stay through job satisfaction was statistically significant ($b = -0.289$), the 95% C.I. was (-0.493, -0.357), and the proportion of mediating effect to total effect was 66.59%. Moreover, the moderated mediation analysis showed that the interaction effect of transition shock and negative coping style on job satisfaction was significant ($b = -0.082$, $p < 0.001$). *Conclusion*. This study revealed the impact of transition shock on intent to stay of newly graduated nurses during the time of COVID-19, and found that job satisfaction played a mediating role and negative coping played a moderating role. These findings are of great significance for nursing managers to take measures to improve the intention of newly graduated nurses to stay. *Implication for Nursing Management*. The level of transition shock is an important indicator reflecting the transition state of newly graduated nurses, and can further predict the job satisfaction and intention of newly graduated nurses to stay. Therefore, nursing managers should pay attention to taking corresponding measures to reduce the level of transition shock of newly graduated nurses.

1. Introduction

For the recent decades, the shortage of nurses has been a global problem that needs to be solved urgently [1]. The nursing deficit will reach 6 million by 2030, according to the World Health Organization (WHO) [2]. In recent years, due to the aging of the population, the demand for nurses in various countries has been rising [3]. However, the impact of

the COVID-19 pandemic on the mental health of nurses may aggravate the nursing shortage in terms of burnout and anxiety caused by pandemic-related factors like high infection levels and ever-increasing workloads [4, 5]. Therefore, joining newly graduated nurses in the healthcare becomes especially important [6, 7]. Nevertheless, the turnover rate of newly graduated nurses is an increasingly severe problem [8]. The studies carried out around the world

showed that a great number of newly graduated nurses have the intent to leave the post within the first year of employment [9–11]. A Chinese study found that up to 74.4% of newly graduated nurses have the intent to leave the organization because of the stress in the transition period [12]. Hence, it has become a hot research topic in recent years to adopt the best strategy to help newly graduated nurses pass through the transition period smoothly, so as to improve the retention rate of newly graduated nurses in healthcare settings [13, 14].

It should not be overlooked that newly graduated nurses would go through a difficult time when they first enter work after graduation [15]. The transition shock of newly graduated nurses is defined as the disturbing or discordant experiences at the initial stage of role adaptation caused by the significant difference between theoretical and practical expectations and reality [15]. Duchscher explained the transition shock of newly graduated nurses from four perspectives: emotional, sociodevelopmental and cultural, physical, and intellectual factors [15]. If not adequately supported, nurses may be trapped in constant self-doubt and fear at this stage. Studies have shown that transition shock exists not only in newly graduated nurses but also in junior nurses with ≤5 years of service [16]. The excessive transition shock of newly graduated nurses may lead to a decrease in their professional quality of life [17] and even affect the safety of patients [18, 19]. The COVID-19 pandemic has made it more difficult for newly graduated nurses to overcome transition shock [20]. In addition to the inherent problems in the transition period, the prevalence of COVID-19 has also caused newly graduated nurses to face the impact of increased workload, reduced on-the-job training, and increased risk of contracting COVID-19 on their physical and mental health [21]. In China, newly graduated nurses are facing a similar situation. In view of the fact that some experienced nurses needed to go out to support mobile cabin hospital during the COVID-19 period, the newly graduated nurses faced greater work pressure [22]. Meanwhile, the COVID-19 pandemic also leads to inadequate preparations for entering clinical work, such as interruption of clinical practice, change in the form of classroom education, economic pressures, and increased concerns about delayed graduation [23]. All the changes mentioned above will cause increased negative emotions in newly graduated nurses in the transition period, which will evolve into a stronger transition shock [20, 24].

1.1. Transition Shock and Intent to Stay, Job Satisfaction. The definition of intent to stay of nurses refers to their views on the likelihood of staying in their current post [25]. The higher the nurses' intent to stay, the lower the burnout level of nurses, and the lower the mortality rate and the incidence of adverse outcomes of patients [26]. Moreover, retaining newly graduated nurses is beneficial to avoid wasting the training cost invested by hospitals in the early stage [27]. Studies have shown that good transition programs can help improve the retention rate of newly graduated nurses [27, 28]; although some qualitative studies have shown

a correlation between newly graduated nurses' satisfaction with the transition and their intent to stay [29, 30].

Multiple studies found that newly graduated nurses' job satisfaction and their intent to stay are closely intertwined [31, 32]. The more satisfied newly graduated nurses are with the job, the more likely they will stay at their current post [31–33]. Although Kim and Yeo found that the transition shock of newly graduated nurses might be associated with their job satisfaction, the mechanism remains unclear [34].

1.2. Transition Shock and Negative Coping. When experiencing transition shock, newly graduated nurses usually have negative emotions such as anxiety and depression [35, 36]. Therefore, they may adopt negative coping strategies to avoid unpleasant experiences [37, 38]. Coping styles are defined as the ideas or behaviors adopted by individuals to cope with adversity and stress [39]. Coping styles can be divided into negative coping and positive coping [40]. Negative coping refers to solving problems by avoiding or withdrawing, while positive coping refers to solving issues directly and rationally [40]. However, there is an asymmetry between negative coping and positive coping [41]. Compared with positive coping, negative coping has a more significant functional influence and is more susceptible to changes due to external intervention [38, 41, 42]. A study showed that negative coping could moderate the relationship between the self-efficacy of medical staff and the posttraumatic stress response caused by the COVID-19 pandemics [43]. Nevertheless, adopting negative coping will not change its destructive or threatening nature [44]. Instead, it just temporarily maintains personal feelings in a relatively good state [44].

1.3. Literature Summary. Considering the difficulties faced by newly graduated nurses in the transition during the COVID-19 period, the rigorous research is needed to identify the appropriate strategies to help them successfully survive the transition shock and improve their intent to stay. However, though previous studies have indicated the relation between newly graduated nurses' transition shock and their intent to stay [29, 30], the roles of negative coping and job satisfaction in the relation between the two have not been analyzed in depth in any literature, especially in the particular period of the COVID-19 pandemic. To this end, the major goal of the present study was to investigate the associations among transition shock, negative coping, job satisfaction, and intent to stay in a sample of Chinese newly graduated nurses during the COVID-19 period.

1.4. Theoretical Foundation and Research Hypotheses. The theoretical framework employed in this study based on the theoretical model of job retention, the theory of organizational socialization, and the conservation of resources (COR) theory.

According to the theoretical model of job retention, job satisfaction is directly related to the intent to stay of nurses, and their job satisfaction and personal characteristics
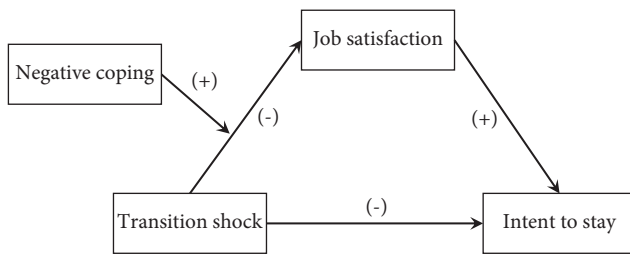
FIGURE 1: The theoretical model of this study.

indirectly affect their choice of retention through their intent to stay [45]. According to Ellenbecker [45], retention is defined as the extent to which nurses stay in their present jobs, and job satisfaction is defined as a positive affective orientation toward employment. The model effectively explains the relationship between job characteristics, job satisfaction, intent to stay, and retention rate.

Besides, organizational socialization, or onboarding, is defined as a process in which new employees become internal personnel of the organization [46]. Bauer and Erdogan [46] summarized the factors affecting the organizational socialization of new employees into the following three aspects: new employee characteristics, new employee behavior, and organizational effort. In the face of a new environment, a proactive personality and supportive organizational strategies help new employees adapt to the new organization [46]. After experiencing the role conflict of transition, newly graduated nurses finally achieve the results of organizational socialization through adjustment and adaptation with the help of joint effort between individuals and organizations [47]. The results of organizational socialization have been mainly measured by job satisfaction, retention, or turnover [47].

COR theory holds that individuals would always try to protect and preserve the resources they own and value [48]. Resources are divided into internal resources and external resources [49]. Internal resources include physical and emotional energy, while external resources include energy that an individual hopes to obtain from the outside world [49]. Newly graduated nurses may experience a loss of these resources when they experience transition shock [15]. When resources are lost, individuals often take the way of making up for or avoiding resource loss to deal with it [50]. In the process of avoiding further loss of resources, individuals may take the initiative to reduce their self-expectations of the role and adopt a negative coping style of feedback avoidance [51].

Therefore, on the abovementioned theoretical basis, the following hypothesis was proposed, and the theoretical model of this study was built, as shown in Figure 1:

(H1). Transitional shock has a direct negative impact on job satisfaction

(H2). Transitional shock has a direct negative impact on intent to stay

(H3). Job satisfaction has a direct positive impact on intent to stay

(H4). Job satisfaction plays a mediating role between transition shock and the intent to stay

(H5). Negative coping plays a moderating role between transition shock and job satisfaction

2. Methods

2.1. Design. A descriptive cross-sectional survey design was adopted in this study followed by the STROBE Statement: guidelines for reporting observational studies (see the supplementary file (available here)).

2.2. Settings and Participants. PASS 2021 was adopted for the calculation of sample size in the current study. According to the prevalence of retention intention in Chinese nurses (standard deviation (SD) = 0.67) [25], a smallest sample size of 690 newly graduated nurses was required, with power of 0.95 and alpha of 0.05. Assuming an attrition rate of 20%, a total of 828 newly graduated nurses were invited.

This study was conducted in 31 tertiary hospitals in Shanghai, China, which were selected through convenience sampling. The inclusion criteria in this study were newly graduated nurses with less than one year of work experience. The exclusion criteria were newly graduated nurses who did not work at the surveyed hospitals during the survey period (i.e., sick leave, participating in continuing education programs). The response rate was 91.7% ($n = 759$).

2.3. Data Collection. Data collection was undertaken from July to August 2021. Dr. Tang presented the project to the director of the nursing department in the hospitals and distributed the questionnaire electronically. Then, the nurses who meet the inclusion criteria received the questionnaire electronically to complete. The first page of the electronic questionnaire is the informed consent. Before entering the filling page, participants need to read the informed consent, including the research purpose, and rights and obligations, and click "Confirm to participate in this study" before entering the formal questionnaire filling page. All the participants were assured that their participation in the study was strictly voluntary and anonymous. After that, the first author collected the answers via the questionnaire database.

2.4. Measures. The questionnaire we used consists of four parts: the demographic datasheet, The Transition Shock of Newly Graduated Nurses Scale [52], The Trait Coping Style Questionnaire [53], and Nurse Job Satisfaction Scale [54].

The demographic datasheet comprises five questions related to age, gender, level of education, marital status, and native place.

The Transition Shock of Newly Graduated Nurses Scale (TSS-NGNs) was developed by Xue et al. [52]. Each item was rated on a 5-point Likert scale (ranging from 1 = "strongly disagree" to 5 = "strongly agree"). This scale consists of 27 items covering four dimensions entitled: "emotional" (8 items, e.g., "Sometimes I feel lonely and inferior"), "socio-developmental and cultural" (8 items, e.g., "I do not often

express my opinions in the department where I work."), "physical" (6 items, e.g., "My skin is getting rough and dry."), and intellectual' (5 items, e.g., "I do not know how to effectively cope with the doubts of patients and their family."). Cronbach's alpha coefficients ranging from 0.873–0.920 for the four dimensions and 0.962 for the total scale are explained in this study.

To assess the degree of negative coping, we adopted the 10-item negative coping subscale of Trait Coping Style Questionnaire (TCSQ) [53]. Each item was rated on a 5-point Likert scale (ranging from 1 = "strongly disagree" to 5 = "strongly agree," e.g., "Unpleasant things can easily cause my mood swings"). The scores indicate the tendency to use negative coping, with higher scores representing a greater tendency to use negative coping. The negative coping subscale has shown good internal consistency and test-retest reliability [53]. In the current study, Cronbach's alpha for the negative coping subscale of TCSQ was 0.895.

Nurse Job Satisfaction Scale (NJSS) was used to assess the degree of job satisfaction of newly graduated nurses [55]. The scale is composed of 38 items representing eight dimensions. Each item was rated on a 5-point Likert scale (ranging from 1 = "strongly disagree" to 5 = "strongly agree," e.g., "The doctor and I worked very well together"). In the current study, Cronbach's alpha was 0.954 for the total scale.

To assess the degree of intent to stay, we adopted the 6-item Nurses' Intent to Stay Scale (NITSS) [54]. Each item was rated on a 5-point Likert scale (ranging from 1 = "strongly disagree" to 5 = "strongly agree," e.g., "I never considered leaving the nursing post."). The second, third, and sixth items in the scale are negative items, the results of which are counted in reverse (e.g., "I would consider leaving my nursing position if other job opportunities (other than nursing) become available"). The scores indicate the degree of intent to stay, with higher scores representing a greater tendency to stay in the current position. The Cronbach's alpha was 0.77 and the content validity index was 0.97.

2.5. Data Analysis. Mplus7.0 was used to analyze the data. Descriptive analyses were performed using frequency, percentage, mean, and standard deviation. Pearson's correlation coefficient was used to examine the associations between the study variables. Structural equation model, which consists of a set of multivariate techniques that allow the researcher to test theory-guided hypotheses with clearly confirmatory ends [56], was utilized to test the hypothetical model of the current study. The maximum likelihood method was used to estimate the structural equation model, and the fitting of the structural model was verified by chi-square (χ^2)/degrees of freedom ratio (df), standardized root mean square residual (SRMR), root mean square error of approximation (RMSEA), comparative fit index (CFI), and Tucker–Lewis index (TLI). The $\chi^2/df \leq 5$, TLI and CFI ≥0.90, and SRMR and RMSEA ≤0.08 were a reasonable-fit [57]. Confirmatory factor analyses were performed to ensure the validity of the study construct. The nonparametric bootstrap was used for mediator testing, sampling was repeated 5000 times. Bootstrap and simple slope method were used to test the moderating effect. The p value was two-tailed, with values below 0.05 showing statistical significance.

2.6. Ethical Consideration. The participants were free to fill out the questionnaire or quit the study. In addition, data collection in this study was conducted on an anonymous basis, and the answers of participants are guaranteed to be used only in this study. Therefore, this study involved no unethical conduct or human clinical trial and would bring no adverse health consequences for the participants, physically or mentally.

3. Results

3.1. Participants Characteristics. The participants consisted of 700 (92.2%) women and 59 (7.8%) men. 75.0% of nurses were under 22 years and 25% were over 23 years. In the current study, 502 (66.1%) nurses had college degrees, 238 (31.4%) nurses had bachelor's degrees, and 19 (2.5%) nurses had master's degrees or above. Most nurses (73.4%) were single, whereas 24.9% of nurses had boyfriends or girlfriends and 1.7% of nurses were married.

3.2. Reliability and Validity. Reliability was analyzed to verify the measures used. The results of the study indicated that Cronbach's alpha values ranged from 0.829 to 0.962 for all scales, showing a high degree of internal consistency of each scale [58]. Confirmatory factor analysis showed that the four-factor model performed the best ($\chi^2/df = 3.076$, RMSEA = 0.052, SRMR = 0.041, CFI = 0.940, and TLI = 0.934) compared to other models (see Table 1), which proved the variables had good construct validity and discriminant validity.

3.3. Correlation Analysis. The values of the mean and standard deviation of the variables and the correlation matrices for the variables are presented in Supplementary Material Table 1. The average score of transition shock was (2.991 ± 0.813), job satisfaction was (3.280 ± 0.501), intent to stay was (3.433 ± 0.731), and negative coping was (2.830 ± 0.708).

Pearson's correlation analysis indicated that transition shock was positively associated with negative coping ($r = 0.623$, $p < 0.01$), and negatively associated with job satisfaction ($r = -0.547$, $p < 0.01$) and intent to stay ($r = -0.445$, $p < 0.01$). Furthermore, negative coping was negatively associated with job satisfaction ($r = -0.420$, $p < 0.01$) and intent to stay ($r = -0.313$, $p < 0.01$). Finally, job satisfaction was significantly and positively associated with intent to stay ($r = 0.638$, $p < 0.01$).

3.4. Hypothesis Test

3.4.1. Mediation Effects of Job Satisfaction. According to the results of path analysis (see Table 2 and Supplementary Material Figure 1), transition shock negatively predicted job

Table 1: Results of comparative confirmatory analysis.

Measurement model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	SRMR
Four-factor model (our hypothesized model)	1057.995	344	3.076	0.940	0.934	0.052	0.041
Three-factor model[a]	1901.146	347	5.479	0.870	0.859	0.077	0.061
Two-factor model[b]	4321.277	349	12.382	0.668	0.641	0.122	0.107
One-factor model[c]	4913.180	350	14.038	0.619	0.589	0.131	0.116

[a]This model combines transition shock and negative coping into one factor. [b]This model combines transition shock, negative coping, and job satisfaction into one factor. [c]This model combines all items into one factor.

Table 2: Results of JS as a mediator in the relationship between TS and STAY.

Criterion	Predictors	R^2	B	S.E.	t	p	95% CI	
JS	TS	0.354	−0.412	0.031	−13.370	<0.001	−0.478	−0.357
STAY	TS	0.545	−0.145	0.038	−3.829	<0.001	−0.216	−0.067
	JS		0.702	0.051	13.869	<0.001	0.614	0.810

TS: transition shock; JS: job satisfaction; STAY: intent to stay.

satisfaction ($b = -0.412$, $p < 0.001$), and H1 was supported. Moreover, transition shock negatively predicted intent to stay ($b = -0.145$, $p < 0.001$), and H2 was supported. Finally, job satisfaction positively predicted intent to stay ($b = 0.702$, $p < 0.001$), and H3 was supported.

We adopted the Bootstrap method to test the significance of mediating path. As shown in Table 3, the indirect effect of transition shock on intent to stay through job satisfaction was statistically significant ($b = -0.289$), the 95% C.I. was (-0.493, -0.357) which did not contain 0. Furthermore, transition shock also had a direct effect on intent to stay ($b = -0.145$), the 95% C.I. was (-0.206, -0.067) which did not contain 0. Thus, job satisfaction partially mediated the effect of transition shock on intent to stay, and the proportion of mediating effect to total effect is 66.59%. Hence, H4 was supported.

3.4.2. Moderating Effects of Negative Coping Style. The moderated mediation analysis (see Table 4) showed that the interaction effect of transition shock and negative coping style on job satisfaction was significant ($b = -0.082$, $p < 0.001$). The results in Table 4 indicated that the relationship between transition shock and job satisfaction was moderated by negative coping style, which means that H5 was supported.

The results of the simple slope test (see Figure 2 and Supplementary Material Table 2) indicated that, when the negative coping style was high, transition shock negatively predicted job satisfaction ($b = -0.463$, $p < 0.001$, bias-corrected confidence interval (BCCI) (-0.565, -0.376)). Moreover, when the negative coping style was middle, transition shock still negatively predicted job satisfaction ($b = -0.380$, $p < 0.001$, BCCI (-0.467, -0.303)), but the association was lower. Finally, when the negative coping style was low, the association between transition shock and job satisfaction was significant but the lowest ($b = -0.298$, $p < 0.001$, BCCI (-0.385, -0.216)). This result indicated that negative coping style regulated the relationship between transition shock and job satisfaction.

Table 3: Results of mediation model.

	B	S.E.	95% CI		Percentage (%)
Total effect	−0.434	0.037	−0.493	−0.357	100.00
Direct effect	−0.145	0.038	−0.206	−0.067	33.41
Indirect effect	−0.289	0.026	−0.338	−0.247	66.59

4. Discussion

The objective of this study was to explore the relationship between newly graduated nurses' transition shock, negative coping, job satisfaction, and intent to stay against the background of the COVID-19 pandemic. Firstly, it proved that transition shock of newly graduated nurses had a significant negative impact on their job satisfaction and intent to stay. Moreover, the results of this study showed that job satisfaction was partly mediated between the transition shock and the intent to stay. Finally, it was found that negative coping played a moderating role in the intermediary mechanism.

4.1. The Mediation of Job Satisfaction in the Relationship between Transition Shock and Intent to Stay. The results of this study showed that newly graduated nurses' transition shock was significantly negatively correlated to their intent to stay, which supported the results of previous studies [29, 59]. According to previous studies, the attrition rate of nurses was caused by the lack of confidence and the support available in the first few months of practice [28]. According to the transition theory of Duchscher and Windey, newly graduated nurses' transition period includes the doing, being, and knowing stages [60]. Their transition shock occurred in the first stage, the doing stage [60]. In addition, for millennial generation nurses, the main factors that made them stay at their posts were the alignment of organizational values, good coworker relationships, being recognized as a respected and valuable member of the team, and cutting-edge technology, such as resources and information easily accessible online [13]. These factors were exactly the important components in the transition shock faced by newly

TABLE 4: Results of moderated-mediation model.

Criterion	Predictors	R^2	B	S.E.	t	p	95% CI	
JS	TS	0.390	−0.380	0.040	−9.439	<0.001	−0.467	−0.303
	NC		−0.055	0.030	−1.851	0.064	−0.110	0.010
	TS ∗ NC		−0.082	0.021	−3.969	<0.001	−0.125	−0.043
STAY	TS	0.545	−0.142	0.037	−3.799	<0.001	−0.211	−0.065
	JS		0.702	0.051	13.893	<0.001	0.616	0.816

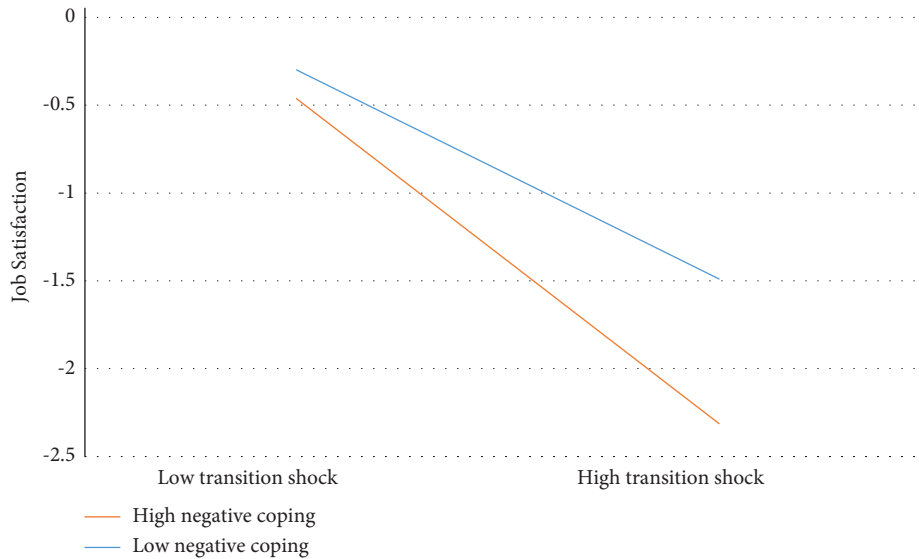TS: transition shock; JS: job satisfaction; STAY: intent to stay; NC: negative coping.

FIGURE 2: Moderating effect of negative coping.

graduated nurses [15]. Therefore, in order to improve newly graduated nurses' retention rate, adopting appropriate measures to reduce the level of newly graduated nurses' transition shock was a critical point at the present time.

The results of this study showed that newly graduated nurses' transition shock was significantly negatively correlated to their job satisfaction, which confirmed our hypothesis and was consistent with the previous study [18]. Meanwhile, the results of this study also showed that job satisfaction mediated between the transition shock and the intent to stay. The relationship between job satisfaction and the intent to stay was repeatedly proven [31]. According to the transition shock theory of Duchscher, newly graduated nurses might be unable to complete the work on time or balance their work and life due to a lack of knowledge and unfamiliarity with the environment at the early stage of clinical work, which was one of the sources of the transition shock experienced by newly graduated nurses [15]. Previous studies have confirmed that the problem of balancing work and life might affect employees' mental health and job satisfaction and their decision to stay in their organization [61]. In addition, other components of newly graduated nurses' transition shock, such as their relationship with colleagues, also had a profound impact on their job satisfaction [62].

4.2. The Moderation of Negative Coping in the Relationship between Transition Shock and Job Satisfaction. Furthermore, it was found in this study that negative coping moderated the relation between transition shock and job satisfaction. The newly graduated nurses who adopted high negative coping could better predict job satisfaction than those who adopted low negative coping, which meant that high negative coping aggravated the negative prediction of transition shock on job satisfaction. Negative coping was deemed as a manifestation of maladaptation. In the long run, it might trigger a series of externalizing and internalizing problem behaviors [40]. Externalizing problem behaviors, such as a cognitive attack, were specifically manifested as outward anger and hostility [63]. Anger was manifested as strong emotions, often in the form of frustration or annoyance. Hostility, however, was manifested as the bitterness, suspicion, and jealousy of others. Internalizing problem behaviors might induce depression and anxiety, resulting in a series of psychological problems [40]. Therefore, adopting negative coping imposed negative impacts on the transition shock of newly graduated nurses. Moreover, it was found that negative coping was associated with job burnout [17], which had been proven to be highly correlated to job satisfaction [64]. Kim and Yeo [34] explored the trend of newly graduated nurses' transition shock

and job satisfaction within one year and believed that the clinical environment was the only factor that can affect the transition shock and job satisfaction. The results of this study showed that the coping style adopted by newly graduated nurses themselves when faced with transition shock was also a non-negligible moderator. This was consistent with the theory of organizational socialization for newly graduated nurses. In this theory, in addition to the positive support strategies from the organization, positive personal characteristics were also crucial in helping newly graduated nurses adapt to the new environment [46].

According to the COR theory, when individuals lose resources at work, they might experience stress in the form of burnout, depression, and physiological outcomes [51]. In such cases, to avoid further loss of resources, individuals automatically lowered their self-expectations of the role, maintained low motivation, and adopted the negative coping style of feedback avoidance [51]. Although employees might psychologically seek to leave work and work-related people to cope with emotional exhaustion, conversely, they might try to increase their acceptance in the organizational system to obtain social resources, especially support from colleagues [65]. Newly graduated nurses who had just entered the workforce had relatively fewer job resources. As a result, they might adopt negative coping to reduce the loss of resources when faced with transition shock. Meanwhile, they were also eager to get support and affirmation from colleagues in the department [66]. A study showed that [67], cooperation with the same preceptor during the internship and induction training could help newly graduated nurses rapidly establish a sense of belonging and adaptation, and help them make a smooth transition. It should be noted that in a study in the United States, researchers set up a new post, the "Nurse Retentionist," which successfully reduced the turnover rate of newly graduated nurses [68]. Therefore, obtaining positive feedback from colleagues in the working environment was of vital importance for newly graduated nurses to reverse negative coping and actively face and overcome the transition shock.

In this study, on the one hand, how newly graduated nurses' transition shock influenced their intent to stay, i.e., the mediating effect of job satisfaction, was explained. On the other hand, the moderating effect of negative coping on the relationship between transition shock and job satisfaction was analyzed. Therefore, the results of this study were very important for nurse managers to develop more appropriate plans to help newly graduated nurses to go through the transition period smoothly and improve their intent to stay and retention rate.

5. Limitations

This study had some limitations. Firstly, the cross-sectional design of this study prevented us from drawing causal explanations. Therefore, the further longitudinal design needed to be taken into consideration. Secondly, the convenient sampling method was adopted in this study, and the samples were all from Shanghai, which was unfavorable to

the generalization of samples. Therefore, the source of samples could be further expanded in future research. In addition, due to the use of online self-rating measurement, there might be response bias in our study. Future research could use multiple sources of data and types of indicators to improve it.

6. Conclusion

In this study, the influence of newly graduated nurses' transition shock on their intent to stay against the background of the COVID-19 pandemic was explored. Furthermore, the mediating effect of job satisfaction and the moderating effect of negative coping therein were found. At present, due to the COVID-19 pandemic, the contradiction between nurse shortage and the growing demand for clinical care has become more intense. These results are instructive for nursing managers to help newly graduated nurses successfully survive the transition period and improve their retention rate.

7. Implication for Nursing Management

The following recommendations were made based on the results of this study: (a) the level of the transition shock is an important indicator that reflects newly graduated nurses' transition state. It can further predict their job satisfaction and intent to stay. Therefore, nurse management should focus on adopting the corresponding measures to reduce the transition shock of newly graduated nurses. (b) It is necessary for newly graduated nurses to adopt positive coping to overcome the transition shock. This means that in the management of newly graduated nurses in the future, in addition to the existing transition programs, attention should also be paid to cultivating positive personal psychology. Positive psychological intervention (PPI) is worthy of consideration. It was proven in previous studies that mindfulness intervention (mindfulness-based program) could help newly graduated nurses smoothly go through the transition period [69]. (c) According to the COR theory, positive feedback from colleagues in the organizational environment is also necessary for newly graduated nurses faced with transition shock. In the study by Zhang, it was expounded that mentorship could provide newly graduated nurses with the necessary psychological and social support [70]. Therefore, allocating mentors to newly graduated nurses may be considered. In addition, adding new roles such as nurse retentionist or peer support may also be considered. Given the situation of the COVID-19 pandemic and the dependence of millennial generation nurses on electronics [13], it is also a good idea to build online support schemes.

To sum up, this study provides new insights that nurse managers can use to develop strategies for promoting newly graduated nurses' retention intention. Cultivating positive personal psychology and provide psychological and social support from mentors or peer colleagues are all worth-trying approaches to mitigate the transition shock of newly graduated nurses.

Data Availability

The data that support the findings of this study are available from the corresponding authors upon reasonable request.

Disclosure

Dr. Yaqi Zhu and Wenjuan Tang are the co-first authors.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

Zhu Yaqi performed conceptualization, methodology, writing-original draft preparation, and visualization. Tang Wenjuan performed data curation and investigation. Zhang Yuanyuan was responsible for writing-review. Li Mengyao was responsible for software and formal analysis. Zhu Weiyi collected resources, supervised the study, and performed review-writing and project administration. Zhang Yaqing collected resources, supervised, and performed review-writing and project administration.

Supplementary Materials

Supplementary Material Figure 1: mediating effects of job satisfaction. Supplementary Material Table 1: mean value, standard deviation, and correlation of all variables. Supplementary Material Table 2: results of the simple slope test. (*Supplementary Materials*)

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Research Article

Job Satisfaction, Intention to Leave, and Related Factors among Foreign-Educated Nurses in Japan: A Cross-Sectional Study

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Aims. To examine the association between job satisfaction and the intention to leave and explore the factors associated with job satisfaction or the intention to leave among foreign-educated nurses in Japan. *Design.* A cross-sectional design was used, and data were collected through an online survey of nurses who were born and received their basic nursing education outside of Japan but are currently working as registered nurses in Japan. Data were analyzed across two phases: the first explored the related factors with intention to leave and job satisfaction using bivariate analysis and regression through IBM SPSS; the second examined the theoretical framework model using a structural equation model through IBM Amos. *Results.* Data from 180 participants (effective response rate: 87.4%) were analyzed. Overall, foreign-educated nurses reported moderate job satisfaction level in Japan. The final model showed good fit indices, indicating that higher workplace discrimination, lower Japanese language satisfaction, and not receiving orientation were predictors of foreign-educated nurses' lower job satisfaction. Lower job satisfaction, fewer years of nursing practice in Japan, single status, and higher language satisfaction predicted a higher intention to leave. *Conclusion.* This study provides incremental evidence of a negative relationship between job satisfaction and intention to leave among foreign-educated nurses in Japan. Workplace discrimination was the main predictor of nurses' job dissatisfaction and indirectly correlated with their intention to leave, as mediated by job satisfaction. *Implications.* Our study suggests that managers should provide a supportive and equal work environment, including implementing policies to reduce workplace discrimination and providing adequate support programs to enhance foreign-educated nurses' job satisfaction and reduce their turnover intention.

1. Introduction

With the global nursing shortage set to increase to over 36 million by 2030 [1], recruiting foreign-educated nurses has become a worldwide phenomenon. Foreign-educated nurses are those who were born and received nursing education in their countries of origin and are now working overseas [2]. More than 30% of nurses in Switzerland, Australia, and Israel are foreign-educated [3]. Japan has a small number of foreign-educated nurses because of public perception that the acceptance of migrants may threaten Japan's hermetic culture [4]. However, a national Japanese study by Hirano et al. [5] indicated that >80% of hospital managers were

interested in recruiting foreign-educated nurses. Global trends also indicate an increasing number of foreign-educated nurses in these receiving countries [3].

Foreign-educated nurses who want to work in Japan as registered nurses are required to undertake Japan's national nursing examination to obtain a nursing license [6]. In Japan, there are two main methods of recruiting foreign-educated nurses. First, the Japanese government began to attract healthcare workers, including nurses, nurse assistants, and others from Indonesia (2008), the Philippines (2009), and Vietnam (2014) under the Economic Partnership Agreement (EPA). The EPA program requires nurses to attend language and practical training programs in Japan.

During practical training, they can work as nurse assistants (candidates) to understand the daily nursing process, laws, and Japanese medical system. Additionally, Japan has a history of recruiting foreign-educated nurses from other countries such as China, Korea, and Mongolia. Unlike recruiting under the EPA program, training is not required for these nurses [6].

Studies have shown that migrants face many challenges in integrating and adapting to the working environments of receiving countries because of communication barriers, skill underutilization, and discrimination, all of which can affect their integration process [7–9]. Among these challenges, workplace discrimination from colleagues, managers, and patients has been frequently reported among foreign-educated nurses [10]. Workplace discrimination refers to unfair terms and preferences regarding personal characteristics such as race, sex, religion, and social status that impair the ability of individuals [11]; it has a serious effect on foreign-educated nurses' physical and mental health, making them feel unaccepted and devalued in the organization and team, impacting patient safety and reducing their job satisfaction [9].

Job satisfaction is an indicator of hospital performance in managing multicultural nursing workplaces [12] and is defined as the degree to which a nurse's job fulfills their perceived needs [13]. Numerous factors contribute to nurses' job satisfaction, including age, sex, supervisor [14], job position, and hospital retirement plan [15]. The intention to leave is linked to nurses' turnover behavior, which harms hospital management by influencing the quality of care [14]. Foreign-educated nurses' intentions to leave include not only leaving the organization or profession but also returning to their countries of origin. The turnover of foreign-educated nurses has a negative impact on employers, especially short-term turnover, which can increase the cost of human resources in hospitals [16].

Research focused on factors related to foreign-educated nurses' job satisfaction or intention to leave has been conducted worldwide [17–20]. A nationwide study of 1951 foreign-educated nurses in Canada found that the ones who were young and had fewer years of residence and nursing practice had higher job satisfaction than their counterparts [19]. Kim et al. [18] investigated 165 Korean nurses in the United States (US) and reported that the more the nurses were satisfied with their organizational commitment and culture, the more satisfied they were with their job. Alreshidi et al. [17] found that foreign-educated nurses in Saudi Arabia who were male, with higher education, and with fewer years of nursing experience (1–4 years) had higher turnover intentions than their counterparts. Perceived quality of orientation predicted organizational- and unit-level turnover intentions among 201 Asian nurses working in the US [20]. However, no studies have investigated job satisfaction or intention to leave among foreign-educated nurses in Japan.

Although the relationship between native nurses' job satisfaction and the intention to leave has been widely investigated, to the best of our knowledge, only one study has investigated the association between foreign-educated nurses' job satisfaction and intention to leave [21]. Goh and Lopez [21] reported that foreign-educated nurses in Singapore who wanted to leave their jobs had significantly lower job satisfaction than those who did not. Furthermore, no study has explored the role of job satisfaction as a mediator in the associations between factors such as workplace discrimination, language ability, demographic characteristics, and intention to leave among foreign-educated nurses.

There has been no research conducted in Japan to explore the correlation between job satisfaction and intention to leave among foreign-educated nurses, nor to identify the factors directly and indirectly linked to job satisfaction or intention to leave. By filling these gaps, this study could provide insights needed to develop a program or strategy for the adaptation and integration of foreign-educated nurses into the workplace environment.

2. Framework and Purpose

2.1. Theoretical Framework. Figure 1 shows this study's theoretical framework. The association between the influencing factors and the outcome variable (job satisfaction) was established based on Herzberg's two-factor theory [22]. Herzberg's two-factor theory, developed from Maslow's five-level hierarchy of needs theory, indicates that motivators and hygiene factors are two groups of elements that influence job satisfaction and dissatisfaction. The motivator directly corresponds to Maslow's highest level of need by asking "What do foreign-educated nurses want from their job?" This includes achievement, recognition, and advancement. Hygiene factors relate to Maslow's lowest needs level surrounding the job, including salary, physical working conditions, organizational policy and administration, and job security. Workplace discrimination was chosen as a hygiene factor because it is an important factor in protecting employees' job security [23]. Although the theory was constructed in 1959, it is still useful in many nursing studies today [24, 25].

The participant factors revealed foreign-educated nurses' characteristics based on previous studies, including socio-demographic characteristics and self-evaluated language ability. Self-evaluated language ability was chosen because previous research revealed that the language barrier was the most difficult for foreign-educated nurses to overcome in their new working environment [8]. Previous studies have empirically supported the association between job satisfaction and the intention to leave [14, 26]. Since the influencing or participant factors that affect foreign-educated nurses' job satisfaction and intention to leave may differ, the path relationship in Figure 1 is shown as a dotted line to demonstrate the exploratory nature of this study.

2.2. Purposes and Research Questions. This study aims to examine the relationship between job satisfaction and the intention to leave as well as identify the factors related to job satisfaction and the intention to leave among foreign-educated nurses in Japan.

We addressed the following research questions:

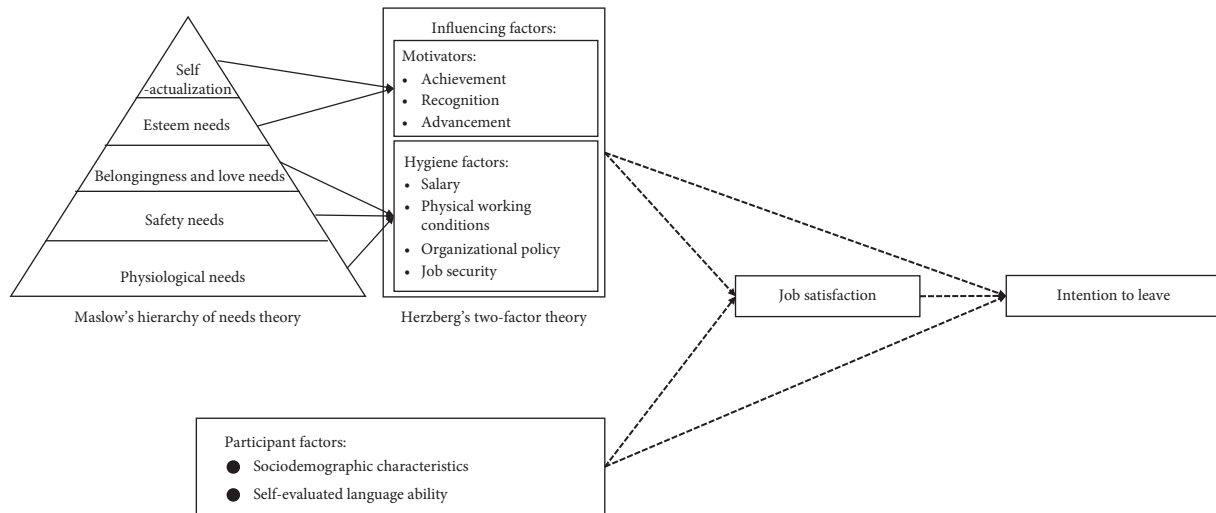(1) What is the level of job satisfaction and intention to leave among foreign-educated nurses in Japan?

FIGURE 1: Theoretical framework.

(2) What factors are related to their job satisfaction and intention to leave?

(3) Is there a relationship between job satisfaction and intention to leave?

3. Materials and Methods

3.1. Study Design. A cross-sectional study was conducted in Japan between June and August 2022. It followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for reporting observational studies.

3.2. Participants. This study recruited participants who met the following eligibility criteria: those who (1) were born and received basic nursing education outside of Japan; (2) had a Japanese registered nursing license; (3) were working as a nurse in Japan at the time of investigation; and (4) volunteered to participate in the study. The questionnaire was distributed to the participants by (1) e-mail including a survey link, through two organizations (one of the organizations actively trains foreign-educated nurses and recruits them; another is an organization for Chinese nurses in Japan), and (2) SNS messages (WeChat and Facebook) with a survey link that were sent through snowball sampling.

3.3. Sample Size and Power. This study's sample size was calculated using G∗Power. In total, 160 participants were needed for the correlation study with a power level of 0.90, a significance level of 5%, and an effect size (r) of 0.25. The selection of the effect size was based on a prior study which explored the association between foreign-educated nurses' job satisfaction and the intention to leave in Singapore [21].

3.4. Data Collection. Data were collected through a self-reported online Google Forms questionnaire. The questionnaire was available in both English and Japanese. To ensure accuracy, logical flow, readability, and ease of use, the questionnaire was piloted by members of our research team (including one nursing research expert and two fully experienced foreign-educated nurses). It took approximately 10–20 minutes to complete the questionnaire.

3.5. Variables and Measurement. The questionnaire comprised 8 sections with a total of 67 items. Items regarding influencing factors (hygiene factors and motivators) were chosen from a previous study that identified the factors related to nurses' job satisfaction according to Herzberg's two-factor theory [27] and studies that revealed the factors related to nurses' job satisfaction [15, 28]. Participant factors including sociodemographic characteristics and self-evaluated language ability were adapted from previous studies on foreign-educated nurses [18, 29].

3.5.1. Hygiene Factors and Motivators. Hygiene factors included orientation for foreign-educated nurses (received or not), working shift (i.e., day shift, night shift, both, or others), yearly gross salary, employment contract (i.e., no fixed contract period, <3 years, ≥3 years but <5 years, ≥5 years, and do not know the period), and workplace discrimination. Workplace discrimination was measured using a one-item question asking participants whether they perceived themselves as having experienced discrimination in the workplace [10]. A 5-point scale was used to rate the discrimination level (1 = rarely or never to 5 = very often or continuously), with higher scores indicating higher discrimination.

Motivators included current position (i.e., staff nurse, head nurse, deputy director, and others), nursing specialist course (yes vs. no), and setting (i.e., hospital, institute, clinic, and others).

3.5.2. Participant Factors. Sociodemographic characteristics included age, sex, marital status, education level, country of origin, country of obtaining basic (first-time) nursing

education, years of residence and nursing practice in Japan, Japanese permanent residence (yes vs. no), living situation (living with someone or not), area of work (in Japan), and working experience in their country of origin (yes, >2 years; yes, <2 years; and no).

Self-evaluated language ability included language confidence and language satisfaction. Regarding language confidence, participants rated their perceptions of how confident they were in their current proficiency in Japanese language on a 4-point scale (4 = confident, 3 = somewhat confident, 2 = not very confident, and 1 = unconfident) [30], and regarding language satisfaction, the participants assessed their satisfaction with their current proficiency in Japanese language on a 5-point Likert scale (5 = very satisfied to 1 = very dissatisfied) [31].

3.5.3. Job Satisfaction.
The Japanese version of the Mueller–McCloskey Satisfaction Scale (MMSS) was used to measure job satisfaction [32]. The MMSS consists of 31 items from 8 dimensions: extrinsic rewards, scheduling, family/work balance, coworkers, interaction, professional opportunities, praise/recognition, and control/responsibility. Each item was measured on a 5-point Likert scale, and the total score ranged from 31 to 155 (a high score indicated a high job satisfaction level). The scale has been translated into Japanese, and its reliability and validity have been examined in Japan [33]. Cronbach's alpha of the MMSS scale is 0.89 in the original version and 0.90 in the Japanese version. The researchers obtained permission to use this scale from the creator and the Japanese translator. Cronbach's alpha for the scale in this study was 0.94, which also showed good reliability.

3.5.4. Intention to Leave.
Based on a previous study, the intention to leave was measured through three dimensions: current organization, nursing profession, and Japan [34]. Participants were asked to rate their intention to leave through the following questions: "Are you considering leaving (1) your current organization, (2) nursing profession, or (3) Japan in the coming year?" The responses were scored as 1 = very unlikely or rare, 2 = unlikely, 3 = highly likely, or 4 = very likely. The possible score ranged from 3 to 12, with lower scores representing a lower intention to leave. Cronbach's alpha for the scale in the current study was 0.74.

3.6. Data Analysis.
Statistics like mean, median, and standard deviation were used to describe the study variables. The normality of the dependent variable (job satisfaction and intention to leave) was examined using the Shapiro–Wilk test and skewness and kurtosis distribution (±2). Job satisfaction and intention to leave were not normally distributed ($p < 0.05$) in the Shapiro–Wilk test, but the skewness and kurtosis values of job satisfaction (total and sub) were within 2 (the normal Q-Q plot was checked). Hence, job satisfaction was treated as an interval variable. Statistical analysis comprised two phases: the first phase was to identify the factors associated with job satisfaction or the intention to leave using SPSS, version 27 (IBM Corp.), and the second

phase was to test the theoretical framework model using structural equation modeling (SEM) through IBM Amos version 28. The level of statistical significance was set at $p < 0.05$.

Bivariate and multiple regression analyses were conducted in the first phase. An independent t-test or analysis of variance was conducted to compare job satisfaction difference among nominal variables (e.g., sex, marital status, and nationality), whereas the Mann–Whitney U test or Kruskal–Wallis test was used to compare the differences in intention to leave among nominal variables. Furthermore, the Pearson correlation test was used to examine the association among job satisfaction, age, years of residence and practice in Japan, education level, nursing experience in the country of origin, turnover experience, workplace discrimination, language confidence, and language satisfaction, whereas Spearman's correlation coefficients were used to analyze the association between ordinal variables of intention to leave and the same variables. Depending on the number of analyses, Bonferroni correction was used for multiple comparisons (e.g., $0.05/3 = 0.017$).

Variables with a p value <0.25 in the bivariate analysis were selected as candidates for forward multivariate regression to reduce potential bias and fulfill the regression model [35]. Linear regression was used to determine factors related to job satisfaction. Regarding the intention to leave, the 4-point Likert scale was collapsed into binary categories of intention to remain (very unlikely or rare and unlikely) and intention to leave (highly likely and very likely) to examine the factors related to the intention to leave through binary logistic regression. Moreover, the three domains were analyzed separately to better understand foreign-educated nurses' intentions to leave. Associations among the added variables were checked using bivariate analysis to adjust the model and avoid multicollinearity, as well as the variance inflation factor (VIF) (VIF < 5) in linear regression. In the bivariate and multivariate analyses, missing values were deleted for each pair.

Variables that were significant ($p < 0.05$) in the regression analysis (phrase one) were selected for phase two to verify the path and synthetic relationship among the theoretical framework models through SEM. According to Kline [36], the SEM case ratio should be >10 : 1. After removing missing data, 167 cases were available to assess the model with 10 parameters and an acceptable ratio of 17 : 1. The maximum likelihood method was used to estimate the covariance matrix, and the 2000 times bootstrap test was used to test the indirect effects. The fit indices used to evaluate the SEM model were chi-square (χ^2, $p > 0.05$), root mean square error of approximation (RMSEA < 0.05), standardized root mean squared residual (SRMR < 0.10), and comparative fit index (CFI > 0.90) [36]. In the discussion, an online t-test calculator [37] was used to compare job satisfaction level and intention to leave with previous studies.

3.7. Ethical Consideration.
The study was approved by the Institutional Review Board (IRB) of the Institute of Education of Tokyo Medical and Dental University (IRB

number: C2021-013). The purpose of the study was explained to the participants at the beginning of the online questionnaire, and clicking the "Agree, approval to participate" button indicated that the participants understood the aim and consented to participate. Participants were informed that their participation was voluntary and that their responses would be kept anonymous.

To compensate the participants for their time and effort, an Amazon gift card (worth $4) was sent to those who provided their e-mail address after completing the questionnaire. E-mail addresses for sending the gift card were collected using a separate Google Form, and participants were informed about their right to provide their e-mail address or not.

4. Results

4.1. Participant Characteristics. In total, 206 foreign-educated nurses responded to the questionnaire. Data from 180 participants (effective response rate: 87.4%) were used for the analysis because 26 participants did not meet the inclusion criteria. Table 1 shows the participants' demographic characteristics. Participants were Chinese ($n = 178$), Taiwanese ($n = 1$), and Indonesian ($n = 1$). Most participants were women (91%) and worked as staff nurses (98%) in Japan. The mean age of all participants was 29.6 ± 3.6 years, and the mean years of residence and nursing practice in Japan were 6.4 ± 3.3 and 4.5 ± 2.4 years, respectively. The average score of job satisfaction was 94.1 ± 17.6 (item mean: 3.0), with a wide range of 31.0 to 145.0, indicating a moderate satisfaction level. In terms of the intention to leave, the median of intention to leave the current organization, the nursing profession, and Japan was 2.0.

4.2. Factors Associated with Job Satisfaction. Table 1 shows that married nurses reported higher job satisfaction than single nurses did ($t = -2.22$, $p = 0.028$). Foreign-educated nurses who had received orientation from their current organization showed higher job satisfaction than those who had not ($t = 2.10$, $p = 0.037$). Night-shift nurses had the lowest job satisfaction scores ($f = 6.45$, $p < 0.001$). Table 2 presents the results of the correlation analyses. Years of nursing practice in Japan ($r = 0.21$, $p = 0.006$), nursing experience in the country of origin ($r = 0.17$, $p = 0.037$), language confidence ($r = 0.18$, $p = 0.015$), and language satisfaction ($r = 0.24$, $p = 0.027$) were positively correlated with job satisfaction. Workplace discrimination was negatively correlated with job satisfaction ($r = -0.44$, $p < 0.001$).

Language confidence is strongly correlated with language satisfaction ($r = 0.62$, $p < 0.001$). Therefore, only language satisfaction was included in the final regression model because language confidence was not significant after controlling for other variables. The predictors of job satisfaction in the linear regression analysis ($R^2 = 0.373$) are presented in Table 3. Workplace discrimination ($\beta = -0.32$, $p < 0.001$) was a negative predictor of job satisfaction, whereas satisfaction with Japanese ($\beta = 0.17$, $p = 0.024$) and receiving orientation ($\beta = 0.16$, $p = 0.010$) were positive predictors of job satisfaction. Compared to nurses who worked two shifts, only night-shift nurses had lower job satisfaction ($\beta = -0.22$, $p = 0.001$), but nurses who worked more flexible hours like short-time or part-time had higher job satisfaction ($\beta = 0.15$, $p = 0.027$).

4.3. Factors Associated with the Intention to Leave. Single nurses had a higher intention to leave compared to married nurses across three domains (current organization: $z = -3.50$, $p < 0.001$; nursing profession: $z = -3.14$, $p = 0.002$; Japan: $z = -3.82$, $p < 0.001$). Nurses with permanent residence in Japan were less likely to leave their current organization ($z = -2.62$, $p = 0.009$) or Japan ($z = -2.73$, $p = 0.006$) than those without it. Nurses who lived with their families were less likely to leave the nursing profession ($h = 10.93$, $p = 0.012$) or Japan ($h = 13.46$, $p = 0.004$) than those who lived alone or with friends. Nurses who received the specialist course in Japan reported a lower intention to leave their current organization ($z = -2.08$, $p = 0.037$) (Table 1). Younger age, fewer years of nursing practice and residence in Japan, and lower job satisfaction were related to a higher intention to leave across all three domains. Furthermore, workplace discrimination was positively associated with the intention to leave the current organization ($\rho = 0.21$, $p < 0.01$) (Table 4).

According to the Spearman correlation coefficients, age, years of residence, and nursing practice in Japan were highly correlated with each other ($\rho > 0.70$, $p < 0.001$). The final model only included years of nursing practice in Japan because it contributed to a higher variance in the model than the other two variables. Living with someone was excluded from the final model because it correlated with marital status (VIF > 5). Table 5 shows the results of the binary logistic regression analysis. Fewer years of practice in Japan (odds ratio (OR) [95% confidence interval (CI)] = 0.45 [0.25–0.79], $p = 0.006$) and lower job satisfaction (OR [95% CI] = 0.96 [0.94–0.99], $p = 0.006$) predicted a higher intention to leave the current organization. Higher satisfaction with Japanese language (OR [95% CI] = 1.78 [1.18–2.68], $p = 0.006$) and single nurses (OR [95% CI] = 0.27 [0.09–0.81], $p = 0.020$) showed a higher intention to leave the nursing profession. Moreover, single nurses were more likely than married nurses to plan to leave Japan (OR [95% CI] = 0.11 [0.02–0.66], $p = 0.016$).

4.4. Final Model and Path Relationship among Variables. Regarding the latent factor of the intention to leave, the standardized factor loadings were statistically significant, with magnitudes ranging from 0.78 (current organization) to 0.43 (Japan) (Figure 2). The final SEM model indicated a satisfactory model fit: chi-square (χ^2) = 17.462, degree of freedom (DF) = 14, $p = 0.232$; RMSEA = 0.037; SRMR = 0.0313; and CFI = 0.984. Received orientation ($\beta = 0.19$, $p = 0.005$), less workplace discrimination ($\beta = -0.34$, $p < 0.001$), and higher language satisfaction ($\beta = 0.18$, $p = 0.009$) were directly related to higher job satisfaction. Fewer years of nursing practice in Japan ($\beta = -0.25$, $p = 0.006$), single status ($\beta = -0.20$, $p = 0.027$), and higher satisfaction with Japanese language ($\beta = 0.19$,

TABLE 1: Participant characteristics ($n = 180$).

Variables	n	Job satisfaction		Intention to leave (current organization)		Intention to leave (nursing profession)[#]		Intention to leave (Japan)	
		Mean (SD)	t/f	Median [25–75th]	z/h	Median [25–75th]	z/h	Median [25–75th]	z/h
Gender			0.45[a]		−0.14[c]		−0.68[c]		−0.13[c]
Women	164	94.4 (15.8)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
Men	16	90.9 (30.2)		2.0 [1.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
Marital status			−2.22[a*]		−3.50[c***]		−3.14[c**]		−3.82[c***]
Single	115	91.9 (18.7)		3.0 [2.0–3.0]		2.0 [1.0–3.0]		1.0 [1.0–2.0]	
Married	65	97.9 (14.8)		2.0 [1.0–3.0]		1.0 [1.0–2.0]		1.0 [1.0–2.0]	
Japanese permanent residence			−1.72[a]		−2.62[c*]		−0.83[c]		−2.73[c**]
Yes	17	101.0 (11.8)		2.0 [1.0–2.0]		1.0 [1.0–2.5]		1.0 [1.0–1.5]	
No	163	93.3 (17.9)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–1.0]	
Living with somebody			2.04[b]		10.93[d*]		6.88[d]		13.46[d**]
Living alone	95	91.5 (18.7)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
Living with partner only	34	93.9 (15.7)		2.5 [2.0–3.0]		1.5 [1.0–2.0]		2.0 [1.0–2.0]	
Living with family member (partner, child, and/or parents)	43	98.7 (14.8)		2.0 [1.0–2.25]		2.0 [1.0–2.0]		1.0 [1.0–2.0]	
Living with friends	8	100.0 (21.8)		3.0 [1.25–3.75]		2.0 [1.0–3.0]		1.5 [1.0–2.0]	
Area of work			0.71[b]		0.30[d]		2.02[d]		0.35[d]
Kanto	123	93.1 (17.2)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
Kinki	39	96.9 (16.0)		2.0 [1.5–3.0]		1.0 [1.0–2.0]		1.0 [1.0–2.0]	
Others	18	94.4 (17.5)		2.0 [1.25–3.75]		2.0 [1.0–2.75]		1.0 [1.0–2.0]	
Setting			0.36[b]		0.72[d]		2.09[d]		0.24[d]
Hospital	151	94.3 (17.6)		2.0 [1.5–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
Care institute	16	91.1 (16.2)		2.0 [2.0–3.0]		2.0 [2.0–3.0]		2.0 [1.0–2.0]	
Clinic	10	97.3 (18.6)		2.5 [2.0–3.0]		2.0 [1.0–3.0]		1.5 [1.0–2.25]	
Others	3	88.7 (27.7)		1.0 [1.0–2.25]		1.0 [1.0–2.25]	Only three participants in this group		
Orientation			2.10[a*]		−0.24[c]		−0.82[c]		−0.33[c]
Yes	60	97.9 (16.3)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
No	120	92.1 (17.9)		2.0 [2.0–3.0]		2.0 [1.0–2.0]		2.0 [1.0–2.0]	
Annual income			0.10[b]		6.85[d]		4.27[d]		2.86[d]
<3 million yen	19	94.9 (17.6)		3.0 [1.5–4.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
3 million to <5 million yen	118	93.8 (17.0)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
≥5 million yen	37	95.0 (20.3)		2.0 [1.75–3.0]		2.0 [1.0–2.0]		2.0 [1.0–2.0]	
Prefer not to answer	6	91.5 (15.0)		1.0 [1.0–2.25]		1.0 [1.0–2.25]		2.0 [1.0–2.0]	
Specialist courses in Japan			0.95[a]		−2.08[c*]		−0.64[c]		−1.96[c]
Yes	10	99.2 (12.4)		2.0 [1.0–3.0]		1.5 [1.0–2.25]		1.0 [1.0–2.0]	
No	170	93.7 (17.8)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
Employment contract			1.83[b]		5.14[d]		6.45[d]		4.63[d]
<3 years	31	88.5 (17.8)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
≥3 years	30	94.7 (18.2)		3.0 [1.5–3.5]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
No fixed contract period	100	96.6 (15.4)		2.0 [2.0–3.0]		2.0 [1.0–2.0]		2.0 [1.0–2.0]	
Do not know if there is a fixed contract period	19	90.6 (23.9)		2.0 [1.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	
Shift			6.45[b***]		8.69[d]		2.01[d]		4.52[d]
Two shifts	124	92.9 (16.3)		2.0 [2.0–3.0]		2.0 [1.0–3.0]		2.0 [1.0–2.0]	

TABLE 1: Continued.

Variables	n	Job satisfaction		Intention to leave (current organization)		Intention to leave (nursing profession)[#]		Intention to leave (Japan)	
		Mean (SD)	t/f	Median [25–75th]	z/h	Median [25–75th]	z/h	Median [25–75th]	z/h
Three shifts	10	98.4 (10.7)		3.0 [1.0–3.0]		2.0 [1.0–3.0]		2.0 [2.0–2.25]	
Day shift only	42	97.8 (18.2)		2.0 [1.0–3.0]		2.0 [1.0–2.5]		1.0 [1.0–2.0]	
Night shift only	2	44.0 (18.4)							
Short-time or part-time	2	118.0 (19.8)		Only two participants for each group					

[#]Missing data with 8 participants (<10% of the total sample), pairwise in the analysis. [a]Student's t-test; [b]one-way analysis of variance with Bonferroni correction; [c]Mann–Whitney U test; [d]Kruskal–Wallis test with Bonferroni correction. $*p < 0.05$; $**p < 0.01$; $***p < 0.001$. SD: standard deviation.

TABLE 2: Results of Pearson correlation test for factors associated with job satisfaction.

Variables	1	2	3	4	5	6	7	8	9
(1) Job satisfaction									
(2) Age	0.113								
(3) Years of residence in Japan[#]	0.076	0.741***							
(4) Years of nursing practice in Japan[#]	0.207**	0.681***	0.766***						
(5) Education level	0.082	0.027	−0.001	−0.023					
(6) Nursing experience in country of origin	0.165*	0.078	−0.045	−0.053	−0.007				
(7) Turnover experience	−0.021	0.325**	0.299**	0.335	−0.05	−0.077			
(8) Workplace discrimination	−0.440***	−0.080	−0.075	−0.128	0.063	−0.094	0.121		
(9) Language confidence	0.182*	0.111	0.239**	0.158*	0.119	0.041	0.127	−0.170*	
(10) Language satisfaction	0.235**	0.220**	0.309**	0.248***	0.069	0.024	0.188*	0.195*	0.624***

[#]Missing data with 5 participants (<10% of the total sample), pairwise in the analysis. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

$p = 0.029$) were directly related to a higher intention to leave. The model estimated 27.2% and 24.3% variances in job satisfaction and intention to leave, respectively.

Table 6 reveals the indirect relationship as follows: through job satisfaction, received orientation ($\beta = -0.05$, $p = 0.018$), years of practice in Japan ($\beta = -0.05$, $p = 0.017$), and language satisfaction ($\beta = -0.05$, $p = 0.031$) had a small negative indirect effect on the intention to leave. Workplace discrimination had a positive indirect effect on intention to leave ($\beta = 0.09$, $p = 0.005$).

5. Discussion

Using Herzberg's two-factor theory as our guiding framework, this is the first study to use SEM, a more rigorous analytic technique, to explore the relationship between foreign-educated nurses' job satisfaction and the intention to leave, as well as to identify the factors associated with those two variables. The results confirmed that higher workplace discrimination, lower Japanese language satisfaction, and not receiving orientation were predictors of foreign-educated nurses' lower job satisfaction. Lower job satisfaction, fewer years of nursing practice in Japan, single status, and higher language satisfaction predicted higher intention to leave. Moreover, workplace discrimination and receiving orientation had significant indirect effects on the intention to leave, with job satisfaction acting as a mediator.

This study revealed that foreign-educated nurses had a moderate level of job satisfaction in Japan, which was significantly higher than that reported in a previous study of 1241 Japanese hospital nurses (3.0 vs. 2.8, $t = 3.3$, $p = 0.001$) [37, 38]. This may be explained by the fact that the availability of stable jobs fulfills foreign-educated nurses' migrant motivation, as they can have better economic benefits and social status than those in their countries of origin [8]. The job satisfaction level in this study was lower than that in the study on 602 foreign-educated nurses (3.0 vs. 3.3, $t = 17.9$, $p < 0.001$) in Saudi Arabia [29, 37], but it was similar to that on 210 foreign-educated nurses (3.0 vs. 2.9, $t = 1.3$ $p = 0.185$) in Ireland [37, 39]. Healthcare systems and workloads vary across countries, which may cause foreign-educated nurses in various countries to fulfill their jobs differently. This also highlights the necessity of investigating foreign-educated nurses' job satisfaction in different receiving countries.

The present study's results showed that foreign-educated nurses had moderate to high intentions of leaving their current organization (2.4 vs. 1.8, $t = 8.2$, $p < 0.001$) and nursing profession (1.9 vs. 1.5, $t = 6.9$, $p < 0.001$), which was higher than those shown in a national study of 1261 Japanese nurses [37, 40]. This is probably due to the high turnover rate of foreign workers in Japan. Japanese national reports indicated that foreign turnover rates are twice as high as those of Japanese workers [41]. The high intention to leave among foreign-educated nurses was considered to be due to the inability to form human relations and adapt to the corporate culture in Japan [42].

In this study, workplace discrimination was the main predictor of job dissatisfaction. This is consistent with the results of a Canadian study of 1952 foreign-educated nurses that found that those who experienced discrimination were less satisfied with their jobs [19]. Discriminatory treatment in the workplace is an additional stressor that reduces foreign-educated nurses' self-esteem, confidence, and well-being and causes negative work attitudes [9]. Foreign-educated nurses who received orientation from their current organization showed higher job satisfaction than those who did not. A similar finding was reported by a US study, which showed that Asian nurses who received orientation with people of similar cultural backgrounds were more satisfied with their practice environment and had more organizational commitment than those who did not [43].

The positive correlation between language satisfaction and job satisfaction was supported by previous qualitative studies that identified language barriers as a crucial problem influencing foreign-educated nurses' job satisfaction [44]. Foreign-educated nurses reported that they face challenges in communicating with patients during nursing care and sought improvement in their language abilities to provide appropriate care and responses to patients [44, 45]. However, nurses with higher language satisfaction were found to have a greater intention to leave their nursing role. The lack of career development opportunities may explain this finding. Foreign-educated nurses have fewer opportunities to apply for management positions or professional development than native nurses [46]. Nurses with good language proficiency likely think there are no opportunities for career development in nursing and plan to leave their nursing roles.

TABLE 3: Predictors of job satisfaction according to linear regression analysis.

Variables	B	β	p	R^2	VIF
Workplace discrimination	−6.24	−0.32	<0.001	0.189	1.23
Received orientation (ref. did not receive)	6.53	0.17	0.010	0.024	1.13
Language satisfaction	2.54	0.16	0.024	0.034	1.24
Nursing experience in country of origin	2.48	0.09	0.181	0.010	1.17
Years of nursing practice in Japan	3.11	0.14	0.071	0.018	1.38
Having Japanese permanent residence (ref. not having)	1.22	0.02	0.803	0.006	1.57
Married (ref. single)	2.65	0.07	0.598	0.001	4.68
Living with somebody (ref. living alone)				0.014	
Living with partner only	−2.28	−0.05	0.597		2.32
Living with family (partner, child, and/or parents)	−1.86	−0.05	0.748		4.87
Living with friends	10.19	0.11	0.085		1.07
Shift (ref. two shifts)				0.076	
Three shifts	3.38	0.04	0.506		1.10
Day shifts only	3.49	0.08	0.216		1.15
Night shifts only	−36.76	−0.22	0.001		1.14
Other (i.e., part-time)	24.13	0.15	0.027		1.06
Employment contract (ref. no fixed contract)				0.002	
<3 years	−1.64	−0.04	0.628		1.30
≥3 years	0.20	0.00	0.952		1.19
Do not know if there is a fixed contract period	−2.00	−0.03	0.622		1.15
Constant	79.28				

Linear regression analysis (enter): $R^2 = 0.373$; $F = 5.499$; Durbin–Watson value = 2.12; ref.: reference; VIF: variance inflation factor.

Through SEM, it was found that years of nursing practice have a positive correlation with job satisfaction and a negative correlation with the intention to leave. Time is reported to be particularly important for foreign-educated nurses' adaptation and integration processes [28]. During the early stages of migration, foreign-educated nurses leave their countries of origin and struggle to adapt to the new work environment and culture, which might result in low resilience and job dissatisfaction [45]. High intention to leave during the initial years of nursing practice may also be explained by the failure to adapt. Hence, specific support for foreign-educated nurses to successfully adapt to their new work environment during their early immigrant years is required to enhance their job satisfaction and retention.

In this study, married nurses showed a lower intention to leave than single nurses, similar to a previous study on Korean nurses in the US [18]. Compared to married nurses, single nurses experience more life changes that require work adjustment, such as moving to a place they are interested in, getting married, and seeking jobs with work-life balance [47]. Moreover, married nurses with children and financial burdens (e.g., house loans) likely find it difficult to make turnover decisions and want to remain stable [18]. Single foreign-educated nurses may feel isolated and seek family support, which prompts them to return to their countries of origin.

Through SEM, the intention to leave was regarded as a latent variable consisting of three domains that each loaded >0.40, which is acceptable [36]. Foreign-educated nurses with lower job satisfaction showed a higher intention to leave, and job satisfaction mediated the relationship between receiving orientation, workplace discrimination, years of nursing practice in Japan, language satisfaction, and intention to leave. This result is consistent with a previous

study among nurses in general [14], indicating that job satisfaction plays a key role in preventing nurses' turnover intentions. However, according to the results of a logistic regression analysis, lower job satisfaction predicted only the intention to leave the current organization and was not statistically significant concerning the intention to leave the nursing profession or Japan. This finding indicates that other factors specifically related to foreign-educated nurses' intentions to leave the nursing profession or Japan have not been measured. Further studies should fill this scholarly gap and contribute to a deeper understanding of turnover among foreign-educated nurses.

5.1. Implication for Nursing Management. Nurse managers and policymakers should develop strategies to prevent workplace discrimination and provide career advancement opportunities to ensure a positive and equal work environment for foreign-educated nurses. Counseling services should be available for those who face challenges caused by cultural differences or workplace discrimination. Moreover, educational programs such as short-term language training to familiarize with Japanese nursing documents, long-term language training to improve communication skills for cross-cultural nurse-patient interaction, and continuing education programs to learn about Japanese nursing culture might help foreign-educated nurses better understand their roles in the new country.

Since most of the study's participants were from China, there are cultural (e.g., Chinese people prefer warm water while Japanese people prefer ice water to drink) and nursing care differences (e.g., bedside daily care in China is mainly provided by patients' families or care assistants while Japanese nursing duties include whole patient daily care, such as

TABLE 4: Results of Spearman correlation test for factors associated with the intention to leave the current organization/nursing profession/Japan.

Variables	1	2	3	4	5	6	7	8	9	10	11	12
(1) Intention to leave current organization												
(2) Intention to leave nursing profession	0.549***											
(3) Intention to leave Japan	0.369***	0.519***										
(4) Age	−0.237**	−0.213**	−0.190*									
(5) Years of residence in Japan#	−0.211**	−0.212**	−0.198**	0.775***								
(6) Years of nursing practice in Japan#	−0.344***	−0.270***	−0.239**	0.697***	0.776***							
(7) Education level	0.008	−0.034	0.046	0.009	−0.021	−0.016						
(8) Nursing experience in country of origin	−0.028	0.029	0.059	0.05	−0.068	−0.078	−0.009					
(9) Turnover experience	−0.085	−0.047	−0.105	0.314***	0.299**	0.347***	−0.052	−0.093				
(10) Job satisfaction	−0.369***	−0.243**	−0.197**	0.084	0.066	0.200**	0.076	0.161*	−0.027			
(11) Workplace discrimination	0.209**	0.123	0.119	−0.088	−0.073	−0.114	0.056	−0.09	0.101	−0.444***		
(12) Language confidence	−0.049	0.062	−0.083	0.096	0.219**	0.163*	0.109	0.034	0.132	0.143	−0.166*	
(13) Language satisfaction	−0.098	0.063	−0.115	0.211**	0.300***	0.254***	0.121	−0.01	0.191*	0.247*	−0.185*	0.610***

#Missing data with 5 participants (<10% of the total sample), pairwise in the analysis. $*p < 0.05$; $**p < 0.01$; $***p < 0.001$.

TABLE 5: Predictors of the intention to leave according to binary logistic regression analysis.

Variables	Current organization			Nursing profession			Japan		
	OR [95% CI]	p	VIF	OR [95% CI]	p	VIF	OR [95% CI]	p	VIF
Job satisfaction	0.96 [0.94–0.99]	0.006	1.49	0.98 [0.95–1.01]	0.110	1.36	1.01 [0.97–1.04]	0.764	1.49
Years of nursing practice in Japan	0.45 [0.25–0.79]	0.006	1.59	0.54 [0.27–1.07]	0.076	1.62	0.88 [0.39–1.95]	0.744	1.59
Language satisfaction	1.16 [0.81–1.67]	0.404	1.30	1.78 [1.18–2.68]	0.006	1.28	1.16 [0.73–1.84]	0.543	1.30
Married (ref. single)	0.71 [0.30–2.49]	0.414	1.20	0.27 [0.09–0.81]	0.020	1.18	0.11 [0.02–0.66]	0.016	1.20
Did not receive nursing specialty course in Japan (ref. received)	0.11 [0.10–1.16]	0.064	1.05	1.21 [0.19–7.66]	0.843	1.05	0.00 [0.00–0.00]	0.999	1.05
No Japanese permanent residence (ref. yes)	0.69 [0.14–3.49]	0.655	1.47	3.96 [0.75–20.87]	0.104	1.51	2.26 [0.17–30.74]	0.541	1.47
Workplace discrimination	1.17 [0.74–1.85]	0.499	1.35	1.14 [0.68–1.91]	0.611	1.27	1.60 [0.89–2.91]	0.119	1.35
Annual income (ref. <3 million)									
3 million to <5 million	0.56 [0.15–2.17]	0.403	3.14	2.81 [0.70–11.28]	0.144	3.06	1.65 [0.30–9.10]	0.564	3.14
≥5 million	0.98 [0.19–5.02]	0.980	3.36	1.24 [0.20–7.77]	0.815	3.32	1.99 [0.22–17.86]	0.538	3.35
Prefer not to answer	0.09 [0.07–1.32]	0.080	1.42	0.79 [0.05–12.16]	0.865	1.44	0.00 [0.00–0.00]	0.999	1.42
Shift (ref. two shifts)									
Three shifts	4.18 [0.78–22.29]	0.094	1.40	2.08 [0.46–9.35]	0.339	1.41	1.91 [0.31–11.92]	0.490	1.40
Day shifts only	0.80 [0.33–1.95]	0.626	1.11	1.33 [0.49–3.61]	0.580	1.11	1.45 [0.43–4.91]	0.550	1.11
Night shifts only	255164759 [0–0]	0.999	—	—	—	—	0.00 [0.00–0.00]	0.999	1.21
Others	2.35 [0.09–64.92]	0.614	1.26	0.00 [0.00–0.00]	1.00	1.22	0.00 [0.00–0.00]	0.999	1.26
Employment contract (ref. <3 years)									
≥3 years	2.16 [0.61–7.60]	0.278	1.26	0.88 [0.25–3.13]	0.838	1.26	1.38 [0.35–5.38]	0.643	1.26
No fixed contract period	1.28 [0.47–3.48]	0.665	1.25	0.67 [0.22–1.99]	0.470	1.24	0.65 [0.18–2.28]	0.498	1.25
Do not know if there is a fixed contract period	1.07 [0.23–5.07]	0.976	1.17	1.33 [0.30–5.81]	0.709	1.13	1.01 [0.14–7.40]	0.990	1.17
Hosmer and Lemeshow test (χ^2, p)	4.580	0.801		9.390	0.310		5.561	0.696	
Nagelkerke R^2	0.325			0.255			0.224		

Logistic regression analysis (enter) with outcome: total score of intention to leave current organization >2 ($n = 83$), ≤2 ($n = 97$); total score of intention to leave nursing profession >2 ($n = 45$), ≤2 ($n = 127$); total score of intention to leave Japan >2 ($n = 25$), ≤2 ($n = 155$). OR: odds ratio; CI: confidence interval; SE: standardized error; ref.: reference; VIF: variance inflation factor.
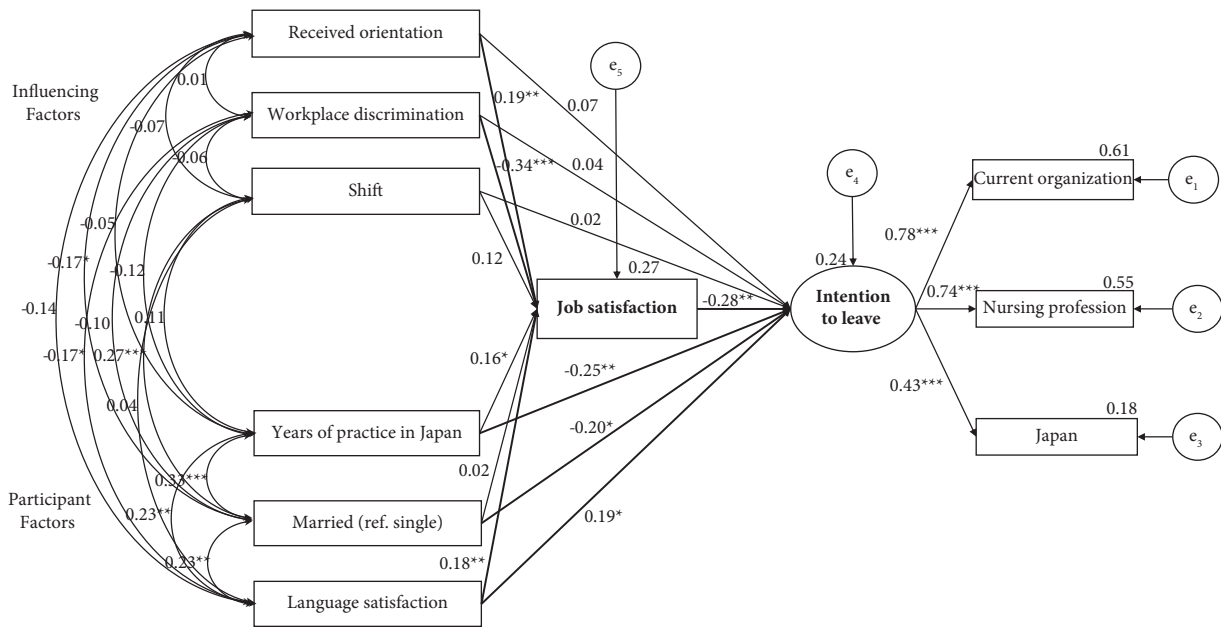
FIGURE 2: Final model and path relationship ($n = 167$).

TABLE 6: Indirect effects of the structural equation modeling result ($n = 167$).

Structural path	β	p
Received orientation ⟶ job satisfaction ⟶ intention to leave	−0.053	0.018
Workplace discrimination ⟶ job satisfaction ⟶ intention to leave	0.093	0.005
Shift ⟶ job satisfaction ⟶ intention to leave	−0.033	0.155
Years of nursing practice in Japan ⟶ job satisfaction ⟶ intention to leave	−0.045	0.017
Married (ref. single) ⟶ job satisfaction ⟶ intention to leave	−0.007	0.741
Language satisfaction ⟶ job satisfaction ⟶ intention to leave	−0.050	0.031

feeding and bathing) [48]. Adequate job orientation programs (e.g., how to provide patient daily care) from employers could assist Chinese-educated nurses in gaining knowledge and skills to adapt to new work environments, enhancing their job satisfaction and reduce turnover in Japan. Providing information comparing Japanese-Chinese nursing and culture to Japanese employers and nurse managers would also help them better understand Chinese-educated nurses, eliminate stereotype-based discrimination (e.g., Chinese nurses cannot provide patients' daily care), and establish adequate support strategies.

Furthermore, managers should develop specific strategies to monitor and support nurses who are at a higher risk of turnover and dissatisfaction, such as those who are single or have less nursing experience. The possible strategies considered were (1) supporting experienced nurses with career development or educational resources; (2) monitoring their job satisfaction and turnover intentions over time; and (3) developing cultural or nursing condition exchange activities with native nurses to support their adaptation.

5.2. Limitations and Further Research Implications. This study has several limitations. The first is the use of a cross-sectional design, which limits the ability to establish causal

relationships. Moreover, the mediation test implies that the longitudinal model is more appropriate than cross-sectional data [49]. Thus, further research using a longitudinal study design is recommended to clarify the mediating role of job satisfaction among foreign-educated nurses. Second, most participants (99%) were Chinese; hence, this study's results cannot be generalized to nurses of other nationalities. Further studies should collect data from foreign-educated nurses of diverse nationalities to address this issue. Third, night-shift nurses showed the lowest job satisfaction; however, data from only two nurses are not sufficient to draw a clear relationship between shift and job satisfaction. Further studies with larger sample sizes are warranted. Finally, nurses with low job satisfaction and high intentions to leave may have already left and were not included in this survey. It would be necessary to survey nurses who have already left, especially those who have left the nursing profession and Japan.

6. Conclusion

This study contributes to the understanding of foreign-educated nurses' job satisfaction and intention to leave. Overall, foreign-educated nurses were moderately satisfied with their jobs in Japan. Higher job satisfaction was shown by foreign-educated nurses who perceived less workplace

discrimination, received orientation, and perceived higher satisfaction with Japanese language. They were more likely to leave if they had lower job satisfaction, higher language satisfaction, fewer years of nursing practice in Japan, and were single. Providing a positive work environment by reducing workplace discrimination and providing adequate orientation as well as language support training and counseling services might enhance foreign-educated nurses' job satisfaction and retention.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

This study was partly presented at the International Council of Nurses (ICN) 2023 Congress.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Authors' Contributions

JH and AK designed the study. JH, CW, and SG collected the data. JH and AK analyzed and interpreted the data. JH prepared the manuscript and revised it. AK reviewed and revised it, while CW and SG commented on the manuscript. All authors approved the final version for submission.

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Supplementary Materials

The supplementary material is the result of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE), which was used as guidance for this study. (*Supplementary Materials*)

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Research Article

Knowledge, Attitudes, and Practices of Bedside Nurses regarding Antimicrobial Stewardship in China: An Explanatory Sequential Mixed Methods Study

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Aim. To evaluate the knowledge, attitudes, and practices of Chinese bedside nurses regarding antimicrobial stewardship, as well as to identify factors that influence nurses' engagement in antimicrobial stewardship. *Background*. Antimicrobial resistance is a pressing global health threat. Antimicrobial stewardship is crucial in combating this issue. Nurses play a key role in implementing antimicrobial stewardship. However, little is known about the involvement of Chinese nurses in antimicrobial stewardship. *Methods*. An explanatory sequential mixed-methods design was employed. A self-developed questionnaire was administered between March and August 2021 ($N = 463$), followed by semi-structured interviews with 17 nurses between March and July 2022. Descriptive statistics and qualitative content analysis were used to analyze the data. *Results*. The study found that nurses scored 75% in knowledge, 82.8% in attitude, and 84.1% in practice domains. There was a moderate correlation between nurses' knowledge, attitudes, and practices. It revealed that knowing local antimicrobial stewardship programmes information and the frequency of receiving antimicrobial stewardship training had a significant impact on nurses' knowledge scores. The willingness to participate in related training influenced nurses' attitude scores. Being a clinical teacher and the frequency of receiving related training influenced nurses' practice scores. The qualitative phase identified three themes: insufficient knowledge of nurses' engagement, diverse attitudes towards engagement, and limited scopes and absence of standards in nurses' participation. *Conclusions*. Our findings emphasize the importance of enhancing nurses' perception and involvement in antimicrobial stewardship. While nurses exhibit positive attitudes and practices, addressing the existing knowledge gap is crucial. To achieve this, it is necessary to clarify the role and responsibilities of nurses in antimicrobial stewardship, provide regular training and innovative methods, strengthen communication and collaboration, and foster a positive work environment. Additionally, actively promoting the development of guidelines and evaluation criteria will enable nurses to more effectively participate. *Implications for Nursing Management*. Regular training of nurses in antimicrobial stewardship needs to be enhanced. Nursing managers should strive to create positive, empowering, and supportive work environments, participate in policy formulation and implementation, and provide clear expectations for nurses' engagement in antimicrobial stewardship.

1. Introduction

The rapid increase in antimicrobial resistance (AMR) poses a serious threat to global health [1]. According to an AMR review commissioned by the United Kingdom government, AMR will cause 10 million deaths a year and cost $1 trillion annually by 2050 [2]. China, as one of the largest consumers of antimicrobials worldwide, faces significant challenges in combating AMR [3]. Due to its high antibiotic consumption rate, China plays a crucial role in the global burden of AMR. In fact, between 2000 and 2015, antimicrobial consumption in China witnessed a staggering 79% increase, surpassing the global average increase in antimicrobial consumption [4]. The existing evidence indicates that the inappropriate use and misuse of antimicrobials are major drivers of increasing AMR [3, 5, 6]. To effectively control and prevent AMR, the involvement of healthcare professionals, particularly nurses, in antimicrobial stewardship (AMS) is crucial [7].

AMS is a coherent set of actions that promote the use of antimicrobials in ways that ensure sustainable access to effective therapy for all who need it [5]. It is a rapidly growing field in medicine with the goal of rational use of antibiotics in terms of dosing, duration of therapy, and route of administration [8]. Furthermore, it is a multidisciplinary approach involving various healthcare professionals, such as microbiologists, pharmacists, infection control practitioners, physicians, and epidemiologists, who are dedicated to controlling AMR [9].

Extensive research has provided compelling evidence regarding the vital roles that nurses play in communication and AMS [10, 11]. These roles encompass prompting, reminding, checking, and questioning prescribers' decisions, all of which contribute to the appropriate use of antimicrobials. Furthermore, with nurses representing the largest healthcare workforce worldwide, their involvement in the comprehensive AMS holds immense potential [6, 12], especially in monitoring the selection, timing, and duration of antimicrobial use, as well as dosage administration [12]. Even a marginal increase of 1% in their engagement, utilizing their full clinical and leadership potential, can yield substantial benefits for healthcare services and patients [13]. It is particularly beneficial in settings where human resources are scarce and it is difficult to establish AMS teams formed by physicians and pharmacists [13].

Several studies [14–16] have investigated the involvement of nurses in AMS, focusing on their knowledge, attitudes, and practices (KAP). These studies found that nurses had a restricted comprehension of the significance of AMS and their corresponding role within it. In addition, they lacked awareness about their specific responsibilities and the particular nursing practices associated with AMS [16, 17]. This lack of awareness poses challenges to fully utilizing nurses' potential in AMS initiatives [18, 19]. Currently, there is no study illustrating the KAP about AMS among nurses in China. A recent panel survey from China even revealed that a larger number of nurses was associated with poorer AMS performance [20], highlighting the need for further investigation and interventions to address any barriers or gaps in knowledge, attitudes, and practice among nurses in China.

This study aims to investigate Chinese nurses' KAP related to AMS and identify the factors influencing their participation. To comprehensively understand these aspects, an explanatory sequential mixed-methods design, combining quantitative and qualitative approaches, is employed. The quantitative phase provides initial insights and trends, while the subsequent qualitative phase offers a deeper understanding and explanation of the observed results [21]. This sequential approach enhances the validity and reliability of the findings and allows for the exploration of outliers, surprising results, and positive-performing exemplars [21]. By employing this mixed-methods design, this study aims to capture the complexity of nurses' perspectives on AMS and the factors influencing their participation. Guided by pragmatism [21], which emphasizes practical knowledge and real-world application, this study offers practical insights for local initiatives involving nursing in AMS. The findings will contribute to both local and global strategies for combating AMR, identifying common challenges and effective approaches in diverse healthcare settings.

2. Methods

This study employed an explanatory sequential mixed-methods design [21], which involves collecting and analyzing quantitative data followed by qualitative data to provide further clarification and supplementation to the quantitative findings. The theoretical framework that guided this study is the Knowledge, Attitudes, and Practice (KAP) model proposed by British scholar Kirster [22]. This model divides the process of behaviour change into three continuous processes: acquiring knowledge, generating beliefs, and forming behaviours [23]. The KAP model was used to guide the survey framework and analysis in the quantitative phase and as an interpretive lens to frame the themes in the qualitative phases.

The quantitative phase of the study had a cross-sectional design and involved the administration of an anonymous online questionnaire between March and August 2021. The questionnaire was designed to assess nurses' knowledge, attitudes, and practices related to AMS. To gain a comprehensive understanding of the factors influencing nurses' engagement in AMS, a qualitative descriptive research design was employed. This involved conducting individual semistructured interviews with nurses between March and July 2022.

To ensure methodological rigour, the study adhered to the guidelines outlined in the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement and Consolidated Criteria for Reporting Qualitative Research (COREQ) (see Supplementary File 1 and File 2). In addition, the entire study adhered to the Good Reporting of a Mixed Methods Study (GRAMMS) criteria (Supplementary File 3).

2.1. Setting. The study was conducted in three tertiary hospitals in northern China, selected based on their long-term implementation of AMS programmes and their status as the

largest medical facilities in the region with 3,000, 2,700, and 2,270 beds, respectively. The number of registered nurses at these hospitals was 1,846, 1,750, and 1,500, respectively.

2.2. Participants and Sampling.

In the quantitative phase, the sample size was determined using Raosoft's online sample size calculator (https://www.raosoft.com/samplesize.html), with a confidence interval of 95%, a margin of error of 5%, and an assumed response distribution of 50% [8]. Considering a potential attrition rate of 20% and the possibility of outliers, a minimum sample size of 453 was deemed necessary. The inclusion criteria were defined as follows: registered nurses with assigned patient care responsibilities and a minimum employment duration of 6 months. Nursing interns and nurses who were registered in other healthcare institutions but undergoing short-term training at the three hospitals were excluded.

In the qualitative phase, purposive sampling was used to select participants who could provide unique and insightful information to uncover new knowledge systems [24]. Seventeen nurses were invited to participate based on their characteristics, knowledge, and expertise. Participants were selected from various departments, organisational levels, and played different roles. The inclusion criteria were as follows: (a) willingness to participate, (b) being a registered nurse involved in direct patient care, (c) having at least 3 years of work experience, and (d) participation in the first-stage questionnaire survey. The exclusion criteria for this phase were consistent with those used in the quantitative phase.

Recruitment was primarily conducted through announcements on WeChat Workgroups, and a snowballing approach was used where interviewees recommended other eligible and interested candidates to the researchers. Recruitment was terminated when data saturation was reached, defined as the point at which three consecutive interviews failed to yield any new information [25].

2.3. Data Collection

2.3.1. The Quantitative Phase.

The data for the quantitative phase were collected using the Wenjuanxing online survey platform, which is widely used in China. An online questionnaire was created on the platform, and a letter explaining the purpose, significance, and survey process of the study was sent to the hospital administrators of each participating hospital to obtain permission for data collection. Once administrative approval was obtained, the researchers contacted the nurse managers of the respective wards. The nurse managers introduced the project background and the inclusion and exclusion criteria for the research subjects in the WeChat workgroup, and then released the questionnaire. As the survey was anonymous, completion of the questionnaire implied consent.

The questionnaire consisted of 51 items divided into four sections. These items were developed based on a literature review [26] and underwent further refinement through group discussions. The split-half reliability coefficient for this questionnaire was 0.783, the Cronbach's alpha reliability

coefficient for the overall questionnaire was 0.964, and the overall content validity index was 0.90, all of which were validated in a pilot study [27].

The first section of the questionnaire included seven demographic items and three prior experience questions. Demographic items included age, sex, education level, years of nursing experience, and experience of AMS education. The second section comprised 15 items to assess participants' AMS knowledge, using a 5-point Likert scale ranging from strongly disagree (1) to strongly agree (5). The section covered topics such as the purpose and team structure of AMS (2 items), participants' understanding of antimicrobial usage (7 items), and participants' AMR-related knowledge (6 items). To assess nurses' attitudes towards AMS, the third section employed a 5-point Likert scale consisting of 14 questions, which explored nurses' perspectives on participation in AMS programmes (5 items), safe and proper administration of antimicrobials (6 items), and the reduction of exposure to antimicrobials (3 items). The final section included 12 questions that assessed nurses' adherence to AMS practices, using a Likert scale ranging from 1 (never) to 5 (always). Questions in this section covered topics such as diagnostic management assistance practice (2 items), proficiency in safe administration techniques for antimicrobials (5 items), and participation in AMS programmes (5 items).

2.3.2. The Qualitative Phase.

In the qualitative phase, face-to-face semistructured interviews were conducted to gather comprehensive insights into nurses' experiences, perceptions, and factors influencing their participation in AMS initiatives. To address the issue of insufficient knowledge identified in the quantitative findings, specific questions were included in the interview guidelines. For example, nurses were asked for their opinions on the finding that many nurses felt they lacked adequate knowledge of AMS. In addition, attitudes towards AMS were further examined by incorporating questions that built upon the positive attitudes identified in the quantitative phase. For instance, nurses were asked to provide their thoughts on the finding that most nurses were willing to participate in AMS, as well as any reasons for potential hesitation. To gain deeper insights into the practical aspects of AMS, questions were developed to explore nurses' experiences and perceptions related to specific AMS practices they were involved in, such as discussions about antibiotic de-escalation. These questions aimed to provide a more nuanced understanding of the practice-setting issues identified in the quantitative phase. The final interview list can be found in Supplementary File 4. It is important to note that not all questions from the interview list were posed during each interview. The selection and sequencing of questions were determined by the natural flow of the conversation and the interviewee' responses. This approach allowed for a more organic and flexible interview process, ensuring that the questions asked were relevant and responsive to the specific context and insights provided by each interviewee [28].

Two nurses were purposively selected for preinterviews, and based on the initial interviews, the guidelines were further refined. The interviews were conducted by a primary

interviewer (WT Z) and a note-taker (YF X) in either the department office or nurses' lounge, based on the interviewees' preferences. Written consent was obtained from the interviewees before the interviews, which were conducted in Standard Mandarin. With permission from the interviewees, conversations were digitally recorded. The interview questions were open-ended, allowing the interviewees to freely express their perspectives. The interviewers maintained a neutral demeanour throughout the interviews to ensure that the interviewees' responses were not influenced or coerced. The average duration of each interview was between 30 and 50 minutes. Data saturation was reached after 14 interviews, with an additional three interviews conducted for confirmation purposes. Two researchers (WT Z and YF X) reviewed the interviews to ensure comprehensive coverage of the research question and confirmed the adequacy of the sample size. Three follow-up telephone calls were conducted with three participants to supplement and clarify certain details, and no additional formal interviews were scheduled or conducted. All the researchers processed prior experience and training in qualitative research methods.

2.4. Data Analysis. The survey data collected in the quantitative phase were analyzed using IBM SPSS Version 23.0 (Armonk, New York, USA: IBM Corp). Descriptive statistics such as means, standard deviations, frequencies, and percentages were used to describe the distributions of the variables. The scoring rate (RT) was calculated by dividing the total score (or score of each domain) by the maximum possible score (or maximum possible score of each domain), and then multiplying by 100% [29]. RT $\geq 80\%$ (4/5) indicated a good level of knowledge, attitudes, and practices regarding AMS, while RT $< 80\%$ indicated poor performance in AMS [30].

To examine the differences in participants' knowledge, attitudes, and practice levels, independent sample *t*-tests, analysis of variance, and multiple linear regression analysis were conducted. In addition, correlation analysis was performed to explore the relationships between participants' knowledge, attitudes, and practice levels.

The audio recordings in the qualitative phase were fully transcribed verbatim by a researcher (WT Z) within 24 hours after each interview and reviewed by one researcher (YF X) for accuracy. The transcripts were then returned to the participants for their input, allowing them to provide any comments or corrections. Finally, the transcripts were securely stored in password-protected Microsoft Office Word documents, guaranteeing the confidentiality and integrity of the data.

The software NVivo V.12 (QSR International, Doncaster, Australia) was employed for organising and coding the data. A content analysis approach with a three-stage process was used to analyze the qualitative data [31]. In the preparatory stage, we recorded the interviews and transcribed them verbatim to ensure accuracy. Descriptive summaries were immediately provided after each interview and shared with

the research team. To familiarize ourselves with the data, two researchers (WT Z and YF X) repeatedly read the transcripts and descriptive summaries. In the preparatory phase of the analysis, the data were categorised and deductively coded, and the codes were combined based on the relevant themes (interviewees' knowledge, attitudes, and practice) that were identified and guided the coding process. In the organisational phase, we identified potential categories, patterns, and themes. The interviewers (WT Z and YF X) led the process of open coding and discussed the identification of codes, patterns, and themes during weekly team meetings. The data was classified and reclassified into comprehensive, higher-order themes until consensus was reached among the research group members. A third researcher (LP S) reviewed the initial analysis and compared the coding to ensure the consistency and interpretability of the data. Finally, we shared the results with all participants and requested their feedback or opinions to be incorporated into the report of the study findings. In the reporting phase of the analysis, direct quotes from interviewees were used to describe and substantiate each theme.

To ensure the privacy and confidentiality of the interviewees, their names were replaced with serial numbers. Data analysis was performed in Chinese to prevent any misunderstandings. During the drafting of the article, the final findings were translated into English by a professional translator fluent in both English and Chinese. This ensured the grammatical accuracy, fluency of the translated text, and accuracy of the translation itself. In addition, no funding was received for this study, and the researchers had no prior bias or specific assumptions about the research themes.

To ensure the rigour and trustworthiness of this phase, the four criteria of Lincoln and Guba for qualitative research were applied [32, 33]. For credibility, the information collected from the interview recordings, the codes applied by both researchers, and the responses reviewed by the interviewees were compared to identify coherence and discrepancy in the utterances. To establish dependability, memos were written after each interview, documenting the interviewees' nonverbal language, willingness to participate, and other contextual details. To enhance transferability, rich descriptions and direct quotes from interviewees were provided to exemplify the identified themes. Moreover, confirmability was ensured through journaling, where a record of our thoughts, biases, and preconceptions was maintained. This practice of reflexivity helped acknowledge and mitigate potential biases.

2.5. Data Integration. The findings from the quantitative stage were compared and interpreted alongside the findings from the qualitative phase using joint display analysis. All authors participated in discussions throughout this integration process.

2.6. Ethical Considerations. The study protocol adhered to the principles of the Declaration of Helsinki, and permission for the study was obtained from the research ethics

committee of the First Hospital of Shanxi Medical University. In the quantitative phase, participants were informed through a letter accompanying the questionnaire that their participation was voluntary and would have no effect on their work and life. Participants' completion and return of the questionnaire were considered to be their informed consent. In the qualitative phase, all interviewees provided signed informed consent before participating in the interviews. Ethical approval included consent for participation and potential publication.

3. Results

3.1. Quantitative Findings

3.1.1. Characteristics of the Study Population. A total of 470 nurses responded to the online survey, but seven were excluded due to concerns regarding quality control (all questions had identical responses). Most respondents ($n = 432$, 93.3%) were women and were between 20 and 40 years old. Approximately 61.6% of nurses ($n = 285$) had a primary professional title, and 96.5% ($n = 447$) had a bachelor's degree or higher. Although we purposefully selected three tertiary hospitals which had AMS programmes, 31.5% ($n = 146$) of nurses were unaware of the existence of AMS teams in their hospitals. Furthermore, 178 nurses (38.4%) had not received AMS training in the past year, and over 430 nurses (92.9%) expressed interest in participating in AMS training.

3.1.2. Knowledge, Attitudes, and Practices of Nurses regarding AMS. The mean knowledge score of the respondents was 56.24 (standard deviation, SD = 9.79), and the scoring rate was 75.0% (lower than a set standard of 80%), indicating that nurses' knowledge of AMS was insufficient. Among the participants, 197 nurses (42.6%) were unaware of the importance or purpose of AMS, and 38.4% of nurses expressed uncertainty or a lack of understanding regarding the indications for antimicrobial therapy in asymptomatic bacteriuria patients. Table 1 presents the three lowest and highest-scoring items for the knowledge domain. Additional detailed information on all items of nurses' KAP on AMS can be found in Supplementary Table 1.

By contrast, the overall mean attitude score was 57.94 (SD = 8.81), and the scoring rate was 82.8% (TS = 70), indicating that the nurses' attitudes towards AMS were positive (higher than a set standard of 80%). A total of 378 respondents (81.6%) agreed that nurses should participate in AMS, and 384 respondents (82.9%) agreed that nurses should be positive about acquiring up-to-date knowledge regarding antimicrobials and AMR. See Table 2 for the three lowest and highest items of the attitudes domain.

Nurses' performance in AMS practices (mean score 50.4 ± 7.51) had an overall scoring rate of 84.1% (TS = 60). The top three items with the highest and lowest scores are shown in Table 3.

3.1.3. Factors Related to Knowledge, Attitudes, and Practices of Nurses

(1) Univariate Analysis. The study conducted a univariate analysis to examine the relationship between the dependent variables (knowledge, attitude, and practice scores) and the independent variables (demographics and experience of AMS). The analysis revealed that several factors had a significant impact on nurses' knowledge of AMS, including age, professional title, clinical teaching status, knowledge of the existence of AMS programme in the hospital, willingness to undergo AMS training, years of nursing experience, frequency of receiving AMS education in the past year, and the department where they worked ($P < 0.05$). The detailed results of the analysis can be found in Table 4.

(2) Multivariate Analysis. The multiple linear regression analysis revealed that a significant independent factor influencing nurses' knowledge, attitudes, and practices regarding AMS was the frequency of receiving AMS education during the past year ($P < 0.05$). Although the univariate analysis indicated that age, professional title, nursing experience, and department were associated with a change in KAP scores, the multivariate analysis did not support this finding (Table 5).

(3) Correlation Analysis of Knowledge, Attitudes, and Practices of Nurses. According to Pearson correlation analysis, nurses' knowledge and attitudes, attitudes and practices, and knowledge and practices regarding AMS were moderately positively correlated, with correlation coefficients of 0.510 ($R^2 = 0.260$), 0.555 ($R^2 = 0.323$), and 0.569 ($R^2 = 0.309$), respectively ($P < 0.001$).

3.2. Qualitative Findings.
A total of 17 nurses participated in semi-structured interviews. The majority of the nurses were female (94.12%), and their ages ranged from 26 to 48 years. The duration of their nursing experience varied from 3 to 28 years, and they worked in different departments. More detailed characteristics of the interviewees can be found in Supplementary Table 2. From the interviews, three main themes emerged regarding nurses' engagement in AMS: insufficient knowledge, diverse attitudes, limited scopes, and the absence of standards in their participation in AMS practices.

3.2.1. Theme 1: Insufficient Knowledge of Nurses' Engagement in AMS. Insufficient AMS-related knowledge is a major barrier to nurse engagement in AMS. A significant proportion of nurses (8 out of 17) were unaware of what AMS is, and five nurses mentioned that AMS was primarily the responsibility of doctors and pharmacists, with little relevance to nursing. Three interviewees reported a lack of understanding regarding the specific content and scope of nursing practice in the context of AMS.

TABLE 1: The three lowest and highest scoring items for the knowledge domain.

Items	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
The top three lowest-scoring items					
K7. I know how to select the PH value and solvent volume in antibiotic configurations	4 (0.9)	58 (12.5)	153 (33.1)	186 (40.2)	62 (13.4)
K1. I know the purpose and significance of antimicrobial stewardship	8 (1.7)	67 (14.5)	122 (26.4)	209 (45.1)	57 (12.3)
K6. I know that β lactams have a high false-positive rate during a skin allergy test	3 (0.7)	42 (9.1)	146 (31.5)	200 (43.2)	72 (15.6)
The top three highest-scoring items					
K3. I know that culture specimens should be collected appropriately before using antimicrobials for treatment	8 (1.7)	33 (7.1)	52 (11.2)	209 (45.1)	161 (34.8)
K9. I understand time-based or concentration-based antibiotic administration	2 (0.4)	26 (5.6)	75 (16.2)	268 (57.9)	92 (19.9)
K5. I know the benefits of inquiring into antibiotic allergy history	1 (0.2)	36 (7.8)	81 (17.5)	245 (52.9)	100 (21.6)

Table 2: The three lowest and highest scoring items for the attitude domain.

Items	Strongly disagree	Disagree	Not sure	Agree	Strongly agree
The top three lowest-scoring items					
A12. Nurses should be part of team discussions regarding antimicrobial adjustments after 72 hours (withdrawal and de-escalation)	4 (0.9)	11 (2.4)	78 (16.8)	248 (53.6)	122 (26.3)
A1. Nurses should participate in antimicrobial stewardship programmes	4 (0.9)	9 (1.9)	72 (15.6)	244 (52.7)	134 (28.9)
A4. Nurses should be positive in acquiring up-to-date knowledge regarding antimicrobials and antimicrobial resistance	5 (1.1)	4 (0.9)	70 (15.1)	244 (52.7)	140 (30.2)
The top three highest-scoring items					
A8. Nurses should be aware of the importance of infection prevention and control measures (hand hygiene, standard precautions, etc.) to prevent nosocomial infections	3 (0.6)	6 (1.3)	39 (8.4)	252 (54.4)	163 (35.2)
A3. Nurses should be aware that rational and prudent use of antimicrobials can delay and reduce the development of multidrug-resistant bacteria	3 (0.6)	7 (1.5)	41 (8.9)	243 (52.5)	169 (36.5)
A11. Nurses should promptly identify incorrect antimicrobial orders and inform the physician when such orders are received	3 (0.6)	5 (1.1)	44 (9.5)	245 (52.9)	166 (35.9)

TABLE 3: The three lowest and highest scoring items for the practice domain.

Items	Never	Rarely	Sometimes	Often	Always
The top three lowest-scoring items					
P8. Participating in discussions regarding antimicrobial adjustment (de-escalation or discontinuation)	25 (5.4)	20 (4.3)	140 (30.3)	163 (35.2)	115 (24.8)
P9. Assessing patients' swallowing function and ability to take oral medications and recommending switching to oral administration as necessary	26 (5.6)	16 (3.5)	122 (26.3)	173 (37.4)	126 (27.2)
P12. Coordinating and discussing antimicrobial therapy with multiple professionals	11 (2.4)	17 (3.7)	91 (19.6)	181 (39.1)	163 (35.2)
The top three highest-scoring items					
P1. Informing patients of proper retention methods and precautions when collecting sputum and urine samples	0 (0.0)	9 (1.9)	22 (4.8)	145 (31.3)	287 (62.0)
P7. Monitoring and reporting adverse reactions to antimicrobial treatment	0 (0.0)	7 (1.5)	32 (6.9)	142 (30.7)	282 (60.9)
P5. Providing antimicrobials without delay, adhering to the appropriate drip rate, and documenting the administration	0 (0.0)	9 (1.9)	29 (6.3)	187 (40.4)	238 (51.4)

TABLE 4: Univariate analysis of AMS knowledge, attitudes, and practices of nurses with different demographic characteristics ($N = 463$).

Variables	n (%)	Knowledge Mean (SD)	Knowledge t/F (P)	Attitudes Mean (SD)	Attitudes t/F (P)	Practices Mean (SD)	Practices t/F (P)
Sex			−1.33 (0.18)		−0.28 (0.78)		−1.45 (0.15)
Male	31 (93.3)	61.77 (10.72)		57.52 (10.37)		56.58 (9.03)	
Female	432 (6.7)	64.50 (11.03)		57.97 (8.70)		58.94 (8.77)	
Age (years)			2.84 (0.02)*		1.83 (0.12)		0.34 (0.85)
20–30	141 (30.4)	63.43 (10.83)		58.65 (8.35)		58.48 (8.30)	
31–35	196 (42.3)	63.75 (11.70)		56.93 (9.38)		58.54 (9.23)	
36–40	92 (19.9)	64.77 (9.42)		58.05 (8.09)		59.71 (8.55)	
41–45	16 (3.5)	69.06 (11.13)		58.81 (9.45)		59.13 (8.55)	
>45	18 (3.9)	71.00 (10.10)		61.88 (7.81)		58.89 (9.85)	
Education level			0.28 (0.76)		1.07 (0.35)		0.51 (0.60)
Junior college or lower	16 (3.5)	65.31 (11.92)		56.38 (7.88)		60.94 (9.77)	
Bachelor degree	425 (91.8)	64.21 (11.13)		57.87 (8.72)		58.69 (8.83)	
Graduate degree	22 (4.7)	65.77 (8.35)		60.32 (8.28)		59 (7.65)	
Professional title			3.71 (0.01)*		1.52 (0.21)		1.01 (0.39)
Junior nurse	64 (13.8)	61.75 (11.00)		58.63 (7.84)		57.14 (8.59)	
Senior nurse	221 (47.7)	63.99 (11.32)		57.63 (8.80)		58.87 (9.01)	
Supervisor nurse	163 (35.2)	65.11 (10.41)		57.67 (9.28)		59.17 (8.67)	
Cochief nurse and higher	15 (3.2)	71.53 (10.16)		62.33 (6.49)		60.33 (7.68)	
Clinical teacher			−3.54 (<0.01)*		−0.29 (0.77)		−3.17 (<0.01)*
No	217 (46.9)	62.41 (10.98)		57.81 (8.43)		57.42 (9.01)	
Yes	246 (53.1)	66.00 (10.81)		58.05 (9.14)		59.99 (8.44)	
Knowing that the hospital has an ASP			−6.83 (<0.01)*		−2.84 (0.01)*		−4.84 (<0.01)*
No	146 (31.5)	59.40 (11.26)		56.25 (8.61)		55.94 (9.35)	
Yes	317 (68.5)	66.58 (10.16)		58.71 (8.80)		60.09 (8.22)	
Nursing experience (years)			3.02 (0.01)*		1.14 (0.34)		1.47 (0.20)
<1	24 (5.2)	58.33 (11.19)		57.54 (8.13)		54.21 (9.85)	
1–5	103 (22.2)	63.77 (9.86)		58.39 (7.94)		58.63 (7.89)	
6–10	154 (33.3)	63.90 (11.96)		57.72 (9.91)		59.31 (8.83)	
11–15	117 (25.3)	64.85 (11.01)		56.92 (8.57)		58.91 (9.33)	
16–20	34 (7.3)	65.74 (9.02)		58.62 (7.81)		59.47 (8.07)	
>20	31 (6.7)	69.32 (9.83)		60.90 (7.95)		59.00 (9.00)	
Willingness to undergo AMS training			−2.05 (0.04)*		−3.51 (<0.01)*		−1.66 (0.11)
No	33 (7.1)	60.55 (12.30)		52.82 (11.96)		56.33 (8.97)	
Yes	430 (92.9)	64.61 (10.88)		58.33 (8.41)		58.97 (8.77)	
Frequency of receiving AMS education in the past year			25.41 (<0.01)*		12.15 (<0.01)*		20.61 (<0.01)*
0	178 (38.4)	59.77 (10.28)		56.13 (8.97)		55.83 (9.36)	
1	134 (28.9)	64.65 (10.67)		56.66 (9.65)		58.17 (8.59)	
2	71 (15.3)	67.63 (10.18)		59.92 (6.63)		61.59 (6.36)	
≥3	80 (17.3)	70.95 (9.45)		62.35 (6.64)		63.89 (6.55)	

TABLE 4: Continued.

Variables	n (%)	Knowledge		Attitudes		Practices	
		Mean (SD)	t/F (P)	Mean (SD)	t/F (P)	Mean (SD)	t/F (P)
Department			**2.43 (0.05)**		**2.77 (0.03)**[*]		**4.95 (<0.01)**[*]
Intensive care unit	76 (16.4)	61.16 (11.98)		55.84 (8.62)		56.11 (9.24)	
Internal medicine department	162 (35.0)	64.23 (9.97)		57.14 (8.50)		57.63 (8.59)	
Department of surgery	169 (36.5)	65.05 (11.85)		59.08 (9.40)		60.77 (8.96)	
Department of emergency	26 (5.6)	66.23 (9.79)		58.96 (6.70)		59.73 (7.29)	
Department of gynaecology	30 (6.5)	67.03 (8.73)		60.27 (7.96)		59.80 (6.35)	

Notes: [*] P value's significance at the 0.05 level. Abbreviations. SD, standard deviation. AMS, antimicrobial stewardship. ASP, antimicrobial stewardship programme.

TABLE 5: Multivariate analysis of nurses' knowledge, attitudes, and practices regarding AMS.

Domains	Independent variables	β	SE	β'	t	P
Knowledge	Constant	46.341	6.669	—	6.949	<0.001
	Knowing the ASP in their hospital	3.872	1.160	0.163	3.337	<0.001
	Frequency of receiving AMS education in the past year	2.955	0.471	0.296	6.270	<0.001
Attitudes	Constant	46.202	5.634	—	8.201	<0.001
	Willingness to undergo AMS training	3.658	1.582	0.107	2.312	0.021
	Frequency of receiving AMS education in the past year	1.701	0.398	0.213	4.273	<0.001
Practices	Constant	50.001	5.430	—	9.208	<0.001
	Clinical teacher	2.084	0.914	0.118	2.280	0.023
	Frequency of receiving AMS education in the past year	2.212	0.384	0.278	5.765	<0.001

Notes: knowledge: $F = 8.166$, $P < 0.001$, $R^2 = 0.191$, adjusted $R^2 = 0.168$. Attitudes: $F = 3.662$, $P < 0.001$, $R^2 = 0.096$, adjusted $R^2 = 0.070$. Practices: $F = 6.498$, $P < 0.001$, $R^2 = 0.158$, adjusted $R^2 = 0.134$. Abbreviations. AMS, antimicrobial stewardship. ASP, antimicrobial stewardship programme.

(1) Sub-Theme 1: Limited Opportunities to Engage in AMS Training. The interviewees reported that AMS training in their hospitals primarily focused on doctors, pharmacists, and laboratory technicians, with less emphasis placed on involving nurses. Even when nurses were notified about training opportunities, they often faced challenges related to time constraints and scheduling conflicts, making it difficult for them to actively participate in the training.

I have rarely received this kind of AMS training. Generally, this training is specifically designed for doctors. Even if I want to participate, I don't know when and where AMS training will be held. (N11)

This training is mostly scheduled during working hours, which presents a challenge for us nurses. Our workload is already overwhelming, making it difficult to find the time to attend. Even when there are training sessions during break time, we often feel exhausted and lack the energy to fully engage. (N8)

(2) Sub-Theme 2: Limited Opportunities to Apply and Retain AMS Knowledge. Despite receiving education on antibacterials during their degree courses or continuing education, nurses frequently encounter difficulties in effectively applying and retaining this knowledge in their daily practice. The demanding and fast-paced work environment often left nurses with insufficient time to fully consider and apply their acquired knowledge, leading to a gradual loss of important details over time.

We often find ourselves lacking the necessary time and opportunities to fully delve into our knowledge, resulting in the gradual loss of important details. For example, when things become busy, it becomes challenging to monitor patients' conditions as meticulously as we were trained to do. As time goes by, this knowledge gradually fades away. (N7)

Furthermore, the restricted input from nurses in prescription decisions further contributed to this perception. This limitation leads to a dearth of opportunities for nurses to apply their AMS knowledge in practical settings.

We are seldom present during multi-disciplinary rounds, and even if we do attend, we lack the authority to provide input on prescription decisions. (N10)

3.2.2. Theme 2: Diverse Attitudes towards Engagement in AMS. The interviewees had diverse attitudes towards engagement in AMS training and practice. A positive attitude primarily stemmed from the recognition of the significance of AMS and a sense of responsibility toward patients safety. Conversely, a negative attitude mainly originated from doctors' sensitivity to their authority, as well as the fear of being blamed. Additionally, department cultures, including doctor-nurse relationships and peer attitudes, could influence nurses' confidence in participating, consequently impacting their attitudes towards AMS involvement.

(1) Sub-Theme 1: Diverse Attitudes towards Engagement in AMS Training. Most interviewees recognised the importance of participation in AMS and tend to have a more positive attitude towards AMS training. In addition, nurses who demonstrate a strong sense of responsibility towards patient safety exhibit a commendable commitment to engaging in AMS training, even in the face of acknowledging their demanding workload and limited time and energy.

I am highly motivated to learn about AMS because it is our duty and a crucial aspect of our work. Acquiring knowledge in this area enables us to identify and prevent potential microbial resistance crises, ultimately reducing the difficulties and losses experienced by our patients. (N3)

However, five nurses held the view that AMS is predominantly the domain of doctors and pharmacists, perceiving it as having minimal relevance to their nursing duties. This perception further dampens their motivation to engage in AMS training.

I don't believe that the training holds much practical value for our work as nurses. After all, prescribing and making choices about antibiotics are not typically included in our job description. (N13)

(2) Sub-Theme 2: Diverse Attitudes towards Engagement in AMS Practice. Nurses demonstrated a positive attitude towards participating in AMS to their strong sense of responsibility, patient safety awareness, and the presence of a harmonious doctor-nurse relationship. Those who expressed a sense of responsibility in advocating for patient rights displayed a commendable willingness to actively engage in AMS practice.

> *It's crucial to the treatment and recovery of patients, and I think our participation in AMS can better facilitate collaboration with doctors, as well as better safeguard the interests and safety of patients. (N12)*

> *That's the way we actively work to protect our patients' rights and keep them safe. It's also a big part of our job. (N6)*

The confidence of nurses in participating in AMS is largely influenced by the doctor-nurse relationship. In healthcare settings where doctors and nurses enjoy a harmonious relationship, nurses are more inclined to seek information from doctors regarding AMS and feel encouraged to present their suggestions and actively participate in decision-making processes.

> *If this situation occurs in a good doctor-nurse relationship, doctors will be very patient, and we are willing to give advice, discuss, and participate in the decision-making process. However, if the doctor-nurse relationship is not good, we may hesitate to ask the doctor for reasons or question the prescription. (N1)*

The sensitivity of doctors to their authority significantly impacts nurses' willingness to question their decisions. Doctors hold higher positions of power in clinical decision-making, especially when it comes to prescribing and AMS. This often leads nurses to hesitate in questioning doctors' decisions for fear of conflict or disrespecting their authority.

> *Doctors are really touchy about their authority in AMS. Sometimes, they get annoyed with the supervision from clinical pharmacists and think they should be the ones making all the decisions, not to mention involving nurses. This could make the collaboration in healthcare even more strained. We (nurses) are hesitant to question their prescribing decisions, afraid it might cause conflict or make them think we don't respect their authority. So, in the end, we just keep quiet. (N4)*

The receptiveness of doctors towards nurses' suggestions played a crucial role in nurses' willingness to engage in AMS. If doctors respond negatively to nurses' suggestions, it can dampen their motivation to actively participate in AMS initiatives. In addition, the opinions of nursing peers within their working unit can influence nurses' attitudes towards AMS participation. Some interviewees mentioned being influenced by their nursing peers and adopting a conformist attitude towards engagement in AMS.

> *The doctors showed little concern for our suggestions. Each time we offered advice, they failed to take it seriously, causing us to eventually give up. (N16)*

> *When I get confused, I try to seek advice from more experienced colleagues. However, they often say that we just need to follow the doctor's orders. They have always done it this way. so, I just comply with it. (N17)*

The fear of being blamed is another significant factor that affects nurses' reluctance to actively engage in AMS practices. Nurses' concerns about their knowledge and abilities in AMS lead to feelings of insecurity and fear. They often fear providing incorrect advice or making mistakes that could potentially jeopardize patient safety. This fear of being held accountable for any negative outcomes further exacerbates their unwillingness to participate in AMS practices.

> *After all, our knowledge about AMS is limited. What if we make a mistake? In such a situation, the doctor may hold us accountable, and the head nurse might criticize us as well. Who will ultimately be responsible? Sometimes, it may seem preferable not to take any action. (N2)*

3.2.3. Theme 3: Limited Scopes and Absence of Standards in Nurses' Participation in AMS Practices. Incorporating the practice domain mentioned in the quantitative phase into the interview guideline, we investigated the perspectives and experiences of nurses regarding AMS practice. The interviewees highlighted that their involvement in AMS was constrained in terms of scope and form. In addition, the absence of guidelines and evaluation metrics further hindered their participation.

(1) Sub-Theme 1: Limited Practice Scope and Form in AMS. Nurses tend to engage in AMS practices that highly overlap with routine nursing practices. However, core nursing practices recommended by the ANA/CDC White Paper [34], such as multidisciplinary ward rounds, medication adjustments, and intravenous to oral transfers, are often excluded from their participation. Ten interviewees emphasized their exclusion from crucial AMS practices, including antimicrobial de-escalation and the switch from intravenous to oral therapy. These interviewees expressed uncertainty about the exact role and responsibilities in AMS. They hope to be more actively involved and provide advice on patient care. However, the power imbalance between doctors and nurses limits their participation in key practical decision-making for AMS. They feel like bystanders, unable to participate in important AMS practice decisions.

> *As a nurse, I often find myself unsure about my exact role and responsibilities in AMS. We only follow the doctor's instructions and have no decision-making power. Although I will try my best to remind the doctors when skin tests are no longer effective and suggest rescheduling them accordingly, all decision-making power is in the hands of doctors. (N10)*

We did not participate in key AMS practices such as antimicrobial de-escalation or the switch from intravenous to oral therapy. We feel like we're on the sidelines, watching the game but unable to play. (N3)

(2) Sub-Theme 2: Absence of Standardized Guidelines, Procedures, and Evaluation Indicators for Nurses' Participation. The lack of standardized guidelines and procedures creates barriers to engagement. Nurses need a clear framework to follow in AMS, outlining the appropriate steps and actions to be taken in various situations. Without this clarity, nurses may not fully understand their responsibilities and may struggle to contribute effectively to AMS efforts.

When I observed repeated infections or poor treatment outcomes in patients, this may be a sign of AMR. However, I often feel confused about how to accurately identify and report this situation, which may result in delays in taking appropriate measures to control and prevent AMR. If I had a guide or process to assist my work, I believe it would be better. (N14)

This lack of standardized guidelines and procedures also extends to the evaluation of nurses' performance in AMS. Without established metrics to assess their effectiveness, nurses may not feel encouraged or supported. They may perceive no difference between being involved or not, leading to a lack of prioritization in AMS practice and insufficient attention being given to AMS.

Is there a standard for participation or non-participation in AMS? How do we evaluate our AMS performance? Without standardised indicators, there is no difference between participating and not participating. So, we might as well not do it. We already have so much work, and this is not necessary. (N13)

3.3. *The Synthesis of Quantitative and Qualitative Results.* The qualitative phase of this study offers additional insights into the quantitative results and supplementary information on potential factors influencing nurses' engagement in AMS. In order to provide a comprehensive representation of the study findings, Figure 1 presents the combined results of the two-stage study in a graphical format.

4. Discussion

To our knowledge, this is the first mixed-methods study conducted in China that specifically assesses the KAP of nurses regarding AMS. In this study, we comprehensively assessed the KAP of Chinese nurses towards AMS and explored factors influencing these aspects. Our findings highlight the crucial need to enhance nurses' AMS knowledge, attitudes, and practice levels. Key influencing factors include awareness of the hospital's ASP, frequency of AMS training, willingness to participate in AMS training, and involvement in clinical teaching. The qualitative findings

further reveal issues such as insufficient AMS knowledge, diverse attitudes towards AMS training and practice, and a limited scope and lack of guidelines in AMS practice.

Interestingly, only 57.5% of nurses in our study understood the importance and purpose of AMS, which is lower than the percentage reported by Abbas et al. (64.2%) [17]. This disparity in knowledge scores can be attributed to the difference in the availability of formal AMS training. In Abbas et al.'s study, nearly all nurses completed a mandatory online education program, while in our study, there was a lack of training and awareness, particularly in key areas such as antibiotic preparation and allergy testing. This highlights the importance of nurses continually updating their knowledge and adhering to the latest information and guidelines [6]. To bridge these knowledge gaps and promote responsible antimicrobial administration, hospitals must emphasize AMS training for nurses [6, 34]. This is further supported by the positive correlation between the frequency of receiving AMS education in the past year and participants' knowledge of AMS.

Providing comparative education is critical for healthcare professionals who are part of an AMS team or are interested in further involvement in AMS activities [35]. However, nurses do not always have the opportunity to participate in AMS training [36]. The qualitative research provides insight into this issue, revealing a lack of opportunities for nurses to engage in AMS training [36, 37]. Interviewees attributed this to insufficient AMS training provided by hospitals, with existing programmes primarily focusing on physicians, pharmacists, and microbiology technicians, neglecting the involvement of nurses. This reflects a significant oversight in recognizing the critical role nurses play in AMS [26]. This reflects a significant oversight in recognizing the critical role nurses play in AMS. To address this, there should be a greater emphasis on developing specialized curriculums for nurses [38], as recommended by the ANA/CDC White Paper [34]. In addition, implementing mandatory education programmes, similar to the one conducted in the Abbas et al. study, can ensure that all nurses receive comprehensive AMS training [17].

The lack of time to attend training was identified as a barrier for some nurses, as these sessions were typically scheduled during work hours, conflicting with nurses' heavy workloads and limiting their ability to participate. This indicates a lack of consideration for the practical constraints faced by nurses and further hinders their access to AMS training [35]. Innovative training models are essential to cater to the practical needs of nurses [39]. Continuing education can be delivered through various formats, including face-to-face sessions, online sessions, blended learning, workshops, and seminars [18, 35, 40, 41]. Among these options, online education stands out due to its numerous advantages like increased accessibility, flexibility, cost-effectiveness, and self-paced learning, which overcome barriers associated with traditional face-to-face education [40–43].

Several key issues affecting the application and retention of AMS knowledge were revealed based on the report of interviewees. The fast-paced work environment leaves them with limited time to consider the specific details of AMS, and
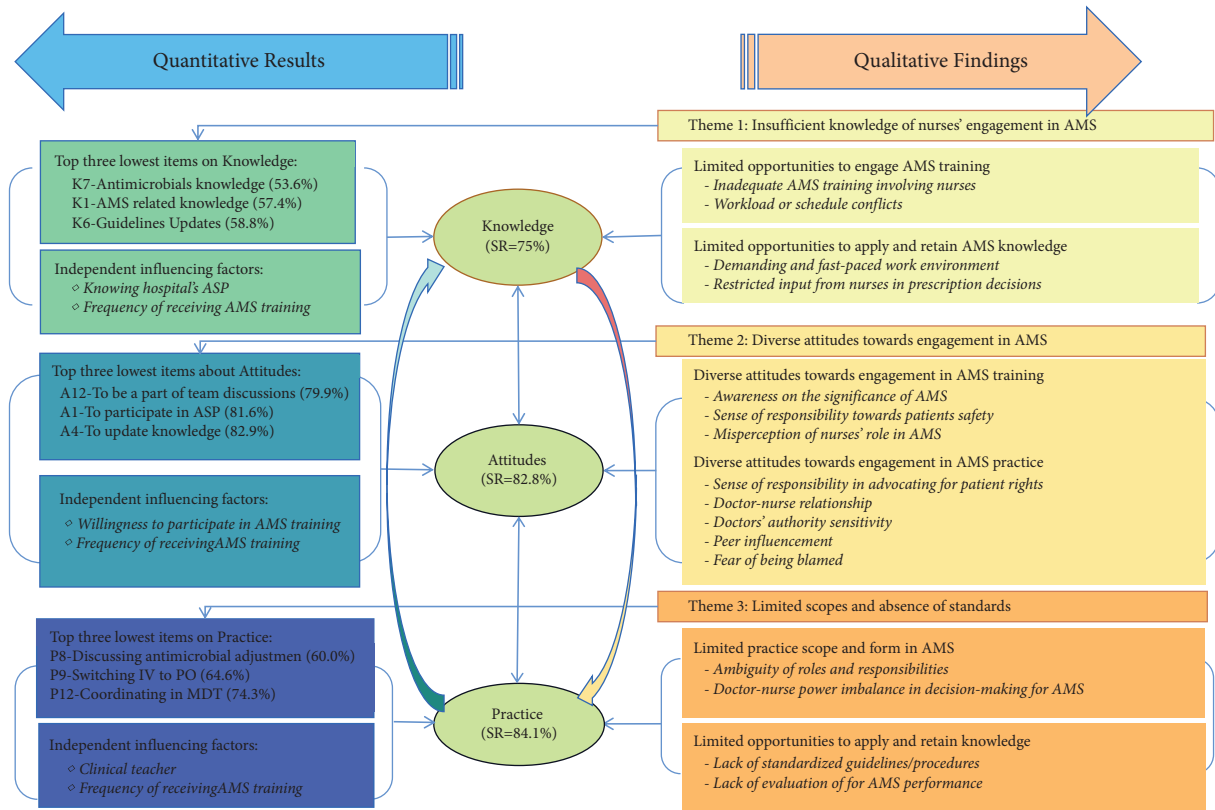
FIGURE 1: Joint display of the findings of the two-phase study. Note: IV to PO: intravenous to per oral; AMS: antimicrobial stewardship; ASP: antimicrobial stewardship programme; MDT: multidisciplinary team.

their restricted input in prescription decisions further limits their ability to apply their knowledge in practice [44]. To address these challenges, a collaborative and inclusive approach to AMS is crucial [38]. This approach aligns with the principle of positive deviance, enabling nurses to leverage their required skills and knowledge [45]. Additionally, healthcare organizations should create a supportive environment where nurses are recognised as valuable contributors and provided with education and training to actively engage in AMS [46]. Encouraging open communication, interdisciplinary teamwork, and providing resources and time for ongoing learning are also helpful [38].

The study provides valuable insights into nurses' attitudes towards AMS and the factors influencing them. Our quantitative research findings suggest that nurses are generally positive about AMS. It is consistent with previous studies [16, 38, 47, 48], which highlight the shared recognition among healthcare professionals, including nurses, of the importance of judicious antimicrobial use in reducing the emergence and spread of AMR and improving patient outcomes [16]. However, qualitative analysis revealed diverse attitudes among nurses about engaging in both AMS training and practice. The underlying problem of nurses' lack of proactive participation in AMS training reflects challenges in education and awareness [49]. An inadequate comprehensive understanding of the importance of AMS and its implications for professional development and

patient safety may be attributed to a lack of relevant training and education among nurses [50]. Furthermore, nurses may perceive AMS as being beyond their remit, diminishing their motivation to engage in AMS training. To address this issue, it is crucial to optimise the AMS training content targeted to fill knowledge gaps, as well as develop comprehensive AMS education and continuous professional development programmes [18, 51]. These initiatives should provide ample opportunities for professional growth and are designed to enhance nurses' understanding of AMS, clarify their role in AMS, and ultimately increase their willingness to participate in AMS training [13]. Additionally, this training should emphasize the connection between nursing contributions and AMS objectives, thereby enhancing their understanding of the importance of AMS participation [16].

The relationship between physicians and nurses is also crucial in shaping nurses' attitudes towards AMS [52, 53]. The study highlights the pressure nurses face due to doctors' authority sensitivity and emphasizes the importance of physicians recognizing nurses' competence and the need for supportive attitudes from healthcare colleagues. Improving physician-nurse relationships, fostering interprofessional collaboration and communication, and cultivating a positive work environment and culture are identified as significant factors in addressing these challenges [54]. Establishing interprofessional AMS committees or organising regular meetings to facilitate dialogue and cooperation among

healthcare professionals is recommended as an effective strategy [55]. In addition, promoting a culture of continuous learning and knowledge sharing within healthcare institutions through peer-to-peer learning, mentorship programmes, and utilizing experts as resources can enhance nurses' understanding of AMS practices [56, 57].

Nurses' fear of being blamed can significantly impact their attitudes towards AMS practices. To address this, it is recommended to establish a supportive work environment that creates a sense of safety for nurses [58, 59]. Encouraging nurses to ask questions, seek clarification, and share their experiences, along with offering feedback and learning opportunities, can contribute to the ongoing improvement of their AMS knowledge and further motivate their active engagement in AMS practices [60]. By addressing these concerns and fostering a supportive environment, nurses can feel empowered to actively participate in AMS and contribute to its success [50].

Our study confirmed previous findings [38, 61] that nurses were confident in routine care practices, such as obtaining cultures before initiating antibiotics, assessing for antibiotic-associated adverse drug reactions, and educating patients and families about appropriate antibiotic use. However, we observed that nurses were less confident or hesitant when it came to participating in discussions regarding the adjustment of antimicrobial therapy, evaluating patients' swallowing function and oral medication ability, and coordinating activities with multidisciplinary professionals. This discrepancy highlights an imbalance in nurses' involvement and confidence in AMS [52, 61]. To address this issue, several factors must be considered, including inadequate training and guidance, workload pressures, and the need for improved communication and collaboration [54]. Addressing these issues will prepare nurses to participate more confidently in AMS, thereby improving the quality and safety of antibiotic use. The quantitative results demonstrating better AMS performance among clinical educators further validate this issue, which may be attributed to their advanced knowledge and skills.

To enhance nurses' participation in AMS practices, additional issues need to be addressed. One such issue is the lack of evaluation indicators for nurses' performance in AMS practices, which hampers their involvement [16]. Establishing clear assessment criteria will enable nurses to evaluate their effectiveness and drive their motivation and commitment [62]. Another issue is the lack of clear guidelines and standards, which can lead to nurses not fully understanding their responsibilities and not knowing how to effectively contribute to AMS efforts. Therefore, it is essential to develop comprehensive guidelines and standards that clearly define nurses' roles, responsibilities, and expectations in AMS practices [52]. These guidelines should provide clear guidance, empowering nurses to actively contribute to the antimicrobial decision-making process [62]. Proposed solutions to these problems should include encouraging nurses to actively participate in the rounding process and provide insights on various issues [50]. Tools like the SBAR (situation, background, assessment, recommendation) tool can facilitate effective communication between bedside nurses and healthcare providers [63, 64]. In addition, fostering a safe learning environment through group discussions, encouraging questions, and providing real-time education will reduce hierarchical perceptions and foster a shared understanding of the care management plan [54]. Furthermore, it is crucial that clinical leaders explicitly support and endorse the role of nurses in AMS [38]. This endorsement can further boost nurse confidence and participation in antibiotic management, leading to safer and more effective patient care [65].

This study has several limitations. Firstly, the self-reported questionnaire used in the study may have influenced respondents' answers due to subjectivity and potential social desirability bias. However, the explanatory sequential mixed methods employed in this study helped mitigate these limitations by validating the quantitative data through subsequent interviews. Despite the small qualitative sample size, the study achieved certain robust results. Second, the study was conducted in a specific province in China, which limits the generalizability of the findings to other regions within the country. Future research should consider expanding the survey area to include a more diverse sample. In addition, incorporating perspectives from other healthcare professionals, such as doctors, pharmacists, and hospital managers, would provide a more comprehensive understanding of nurses' involvement in AMS. Third, this study focused on nurses' attitudes in a medical setting where they are not authorized to prescribe medication. Therefore, generalizing the findings to other national or regional settings with different policies and medical contexts may be limited. Further research is needed to explore nurse KAP in various contexts to provide a more comprehensive understanding of the factors influencing AMS.

5. Implications for Nursing Management

Nursing managers should consider several key reforms to enhance nurses' participation in AMS initiatives. First, prioritising education and training programmes can improve nurses' knowledge and understanding of AMS principles and practices. Secondly, fostering collaboration and effective communication among healthcare professionals, including nurses, physicians, pharmacists, and other stakeholders, is essential to optimise antimicrobial use. Thirdly, nursing managers should ensure adequate staffing levels and workload management to allow nurses to dedicate sufficient time and attention to AMS activities without compromising patient care. Lastly, nursing managers should actively participate in policy formulation and implementation, advocating for the integration of AMS guidelines and standards into organisational policies and providing clear expectations for the participation of nurses in AMS.

6. Conclusions

The findings underscore the imperative to enhance nurses' understanding and engagement with AMS. Despite positive attitudes and practices, there's a noticeable knowledge gap that needs to be addressed. Influential factors included awareness of the hospital's ASP, frequency of AMS training,

and willingness to participate in such training. Qualitative insights further elucidate the limited scope and lack of guidelines in AMS practice, reinforcing the need for more structured and frequent training initiatives. This study highlights the importance of targeted interventions to enhance AMS knowledge and engagement among nurses. It is essential to explicitly support the role of nurses in AMS, enhance education, acknowledge the practical constraints of nurses, and innovate training approaches. Fostering a supportive organisational culture, promoting multidisciplinary dialogue, ensuring an inclusive learning environment, and encouraging the development of AMS-integrated tools can empower nurses in AMS.

Data Availability

All data from the study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

Supplementary Materials

Please refer to the following supplementary files for the relevant study guidance and checklists: Supplementary File 1: the STROBE statement guiding the quantitative study, while Supplementary File 2: the COREQ checklist guiding the qualitative study. Supplementary File 3: the GRAMMS Checklist. Supplementary File 4: the interview guidelines for the quantitative phase. Furthermore, detailed information on all items of nurses' knowledge, attitudes, and practices (KAP) on antimicrobial stewardship (AMS) can be found in Supplementary Table 1. The characteristics of the 17 interviewees in the qualitative phase are presented in Supplementary Table 2. (*Supplementary Materials*)

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Research Article

Leaders Condition the Work Experience: A Test of a Job Resources-Demands Model Invariance in Two Countries

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Aim(s). This two-wave study examines how transformational and laissez-faire leadership affect role overload and conflict and subsequent outcomes, including anxiety and intention to leave the organization. *Background.* In today's healthcare sector, promoting health among employees is more relevant than ever. Health-promoting leadership styles, such as transformational leadership, can positively affect staff well-being, but research on laissez-faire leadership is particularly sparse, though it is believed to be detrimental. Past research suggests that leadership conditions work experiences and can exacerbate or mitigate role stressors that result in individual outcomes. *Method(s).* Questionnaires were administered to nurses in the USA ($n = 208$) and Spain ($n = 220$), with a five- and eight-week separation, respectively. *Results.* Transformational leadership has a negative and laissez-faire leadership has a positive relationship with adverse outcomes. Furthermore, role overload and conflict mediate the relationship between leadership styles and outcomes. *Conclusion(s).* The study provides incremental evidence of the negative implications of laissez-faire leadership compared with the positive implications of transformational leadership on outcomes via role stressors as motivational mechanisms. *Implications for Nursing Management.* Learning about the medium-term implications of leadership styles on stressors and health-related outcomes would enrich opportunities for leadership training in organizations.

1. Background

According to Katz and Kahn's [1] social environment model, the work context influences the psychological experiences of stressors. Leaders are a pivotal component of the work context [2] and are the first in line to promote healthy work practices and worker well-being [3]. Extant literature on leadership has mainly examined the relationship between leadership and performance-related outcomes, and less often leadership in relation to well-being [3]; a few studies show the effects of leadership on subordinate well-being, including anxiety, burnout, stress, turnover [4–6], and mental health [7] as first-level outcomes that mediate the relationship between leadership style and performance. However, few studies have analyzed mediating factors [3, 4, 8] as mechanisms for the relationship between leadership style and well-being.

The Job Demands-Resources (JD-R) model [9] positions leadership as a key variable influencing perceptions of role demands and resources (e.g., [10]). Thus, positive behavioral qualities in leadership are viewed as a resource to mitigate the adverse effects of stressors [4, 5, 10]. However, health-promoting leadership, such as transformational leadership, can also prevent subordinates' experienced stressors, and, therefore, it also serves as an antecedent to job demands. Therefore, we propose and test a job resources-demands model (see Figure 1).

Results from studies in different countries in the healthcare sector show that transformational leaders (i.e., leaders that inspire, give individualized consideration, intellectually stimulate, and idealize influence) [11] help prevent job demands that affect well-being (e.g., [5, 12, 13]), whereas laissez-faire leadership (i.e., leaders that are unengaged with their subordinates) was not predictive of
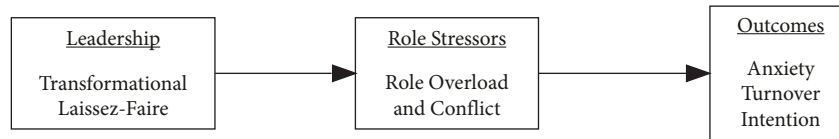
Figure 1: Proposed a job resources-demands model.

subordinate anxiety [14]. Transformational leadership is considered a positive resource, as such leaders focus on employee growth and development; however, laissez-faire leaders reflect negative behavioral qualities in leadership, as they neither care about the person nor the tasks. Laissez-faire leaders are unlikely to prevent stressors and strains. We contend that leaders condition subordinates' experiences, including stressors they perceive, which in turn relate to well-being outcomes.

As leaders influence subordinates' experiences in the workplace [15], it should only make sense to examine the favorably resourced context as an antecedent to perceptions of stressors and well-being. We, therefore, propose, per our JR-D model, that employees' experiences in a health-promoting (transformational) leadership context prevent stressors that lead to adverse outcomes, whereas reports of a laissez-faire leader will intensify them. Moreover, stressors' implications on strains will be weaker because of the positive behavioral qualities of the transformational leader, but stronger when faced with a laissez-faire leader.

The focal outcomes in this study are anxiety and the intention to leave the organization (aka. turnover intention). Anxiety is a psychophysiological response that can manifest as tightness in the chest, fear or worry, and even panic attacks [16]. It is an important first indication of psychological distress [17]. Turnover intention (hereto turnover) reflects a person's behavioral inclination to leave his or her workplace [16]. Findings associated with turnover can help make a stronger argument to management about why they might invest in leadership development. Current results show that transformational leadership indirectly and negatively relates to turnover via work stress [6] and irritation via job demands [5]. However, research on laissez-faire leadership, a passive leadership style, is scarce. In one study, laissez-faire leadership had no effect on anxiety [14], but in another, passive-avoidant leadership resulted in anxiety via role ambiguity [18]. Therefore, we expect leadership styles to indirectly relate to anxiety and turnover via role stressors.

1.1. Current Study. This study uses a two-wave approach to study how transformational and laissez-faire leadership relates to subordinates' perceptions of role overload and conflict (ROC), which further impact subordinates' reports of anxiety (a personal consequence) and turnover intention (an organizational consequence). The decision to examine leadership styles in relation to role stressors and strains is consistent with the theoretical linkage of stressors as the motivational mechanism that could explain the implications of leadership styles on well-being outcomes [3]. Moreover, theoretically, a leader's

behaviors have both long-term and short-term impacts (e.g., [19]. In the short term, it should immediately relate to the experience of stressors, and in the long term, it should affect outcomes via stressors. Therefore, we assessed leadership and stressors at Time 1 (T1) and outcomes at Time 2 (T2).

Our study presents two novel contributions. First, consistent with the results of an earlier study [18], we are here proposing a job resources-demands (JR-D, instead of JD-R) model to analyze work role stressors as job demands that mediate the relationship between both active and inactive leadership styles and well-being-related outcomes. This point is particularly relevant given the scarcity of research linking inactive (laissez-faire) leadership with well-being via the motivational mechanisms of role stressors. Second, we demonstrate model invariance in a two-country study. Our samples came from the same profession, but from different countries. Burgeoning research shows that although the implications of a transformational leadership style may be positive across cultures, the relationship is stronger in high uncertainty avoidant cultures [20]. Watts et al. [20] identified Spain, a Latin European country, as high on uncertainty avoidance, and the USA as low on uncertainty avoidance. Thus, the second aim is to show consistency in relationship patterns or to give credence to Watts et al.'s findings.

1.2. Hypotheses (H). Regardless of cultural context,

H_1: laissez-faire leadership (Time 1 or T1) will positively relate to (a) anxiety and (b) turnover intention (Time 2 or T2)

H_2: role overload and conflict (T1) will mediate the effect of laissez-faire leadership on (a) anxiety and (b) turnover intention (T2)

H_3: transformational leadership (T1) will negatively relate to anxiety and turnover intentions (T2)

H_4: role overload and conflict (T1) will mediate the relationship between transformational leadership (T1) and both (a) anxiety and (b) turnover intention (at T2)

2. Methods

2.1. Participants. Participants included 428 nurses working in two nursing homes in Spain and one hospital in the USA. These countries were chosen because of their clear cultural values differences in several cultural values, chief among them, uncertainty avoidance [21], which could influence the perception of leadership and role stressors [22], as could their differing healthcare systems [23].

2.2. Measures. With the exception of the questions on laissez-faire leadership, all other survey items were rated on a 7-pointLikert-type scale from 1 = "strongly disagree" to 7 = "strongly agree" and translated into Spanish following the guidelines of the International Test Commission [24].

2.2.1. Leadership Style. Eight items come from the Human Systems Audit transformational leadership short scale [25]. An example item is "S/he promotes the use of intelligence to overcome obstacles." Another four items addressing laissez-faire leadership were adopted from the MLQ-5X Multifactor Leadership Questionnaire (MLQ) 5X [26, 27]. An example of a laissez-faire leadership item is "Is absent when needed." Leadership items were rated on a 5-point scale, from 0, "never," to 4, "almost always." In Spain and the USA, Cronbach alphas for transformational leadership were 0.97 and 0.98, respectively, and for laissez-faire leadership, alphas were 0.73 and 0.76, respectively.

2.2.2. Role Overload and Conflict (ROC). Consistent with Katz and Kahn [1], a single index of ROC was created. Four role overload and three role conflict items were drawn from a previously cross-culturally validated measure of role stressors [16] (e.g., "It seems like I have too much work for one person to do," and "I receive incompatible requests from two or more people"). Cronbach alpha coefficients were modest in the Spanish sample ($\alpha = 0.63$), but acceptable in the U.S. sample ($\alpha = 0.83$, see main diagonals of Table 1). Low alpha coefficients are not unusual when a measure developed in one language is administered (after proper translation and back translation) into another language, particularly Spanish [28].

2.2.3. Outcomes. We drew on four items (e.g., "I have felt fidgety or nervous as a result of my job") from Parker and Decotiis [29] to assess anxiety. Cronbach alpha coefficients were strong in both Spain ($\alpha = 0.85$) and the USA ($\alpha = 0.91$). Furthermore, to assess turnover intention, we adopted three items (e.g., "I often think about quitting") from Seashore et al. [30]. Reliability coefficients were strong in Spain ($\alpha = 0.87$) and the USA ($\alpha = 0.88$).

2.3. Procedures. The first and second authors secured agreements for data collection at the data collection sites and received approval for data collection from the second author's Institutional Review Board. Paper-pencil surveys were administered to nurses in each healthcare institution. The surveys included an informed consent form. Respondents were under no obligation to complete the survey, which was both entirely voluntary and anonymous. In the USA, an envelope addressed to the second author was appended to the survey; completed surveys were sent internally to a specific office for retrieval. Nurses in Spain completed surveys during specified work hours, sealed them in envelopes, and returned them to the hospital research director, who presided over the survey distribution. Data were collected at two times (T1 and T2), separated by five (USA) and

eight (Spain) weeks (during the data collection times permitted by the administrative staff of the facilities). T1 surveyed stressors, strains, and leadership styles. T2 surveyed stressors and strains. As the surveys were anonymous, all nurses received both surveys. A self-generated identification code included on both surveys, along with some key demographics (i.e., age and sex), was used to match respondents across both surveys. Nurses who completed T1, but not T2 or T2, but not T1 are not included in the study's analyses.

2.4. Data Analysis. Descriptive analyses and structural equation modeling were used to test hypotheses. Statistical analyses were conducted using R software version 3.4.4 [31]. Additionally, the psych package [32] was employed for some of the psychometric analyses, whereas the lavaan Package [33] was used for carrying out the Structural Equation Modeling (SEM). SEM models were estimated using full information maximum likelihood (FIML) and robust standard errors (Huber-White). Although there were missing data, we assumed that the missing data were completely at random (MCAR) since statistical tests yielded nonsignificant results in the U.S. sample ($p = 0.66$) and, thus, the chosen estimation procedure can be regarded as adequate. Concerning missing data distributions along the two measurement times, 29.8% of participants presented missing scores in the US sample (distributions among scales: $M = 17.07\%$, $SD = 18.03\%$) at T1, whilst no missing data patterns were found at the Spanish sample. As for the second measurement wave, 37.50% of responses had missing data in the US sample (scales distributions: $M = 20.43\%$, $SD = 22.78\%$) and 24.09% in the Spanish sample ($M = 24.09\%$, $SD = 0.0\%$)).

Measurement and structural models were estimated following a two-step approach in order to avoid problems that might arise when interpreting both models simultaneously. In total, we estimated the following three SEM nested models: a first model (Model 1) that takes into account the effect of leadership style over the outcome variables (either turnover intention or anxiety); a second model (Model 2) in which ROC fully mediates the effect of leadership over the outcome variables; a third model (Model 3) implies the partial mediation of ROC in the relationship between leadership and the outcomes, that is to say, direct and indirect effects were included in the model. As for the interpretation of the goodness of fit related to these models, we employed comparative fit and Tucker Lewis indices (CFI and TLI, respectively; values over 0.90 correspond to an acceptable fit in both cases), root mean square error of approximation as well as its 90% confidence interval (RMSEA; RMSEA <0.05 is considered adequate enough, whereas regarding the CI, lower bounds lower than 0.05, ideally closer to 0.00, and upper bounds lower than 0.08 would imply an acceptable fit [34]. To compare the nested models, we also obtained the sample-size adjusted Bayesian Information Criterion (saBIC; in general, a lower value implies a better fit). Bias-corrected and accelerated confidence intervals were obtained by means of a bootstrapping

Table 1: Means and standard deviations, correlations (upper diagonal), sample sizes (lower diagonal), and Cronbach's alpha coefficients diagonal) for the overall (a), the U.S. (b), and the Spanish (c) samples.

	Time	M	SD	1	2	3	4	5
				(a) Overall sample				
(1) Laissez-faire	1	1.91	0.96	(0.75)	−0.61**	0.36**	0.26**	0.25**
(2) Transformational	1	5.20	1.62	337	(0.97)	−0.33**	−0.27**	−0.29**
(3) ROC	1	4.28	1.14	340	360	(0.72)	0.48**	0.33**
(4) Anxiety	2	3.26	1.64	286	298	302	(0.86)	0.49**
(5) Turnover intention	2	2.25	1.54	286	298	302	352	(0.91)
				(b) US sample				
(1) Laissez-faire	1	2.21	0.98	(0.76)	−0.66**	0.45**	0.32*	0.28
(2) Transformational	1	4.89	1.67	117	(0.98)	−0.34**	−0.12	−0.22
(3) ROC	1	4.36	1.25	120	140	(0.83)	0.52**	0.40**
(4) Anxiety	2	3.39	1.66	66	78	82	(0.91)	0.49**
(5) Turnover intention	2	2.65	1.52	66	78	82	132	(0.88)
				(c) Spanish sample				
(1) Laissez-faire	1	1.74	0.91	(0.73)	−0.57**	0.29**	0.23**	0.21**
(2) Transformational	1	5.40	1.57	220	(0.97)	−0.31**	−0.31**	−0.29**
(3) ROC	1	4.23	1.05	220	220	(0.63)	0.47**	0.29**
(4) Anxiety	2	3.18	1.62	220	220	220	(0.85)	0.49**
(5) Turnover intention	2	2.00	1.50	220	220	220	220	(0.92)

Note. $^*p < 0.05$; $^{**}p < 0.01$. Laissez-faire and transformational refer to leadership styles. ROC = role overload and conflict.

procedure (5000 samples generated within each run) for estimating the indirect effects. Since several authors (cf., [35] discouraged the use of asymptotic theory when testing indirect effects (i.e., tests assuming normality for the sampling distribution of the test statistic), we assumed a significant indirect effect whenever the confidence interval did not include zero.

3. Results

The samples consisted primarily of female nurses (91.8% in Spain and 96.1% in the USA). Nurses' ages ranged from 19 to 65 ($M = 43.3$ and SD = 11.4) years in Spain and 26 to 66 ($M = 47.5$ and SD = 10.29) years in the USA. In both countries, most of the nurses worked full-time (85.9% in Spain and 70.6% in the USA). Tenure ranged from brand new to 32 ($M = 7.01$ and SD = 6.75) years in Spain, and from brand new to 46 ($M = 10.95$ and SD = 10.2) years in the USA.

Per Table 1, Hypotheses 1 (H_1) and 3 (H_3) were supported in the overall and Spanish samples. In the Spanish sample, laissez-faire leadership (H_1) at T1 positively related with both turnover intention ($r = 0.21$, $p < 0.01$) and anxiety ($r = 0.23$, $p < 0.01$), whereas transformational leadership style (H_3) at T1 negatively related with turnover intention ($r = −0.29$, $p < 0.01$) and anxiety ($r = −0.31$, $p < 0.01$) at T2. In contrast, laissez-faire leadership style negatively correlated with anxiety ($r = −0.32$, $p < 0.05$) in the U.S. sample, but no significant correlations were obtained between transformational leadership style and turnover intention measured at T2. All correlations differed significantly from zero when analyzing the two samples combined (i.e., the overall sample).

3.1. Role Overload and Conflict as Mediator of Laissez-Faire Leadership and Strains

3.1.1. Overall Sample. Table 2 summarizes all the SEM models, including the laissez-faire scores as the main predictor for the samples. The models for the overall sample concerning turnover intention, showed acceptable fit as both CFI and LTI were greater than 0.90 and RMSEA values were lower than 0.08. The partial and full mediation models were comparatively better than the model including the direct effect of leadership over turnover intention (see Figure 2). Given the absence of statistically significant differences between the previous two models ($\Delta\chi^2$ (1) = 1.45; $p = 0.23$), we opted for the most parsimonious one (Model 2). The indirect effect of laissez-faire leadership on turnover intention, mediated by ROC, can be considered significant given the obtained confidence interval (estimate = 0.359; 95% CI = 0.21,0.509).

The SEM models related to anxiety fit the data adequately (CFI and LTI values over 0.90 and RMSEA below 0.08), except for the direct effect model. The full mediation model could be considered the better model according to saBIC indices and a LR test comparing the above-mentioned model with the partial mediation model ($\Delta\chi^2$ (1) = 0.00; $p = 0.98$). The estimated indirect effect of laissez-faire leadership on anxiety at T2 was 0.55, and its confidence interval did not include the zero value (95% CI = 0.36, 0.74). According to these findings, we found support for H_2 in the combined sample; the amount of variance accounted for in the outcome variables via the mediation models was 20% for turnover intention and 43% for anxiety.

TABLE 2: Results for the structural models studied using the laissez-faire leadership variable as the predictor in the overall (a), American (b), and Spanish samples (c). Role overload and conflict (mediator) were included in models 2 and 3.

(a) Overall sample

Response: Turnover Intention

	Model 1	Model 2	Model 3
Chi-square	176.72	157.76	156.13
Df	75	75	74
p value	<0.001	<0.001	<0.001
CFI	0.94	0.95	0.95
TLI	0.92	0.94	0.94
RMSEA (90% CI)	0.06 (0.05–0.07)	0.05 (0.04–0.06)	0.05 (0.04–0.06)
SaBIC	17964.61	17945.66	1946.90

Response: Anxiety

	Model 1	Model 2	Model 3
Chi-square	284.04	218.66	218.66
Df	88	88	87
p value	<0.001	<0.001	<0.001
CFI	0.88	0.92	0.92
TLI	0.85	0.9	0.9
RMSEA (90% CI)	0.07 (0.06–0.08)	0.06 (0.05–0.07)	0.06 (0.05–0.07)
SaBIC	19857.64	19792.26	19795.13

(b) U.S. sample

Response: Turnover Intention

	Model 1	Model 2	Model 3
Chi-square	176.30	166.92	166.59
Df	75	75	74
p value	<0.001	<0.001	<0.001
CFI	0.88	0.89	0.89
TLI	0.85	0.86	0.86
RMSEA (90% CI)	0.08 (0.07–0.1)	0.08 (0.06–0.09)	0.08 (0.06–0.09)
SaBIC	6873.04	6863.67	6865.47

Response: Anxiety

	Model 1	Model 2	Model 3
Chi-square	227.92	216.14	215.80
Df	88	88	87
p value	<0.001	<0.001	<0.001
CFI	0.86	0.87	0.87
TLI	0.83	0.85	0.84
RMSEA (90% CI)	0.09 (0.07–0.1)	0.08 (0.07–0.1)	0.09 (0.07–0.1)
SaBIC	7365.26	7353.48	7355.28

(c) Spanish sample

Response: Turnover Intention

	Model 1	Model 2	Model 3
Chi-square	104.35	93.73	92.47
Df	75	75	74
p value	0.01	0.07	0.07
CFI	0.97	0.98	0.98
TLI	0.96	0.97	0.97
RMSEA (90% CI)	0.04 (0.02–0.06)	0.03 (0.0–0.05)	0.03 (0.0–0.05)
SaBIC	10866.1	10855.48	10856.44

Response: Anxiety

	Model 1	Model 2	Model 3
Chi-square	187.96	140.14	140.13
Df	88	88	87
p value	<0.001	<0.001	<0.001
CFI	0.88	0.94	0.93
TLI	0.85	0.92	0.92
RMSEA (90% CI)	0.07 (0.06–0.09)	0.05 (0.04–0.07)	0.05 (0.04–0.07)
SaBIC	12207.64	12159.82	12162.03

Note. Model 1: direct effect only; model 2: full mediation model; model 3: partial mediation model. CFI = Comparative Fit Index. TLI = Tucker Lewis Index. RMSEA = Root Mean Square Error of Approximation. saBIC = Sample Adjusted Bayesian Index Criterion.
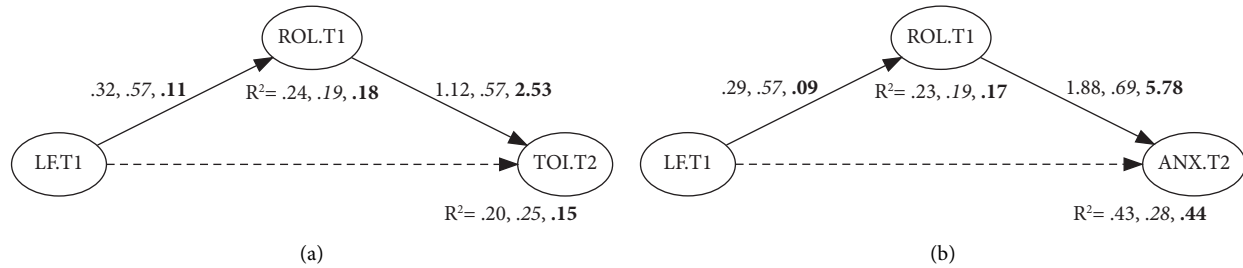
FIGURE 2: Path diagram of estimated coefficients in the overall, American (italic), and Spanish samples (bold), taking into account the full mediation model (model 2) for the laissez-faire effect over perceived strains. *Note.* LF.T1 = Laissez-faire scores at time 1 (T1); ROL.T1 = role overload and conflict at T1; TOI.T2 = turnover intention at time 2 (T2); anxiety.T2 = anxiety scores at T2.

3.1.2. U.S. Sample. Table 2 shows the results for the SEM models in the U.S. sample including laissez-faire leadership as the predictor variable (see Table 2 (b)). A poor fit to the data can be assumed in all models (CFI and LTI values below 0.95 and RMSEA over 0.08). As found previously, we assumed the equivalence of the full mediation model to the partial mediation one in terms of goodness of fit ($\Delta\chi^2(1) = 0.24$; $p = 0.62$). The indirect effect of laissez-faire leadership on turnover intention, mediated by ROC, can be considered significant given the obtained confidence interval (estimate = 0.32; 95% CI = 0.11, 0.54).

Concerning anxiety, the three SEM models showed a poor fit to the data by examining the goodness of fit indices used in the current study. As it occurred in other cases, the full mediation model could be considered the better model after comparing saBIC indices and carrying out a LR test with a partial mediation model ($\Delta\chi^2(1) = 0.34$; $p = 0.56$). The estimated indirect effect of laissez-faire leadership on anxiety at T2 was 0.39, and its confidence interval did not include the zero value (95% CI = 0.14, 0.65). Thus, H_2 was supported in the U.S. sample when taking laissez-faire leadership as the predictor for both response variables. In this regard, full mediation models achieved R-squared indices of 0.25 and 0.28 for turnover intention and anxiety at T2, respectively.

3.1.3. Spanish Sample. Focusing on turnover intention, the models showed a good fit, as both CFI and LTI were greater than 0.95 and RMSEA values were lower than 0.05. Even the Chi-square test indicated a good fit to the data in Models 2 and 3. The partial and full mediation models were comparatively better than the remaining ones looking at the saBIC indices. Given the absence of statistically significant differences between the previous two models ($\Delta\chi^2(1) = 1.23$; $p = 0.27$), we opted for the most parsimonious one (Model 2). The estimated indirect effect showed a positive effect of laissez-faire leadership in relation to turnover intention as mediated by ROC (estimate = 0.289; 95% CI = 0.09, 0.49).

When examining anxiety as an outcome, we found that the best models in terms of the combined criteria seen so far were the mediation models (Models 2 and 3). For Model 2, since the likelihood ratio test did not yield significant differences between these models ($\Delta\chi^2(1) = 0.01$; $p = 0.93$), we kept Model 2 as the most fitted one. The indirect effect of laissez-faire leadership on anxiety mediated by ROC was

0.52 (95% CI = 0.23, 0.81). Thus, when laissez-faire leadership was accounted for as the predictor, H_2 was supported. Full mediation models achieved R-squared indices of 0.15 and 0.44 for turnover intention and anxiety at T2, respectively.

3.2. Role Overload and Conflict as Mediator of Transformational Leadership and Strains

3.2.1. Overall Sample. Table 3 (a) shows results for the SEM models including transformational leadership in the two samples. If the turnover intention is included as the response, an acceptable fit can be assumed in the three models looking at the CFI and LTI (all values greater than 0.90) and the RMSEA (<0.08) except the direct effect model (RMSEA = 0.08). Full and partial mediation models seemed to be better than the alternative after inspecting the information criteria (see Figure 3). The partial mediation model is considered the best one since significant differences were found in terms of goodness of fit ($\Delta\chi^2(1) = 4.11$; $p = 0.04$). The indirect effects of transformational leadership on turnover intention mediated by ROC were estimated to be −0.14, and can be regarded as significant since its Bootstrap CI did not include zero (95% CI = −0.21, −0.075).

The SEM models fit the data reasonably well when including anxiety as the response (CFI and LTI values over 0.90 and RMSEA below 0.08), with the exception of model 1 (RMSEA = 0.08). The full mediation model can be preferred over the partial mediation alternative since the saBIC index of the first model is lower and the LR test yielded non-significant differences between the two models ($\Delta\chi^2(1) = 0.25$; $p = 0.62$). The estimated mediated effect of transformational leadership on anxiety at T2 was −0.28, and its confidence interval did not include the zero value (95% CI = −0.38, −0.18). Therefore, overall, we supported H_4; the mediation models, including turnover intention and anxiety as outcomes at T2, achieved 20% and 43% of explained variance, respectively.

3.2.2. U.S. Sample. Results for the SEM models including transformational leadership in the U.S. sample are shown in Table 3 (b). Acceptable fit can be assumed in the three models looking at the CFI and LTI (all values greater than 0.90), but not according to the RMSEA (>0.08). According to the saBIC indices, full and partial mediation models

TABLE 3: Results for the structural models studied using the transformational leadership variable as the predictor in the overall (a), the USA (b), and the Spanish samples (c). Role overload and conflict (mediator) were included in models 2 and 3.

(a) Overall sample

	Response: Turnover Intention		
	Model 1	Model 2	Model 3
Chi-square	413.72	395.54	390.32
Df	133	133	132
p value	<0.001	<0.001	<0.001
CFI	0.95	0.95	0.95
TLI	0.94	0.94	0.94
RMSEA (90% CI)	0.07 (0.06–0.08)	0.07 (0.06–0.08)	0.07 (0.06–0.08)
saBIC	21553.13	21534.95	21532.61

	Response: Anxiety		
	Model 1	Model 2	Model 3
Chi-square	522.54	449.28	448.96
Df	150	150	149
p value	<0.001	<0.001	<0.001
CFI	0.93	0.94	0.94
TLI	0.92	0.93	0.93
RMSEA (90% CI)	0.08 (0.07–0.08)	0.07 (0.06–0.08)	0.07 (0.06–0.08)
SABIC	23455.08	23381.82	23384.37

(b) U.S. sample

	Response: Turnover Intention		
	Model 1	Model 2	Model 3
Chi-square	340.9	327.25	327.07
Df	133	133	132
p value	<0.001	<0.001	<0.001
CFI	0.91	0.92	0.92
TLI	0.90	0.90	0.90
RMSEA (90% CI)	0.09 (0.08–0.1)	0.09 (0.07–0.1)	0.09 (0.07–0.1)
saBIC	8339.31	8325.66	8327.62

	Response: Anxiety		
	Model 1	Model 2	Model 3
Chi-square	423.27	405.40	405.17
Df	150	150	149
p value	<0.001	<0.001	<0.001
CFI	0.89	0.9	0.9
TLI	0.88	0.89	0.88
RMSEA (90% CI)	0.09 (0.08–0.11)	0.09 (0.08–0.09)	0.09 (0.08–0.09)
SABIC	8833.85	8815.97	8817.88

(c) Spanish sample

	Response: Turnover Intention		
	Model 1	Model 2	Model 3
Chi-square	299.29	294.07	288.73
Df	133	133	132
p value	<0.001	<0.001	<0.001
CFI	0.94	0.95	0.95
TLI	0.94	0.94	0.94
RMSEA (90% CI)	0.08 (0.06–0.09)	0.07 (0.06–0.09)	0.07 (0.06–0.08)
saBIC	12989.05	12983.82	12980.7

	Response: Anxiety		
	Model 1	Model 2	Model 3
Chi-square	372.33	326.69	325.37
Df	150	150	149
p value	<0.001	<0.001	<0.001
CFI	0.92	0.94	0.94
TLI	0.91	0.93	0.93
RMSEA (90% CI)	0.08 (0.07–0.09)	0.07 (0.06–0.08)	0.07 (0.06–0.08)
SABIC	14332.1	14286.46	14287.36

Note. Model 1: direct effect only; model 2: full mediation model; model 3: partial mediation model. CFI = Comparative Fit Index. TLI = Tucker Lewis Index. RMSEA = Root Mean Square Error of Approximation. saBIC = Sample Adjusted Bayesian Index Criterion.
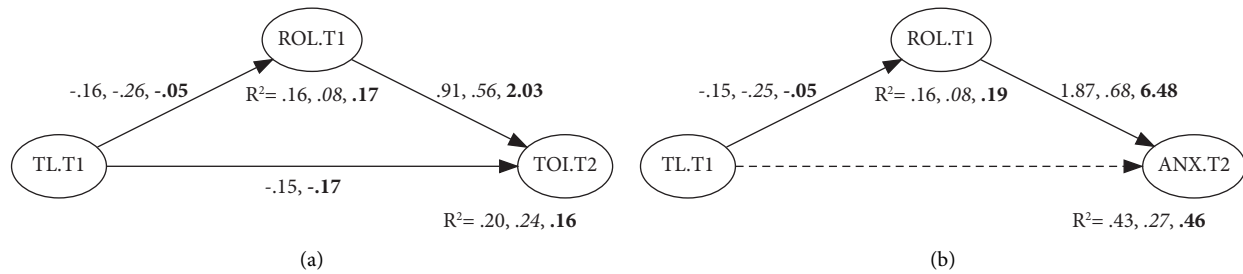
FIGURE 3: Path diagram of estimated coefficients in the overall, American (italic), and Spanish samples (bold), taking into account the full (model 2) or the partial mediation (model 3) model for the transformational leadership effect over perceived strains. *Note.* TL.T1 = transformational leadership scores at time 1 (T1); ROL.T1 = role overload and conflict at T1; TOI.T2 = turnover intention at time 2 (T2); anxiety.T2 = anxiety scores at T2.

seemed to be better than the alternatives. The full mediation model is considered the best one once we assume both mediation models equivalent in terms of goodness of fit ($\Delta\chi^2(1) = 0.18$; $p = 0.67$). Transformational leadership's indirect effects on turnover intention mediated by ROC were estimated to be −0.14, and can be regarded as significant since its Bootstrap CI did not include the zero (95% CI = −0.26, −0.026).

Concerning anxiety, the three SEM models fit poorly to the data (most of the CFI and LTI values below 0.90 and RMSEA >0.08). The full mediation model could be considered better after comparing saBIC indices and carrying out a LR test with a partial mediation model ($\Delta\chi^2(1) = 0.16$; $p = 0.69$). The estimated mediated effect of transformational leadership over anxiety at T2 was −0.17, and its confidence interval did not include the zero value (95% CI = −0.22, −0.072). Thus, in the U.S. sample, we supported H_4; the mediation models, including turnover intention and anxiety as outcomes at T2, achieved 19% and 27% of explained variance, respectively.

3.2.3. Spanish Sample. The main results regarding SEM models, taking into account transformational leadership, are shown in Table 3 (c). In the three studied models, we included transformational leadership as the predictor, turnover intention or anxiety as outcomes, and ROC as the mediator. With turnover intention as the outcome, the three models did yield a reasonably good fit in terms of CFI and TLI (with values over 0.94), and RMSEA (values being <0.08, except for model 1 which is equal to 0.08). When comparing the models in terms of information criterion, Models 2 and 3 (i.e., full and partial mediation models) present better goodness of fit. Carrying out a likelihood ratio test, (Yuan–Bentler scaled LR test), we found significant differences between the models ($\Delta\chi^2(1) = 4.30$; $p = 0.04$) and thus advocated for the partial mediation model. By using the bootstrapping procedure, we obtained a confidence interval for the indirect effect which did not include the zero value (estimate = −0.12; 95% CI = −0.20, −0.033).

Concerning anxiety at T2, models 2 and 3 were similar in terms of goodness of fit (CFI = 0.94; LTI = 0.93; and RMSEA = 0.07) and better than the other model when comparing saBICs. Since no significant differences between

them were found ($\Delta\chi^2(1) = 1.07$; $p = 0.30$), we identified the full mediation model as the best one. The mediated effect of transformational leadership on turnover intention through ROC was estimated to be −0.30 (95% CI = −0.44, −0.16). Thus, when accounting for transformational leadership as the predictor, H_4 was supported. Full mediation models explained 16% and 46% of the variability in turnover intention and anxiety variables at T2, respectively.

4. Discussion

This study aimed to examine the role of a supervisor's leadership style as a factor that conditions a subordinate's work environment, which then stimulates an individual's perceived ROC and subsequent psychophysiological and behavioral intentional responses, namely, anxiety and turnover intention. Furthermore, these relationships were studied in two countries to explore their portability. However, the literature on this topic from different countries is too scant to be able to derive cross-cultural hypotheses, and therefore, cultural explanations are post hoc.

As expected in H_1, nurses perceived that their supervisor employed a laissez-faire leadership style related to nurses' higher levels of anxiety and turnover intention, but only in the Spanish sample. Similarly, transformational leadership is negatively related to anxiety and turnover intention in the Spanish, but it is negatively related to turnover intention in the U.S. sample (H_3). That there was no direct link between leadership style and strains for the U.S. sample was also found in Lyons and Schneider [36]. Specifically, transformational and transactional leadership styles had no effect on positive affect (a variable that can be considered the opposite of anxiety).

One might explain these results from a cultural lens. We surmise, post hoc, that there was no direct link between leadership style and anxiety due to the U.S. endorsement of Mastery values [37]. Mastery cultures expect that individuals are responsible for their own responses to environmental conditions. Therefore, U.S. participants in this study and Lyons and Schneider's [36] study may be influenced more by the culture-level values of Mastery, wherein it is expected that individuals "get. . .ahead through active self-assertion" [37], p. 28) and are, therefore, responsible for their own

interpretation and responses to environmental conditions. Per Glazer et al. [38] Mastery cultures reinforce individual-level internal locus of control; in countries where the internal locus of control (i.e., a person believes that he or she is responsible for what happens to him or her) is stronger (e.g., the USA), those with an internal locus of control would, in fact, have less job stress, but in countries where the external locus of control (i.e., a person believes that others are responsible for what happens to him or her) is stronger, a person with an internal locus of control would, in fact, experience more job stress. U.S. leaders, therefore, may not be a direct influence on individuals' responses, but instead, the influence over strains may be driven by the culture's emphasis on Mastery and one's internal locus of control.

In contrast, Spanish culture strongly endorses egalitarian values (emphasizing others' welfare) and intellectual autonomy (i.e., the culture reinforces individual pursuit of independent ideas and intellectual stimulation) [37]. Leaders can either hinder or enable such pursuits, and therefore they may be viewed as directly responsible for employee well-being.

Per H_2, laissez-faire leadership was positively related to ROC, which mediated the relationship between laissez-faire leadership and both anxiety and turnover intention. Skogstad et al. [39] also found a positive link between laissez-faire leadership and role stressors. Our study results suggest that laissez-faire leadership supports a noxious work environment that can lead to nurses' perceptions of ROC, increased anxiety, and greater turnover intention. Furthermore, supporting H_4, transformational leadership is related to lower ROC, which is further related to lower anxiety and turnover intention. In other words, stressors (ROC) are a psychological process variable linking leadership style with psychological and behavioral outcomes [18]. Fernet et al. [12] also found that (emotional, cognitive, and physical) job demands mediated the relationship between transformational leadership and strain, specifically burnout, amongst a sample of French-Canadian nurses and school administrators, but as with the current study's results regarding U.S. study participants, transformational leadership did not directly relate to anxiety. This was also confirmed by Berger et al. [18] and Nielsen et al. [13]. Nielsen et al. found that work characteristics at T1 and T2 mediated the relationship between transformational leadership at T1 and well-being at T2, but there was no direct link between transformational leadership at T1 and well-being at T2. Thus, a transformational leader helps to reduce perceived ROC, which has an immediate effect on mitigating feelings of anxiety and turnover intention. In other words, transformational leadership stimulates a healthy work environment [36].

Despite the promising results, several limitations need to be addressed in future studies. First, the U.S. sample size is smaller than the Spanish one, and it is mainly due to attrition. A better sample size would be at least 200 nurses [40]. Nonetheless, SEM results demonstrate invariance between the two country samples. Second, Cronbach alpha reliability coefficients for the Spanish sample are low for the ROC measure. To improve upon this finding, we recommend retaining all 10 ROC survey items, per the original measure adapted from Glazer and Beehr [16]. These constructs were both valid and culturally invariant in their four-country study (albeit it did not include Spain). Third, this study focused on transformational and laissez-faire leadership only. The nurses' mean scores on laissez-faire leadership were quite low, particularly in Spain; thus, it is difficult to affirm the findings. Nonetheless, the findings are consistent with theory, so we do not dismiss them.

Given that our results were mostly invariant between the two countries, we have confidence that leaders condition subordinates' experiences of the work environment. Still, more cross-cultural research is needed on the effects of an inactive leadership style compared to other leadership styles on more worker attitudes, affects, and behaviors. Furthermore, a real-world intervention in which leaders are trained to adopt a transformational leadership would yield greater conclusive evidence that leaders condition experiences in the work environment.

5. Conclusions

The findings of this study demonstrate that leaders are a part of the work environment and condition work experiences. Specifically, leadership style relates to health and well-being through work stressors [12, 13]. Moreover, the study findings are being captured for the first time captured in a field study of healthcare providers in two countries. In both Spain and the USA, leadership style directly affected psychological processes (i.e., the perception of ROC) that then led one to experience anxiety or turnover intention. Theoretically, when it comes to leadership, we recommend revising the JD-R theory as the JR-D theory.

5.1. Implications for Nursing Management. Practically, management might take note that a healthy leadership style is one that emulates an engaged and considerate leader. These findings are important, as a nurse supervisor's leadership style has indirect implications on patient satisfaction with the quality of care [41]. Management should consider offering leadership training to ensure a more transformational style that would reduce anxiety and turnover and preserve quality healthcare.

Data Availability

Data are available upon request. Please contact the authors by e-mail.

Conflicts of Interest

The authors declare that they have no conflicts of interest to disclose.

Authors' Contributions

Rita Berger and Sharon Glazer contributed equally to this paper.

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Research Article

The Levels and Influencing Factors of Compassion Fatigue among New Nurses during the COVID-19 Pandemic

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Aim. To investigate the levels and influencing factors of compassion fatigue among new nurses during the COVID-19 pandemic. *Background*. New nurses are often unable to cope with the escalating nursing problems during the COVID-19 epidemic because of their lack of work experience, which may reduce their level of compassion satisfaction and cause compassion fatigue. However, there is little research on compassion fatigue and compassion satisfaction among new nurses during the COVID-19 epidemic. *Methods*. This was a cross-sectional study. From June to October 2021, 520 new nurses were selected from eight designated hospital for treatment of COVID-19 in China for electronic survey. Questions elicited social-demographics, work-related information, lifestyle factors, and the Chinese version Professional Quality of Life Scale. *Results*. The scores of compassion satisfaction, burnout, and secondary traumatic stress of new nurses were 31.85 ± 6.18, 27.94 ± 5.04, and 27.17 ± 4.87, respectively. In addition, regression analysis showed that nurses' compassion satisfaction, burnout, and secondary traumatic stress were affected by social-demographics, work-related information, and lifestyle factors. *Conclusions*. During the COVID-19 epidemic, compassion satisfaction, burnout, and secondary traumatic stress of new nurses were at a moderate level, which were relatively affected by work-related information and lifestyle, and had little correlation with social-demographics. *Implications for Nursing Management*. Hospital administrators can promote new nurses' compassion satisfaction and alleviate their compassion fatigue by improving job satisfaction, encouraging smoking cessation, arranging work hours reasonably, ensuring sleep hours, reducing workplace violence, and strengthening the reporting of violence incidents.

1. Introduction

Since COVID-19 was first reported in Wuhan, China, at the end of 2019, it has rapidly swept the world and become a major health issue worldwide [1]. Due to the continuous development, spread, and repetition of COVID-19 epidemic, more nurses are required to maintain good physical and mental conditions to face patients and provide effective care for patients [2, 3]. Unfortunately, the loss of nursing talents and the lack of nursing team personnel have always been an important challenge for hospital administrators around the world, especially during the COVID-19 epidemic [4]. Gong et al. [5] believed that recruiting and training new nurses is one of the valid ways to supplement nursing talents and expand the nursing team. However, during the COVID-19 epidemic, new nurses (defined as nurses who have been engaged in clinical nursing work for less than 3 years) who have just entered the workplace have received

little attention [3]. In fact, new nurses are often unable to deal with the escalating nursing problems during the epidemic because of lack of work experience and slow adaptation to clinical work, which may cause them to have various mental health problems, such as compassion fatigue, and may eventually lead to their resignation [6, 7]. Therefore, in order to reduce the impact of COVID-19 epidemic on new nurses and further stabilize the nursing team, it is necessary to clarify the prevalence and influencing factors of compassion satisfaction and compassion fatigue of new nurses during the COVID-19 epidemic.

2. Background

2.1. Compassion Fatigue. During the COVID-19 epidemic, the nurses had high work intensity and heavy work tasks and were frequently exposed to traumatic situations such as virus infection and serious illness of patients, which increased the work pressure of nurses and easily led to frequent mental health problems, such as compassion fatigue [2, 8]. Compassion fatigue is often used as a substitute term for the results of various occupational stresses, which refer to emotional exhaustion caused by long-term in-depth contact with patients, excessive empathy, and exposure to occupational stress [9]. Specifically, compassion fatigue included burnout and secondary traumatic stress [10]. Among them, burnout was described as a sense of frustration and fatigue caused by long-term work pressure, and secondary traumatic stress was considered as an occupational hazard to caregivers caused by repeated exposure to patients' traumatic experiences [11, 12]. Coetzee and Laschinger [13] believed that compassion fatigue might lead to nurses' apathy, unresponsiveness, lack of judgment, and even collapse in nursing work, which would then affect their work efficiency and care level. Moreover, Xie et al. [14] pointed out that young and inexperienced nurses were more prone to burnout and secondary traumatic stress than senior nurses, and the level of compassion fatigue was higher.

2.2. Compassion Satisfaction. In contrast to the negative impact of compassion fatigue on nurses' physical and mental health, compassion satisfaction is considered to be the sense of achievement and satisfaction that nurses get by alleviating patients' pain through clinical nursing work and nursing behavior, which is a positive response [15]. Compassion satisfaction is closely related to the sense of personal achievement, which originates from helping others to survive traumatic events as caregivers and obtaining positive support from others [14, 16]. Some studies showed that compassion satisfaction could provide nurses with work motivation, enhance their insight, strengthen their sense of faith, and alleviate their compassion fatigue, so as to promote nurses to show an optimistic and positive work attitude and high-level work efficiency and strong willingness to stay, which is conducive to improving the overall nursing quality [17, 18]. Moreover, Wang et al. [15] believed that nurses with rich work experience had a higher level of compassion satisfaction, and on the contrary, new nurses had a lower

level of compassion satisfaction, which may be affected by their lack of clinical experience.

Although many previous studies have investigated the level of compassion satisfaction and compassion fatigue of nurses, there are few studies on new nurses, especially during the COVID-19 epidemic. In view of the frequent occurrence and serious consequences of compassion fatigue during the COVID-19 epidemic, in order to reduce the impact of compassion fatigue on new nurses' physical and mental health and help hospital administrators retain nursing staff, our research objective is to describe the current situation of compassion satisfaction and compassion fatigue of new nurses during the COVID-19 epidemic. The specific aims of this study were to (1) evaluate the prevalence of compassion satisfaction, burnout, and secondary traumatic stress of new nurses during the COVID-19 epidemic and (2) clarify the impact of social-demographics, work-related information, and lifestyle on new nurses' compassion satisfaction, burnout, and secondary traumatic stress.

3. Methods

3.1. Aims. This study aimed to investigate the levels and influencing factors of compassion fatigue among new nurses during the COVID-19 pandemic.

3.2. Design. A cross-sectional survey design was used.

3.3. Participants. From June 2021 to October 2021, participants were selected from eight Class A tertiary general hospitals designated to treat patients with COVID-19 in Sichuan Province, China, by convenient sampling. The participants work in different departments, including internal medicine, surgery, obstetrics, pediatrics, emergency, ICU, and infection department. The inclusion criteria were as follows: (a) registered nurses, (b) completed prejob training and engaged in clinical nursing for 6 months to 3 years, and (c) informed consent and voluntary participation in the study. Exclusion criteria were as follows: (a) nonformal staff of the investigated hospital and (b) those who are not on duty due to various reasons (such as health problems and advanced studies).

3.4. Data Collection. Before the investigation, the hospital administrators were contacted, and the investigation permission was obtained. The electronic questionnaire was distributed through WeChat and QQ groups, and the electronic questionnaire contained unified guidelines to introduce the purpose, variables, and questionnaire filling methods of this survey in detail. All items were set as required, and the same IP address could only be filled in once. The respondents were informed that the questionnaire was completed anonymously and voluntarily, and the completion and submission of the questionnaire was deemed as informed consent. The sample size calculation formula $N = Z_{1-a/2}{}^2 p \ (1-p)/d^2$ was used, where $Z_{1-a/2} = 1.96$ (at 5% type 1 error $P < 0.05$), d represented the allowable error, 0.05

was taken in this study, and *P* was based on a similar previous study, 22% [12]. According to the formula, the sample size was 264. Considering that there may be problems such as missing items in the questionnaire, the sample size was expanded by 20%, and it was concluded that at least 317 nurses need to be investigated. A total of 558 questionnaires were distributed, and after excluding 38 invalid questionnaires, a total of 520 questionnaires were collected, with an effective recovery rate of 93.19%. The STROBE checklist was used to report findings.

3.5. Measures

3.5.1. Social-Demographics, Work-Related Information, and Lifestyle Questionnaire. The self-designed questionnaire was used to collect new nurses' social-demographics (age, gender, education level, and marital status), work-related information (shift predominantly worked, work hours per day, workplace violence experience, and job satisfaction), and lifestyle (sleep hours per day, smoking, and alcohol).

3.5.2. The Chinese Version Professional Quality of Life Scale (ProQOL-CN). ProQOL-CN, translated and revised by Chen and Wang [19] of the original ProQOL, developed by Stamm [10], was used. The ProQOL-CN includes three subscales: compassion satisfaction, burnout, and secondary traumatic stress, which are used to independently measure the level of compassion satisfaction, burnout, and secondary traumatic stress of nurses. Each subscale includes 10 items, a total of 30 items. The 5-point Likert scale is adopted, and the scores from "never" to "always" are 1–5, respectively, of which 1, 4, 15, 17, and 29 are reverse scoring items. The higher the score, the higher the level of compassion satisfaction, burnout, and secondary traumatic stress. It was found that ProQOL-CN has appropriate reliability and validity in Chinese nurse, and the scores of each subscale ≤22 are low level, 23–41 are moderate level, and ≥42 are high level [8, 19]. In this study, the Cronbach's α of compassion satisfaction, burnout, and secondary traumatic stress were 0.907, 0.782, and 0.790.

4. Data Analysis

All analyses were performed using SPSS version 26.0, and $P < 0.05$ was considered statistically significant (two-sided). Descriptive statistics were used to present the new nurses' social-demographics, work-related information, lifestyle, compassion satisfaction, burnout, and secondary traumatic stress. Independent *t*-tests were used to analyse the differences in gender, education level, main shifts, work hours per day, workplace violence experience, sleep hours per day, smoking, and alcohol. Study variables were compared among marital status and job satisfaction groups using one-way ANOVA. Multiple linear regression analysis models were performed to identify the influencing factors of compassion satisfaction, burnout, and secondary traumatic stress.

5. Ethical Consideration

The principles of anonymity and informed consent were strictly followed throughout the study, and this study has been approved by the Ethics Committee of Chengdu University of Traditional Chinese Medicine (number: 2020-KL084).

6. Results

6.1. Participant Characteristics. Of the 520 new nurses, 12.31% were males and 87.69% were females, with the average age of 23.64 ± 1.39. 40.19% of new nurses were single. The majority of new nurses had bachelor degree or above (68.27%), were on day shift (61.35%), worked hours per day >8 h (68.27%), and slept hours per day >7 h (66.54%). More than half of new nurses had workplace violence experience (60.96%) and thought their job satisfaction was average (53.46%). Only 4.04% of new nurses smoked and only 7.31% drank alcohol (Table 1).

6.1.1. The Level of Compassion Satisfaction, Burnout, and Secondary Traumatic Stress. The scores of compassion satisfaction, burnout, and secondary traumatic stress of new nurses were 31.85 ± 6.18, 27.94 ± 5.04, and 27.17 ± 4.87, respectively. The low and moderate prevalence rates of compassion satisfaction were 93.65%, the moderate and high prevalence rates of burnout were 85.38%, and the moderate and high prevalence rates of secondary traumatic stress were 83.46% (Table 2).

6.1.2. The Factors Associated with Compassion Satisfaction, Burnout, and Secondary Traumatic Stress. Independent *t*-tests and one-way ANOVA showed that new nurses, who worked day shift, had high job satisfaction, slept >7 h per day, did not smoke and drank alcohol, and had higher scores of compassion satisfaction, while new nurses who were single, night shift, worked >8 h per day, had low job satisfaction, slept ≤7 h per day, and experienced workplace violence, and had higher burnout scores, while new nurses who worked >8 h per day and experienced workplace violence had higher secondary traumatic stress scores (Table 1).

Multiple linear regression analysis showed that job satisfaction, sleep hours per day, smoking, and workplace violence experience were the influencing factors of compassion satisfaction of new nurses, which explained 22.1% of the total variance, while job satisfaction, sleep hours per day, and work hours per day were the influencing factors of new nurses' burnout, which explained 38.3% of the total variance, while workplace violence experience and work hours per day were the influencing factors of new nurses' secondary traumatic stress, which explained 2.1% of the total variance (Table 3).

7. Discussion

For nurses, compassion fatigue is an occupational hazard, providing compassion to others is the primary premise, and

TABLE 1: Demographic characteristics and scores of compassion satisfaction, burnout, and secondary traumatic stress of new nurses.

Variables	N (%)	Compassion satisfaction Mean (SD)	Burnout Mean (SD)	Secondary traumatic stress Mean (SD)
Gender				
Male	64 (12.31)	31.42 (7.04)	28.52 (5.17)	27.75 (6.01)
Female	456 (87.69)	31.91 (6.56)	27.86 (5.02)	27.09 (4.69)
t		0.350	0.944	1.043
P		0.555	0.332	0.308
Education level				
Associate degree or less	165 (31.73)	32.09 (6.71)	27.55 (5.24)	27.05 (5.18)
Bachelor degree or above	355 (68.27)	31.74 (5.92)	28.12 (4.94)	27.22 (4.73)
t		0.367	1.454	0.143
P		0.545	0.229	0.705
Marital status				
Married	115 (22.12)	32.24 (6.29)	27.97 (4.98)	27.57 (4.90)
Member of an unmarried couple	196 (37.69)	32.05 (5.59)	27.28 (4.38)	26.90 (4.48)
Single	209 (40.19)	31.45 (6.63)	28.55 (5.58)	27.20 (5.21)
F		0.769	3.237	0.687
P		0.464	**0.040**	0.504
Shift predominantly worked				
Day shift	319 (61.35)	32.47 (6.07)	27.42 (5.04)	27.15 (5.00)
Night shift	201 (38.65)	30.86 (6.24)	28.77 (4.95)	27.19 (4.68)
t		8.516	8.883	0.010
P		**0.004**	**0.003**	0.921
Work hours per day				
≤8 h	165 (31.73)	32.31 (6.49)	26.59 (4.97)	26.45 (5.09)
>8 h	355 (68.27)	31.64 (6.03)	28.57 (4.96)	27.50 (4.74)
t		1.334	17.851	5.302
P		0.249	**≤0.001**	**0.022**
Workplace violence experience				
Yes	317 (60.96)	31.72 (6.34)	28.60 (5.16)	27.68 (4.88)
No	203 (39.04)	32.05 (5.94)	26.92 (4.69)	26.37 (4.77)
t		0.363	14.143	9.064
P		0.547	**≤0.001**	**0.003**
Job satisfaction				
Very dissatisfied	27 (5.19)	25.44 (7.77)	34.67 (5.85)	28.07 (6.84)
Dissatisfied	82 (15.77)	28.38 (5.56)	32.04 (3.92)	27.84 (5.06)
Average	278 (53.46)	31.64 (5.34)	28.04 (3.85)	27.20 (4.71)
Satisfied	129 (24.81)	35.73 (5.30)	24.75 (3.95)	26.45 (4.64)
Very satisfied	4 (0.77)	35.75 (7.04)	23.81 (5.91)	26.25 (2.06)
F		33.670	74.568	1.382
P		**≤0.001**	**≤0.001**	0.239
Sleep hours per day				
≤7 h	174 (33.46)	30.71 (6.74)	29.37 (5.20)	27.66 (5.26)
>7 h	346 (66.54)	32.42 (5.81)	27.22 (4.81)	26.92 (4.66)
t		8.991	21.928	2.691
P		**0.003**	**≤0.001**	0.101
Smoking				
Yes	21 (4.04)	24.70 (7.89)	30.60 (4.81)	24.40 (6.72)
No	499 (95.96)	31.99 (6.07)	27.89 (5.04)	27.22 (4.82)
t		13.986	2.844	3.302
P		**≤0.001**	0.092	0.070
Alcohol				
Yes	38 (7.31)	29.92 (6.98)	29.13 (4.65)	27.08 (5.31)
No	482 (92.69)	32.00 (6.10)	27.85 (5.06)	27.17 (4.84)
t		4.016	2.287	0.013
P		**0.046**	0.131	0.908

N = 520. The bold values represent statistically significant *P* values (*P* < 0.05).

Table 2: The level of compassion satisfaction, burnout and secondary traumatic stress of new nurses.

Variable	Mean (SD)	Low level N (%)	Moderate level N (%)	High level N (%)
Compassion satisfaction	31.85 ± 6.18	30 (5.77)	457 (87.88)	33 (6.35)
Burnout	27.94 ± 5.04	76 (14.62)	439 (84.42)	5 (0.96)
Secondary traumatic stress	27.17 ± 4.87	86 (16.54)	431 (82.88)	3 (0.58)

$N = 520$.

Table 3: Multiple linear regression analyses of compassion satisfaction, burnout, and secondary traumatic stress.

Variable	B	SE	Beta	t	P
Compassion satisfaction[a]					
(Constant)	13.396	3.541		3.783	≤0.001
Job satisfaction	3.415	0.310	0.444	11.002	≤0.001
Sleep hours per day	1.299	0.511	0.099	2.543	0.011
Smoking	−4.422	1.767	−0.098	−2.503	0.013
Workplace violence experience	−1.022	0.503	−0.081	−2.030	0.043
Burnout[b]					
(Constant)	39.075	0.793		49.294	≤0.001
Job satisfaction	−3.606	0.219	−0.575	−16.482	≤0.001
Sleep hours per day	−1.418	0.375	−0.133	−3.779	≤0.001
Work hours per day	0.931	0.382	0.086	2.438	0.015
Secondary traumatic stress[c]					
(Constant)	28.233	0.739		38.225	≤0.001
Workplace violence experience	1.222	0.436	0.122	2.806	0.005
Work hours per day	0.927	0.456	0.089	2.031	0.043

[a]$F = 37.799$, $P \leq 0.001$, and adjusted $R^2 = 0.221$; [b]$F = 108.167$, $P \leq 0.001$, and adjusted $R^2 = 0.383$; [c]$F = 6.622$, $P \leq 0.001$, and adjusted $R^2 = 0.021$. $N = 520$.

indirect contact with traumatic events is the "cost of caring" [15, 20]. Compassion satisfaction is a positive consequence of providing care services for the injured, which is conducive to improving nurses' work efficiency and nursing service quality [13]. The results of this study showed that during the COVID-19 epidemic, new nurses scored 31.85 ± 6.18 on compassion satisfaction, 27.94 ± 5.04 on burnout, 27.17 ± 4.87 on secondary traumatic stress, and the low and moderate prevalence rates of compassion satisfaction were 93.65%, the moderate and high prevalence rates of burnout were 85.38%, and the moderate and high prevalence rates of secondary traumatic stress were 83.46%. Compared with previous studies in Chinese oncology nurses [21], our findings were similar to their level of compassion satisfaction, but burnout and secondary traumatic stress were significantly higher. Furthermore, compared with a systematic review including 79 studies in various countries, new nurses in our study had a lower prevalence of compassion satisfaction and a higher prevalence of burnout and secondary traumatic stress [12]. This difference may be explained by the differences in different work fields, working years, cultural backgrounds, social environments, and individual characteristics of nurses. In addition, compared with Zhuang et al.'s [8] research on compassion fatigue of nurses under the COVID-19 epidemic, the level of compassion satisfaction of nurses in this study is lower, while the

level of burnout and secondary traumatic stress is higher, which may be related to the fact that the respondents of this study are new nurses. New nurses have short working years and lack of work experience, so they cannot quickly adapt to and adjust their working conditions in the face of the COVID-19 epidemic, a public health emergency, prone to negative psychology or emotions. Therefore, based on the existing data, health institutions should pay more attention to how to help new nurses improve compassion satisfaction and alleviate compassion fatigue during the COVID-19 epidemic.

7.1. The Factors Associated with Compassion Satisfaction.

Our research suggested that during the COVID-19 epidemic, higher job satisfaction and sleep hours per day >7 h had a positive impact on the compassion satisfaction level of new nurses. This is consistent with the findings of previous studies, which believed that nurses with higher job satisfaction and sufficient sleep time had stronger adaptability and recovery ability and could more appreciate their own value from the intense and cumbersome nursing work during the epidemic, thus promoting compassion satisfaction [8, 22]. In addition, our study showed that smoking and workplace violence experience had a negative impact on the compassion satisfaction level of new nurses. Itzhaki et al. [23] proposed that workplace violence would increase nurses' work stress and thus reduce nurses' compassion satisfaction. During the COVID-19 epidemic, most of the new nurses may suffer workplace violence due to lack of nursing experience and insufficient adaptability, which will increase their psychological burden and is not conducive to their compassion satisfaction. Moreover, Wang et al. [15] reported that smoking could affect nurses' compassion satisfaction as a negative factor, which is consistent with this study. Therefore, improving job satisfaction, ensuring sleep time, reducing the prevalence of workplace violence, and urging smoking cessation may be important means to support new nurses' compassion satisfaction during the COVID-19 epidemic.

7.2. The Factors Associated with Burnout.

The current research results showed that new nurses with higher job satisfaction and sleep hours per day >7 h had lower burnout level, and new nurses with work hours per day >8 h had higher burnout level during the COVID-19 epidemic. In such a special environment as the COVID-19, the higher the job satisfaction of nurses, the more they can get achievement in the process of caring for patients, which provides motivation for their nursing work, strengthens their

determination to face difficulties, and reduces the level of burnout [22]. Moreover, some studies suggested that scientific and reasonable working arrangement helped nurses to devote themselves to nursing care more wholeheartedly, while adequate sleep played a vital role in the rapid recovery of nurses after work, especially during the COVID-19 epidemic [1, 24]. Hence, promoting job satisfaction, limiting working hours to manageable levels, and ensuring sleep may help prevent new nurses from burnout during the COVID-19 epidemic.

7.3. The Factors Associated with Secondary Traumatic Stress. This study revealed that workplace violence experience and work hours per day >8 h were the positive factors of secondary traumatic stress of new nurses during the COVID-19 epidemic, which is consistent with the study of Okoli et al. [25] and Falatah and Alhalal [26]. On the one hand, during the COVID-19 epidemic, various violent acts against medical and health care personnel have increased, and nurses, who have the most contact with patients, also face the highest risk of violent attacks, especially new nurses with insufficient nursing experience, while nurses suffering from workplace violence had a higher level of secondary traumatic stress [18, 25, 27]. On the other hand, the normalization of the prevention and control of the COVID-19 epidemic have led to the extension of nurses' working hours and an increase in their workload, which has become the main cause of nurses' work pressure, and may directly affect their mental health and increase the risk of secondary traumatic stress [26, 28]. Thus, it is necessary to strengthen the attention to the mental health of new nurses, establish and improve the reporting system of violent incidents, and reasonably arrange the working time and workload to prevent the secondary traumatic stress of new nurses during the COVID-19 epidemic.

8. Limitations

There are some limitations in this study. First, the cross-sectional survey cannot explore the causal relationship between various factors. Second, convenience sampling may affect the universality of results. Third, we followed the principle of voluntariness in the investigation, and the questionnaires were all self-reported, which may lead to some bias in the research results. Finally, when investigating the workplace violence experience of new nurses, we did not distinguish the type and frequency of violence, and the interpretation rate of factors to secondary traumatic stress of new nurses was low, which may need to be explored in future studies.

9. Implications for Nursing Management

Medical and health organizations need to improve their understanding of compassion satisfaction and compassion fatigue of new nurses and develop targeted strategies, especially during the COVID-19 epidemic. On the one hand, they need to improve the job satisfaction through some specific means, such as allowing nurses to participate in shift scheduling, improving nurses' autonomy, and reasonably arranging workload, so as to promote compassion satisfaction and reduce the risk of compassion fatigue. On the other hand, encouraging smoking cessation, reasonably arranging working hours, ensuring rest time, reducing workplace violence, and strengthening the reporting after violent incidents can all improve compassion satisfaction of new nurses and alleviate their compassion fatigue.

10. Conclusion

Although there are some limitations in the study design, this study also provides some important information about compassion satisfaction, burnout, and secondary traumatic stress of new nurses during the COVID-19 epidemic. The results revealed that during the COVID-19 epidemic, compassion satisfaction, burnout, and secondary traumatic stress of new nurses were at a moderate level, which was relatively affected by work-related information and lifestyle, and had little correlation with social-demographics. Among them, job satisfaction and sleep hours per day are the factors that promote the increase of compassion satisfaction and the decrease of burnout, smoking is the negative factor that affects compassion satisfaction, workplace violence experience is the factor that promotes the decrease of compassion satisfaction and the increase of secondary traumatic stress, and work hours per day is the positive factor of burnout and secondary traumatic stress. These findings may have guiding significance for nursing managers to formulate work-related policies and practice to improve the physical and mental health of new nurses during the COVID-19 epidemic.

Data Availability

The data used to support the findings of this study are available from the corresponding authors upon reasonable request.

Ethical Approval

The study was approved by the Ethics Committee of Chengdu University of Traditional Chinese Medicine (number: 2020-KL084).

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

Li Zeng performed data curation and formal analysis, contributed to methodology, visualized the study, prepared the original draft, and reviewed and edited the manuscript. Dong Liu performed data curation, validated the data, and reviewed and edited the manuscript. Xiaoli Liang investigated the data, was involved in study supervision, and contributed to methodology. Lan Li investigated the data, was responsible for software, and contributed to methodology. Yihang Peng was responsible for resources and software and validated the data. Man Jin performed data

curation and formal analysis and validated the study. Wanqing Xie investigated the data, performed data curation, and contributed to methodology. Jialin Wang conceptualized the study, investigated the data, was involved in study supervision, and reviewed and edited the manuscript.

Acknowledgments

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Review Article

Levels of Anxiety and Fear among Nurses During the COVID-19 Pandemic: A Systematic Review

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Aim. The aim of this review is to find out what levels of anxiety and fear have been shown by nurses during the COVID-19 pandemic. *Background*. Health security crises affect not only physical health but also the mental health and wellbeing of healthcare professionals due to a higher level of exposure. *Evaluation*. A systematic review was carried out following the PRISMA statement. Methodological quality was assessed using the Joanna Briggs Institute critical appraisal tools. The literature search was carried out in the PubMed, Scopus, and Web of Science (WoS) electronic databases based on the keywords that the research question yielded following the PECOT strategy. For the selection of articles, original articles, meta-analyses, systematic reviews, short communication articles, and case reports were included. Then, a series of inclusion and exclusion criteria were applied, screening the results to obtain a total of 18 articles, which were used to elaborate the study. *Key Issues*. Fear and anxiety levels were described in a total of 18 selected studies. The main fear-related concerns of the nurses were associated with the fear of infecting their family or friends and the fear of the death of a family member or friend. *Conclusions*. The main psychological impact on nurses during the COVID-19 pandemic was related to fear, anxiety, stress, and depression. Fear of infecting family members or of being infected were the main impacts perceived by nurses. *Implications for Nursing Management*. In general, high scores were found for levels of fear and anxiety, although the figures varied by country and time of data collection. Resilience was considered the main tool for coping with the loss and trauma experienced by nurses.

1. Background

On 31 December, 2019, the Wuhan Municipal Health and Sanitation Commission (Hubei, China) reported an outbreak in 27 people diagnosed with a type of pneumonia of unknown aetiology. All these people had in common that they had been in a seafood and poultry market in Wuhan in the previous days and this market was considered to be the epicentre of the outbreak [1].

The World Health Organization (WHO) has reported outbreaks caused by different infectious diseases over the past 20 years, such as severe acute respiratory syndrome (SARS) in 2003, influenza caused by the H1N1 subtype in 2009, Middle East respiratory syndrome in 2012, and Ebola virus in 2014 [2]. In late 2019, the Organization also reported on the presence of a new coronavirus (COVID-19) that was spreading rapidly worldwide [3], with the WHO declaring a pandemic on 11 March, 2020 [4].

This new virus has caused a drastic change in many aspects of our daily and working lives [5]. Today, it is impossible to estimate the number of people who have been infected. What is known is that the COVID-19 pandemic has put the healthcare system of many countries to the test. In response, many governments worldwide have implemented exceptional emergency measures, imposing severe confinement, quarantine, and social isolation measures [6]. Health security crises have been shown to generate stress and/or distress in the general population and even more so in healthcare workers [6].

Nurses have felt overwhelmed by heavy workloads during the COVID-19 pandemic, as they have been forced to prevent infections under adverse conditions, have close contact with confirmed cases, perform sample collection, and waste disposal [7].

At the organizational level, all care units have needed restructuring to cope with the disease (COVID-19 floors, adapted critical care units, clean pathway and COVID-19 pathway for the entry of patients, and relocation of staff) [8]. To this, the lack of material resources for patients should be added, such as respirators and nasal cannulas, and personal protective equipment for professionals such as gloves, gowns, and masks, which in some cases were reused [9], both in healthcare centres (hospitals and health centres) and in social-health centres (nursing homes). Both the lack of material and the close contact in the treatment of patients infected with SARS-CoV-2 place healthcare professionals at greater risk of infection, especially nurses, as they spend the most time with patients and perform techniques on patients the most [10].

In this pandemic context, many healthcare workers suffer from somatic symptoms such as cardiovascular, respiratory, neurological, and gastrointestinal symptoms, as well as psychological symptoms such as depression, fear, anxiety, and stress more frequently [11].

Fear and anxiety caused by possible illness can impose a high and destructive psychological burden, leading to mental problems, weakening of the immune system, and reduced body's ability to fight disease [12]. Anxiety is often related to feelings of unease and apprehension, being a psychological and physiological state characterised by cognitive, emotional, and behavioural factors [13].

Depending on the situation, these negative emotions can motivate actions, or on the contrary, contribute to an unwillingness to carry them out. Inhibiting the expression of these emotions leads to their intensification, or in the case of their maintenance, to emotional tension. According to experts, expressing negative emotions is beneficial and is recommended in psychotherapy [14].

Other determinants regarding physical and emotional health are sociodemographic characteristics. Demographic characteristics such as age, education, socioeconomic status, and nature of work are very important in explaining negative effects on psychological health [15]. These negative emotions, coupled with poor working conditions and limited resources, lead to a greater predisposition to incidents and failures in patient care, thus putting patient safety at risk [16].

The National Institute for Occupational Safety and Health (NIOSH) has ranked nursing as the 12th most stressful profession and the most stressful of all healthcare professions [12]. In addition, the International Council of Nurses (ICN) reported that more than 600 nurses worldwide had died from COVID-19 as of 3 June, 2020. The first case of COVID-19 was confirmed in Ethiopia on 13 March, 2020, which was the first to be reported since the start of the outbreak in China in December, 2019. According to the National Ministry of Health, there were 31,336 COVID-19 cases and 544 (1.74%) deaths reported in Ethiopia as of 17 August, 2020 [1]. A study in China, where the COVID-19 outbreak began, assessed the psychological effects on 4692 nurses working in government-designated hospitals during the pandemic. The findings showed that the mental health of frontline nurses was generally poor, with 42.7% of them experiencing somatic symptoms, 9.4% depression, 8.1% anxiety, and 6.5% suicidal ideation [7].

The pandemic has affected not only physical health but also the mental health and wellbeing. The consequences can be particularly severe for healthcare professionals due to the higher level of exposure they experience. It is, therefore, crucial to estimate the psychological impact of the COVID-19 outbreak on healthcare workers, and more specifically on nurses because of their level of exposure [4]. The fact is that during the COVID-19 pandemic, nurses have been overwhelmed by heavy workloads, forced to prevent infections in adverse conditions, and having close contact with confirmed cases by taking samples or disposing of waste [7]. As a consequence, in this pandemic context, many healthcare workers have been suffering from somatic symptoms such as cardiovascular, respiratory, neurological, and gastrointestinal ones, as well as psychological symptoms such as depression, fear, anxiety, and stress more frequently than before [11].

Fear and anxiety derived from potential illness may impose a high and destructive psychological burden, leading to mental problems, weakening of the immune system, and reduced body's ability to fight disease [12]. Anxiety is often related to feelings of unease and apprehension, being both a psychological and physiological state characterised by cognitive, emotional, and behavioural factors [13].

Depending on the situation, these negative feelings can motivate actions, or on the contrary, contribute to an unwillingness to carry out certain protective behaviours. Inhibiting the expression of these emotions leads to their intensification, or if these are maintained, to emotional tension. According to experts, expressing negative emotions is beneficial and is recommended in psychotherapy [14].

Other determinants with regard to physical and emotional health are sociodemographic characteristics. Age, education, socioeconomic status, and nature of work are key in explaining negative effects on psychological health [15]. The same happens with sex. A report carried out by the European Parliament indicates that there are significant differences in mental health and wellbeing between men and women, highlighting in this report that women are more exposed to factors such as gender inequality, socioeconomic discrimination, overwork, gender-based violence, hunger,

and malnutrition. These are all problems that significantly increase the likelihood of suffering from mental health problems among women. For all these reasons, it is estimated that broadly speaking, women show higher rates of depression, stress, anxiety, somatisation, and eating disorders than men [17].

In addition, in most societies, women are the main responsible ones for household chores (cooking, cleaning, and childcare), tasks that were accentuated during the confinement [18, 19]. Furthermore, according to the Official State Bulletin of Public Administrations, the percentage of employed women working in the Spanish health system is 74.2% [20].

What is certain is that these negative emotions, together with poor working conditions, and limited resources, lead to a greater predisposition to incidents and errors as regards patient care, which may in turn jeopardise patient safety [16].

Therefore, the aim of the present study was to identify the levels of anxiety and fear, as well as other associated symptoms, experienced by nurses during the COVID-19 pandemic. Secondary objectives are also defined such as the identification of the coping strategies used and the description of existing scales for the evaluation of the impact that the COVID-19 pandemic has had on mental health.

2. Methods

2.1. Study Design. Based on evidence-based medicine (EBM) [21] and following the criteria of the PRISMA statement [22], a systematic search for studies assessing the levels of fear and anxiety experienced by nurses during the COVID-19 pandemic was conducted. The followed protocol is listed in the International Prospective Register of Systematic Reviews (PROSPERO) with code CRD42022385193.

2.2. Search Strategy. The bibliographic search was carried out in the following electronic databases: PubMed, Scopus, and Web of Science (WoS), based on the keywords yielded by the research question that followed the PECOT strategy (Table 1). In addition, access was provided to websites of interest, such as those of the World Health Organization (WHO) and the National Statistics Institute (INE, for its Spanish acronym).

The descriptors used were as follows: nurse, COVID-19, anxiety, and fear. In order to enlarge the scope of the search, synonymous terms were used to complete the search based on the Medical Subject Headings (MeSH) thesaurus (Table 2), linked by the Boolean operators AND and OR.

Two researchers independently carried out the literature search and selected the articles included according to previously established criteria, subsequently agreeing on the results. Finally, Table 3 shows the search strategy used for each of the databases.

2.3. Selection Criteria. The inclusion criteria were the following: (1) written in English, Spanish, French, or Portuguese; (2) original articles, meta-analyses, systematic reviews, short communication articles, and case reports; (3) published from 2020 onwards; (4) population: nurses; and (5) articles assessing anxiety and fear levels, as well as other associated symptoms. Likewise, articles whose study population did not consist of nurses, or whose sample size was smaller than 50, as well as studies with low scientific-technical quality or whose sample consisted of students, were excluded from the sample.

2.4. Data Collection and Extraction. The final selection of the articles that compose the study sample, following the PRISMA 2020 guidelines for reporting systematic reviews [22], was peer-reviewed. All articles obtained as a result of the databases search were read by two different authors and screened and selected independently. Duplicate studies were removed, and the articles that could be included according to the previously established criteria, after reading the title and abstract, were selected. Then, two authors revised the text of the studies and decided to finally include or exclude them. A third author had the option to include a study or not in case of discrepancy. For the selection, data regarding authorship and year of publication, context, objective, type of study, participants, methods, main findings, and quality of the studies were compiled.

2.5. Methodological Quality Assessment. A critical appraisal tool for nonrandomised studies from the Joanna Briggs Institute (JBI) [23] of the University of Adelaide (Australia) was used to assess the methodological quality of the selected articles. There is a version for quantitative cross-sectional studies [24] (Supplementary Material 1) and for qualitative studies [25] (Supplementary Material 2) were used, with a cut-off point of 6 for inclusion in the review for quantitative studies and of 8 for qualitative studies.

3. Results

The initial search identified a total of 798 references, which were then screened according to the topic of this review. A total of 18 studies were finally selected (Figure 1), 16 of them quantitative and 2 qualitative. Articles were found from different parts of the world, recruiting 4 from Spain, 2 from China, 3 from Saudi Arabia, 2 from Turkey, 1 from Ethiopia, 1 from Iran, 1 from Pakistan, 1 from Korea, 1 from Portugal, 1 from Jordan, and 1 from the United States.

In all the selected articles, the sample consisted of nurses; two of the articles also included nursing assistants. The included studies were assessed with the JBI critical appraisal tool, where they scored medium-high in both cross-sectional observational and qualitative studies.

Table 4, based on the Iberoamerican Cochrane Centre Handbook [33], shows the characteristics of each of the 18 studies included in this review. These were classified by author and year of publication, country, objective, design, participants, methods used, and main findings. In addition, the results of the JBI critical appraisal tool were added [34].

TABLE 1: PECOT format: keywords.

Population	Nurses
Effect	Fear and anxiety level
Comparator	Other variables
Outcomes	Prevalence of anxiety-fear, predisposing/protective factors, differences between countries and services, frontline vs. nonfrontline differences, and differences/fluctuations over time
Time	During the COVID-19 pandemic
Research question	What levels of anxiety and fear have nurses shown during the COVID-19 pandemic?

TABLE 2: Search terms.

MeSH	Terms
Nurse	Healthcare professionals OR healthcare workers OR healthcare providers OR nurse
COVID-19	COVID-19
Anxiety	Anxiety
Fear	Fear

TABLE 3: Search strategy in each database.

Database	Search strategy	Search date	Outcomes	Selected
PubMed	(nurs* AND (COVID-19 AND (anxiety AND fear))	03/08/22	197	18
WoS	nurs* (topic) AND fear AND anxiety (topic) AND COVID-19 (topic)	03/08/22	311	34
Scopus	((nurs*) AND (anxiety AND fear) AND (COVID-19))	03/08/22	321	26
Total			798	78

The main dimensions measured in the studies, in addition to anxiety and fear, were depression, stress, and others such as insomnia or certain coping strategies.

3.1. Fear. The only specific tool to measure fear in the selected studies was the Fear of COVID-19 Scale (FCV-19), designed by Ahorsu et al. in reference [35]. This has proven to be a valid and reliable instrument to specifically assess fear of COVID-19.

The study carried out by Simón Melchor et al. [6] in Spain, using the scale described previously, detected significant levels of fear in 46.9% of the sample, with a mean score for this scale of 21.54 points. Variables such as working in a COVID-19 unit, having more experience, being a specialised care nurse, and not living with relatives triggered higher levels of fear symptomatology [6].

The study conducted by Abid et al. [15] in Pakistan measured fear in the same way. In this case, the mean score was 23.92 points, confirming that high levels of fear of COVID-19 were strongly associated with negative emotional responses [15].

The mean score for this scale decreased in the study conducted by Cho and Kim [7]; in Korea, being 18.14. In terms of fear, statistically significant differences were found with respect to marital status, living with a partner, living with children, type of work related to COVID-19, and training in personal protection equipment (PPE) [7].

Finally, in the study conducted by Alnazly and Hjazeen [30] in Jordan, a mean score for the FCV-19 of 24.34 was obtained, indicating a remarkable fear of the COVID-19 pandemic. Female nurses were also found to have a higher mean score for fear of COVID-19 than their male counterparts [30].

The rest of the studies assessed fear using other types of questionnaires or surveys, and most of them agreed that the highest levels of fear were related to the fear of infecting their relatives or friends and the fear of death of one of them. This was stated in studies such as the one by Mekonen et al. [1], by Isik et al. [4], Altun Uğraş et al. [11], and more. This has been evidenced by some recorded expressions of nurses such as "I am petrified because when I go home, I am a danger to my family and a potential harm to them" [31]. Thus, the degree of exposure was positively associated with fear [5]. Fear and anxiety can also lead to such a destructive psychological burden that it may weaken the immune system, reducing the body's ability to fight disease [12].

3.2. Anxiety, Depression, and Stress. Many of the selected articles measured anxiety, stress, and depression together using the 21-item depression, anxiety, and stress scale (DASS-21) [36]. Through this scale, these articles revealed that the prevalence of anxiety, depression, and stress among nurses was 69.6%, 55.3%, and 20.5%, respectively, with a 95% CI. Also, the likelihood of anxiety was three times higher among nurses who did not have a COVID-19 management guide and four times higher in those with a chronic disease [1].

In another study, according to the DASS scale, 46.4% of the sample showed moderate to extremely severe anxiety, and those nurses who had had or were suffering from
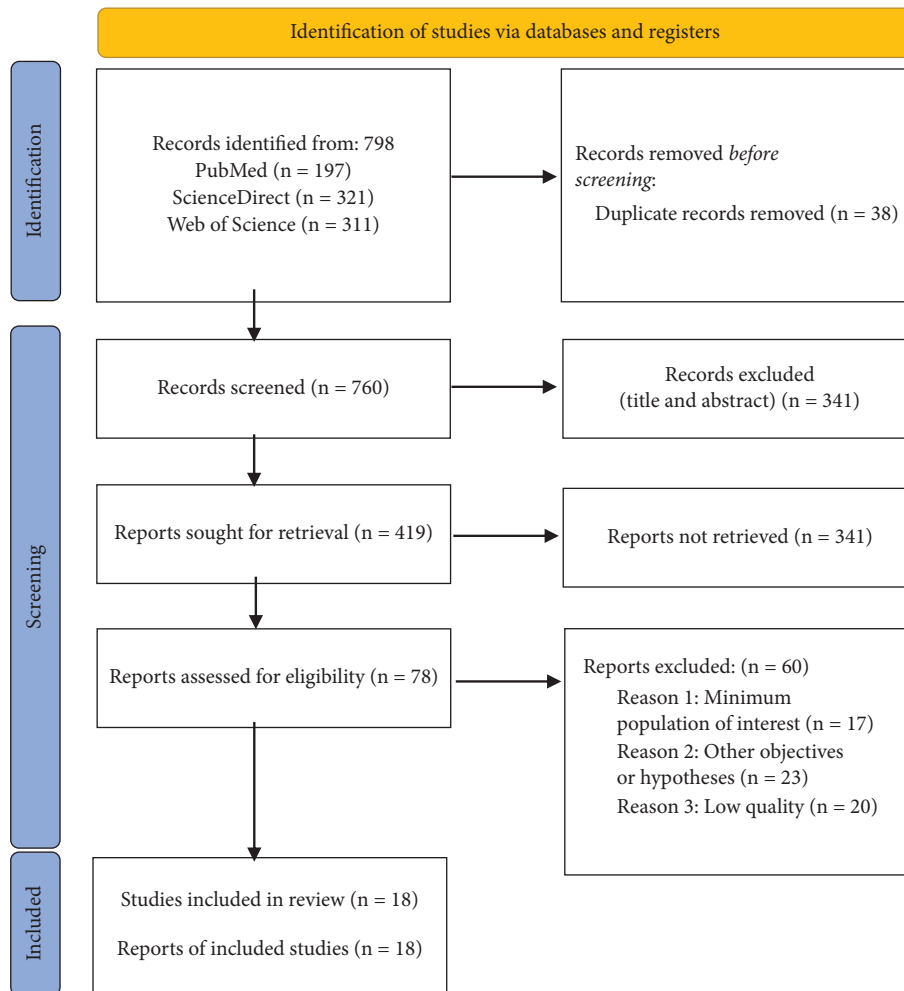
Figure 1: PRISMA flowchart.

COVID-19 and who had a risk comorbidity were found to be at higher risk of anxiety. In the case of depression, 66.7% reported moderate to severe depression. Nurses who had had or were suffering from COVID-19 infection, with work experience of more than 10 years, aged 46 years or older, and with risk comorbidity due to COVID-19 were at a higher risk of depression. Finally, 18.2% of the sample had moderate stress. Those who were suffering or had suffered from COVID-19 infection and who were working more hours per month than the normal working day were at a higher risk of experiencing stress [6].

In the study by Abid et al. [15], the same scale was used to detect that 66% of the sample suffered from anxiety, 55% from depression, and 49% from stress.

Another study using the DASS scale found that 78.0% of the sample suffered from anxiety, of whom 16.6% reported symptoms of mild anxiety, 19.5% of moderate anxiety, 14.6% of severe anxiety, and 27.2% of most severe anxiety. 84.3% showed signs of depression, with 11.7% being mild, 36.9% moderate, 19.2% severe, and 16.3% most severe. Finally, 65.74% showed signs of stress, with 16.3% showing mild, 23.4% moderate, 20% severe, and 6.1% most severe symptoms [4].

Likewise, the study carried out by Sampaio et al. [27] reported that anxiety symptoms decreased over time. Possible predictors of changes in anxiety scores were sex, age, nursing speciality, number and quality of face masks, number, and quality of PPE. They concluded that the greater the fear, the more anxiety symptoms. With regard to depression, male participants had a lower mean score for depression compared to females. As with anxiety, male nurse specialists were found to have a lower score for depression, and here the rule that the higher the fear, the more symptoms of depression was also true. For stress, the mean score remained almost stable over time. Men, with experience, and specialists had lower scores for stress. The higher the fear, the more stress symptoms [27].

Finally, the study by Alnazly and Hjazeen [30] also used the DASS scale, concluding that 73.8% of the sample had an extremely severe level of anxiety, 43.8% had a moderate level of depression, and 45.4% had a severe level of stress [30].

Anxiety and depression were also measured together using the Hospital Anxiety and Depression Scale (HADS). This scale assesses the severity of symptoms and occurrence of anxiety and depressive disorders in somatic, psychiatric,

TABLE 4: Characteristics of the studies included in the systematic review.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [1]	North-west Amhara (Ethiopia)	To assess the prevalence and associated factors of anxiety, depression, and stress in nurses	Cross-sectional quantitative study	995 nurses in Amhara hospitals	DASS-21	The prevalence of anxiety, depression, and stress was 69.6%, 55.3%, and 20.5%, respectively. Some factors that were significantly associated with anxiety, depression, or stress were workload, sex, having adequate protective equipment, having children, living with people over 60 years old, having a chronic illness, and having a history of mental disorders, among others.	7/8
Reference [12]	Tehran (Iran)	To assess the relationship between COVID-19 and death anxiety in nurses	Cross-sectional quantitative study	110 nurses working in the ICU in Tehran's hospitals	Templer scale	Mild anxiety levels were identified in 30.9% of the sample, and severe anxiety in 69.1%. The results also showed that the level of death anxiety was associated with age, working hours per week, having children, exposure to patient death, and satisfaction with personal protective equipment.	6/8
Reference [6]	Huesca (Spain)	To analyse the psycho-emotional impact of COVID-19 on nurses in the province of Huesca	Cross-sectional quantitative study	179 nurses working during the pandemic in Huesca	(i) DASS-21 (ii) FCV-19S (iii) ISI (iv) MBI	Depression was diagnosed in 16.8% of the sample, anxiety in 46.4%, and stress in 22.4%. Insomnia was detected in 77.6%, and a high score for burnout syndrome in 50.0%. The FCV-19S scale detected fear in 46.9% of the sample. The data revealed that variables such as spending more time at work, having less leisure time, a greater work experience, and the presence of risk comorbidities for COVID-19, among others, constitute precipitating factors for suffering from mental health problems.	7/8

Table 4: Continued.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [5]	Spain	To analyse the psychosocial impact of the COVID-19 pandemic on ICU nurses in Spain	Cross-sectional quantitative study	456 ICU nurses who had worked during the COVID-19 pandemic in Spain	Self-administered questionnaire created ad hoc	53.1% had experienced difficulty concentrating at work; for 63.8%, work performance had been negatively affected; 81.8% reported feeling much more tired; 89.9% had problems sleeping; 53.5% felt much more anxious than usual; 82.5% of participants felt down, depressed, or hopeless; 52.2% had felt much more psychological stress than usual; 56.8% felt much more fearful than usual; 18.2% had increased their use of psychotropic drugs. Finally, women were more prone to anxiety than men.	7/8
Reference [13]	Wuhan (China)	To investigate anxiety levels in nurses and the association with perceived stress and insomnia	Cross-sectional quantitative study	643 nurses working on the frontline with COVID-19 patients from 3 to 10 March 2020 in hospitals in China	(i) Socio-demographic questionnaire (ii) GAD-7 (iii) Questionnaire regarding the COVID-19 environment (iv) AIS	33.4% of the nurses surveyed reported episodes of anxiety which they associated with factors such as perceived stress and insomnia. Significant associations were detected between anxiety, perceived stress, insomnia, working four night shifts per week, work experience, and fear of COVID-19.	7/8
Reference [15]	Gujrat (Pakistan)	To determine the predictive association between fear of COVID-19 and emotional distress in nurses	Cross-sectional quantitative study	Nursing staff in public and private sector hospitals in Gujrat ($n = 500$)	(i) FCV-19S (ii) DASS-21	71% were women. The mean score for the FCV-19 was 23.92. For the DASS-21, it was 32.15. Fear of COVID-19 was a significant predictor of stress, depression, and anxiety in nurses. A significant mediating role of demographic variables such as sex, age, education, and marital status was detected in the predictive association between fear of COVID-19 and emotional distress in nurses.	6/8

TABLE 4: Continued.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [4]	Turkey	To determine the levels of depression, anxiety, and stress in the mental health of nurses during COVID-19	Cross-sectional quantitative study	Nurses actively working in the public and private sectors in Turkey (826)	DASS-21	84.3% showed symptoms of depression, 78% anxiety, and 65.74% stress. The most important problems included equipment shortages, administrative problems, and issues such as accommodation and food, and these had a statistically significant correlation with the nurses' levels of depression, anxiety, and stress. Taking the necessary steps to address problems and fears is important to protect the health, productivity, and efficiency of nurses during the pandemic period.	6/8
Reference [7]	Korea	To identify factors affecting fear, anxiety, and depression in nurses working on the frontline with COVID-19 patients	Cross-sectional quantitative study	975 nurses who had contact with COVID-19 patients for 3 months	(i) Hospital safety climate survey (ii) FCV-19 (iii) GAD-7 (iv) PHQ	COVID-19 increased nurses' levels of fear, anxiety, and depressive symptoms. Hospital safety climate influenced nurses' mental well-being. In terms of fear, statistically significant differences were found with regard to marital status, living with a partner, living with children, and type of work. There were significant differences in the level of anxiety according to living together, type of work, and work experience longer than 3 months. Depressive symptoms varied with age, educational level, and annual income.	

Table 4: Continued.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [25]	Saudi Arabia	To assess nurses' feelings towards COVID-19 and determine stressors while exploring coping strategies and coping factors	Cross-sectional quantitative study	Nurses working in the Ministry of Health hospitals (Saudi Arabia) caring for patients with COVID-19 ($n = 313$)	(i) MERS-CoV staff questionnaire (ii) Brief COPE	Women, married, with a bachelor's degree, and aged 25–34 years had more significant coping strategies. Most were nervous about the risk of contracting the disease, unhappy about working overtime, and frightened about exposure to the virus. Factors that increased stress were the thought that they could transmit the virus, the lack of PPE, and that they could be positive when they had symptoms. They found comfort in their religion, advice from friends, and family. Women were more able to use coping strategies.	6/8
Reference [11]	Turkey	To examine health problems and stressors related to patient care in ICU nurses during COVID-19	Cross-sectional quantitative study	Nurses working in the ICU and caring for adult patients with COVID-19 in Turkey ($n = 1140$)	Self-administered questionnaire created ad hoc	The majority of the sample was female, with a mean age of 29.7 years. Of the total, only 15.6% experienced health problems during the pandemic. The most common psychological complaints were anxiety (3%), insomnia (1.1%), and depression (0.4%). 92.3% were afraid of carrying COVID-19 and infecting their loved ones, 78.9% were afraid of being separated from loved ones, 74.4% were afraid of getting sick with COVID-19, 73.4% were anxious about the lack of curative treatment for the disease, and 71.8% were anxious about the possible second and third waves of the pandemic.	6/8

TABLE 4: Continued.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [26]	Jiangsu province (China)	To identify the impact of COVID-19 on the psychology of Chinese nurses in emergency departments and fever clinics and to identify associated factors	Cross-sectional quantitative study	Nurses working in hospitals in the province of Jiangsu and who were exposed to COVID-19 for more than one month ($n = 437$)	(i) Self-rating anxiety scale (ii) Perceived stress scale-14 (iii) Simplified coping style questionnaire	96.47% were women, with a mean age of 33.15 years. 34% reported mild anxiety, 3.53% moderate, and 0.44% severe. Excessive stress was detected in 32.23%. Being a woman, having less time off, having children, lack of confidence, regrets about being a nurse, and fear of contagion were risk factors for anxiety. Participants with positive attitudes, who did not regret being a nurse, who were trained in emergencies, who were willing to go to Hubei province to be rescued, and who did not fear infecting others responded more positively to stress.	6/8
Reference [27]	Portugal	To assess variations in sleep quality and symptoms of depression, anxiety, and stress among nurses during the COVID-19 outbreak, as well as to assess risk factors	Prospective cohort study	Frontline nurses in Portugal during the COVID-19 pandemic ($n = 829$)	DASS-21	81.4% were women with a mean age of 39.0 years. In the DASS-21, there was a tendency for a decrease in all three scores over time. Predictors of change in depression were sex, age, nursing specialty, number and quality of face masks, quality of gowns, quality of glasses, fear of infection, and infection. As regards stress, predictors of change were sex, age, nursing specialty, number of gloves, quality of face masks, quality of gowns, quality of glasses, fear of infection, and infection. A large number of nurses had poor sleep quality, decreasing over time.	7/8

TABLE 4: Continued.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [28]	Spain	To determine symptoms of depression and/or anxiety among nurses and nursing assistants during the periods known as the first and second waves of COVID-19	Cross-sectional quantitative study	Practising nurses or auxiliary nurses in Spain during the first and second waves of COVID-19 ($n = 627$)	HADS	At baseline, 28.4% reported sleep disturbances every day. In the first period, 68.3% suffered from anxiety, and 18.2% were at risk of it. All scores decreased in the second period. During the first period, 49.6% were depressed, and 21.4% were at risk of depression. All scores decreased in the second period compared to the first one. The results showed that in the first period, the percentages of anxiety and depression were lower in the nurses' group than in the auxiliary nurses' group. In the second period, the frequencies decreased in both.	7/8
Reference [3]	Saudi Arabia (KSA)	To assess the psychological effects derived from fear and stress levels due to COVID-19 on KSA nurses	Cross-sectional quantitative study	Nurses working in hospitals during the COVID-19 outbreak and who understand English ($n = 300$)	Self-administered questionnaire created ad hoc	The majority were women. Nurses had high levels of anxiety and stress during the COVID-19 outbreak. Participants reported that their work put them at high risk of infection, caused them a lot of stress at work, and they had a high level of fear of transmitting COVID-19 to their families, friends, and colleagues. The results pointed to some predictors that increased the nurses' level of fear, such as social networks, exposure to pre-outbreak trauma, and availability to care for infected patients.	7/8

TABLE 4: Continued.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [29]	Saudi Arabia (KSA)	To assess nurses' knowledge of COVID-19 and level of anxiety about the COVID-19 outbreak in the current pandemic situation	Cross-sectional quantitative study	87 nurses from the medical and surgical departments at King Abdul Aziz University Hospital in Jeddah working with COVID-19 patients	Self-administered questionnaire created ad hoc	A minority (35.6%) rated their level of anxiety about infecting their loved ones as 10 out of 10, although the mean was 5.7 on the Likert scale. Respondents had adequate and good knowledge about the causes, transmission, symptoms, treatment, and mortality rates of COVID-19 (71.90%). The main sources of information for nurses were social networks (51.7%) and the World Health Organization, and the Ministry of Health (36.8%).	6/8
Reference [30]	Amman (Jordan)	To assess levels of psychological distress among nurses during COVID-19 and to determine associated factors and coping strategies	Cross-sectional quantitative study	Nurses from hospitals located in the Amman area and who have provided care to patients with COVID-19 or suspected COVID-19 ($n = 130$)	(i) FCV-19S (ii) DASS (iii) Brief coping inventory	Nurses have moderate levels of fear and depression. Anxiety and fear were positively correlated. Female nurses had greater psychological distress and fear than male nurses. Nurses who cared for COVID-19 positive patients and those who had a friend or family member who had tested positive had higher levels of fear and psychological distress. Working longer hours was moderately related to fear and anxiety. Nurses were also found to generally adopt maladaptive coping styles.	6/8

Table 4: Continued.

Studies	Context	Objective	Type of study	Participants	Methods	Main findings	JBI
Reference [31]	United States	To describe the experiences of ICU nurses during the COVID-19 pandemic in the United States	Cross-sectional quantitative study	Nurses working in ICUs in the USA during the COVID-19 pandemic ($n = 285$)	Electronic survey	Nurses working in the ICU in the US during the COVID-19 pandemic experienced an increased burden due to lack of treatment, poor prognosis, and lack of family presence. The physical, emotional, and psychological impact resulted in burnout, anxiety, insomnia, and distress. The pandemic led some nurses to question their decision to become nurses. Compared to other healthcare workers, nurses reported higher levels of anxiety and depression. Despite the challenges, they identified positive aspects.	
Reference [32]		To analyse and synthesise qualitative studies investigating nurses' perceptions of the psychological impacts of COVID-19	Systematic review of qualitative studies	Qualitative studies that analysed nurses' perceptions of the psychological impacts of COVID-19	Qualitative systematic review	The main psychological impacts perceived by frontline nurses were fear, anxiety, stress, social isolation, depressive symptoms, uncertainty, and frustration. Fear of infecting or being infected was the main perceived impact. They experienced loneliness and a high level of anxiety, higher than that of the general population. Nurses felt that resilience helped to counteract the losses and trauma they experienced.	

and primary care patients and also in the general population [37].

The data showed that in the first period, 68.3% of the subjects suffered from anxiety, and 18.2% were at risk of it. The results also showed that during the first period, 49.6% of the subjects were depressed, and 21.4% were at risk of depression. All scores decreased in the second period compared to the first [28].

One of the instruments used to specifically measure anxiety was the Templer questionnaire, which in this case, specifically measures the level of death anxiety [38]. This identified levels of mild and severe anxiety in 30.9% and 69.1% of the nurses, respectively [12].

Another instrument used was the Generalised Anxiety Disorder Scale (GAD-7), developed by Spitzer et al. [39], with the percentage range of nurses suffering from anxiety being between 30% and 40% and from severe anxiety ranging from 1.2% to 2.4%. In this case, the mean number of daily working hours was significantly associated with anxiety [13]. This same scale was also used by Cho and Kim [7], and a mean score for this scale of 5.01 was detected, indicating mild anxiety symptoms. In this study, anxiety was affected by work experience of more than 3 months and time in charge of work related to COVID-19.

Anxiety was also specifically measured through the Self-Rating Anxiety Scale (SAS) compiled by Zung [40]. Among the participants, 34% reported mild anxiety levels, 3.53% moderate anxiety, and 0.44% severe anxiety. Being a woman, having less rest time, having children, lacking confidence in fighting the pandemic, regretting being a nurse, and fear of contagion in the family were risk factors for reporting anxiety [26].

The other authors opted to use their own questionnaires to measure anxiety. This was the case of Muñoz–Muñoz et al. [5], where it was concluded that female nurses were more likely to suffer from anxiety (59.3%), compared to men (43.4%). Similarly, Altun Uğraş et al. [11] stated that 73.4% of the sample had anxiety related to the lack of healing treatment for the disease and 71.8% related to a possible second and third wave of the pandemic. The study conducted by Tayyib and Alsolami [3] indicated high levels of anxiety (7.76 out of 10). Using the same method, Alsharif [29] confirmed that 20% of the sample rated their level of anxiety about the infection as 10 out of 10. The overall mean for anxiety levels was 5.7 on the 10-point Likert scale.

In the case of depression, to specifically measure this construct, Cho and Kim [7] used the Patient Health Questionnaire created by Kroenke et al. [41]. In this questionnaire, Cronbach's alpha was 0.86 for patients with COVID-19, which confirmed its relationship with depression [7].

In the case of stress, some authors also used specific scales such as the Perceived Stress Scale (PSS) developed by Cohen et al. [42]. Through this scale, 41.4% of the participants reported stress. This study showed that a stable and safe work environment is a key factor in reducing perceived stress [13]. This same scale was used by Cui et al. [26], finding excessive stress in 32.23%. Fear of infecting family members, the regret of being a nurse, and the number of night shifts in a week were positively correlated with reported stress [26].

Other authors used their own questionnaires to assess stress, as was the case of Muñoz–Muñoz et al. [5]; in which 52.2% considered that they had felt much more psychological stress than usual. In the study by Natividad et al. [25], the highest scores for stress were identified in nurses who believed they could transmit COVID-19 to their family and friends, followed by the inadequacy of the PPE and that they could be positive for the disease whenever they had respiratory symptoms.

Overall, in the study by Huerta-González et al. [32], the main fears expressed by nurses were infecting family members or being infected, followed by the fear of death of patients. In the case of Guttormson et al. [31], participants frequently shared concern for family and friends. Some nurses even put their decision to become a nurse to question and reported overwhelming distress suffered on a daily basis. Some nurses also reported a lack of understanding of their environment.

3.3. Other Symptoms.

Another assessed symptom was insomnia. This was carried out through specific tools such as the Insomnia Severity Index (ISI) [43]. It was possible to detect insomnia in 77.6% of the sample. Of these, 55.9% suffered from moderate to severe insomnia. Nurses who were suffering or had suffered from COVID-19, who were working more hours per month than the normal working day, and who did so in specialised care had a higher risk of suffering from insomnia. On the contrary, those with more leisure activities had a lower risk [6]. Another scale to measure sleep quality used by another study was the Athens Insomnia Scale (AIS) [44], detecting insomnia in 41.5% of the sample [13]. Using their own questionnaires, the study carried out by Sampaio et al. [27] detected a large number of nurses with poor sleep quality, which decreased significantly over time.

The presence of emotional exhaustion and personal fulfilment was also assessed using the Maslach Burnout Inventory (MBI) [45]. Nurses who had suffered or were suffering from COVID-19, with work experience of more than 10 years, who were working more hours per month than the normal working day, and whose workstation was in a COVID-19 unit were at greater risk of presenting high emotional exhaustion. On the other hand, nurses who had suffered or were suffering from COVID-19, who worked shifts, who had comorbidity risk for COVID-19, and who worked in specialised care were more at risk of presenting a low level of personal fulfilment [6].

Finally, in one of the studies, with the aim of specifically measuring coping strategies, the Coping Style or Simplified Coping Style Scale (SCSQ) [46] was used, which concluded that negative coping behaviours such as fantasy, avoidance, self-blame, and indulgence have a negative impact on psychological well-being [26]. In this line, another study concluded that resilience, understood as the ability to adapt flexibly to changes caused by stressful events and to recover from negative emotional experiences, was considered by nurses as the main coping technique to counteract the losses and traumas experienced [32].

4. Discussion

The aim of this review was to assess the fear and anxiety experienced by nurses during the COVID-19 pandemic. To do so, levels of fear and anxiety were analysed in a total of 18 selected studies, where data on other mental health problems such as depression, stress, and insomnia were also provided.

The main findings of this systematic review are based on the fact that the only tool found that assesses any mental health problem specific to the COVID-19 pandemic is the Fear of COVID-19 Scale (FCV-19), created by Ahorsu et al. [35]. This scale was used by several selected studies, with scores generally higher than 20 in almost all studies, which indicated high levels of fear of the COVID-19 pandemic. The main fear complaints nurses expressed were related to fear of infecting their family or friends and fear of the death of a family member or friend.

No specific scale to measure COVID-19 anxiety was found in the selected articles, with most authors opting for the Depression, Anxiety, and Stress Scale (DASS) [36]. In general, high scores were obtained for these three constructs, although the figures varied from study to study, considering that they were developed in different countries and at different times.

However, it is known that there is a specific scale to measure fear and anxiety in the face of COVID-19. In Spain, a group of researchers designed the so-called COVID-19 Anxiety and Fear Assessment Scale (AMICO). It is composed of 16 items and proved to be a reliable and valid tool to be used as a screening instrument [47]. Probably, one of the reasons why this scale has not been used in the selected articles is because, so far, it has only been validated in Spain and is in the process of being validated in other countries such as the United Kingdom and Portugal.

Differences may have also been influenced by the timing of the study and the different restrictive measures in place at the time in each country, which varied widely throughout the pandemic. For example, a study by Burton et al. [48] reported that rates of suicidal ideation had increased during the first weeks of confinement in countries such as the UK. Similarly, a study by Gasteiger et al. [49] found that depression and anxiety had been most negatively affected during the first ten weeks of social distancing during the COVID-19 pandemic. All these negative emotions can cause problems at the psychological level and, of course, in work carried out by the nursing staff, bringing about errors, and malpractice, which would also influence patient safety [50, 51].

A cross-sectional study revealed that nurses working on the frontline during the COVID-19 pandemic, i.e., in ICU and emergency departments, reported workload and compassion fatigue, with associated mental health consequences [52]. However, other studies showed that frontline nurses may have shown less concern and fear for their safety, as they believed in the effectiveness of their protective equipment, whereas many clinical nurses, not on the frontline, who encountered problems with ineffective and insufficient medical protection, became anxious and worried, especially at the beginning of the pandemic, when there was a lack of

medical equipment [53]. Therefore, it can be said that risk perception is a mental psychological construct that is subject to cognitive, emotional, socio-cultural, political, and personal variables [54]. It would therefore be necessary to assess more specific groups within society.

In addition to these, some risk factors potentially associated with mental health symptoms among nurses have also been identified, which can be divided into four major sections [27]:

(1) Personal factors, such as age, sex, and nursing specialisation

(2) Working conditions, such as the existence of adequate PPE.

(3) Family dynamics, such as being far from home.

(4) Attitude towards COVID-19, such as fear of getting infected or fear of infecting others.

Among the limitations of the current study, it is worth mentioning that all articles written in languages other than Spanish, Portuguese, or English were rejected; this may have led to excluding articles that met the rest of the inclusion requirements. Also, studies conducted in China were included, and, being the country where the COVID-19 outbreak started, the sample might have different characteristics from others when assessing potential mental health-related problems. It should also be noted that the incidence of cases worldwide was not uniform, nor were the proposed restrictions. Another possible limitation could be that the studies found were conducted on different dates, which may have affected the results due to the progression of the pandemic itself. Likewise, there has been variability in the instruments used by the different authors to measure the same construct, which may also be a limitation of this study.

Regarding the applicability of this study, it is worth highlighting the need to identify the impact that the COVID-19 pandemic has had on nurses in different cultural contexts, as a starting point, based on a systematic and rigorous review, for the design and implementation of support or follow-up strategies by managers. This study also highlights the need to study the impact that the COVID-19 pandemic has had on other groups of health and nonhealth professionals because all of them make up the work team that provides patient care and attention and are therefore susceptible to receiving help and support from the health managers of each health centre.

5. Conclusion

The results of the study show that the main psychological impacts on the nurses during the COVID-19 pandemic were fear, anxiety, stress, and depression and, as a consequence of these, other problems such as insomnia. Fear of infecting family members or being infected and fear of the death of a loved one were the main impacts perceived by the nurses.

Resilience was considered the main tool to cope with the losses and traumas experienced by the nurses.

The impact that the COVID-19 pandemic has had on physical and mental health identified in this review should

provide the basis for new studies to identify the prevalence of the main symptoms described, following the chronological and epidemiological evolution of the pandemic, as well as the study of their relationship with different levels of care or areas of specific clinical care. This could generate new strategies to improve nurses' coping strategies in health crisis situations, as well as encourage leadership and management procedures to be put in place by managers during these situations. The finding obtained in the present study also allows for the possibility of creating tools to assess the impact that these crisis situations have at all professional levels as a measure of prevention and screening of occupational health problems that could indirectly affect the quality of the services provided.

6. Implications for Nursing Management

Although the vast majority of the referred studies affirm a high prevalence of psychological distress among healthcare professionals who have been active during COVID-19 [55], there are some differences with respect to the results found in the different studies included in this systematic review. This may be due to the fact that, in some selected studies, the sample of nurses worked specifically in the ICU, a unit with a high care burden during the COVID-19 outbreak; other nurses worked exclusively with COVID-positive patients; and in other studies, the area of work was not specified, but they were focused on the general nursing population. In this regard, a study focusing on healthcare professionals by Li et al. [56] concluded that frontline workers experienced greater mental health deterioration during the pandemic than other healthcare workers who were not so exposed.

Abbreviations

AIS: Athens Insomnia Scale
AMICO: COVID-19 Anxiety And Fear Assessment Scale
CI: Confidence interval
COVID-19: Coronavirus disease 2019
DASS-21: 21-item Depression, Anxiety, and Stress Scale
EBM: Evidence-based medicine
FCV-19: Fear of COVID-19 scale
GAD-7: Generalised Anxiety Disorder Scale
HADS: Hospital Anxiety and Depression Scale
ICN: International Council of Nurses
ICU: Intensive care unit
ISI: Insomnia Severity Index
JBI: Joanna Briggs Institute
MBI: Maslach burnout inventory
MeSH: Medical subject headings
NIOSH: National Institute for Occupational Safety and Health
PECOT: Population, effect, comparison, outcomes, time, research question
PPE: Personal protection equipment
PRISMA: Preferred reporting items for systematic reviews and meta-analyses
PSS: Perceived Stress Scale
SARS: Severe acute respiratory syndrome
SAS: Self-rating Anxiety Scale
SCSQ: Coping style or Simplified Coping Style Scale
WHO: World Health Organization
WoS: Web of science.

Data Availability

All data generated or analysed during this study are included in this published article (and its supplementary information files).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Cristina Morgado-Toscano, Juan Gómez-Salgado, Juan Jesús García-Iglesias, Javier Fagundo-Rivera, Daniel López-López, and Regina Allande-Cussó performed conceptualization, data curation, formal analysis, investigation, methodology, project administration, resources, software, supervision, validation, and visualization; wrote the original draft; and reviewed the article.

Supplementary Materials

A critical appraisal tool for nonrandomised studies from the Joanna Briggs Institute (JBI) [23] of the University of Adelaide (Australia) was used to assess the methodological quality of the selected articles. There is a version for quantitative cross-sectional studies [24] (Supplementary Material 1) and for qualitative studies [25] (Supplementary Material 2) were used, with a cut-off point of 6 for inclusion in the review for quantitative studies and of 8 for qualitative studies. (*Supplementary Materials*)

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Research Article

Lower Urinary Tract Symptoms in Female Nurses: Evidence from the Nurse Urinary Related Health Study of China

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Aims. To estimate the prevalence and bother of lower urinary tract symptoms (LUTS) and the work-related and individual factors associated with LUTS among a representative sample of female nurses. *Background.* A healthy nursing workforce is essential to advance global health goals, especially during times of extraordinary demand for nursing care. LUTS frequently occur and persist in women and are correlated with multiple negative health outcomes and diminished work engagement and productivity. However, the study of LUTS among female nurses failed to receive sufficient attention from researchers. *Methods.* We used baseline data for 13,191 female nurses in China collected for the prospective cohort study, the Nurse Urinary Related Health Study (NURS). We assessed nurses' self-reported LUTS and symptom-related bother using the International Consultation on Incontinence Questionnaire-Female LUTS. We used descriptive statistics to summarize LUTS prevalence and its related bother and a mixed-effects logistic regression model to test the effects of work-related and individual factors on LUTS. *Results.* Most of the participants in this study were younger than 40 years old (82.9%), were married (74.8%), and had given birth once or never (73.7%). Few participants had chronic diseases (3.4%), consumed alcohol (7.3%), smoked (0.4%), or had overweight/obesity (27.7%). The prevalence of any LUTS was 51.1%, and over 50% of the nurses with LUTS in this study had experienced moderate or severe bother, except for urinary frequency. Working longer than five years, more than 40 hours per week, and in Level A, major tertiary hospitals were found to be risk factors of LUTS, and a nurse-to-bed ratio higher than 0.40 was found to be a protective factor. Increased fluid intake also was found to be a protective factor of LUTS in nurses, and having chronic constipation was found to be a risk factor. *Conclusions.* LUTS are highly prevalent and severely bothersome among female nurses in China, despite the fact that the female nurses in this study were relatively young, healthy, had few childbirths, and were living healthy lifestyles. This finding warrants remedial action that is related to both behavioral and environmental factors to ensure a healthy nursing workforce. Nurses cannot reasonably be expected to contribute to global health when one of their basic needs as humans, i.e., the normal function of urinary elimination, is ignored. *Implications for Nursing Management.* Nurse managers should be aware that nurses' basic needs regarding urination are negatively affected by LUTS and related bother. Nurse managers should address LUTS-related problems on multiple levels, including overseeing and reporting LUTS in nurses, exploring innovative care models to mitigate the negative effects of excessive workloads on nurses, and remodeling the nursing culture and encouraging positive coping behaviors for the self-health of nurses.

1. Background

Urinary elimination is a basic human function that can be compromised by lower urinary tract symptoms (LUTS), which include nocturia, urinary urgency, bladder pain, urinary frequency, hesitancy, straining, intermittency, and urinary incontinence [1]. LUTS are very prevalent health conditions that especially affect the female population. Global estimations indicate that approximately 1.6 billion (46.8%) women have at least one type of LUTS [2]. Symptom experience, i.e., LUTS "bother," has been found to be associated with multiple negative health outcomes, including distress, shame, social isolation [3], and diminished sexual health, emotional well-being, and quality of life [4–6]. In addition, LUTS are associated with heavy economic burden due to the costs of professional therapy and routine care [7]. LUTS are therefore a pressing health concern in the female population.

Female nurses are the focus population for this LUTS study. Female nurses are susceptible to LUTS, as evidenced by the prevalence rate of LUTS in small samples of nurses that ranges from 65% to 90% [8, 9], which is a higher prevalence rate than in the general female population. Nurses play a vital role in global health promotion [10, 11], which is already challenged by the worldwide shortage of nurses. Having nurses with LUTS and who experience symptom-related bother might exacerbate this situation, as LUTS and bother of LUTS have been found to be significantly associated with reduced work engagement and productivity in female workers [12].

The study of LUTS among female nurses has failed to receive sufficient attention from researchers. Only a few LUTS, in particular urinary incontinence and urinary urgency, have been investigated among representative nurse samples, and these studies were limited to developed countries such as the United States and Japan [13, 14]. The characteristics of nurses working in developed countries differ from those of nurses working in developing countries. For example, frontline nurses in China typically are younger than nurses working in developed countries [13–15]. LUTS are associated with age, and thus, prevalence findings from developed countries may not be able to be extrapolated to nurses working in developing countries. In addition, the literature indicates that little is known about LUTS bother in female nurses. Despite the fact that the health of nurses is often negatively influenced by hazardous and risk-related working conditions, the evidence for LUTS is limited primarily to intrinsic determinants of LUTS, such as advancing age, marital status, and parity [16]. Thus, the effects of work-related factors on LUTS in representative samples of female nurses remain unclear.

To address these research gaps and accumulate evidence that will be beneficial for mitigating LUTS in nurses, we analyzed baseline data collected in an ongoing prospective cohort study of a representative sample of female nurses in China, i.e., the Nurse Urinary Related Health Study (NURS), to undertake the following three research objectives: (1) describe the prevalence of LUTS in a representative sample of female nurses, (2) document the perceived bother of female nurses with LUTS, and (3) quantify the correlation of work-related factors with LUTS among female nurses.

2. Methods

2.1. Design and Participants. The inaugural survey of NURS was conducted between November 2020 and February 2021 in Shandong Province, China. A two-stage cluster sampling design was used to recruit eligible nurses for NURS. The 17 prefecture-level administrative regions in Shandong Province were stratified into four categories, i.e., high, medium-high, medium-low, and low developed regions, based on the quartile spacing of their gross domestic product in 2019. Tertiary hospitals in China are categorized into three subsidiary levels, A, B, and C, based primarily on the number of hospital beds, level of quality of care, and available medical technologies. Most nurses in China are employed in Level A and Level B major tertiary hospitals, and therefore, the number of level A and level B major tertiary hospitals per region was collected to create a contingency table (Table 1), and 20% of hospitals in each cell were randomly sampled using a random number generator. As depicted in Figure 1, a total of 20 hospitals were sampled and contact was made with all female registered nurses ($n = 17,999$) from these hospitals unless they failed to respond ($n = 2892$) or refused to participate ($n = 207$). The exclusion criteria for this study were set as follows: (1) being pregnant, (2) having a urinary tract infection in the last month or three times within the past year, (3) having been diagnosed with a lower urinary tract injury or disease, (4) having pelvic or endoscopic genitourinary surgery within the past three months, (5) receiving chemotherapy for cancer, (6) having a spinal cord injury, cerebrovascular disease, or nephropathy, and (7) taking diuretics during the investigation. The final sample for this analysis was 13,191 female nurses.

All parties involved respected the relevant principles stipulated in the Declaration of Helsinki [17]. The ethical oversight of NURS was obtained from the institutional review boards of the researchers' university (No. 2019-R-021). A detailed description of NURS can be found in the following weblink: https://www.nursing.sdu.edu.cn/info/1170/3676.htm.

2.2. Data Collection. NURS uses the e-survey to collect data. To facilitate data collection, the principal investigator contacted the director of the nursing department in each of the 20 hospitals and obtained hospital-level informed consent. The director of the nursing department provided a spreadsheet with the total number of full-time equivalent registered nurses at the hospital for the investigator's reference. Each director was asked to recommend at least two coordinators to facilitate access to the e-survey for all nurses. The e-survey was created on WJX.cn, an online survey tool. The first screen of the e-survey presented information about the study. Then, the participant was asked to check a tick-box to give informed consent before proceeding. The expiration of the web link was set at two weeks from the initial opening, and no incentives for respondents were provided.

TABLE 1: The number of level A and level B major tertiary hospitals across regions with diverse GDP.

Regions	Regions with high GDP	Regions with medium-high GDP	Regions with medium-low GDP	Regions with low GDP	Total number
Hospital level					
Level A major tertiary hospital	20	10	9	9	48
Level B major tertiary hospital	19	10	8	11	48

Female nurses in 20 major tertiary hospitals (n = 17,999)

Non-responders (n = 2892)

Responders (n = 15,107)

Respondents refuse to participate (n = 207)

Sample size in NURS (n = 14,900)

Non-eligible participants (n = 1709)
(1) being pregnant = 802
(2) having a urinary tract infection in the last month or three times per year = 682
(3) having been diagnosed lower urinary tract injury or diseases = 96
(4) having pelvic or endoscopic genitourinary surgery within the past three months = 33
(5) having spinal cord injury, cerebrovascular diseases or nephropathy = 59
(6) receiving chemotherapy for cancer = 32
(7) taking diuretics during the investigation = 5

Sample size used for analyses (n = 13,191)

FIGURE 1: Study flowchart.

2.3. Measures

2.3.1. LUTS and Symptom-Related Bother.

The International Consultation on Incontinence Questionnaire-Female LUTS was used with permission obtained from the Bristol Urological Institute, UK to assess nurses' LUTS and symptom-related bother [18]. Eleven items were used to assess symptoms of nocturia, urgency, bladder pain, daytime frequency, hesitancy, straining, intermittency, urgency urinary incontinence, stress urinary incontinence, unexplained urinary incontinence, and nocturnal enuresis experienced by individuals during the past four weeks [19]. Of these 11 symptoms, nocturia was defined as at least two times of urination per night (not during the night shift) [20]; frequency was defined as urinating more than eight times during the day (not during the night shift) [1]; and all other symptoms were graded on a five-point scale of never, occasionally, sometimes, most of the time, and all of the time. Nurses with responses of never and occasionally were categorized as having no such symptom [20]. If nurses reported at least one type of LUTS, they would be coded as having LUTS.

Along with each symptom, an additional item was designed for the International Consultation on Incontinence Questionnaire-Female LUTS to capture individuals' perceived symptom-specific bother. Bother was graded on a visual analogue scale that ranged from 0 (not at all) to 10 (a great deal). Nurses' responses were categorized into no bother (score of 0), minor bother (score of 1–4), moderate bother (score of 5–7), and severe bother (score of 8–10) [21].

2.3.2. Work-Related Characteristics. Multiple self-reported work-related characteristics were assessed and included years of work (≤5, 5–10, >10), average work hours per week (≤40, >40), night shift in the past six months (yes, no), professional title (senior nurse or below, supervisor nurse or above), hospital-level (Level B major tertiary hospital, Level A major tertiary hospital), and department type (internal medicine, surgery, operating room, intensive care unit, outpatient and emergency, pediatrics, obstetrics and gynecology, nursing administration, and others). In addition, the principal investigator calculated the nurse-to-bed ratio variable using the number of full-time equivalent registered nurses divided by the number of beds in a hospital. The National Care Nursing Development Plan of China recommends that the nurse-to-bed ratio of major tertiary hospitals should shift from 0.60 to 0.80, but very few of the major tertiary hospitals across the country have been able to meet this standard. Therefore, we categorized the nurse-to-bed ratio into three levels based on the minimum ratio of 0.40 and the formerly recommended ratio of 0.60. As such, the nurse-to-bed ratio was categorized into <0.40, 0.40 to 0.60, and ≥0.60.

2.3.3. Individual Characteristics. Data were collected for self-reported individual characteristics, including demographic characteristics and health-related characteristics. The demographic characteristics assessed include age, race/ethnicity (Han Chinese, others), educational background (below bachelor's degree, bachelor's degree or above), marital status (single/separated/divorced/widowed, married), and monthly income (≤RMB 6000, >RMB 6000). Data also were collected for health-related characteristics that are known to be associated with LUTS [22]: parity (0, 1, ≥2), average fluid intake per day (≤500 ml, 500 ml–1500 ml, >1500 ml), body mass index (BMI) (underweight/normal, overweight/obesity), chronic constipation (yes/no), alcohol use (yes/no), smoking (yes/no), taking part in physical exercise (yes/no), and chronic disease (yes/no). Data were collected for four chronic diseases that are associated with LUTS: hypertension, heart disease, diabetes, and hyperlipidemia [16]. Nurses with any of the four chronic diseases were coded as "yes" and those without any of these conditions were coded as "no."

2.4. Statistical Analysis. The characteristics of nurses are described in terms of mean ± standard deviation or frequencies and percentages, as appropriate. The prevalence of LUTS and nurses' perceived symptom-specific bother are presented as numbers and percentages with 95% confidence interval (95% CI). A mixed-effects logistic regression model was used to regress individual and work-related characteristics (fixed effects), hospital ID (i.e., 1 to 20), and department type (random effects) on LUTS. Cases with missing values were excluded in the model. All analyses were performed using Stata SE 16.0, and $p < 0.05$ indicates statistical significance.

3. Results

3.1. Participants. Table 2 presents a summary of the detailed characteristics of the sample. The mean age of the 13,191 female nurses at the time of the survey was 32.67 ± 7.52 years (range: 19–60 years), with the majority younger than 40 years old (82.9%, 95% CI = 82.3–83.6). Most participants were married (74.8%) and had given birth once or never (73.7%). Very few participants had chronic diseases (3.4%), consumed alcohol (7.3%), or smoked (0.4%). Fewer than 30% of the female nurses in the sample had overweight/obesity. More than 70% had a fluid intake of less than or equal to 1500 ml fluid per day, and more than 26% had chronic constipation. The nurse-to-bed ratio ranged from 0.36 to 0.79, and more than 30% of the female nurses in the sample worked in hospitals with a nurse-to-bed ratio below 0.60. Approximately 50% of the nurses reported that they work more than 40 hours per week, and the mean work hours per week of female nurses was approximately 45 hours. More than 60% of nurses worked in a Level A major tertiary hospital, and roughly 28% of female nurses had worked in hospitals for less than five years.

3.2. Prevalence of LUTS. Table 3 presents a summary of the prevalence and symptom-specific bother of LUTS reported by the female nurses in this study. The prevalence of LUTS is 51.1% (95% CI = 50.2–51.9). Of all LUTS, urinary urgency is the most prevalent symptom (26.1%, 95% CI = 25.3–26.8), followed by stress urinary incontinence (17.9%, 95% CI = 17.2–18.5), nocturia (13.9%, 95% CI = 13.3–14.5), urgency urinary incontinence (12.2%, 95% CI = 11.6–12.7), and hesitancy (11.9%, 95% CI = 11.3–12.4). Frequency is the least prevalent symptom of LUTS found for female nurses (0.7%, 95% CI = 0.5–0.8).

3.3. Symptom-Specific Bother of LUTS. Table 3 also presents the prevalence of LUTS bother. Except for frequency, more than 90% of nurses with LUTS reported at least minor bother, and more than 50% of nurses with LUTS reported moderate bother and severe bother. Nurses with unexplained urinary incontinence were most likely to report at least minor bother (97.9%) and at least moderate bother (77.1%). Other LUTS that were likely to be reported by nurses as at least moderate bother include nocturnal enuresis (71.6%), urgency urinary incontinence (70.3%), bladder pain (69.5%), stress urinary incontinence (69.5%), and straining (63.9%). Stress urinary incontinence was most likely to be reported as severe bother by nurses (36.9%), followed by unexplained urinary incontinence (33.3%) and urgency urinary incontinence (32.3%).

3.4. Work-Related Factors Associated with LUTS. Table 4 presents a summary of the work-related factors associated with LUTS. Nurses who had worked five to ten years (OR = 1.244, 95% CI = 1.112–1.391) or longer than ten years

TABLE 2: Description of participants' characteristics.

Variables	Total ($n = 13{,}191$) Mean ± SD or n (%)	95% CI	With LUTS ($n = 6735$) Mean ± SD or n (%)	95% CI	Without LUTS ($n = 6456$) Mean ± SD or n (%)	95% CI
Age (years)	32.67 ± 7.52	32.54–32.80	33.59 ± 7.53	33.41–33.77	31.72 ± 7.38	31.54–31.90
Age						
<40 years	10,940 (82.9)	82.3–83.6	5443 (80.8)	79.9–81.7	5497 (85.1)	84.3–86.0
≥40 years	2251 (17.1)	16.4–17.7	1292 (19.2)	18.3–20.1	959 (14.9)	14.0–15.7
Race/ethnicity						
Han Chinese	13,068 (99.1)	98.9–99.2	6663 (98.9)	98.7–99.2	6405 (99.2)	99.0–99.4
Other	123 (0.9)	0.8–1.1	72 (1.1)	0.8–1.3	51 (0.8)	0.6–1.0
Educational background						
Below bachelor degree	2662 (20.2)	19.5–20.9	1229 (18.2)	17.3–19.2	1433 (22.2)	21.2–23.2
Bachelor degree or higher	10,529 (79.8)	79.1–80.5	5506 (81.8)	80.8–82.7	5023 (77.8)	76.8–78.8
Marital status						
Single, separated, divorced, or widowed	3319 (25.2)	24.4–25.9	1275 (18.9)	18.0–19.9	2044 (31.7)	30.5–32.8
Married	9872 (74.8)	74.1–75.6	5460 (81.1)	80.1–82.0	4412 (68.3)	67.2–69.5
Monthly income						
≤RMB 6000	7701 (58.4)	57.5–59.2	3752 (55.7)	54.5–56.9	3949 (61.2)	60.0–62.4
>RMB 6000	5490 (41.6)	40.8–42.5	2983 (44.3)	43.1–45.5	2507 (38.8)	37.6–40.0
Parity[a]						
0	4110 (31.5)	30.7–32.3	1637 (24.4)	23.4–25.5	2473 (38.9)	37.7–40.1
1	5515 (42.2)	41.4–43.1	3049 (45.5)	44.3–46.7	2466 (38.8)	37.6–40.0
≥2	3434 (26.3)	25.5–27.1	2014 (30.1)	29.0–31.2	1420 (22.3)	21.3–23.4
BMI[a]						
Underweight/normal	9524 (72.3)	71.5–73.0	4669 (69.4)	68.3–70.5	4885 (75.3)	74.2–76.3
Overweight/obesity	3654 (27.7)	27.0–28.5	2059 (30.6)	29.5–31.7	1595 (24.7)	23.7–25.8
Chronic diseases						
No	12,747 (96.6)	96.3–96.9	6442 (95.6)	95.1–96.1	6305 (97.7)	97.3–98.0
Yes	444 (3.4)	3.1–3.7	293 (4.4)	3.9–4.9	151 (2.3)	2.0–2.7
Chronic constipation						
No	9675 (73.3)	72.6–74.1	4527 (67.2)	66.1–68.3	5148 (79.7)	78.7–80.7
Yes	3516 (26.7)	25.9–27.4	2208 (32.8)	31.7–33.9	1308 (20.3)	19.3–21.3
Alcohol use						
No	12,228 (92.7)	92.2–93.1	6193 (92.0)	91.3–92.6	6035 (93.5)	92.9–94.1
Yes	963 (7.3)	6.9–7.8	542 (8.0)	7.4–8.7	421 (6.5)	5.9–7.1
Smoking						
No	13,145 (99.6)	99.5–99.7	6711 (99.6)	99.5–99.8	6434 (99.7)	99.5–99.8
Yes	46(0.4)	0.3–0.5	24(0.4)	0.2–0.5	22 (0.3)	0.2–0.5
Average fluid intake per day[c]						
≤500 ml	2160 (16.4)	15.8–17.0	1202 (17.8)	17.0–18.8	958 (14.8)	14.0–15.7
500 ml–1500 ml	7563 (57.3)	56.5–58.2	3816 (56.7)	55.5–57.8	3747 (58.0)	56.8–59.2
>1500 ml	3468 (26.3)	25.5–27.0	1717 (25.5)	24.5–26.5	1751 (27.1)	26.1–28.2
Taking part in physical exercise						
No	10,695 (81.1)	80.4–81.7	5563 (82.6)	81.7–83.5	5132 (79.5)	78.5–80.5
Yes	2496 (18.9)	18.3–19.6	1172 (17.4)	16.5–18.3	1324 (20.5)	19.5–21.5
Working years						
≤5	3710 (28.1)	27.4–28.9	1476 (21.9)	20.9–22.9	2234 (34.6)	33.5–35.8
5–10	4620 (35.0)	34.2–35.8	2500 (37.1)	36.0–38.3	2120 (32.8)	31.7–34.0
>10	4861 (36.9)	36.0–37.7	2759 (41.0)	39.8–42.1	2102 (32.6)	31.4–33.7
Professional title[b]						
Senior nurse or below	8357 (63.4)	62.5–64.2	3993 (59.3)	58.1–60.5	4364 (67.6)	66.4–68.7
Supervisor nurse or higher	4834 (36.6)	35.8–37.5	2742 (40.7)	39.5–41.9	2092 (32.4)	31.3–33.6
Work hours per week (hours/week)	44.57 ± 8.00	44.43–44.70	45.00 ± 8.16	44.80–45.19	44.11 ± 7.81	43.93–44.31
Work hours per week						
≤40	7109 (53.9)	53.0–54.7	3433 (51.0)	49.8–52.2	3676 (56.9)	55.7–58.1
>40	6082 (46.1)	45.3–47.0	3302 (49.0)	47.8–50.2	2780 (43.1)	41.9–44.3
Night shift in the past 6 months						
No	4788 (36.3)	35.5–37.1	2530 (37.6)	36.4–38.7	2258 (35.0)	33.8–36.1
Yes	8403 (63.7)	62.9–64.5	4205 (62.4)	61.3–63.6	4198 (65.0)	63.9–66.2
Hospital level						
Level B major tertiary hospital	4885 (37.0)	36.2–37.9	2361 (35.1)	33.9–36.2	2524 (39.1)	37.9–40.3

Table 2: Continued.

Variables	Total (n = 13,191)		With LUTS (n = 6735)		Without LUTS (n = 6456)	
	Mean ± SD or n (%)	95% CI	Mean ± SD or n (%)	95% CI	Mean ± SD or n (%)	95% CI
Level A major tertiary hospital	8306 (63.0)	62.1–63.8	4374 (64.9)	63.8–66.1	3932 (60.9)	59.7–62.1
Nurse-to-bed ratio[c]						
0.36 to < 0.40	529 (4.0)	3.7–4.4	320 (4.8)	4.3–5.3	209 (3.2)	2.8–3.7
0.40–0.60	3822 (29.0)	28.2–29.8	1871 (27.8)	26.7–28.9	1951 (30.2)	29.1–31.4
≥0.60 to 0.79	8840 (67.0)	66.2–67.8	4544 (67.5)	66.3–68.6	4296 (66.5)	65.4–67.7
Department type[c]						
Internal medicine	4101 (31.1)	30.3–31.9	2125 (31.6)	30.5–32.7	1976 (30.6)	29.5–31.7
Surgery	2932 (22.2)	21.5–22.9	1492 (22.2)	21.2–23.2	1440 (22.3)	21.3–23.3
Operating room	709 (5.4)	5.0–5.8	375 (5.6)	5.0–6.1	334 (5.2)	4.7–5.7
Intensive care unit	877 (6.6)	6.2–7.1	426 (6.3)	5.8–6.9	451 (7.0)	6.4–7.6
Out-patient and emergency	1152 (8.7)	8.3–9.2	600 (8.9)	8.3–9.6	552 (8.6)	7.9–9.3
Pediatrics	891 (6.8)	6.3–7.2	442 (6.6)	6.0–7.2	449 (7.0)	6.4–7.6
Obstetrics and gynecology	1149 (8.7)	8.2–9.2	597 (8.9)	8.2–9.6	552 (8.6)	7.9–9.3
Nursing administration	446 (3.4)	3.1–3.7	231 (3.4)	3.0–3.9	215 (3.3)	2.9–3.8
Other	934 (7.1)	6.7–7.5	447 (6.6)	6.1–7.3	487 (7.5)	6.9–8.2

Note: LUTS: lower urinary tract symptoms. With LUTS: having at least one type of lower urinary tract symptoms. Without LUTS: not having any type of lower urinary tract symptoms. [a]Variables with missing data: parity (n = 132) and BMI (n = 13). [b]Professional title: There are five grades of registered nurses in Mainland China. Senior or below indicates grades 1 and 2 registered nurses, and supervisor nurses or above indicates grades 3, 4, and 5 registered nurses. [c]Percentages are rounded to the nearest percent. 1 RMB = 0.1494 US dollars.

Table 3: Prevalence and symptom-specific bother of lower urinary tract symptoms.

Symptoms	LUTS (n = 13,191)		Symptom-specific bother of LUTS (n = 6735)							
			No		Minor		Moderate		Severe	
	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI	n (%)	95% CI
Nocturia	1833 (13.9)	13.3–14.5	180 (9.8)	8.5–11.3	617 (33.7)	31.5–35.9	668 (36.4)	34.2–38.7	368 (20.1)	18.3–22.0
Urinary urgency	3437 (26.1)	25.3–26.8	271 (7.9)	7.0–8.8	1230 (35.8)	34.2–37.4	1366 (39.7)	38.1–41.4	570 (16.6)	15.4–17.9
Bladder pain	1056 (8.0)	7.5–8.5	40 (3.8)	2.7–5.1	282 (26.7)	24.1–29.5	485 (45.9)	42.9–49.0	249 (23.6)	21.0–26.3
Frequency	86 (0.7)	0.5–0.8	29 (33.7)	23.9–44.7	22 (25.6)	16.8–36.1	24 (27.9)	18.8–38.6	11 (12.8)	6.6–21.7
Hesitancy[a]	1563 (11.9)	11.3–12.4	140 (9.0)	7.6–10.5	576 (36.9)	34.5–39.3	643 (41.1)	38.7–43.6	204 (13.1)	11.4–14.8
Straining[a]	883 (6.7)	6.3–7.1	35 (4.0)	2.8–5.5	284 (32.2)	29.1–35.4	397 (45.0)	41.6–48.3	167 (18.9)	16.4–21.7
Intermittency[a]	1032 (7.8)	7.4–8.3	79 (7.7)	6.1–9.4	362 (35.1)	32.2–38.1	422 (40.9)	37.9–44.0	169 (16.4)	14.2–18.8
UUI[a]	1603 (12.2)	11.6–12.7	51 (3.2)	2.4–4.2	426 (26.6)	24.4–28.8	609 (38.0)	35.6–40.4	517 (32.3)	30.0–34.6
SUI	2356 (17.9)	17.2–18.5	68 (2.9)	2.2–3.6	651 (27.6)	25.8–29.5	767 (32.6)	30.7–34.5	870 (36.9)	35.0–38.9
Unexplained UI	571 (4.3)	4.0–4.7	12 (2.1)	1.1–3.6	119 (20.8)	17.6–24.4	250 (43.8)	39.7–48.0	190 (33.3)	29.4–37.3
Nocturnal enuresis	176 (1.3)	1.1–1.5	4 (2.3)	0.6–5.7	46 (26.1)	19.8–33.3	84 (47.7)	40.2–55.4	42 (23.9)	17.8–30.9
Any LUTS	6735 (51.1)	50.2–51.9								

Note: UUI: urgency urinary incontinence. SUI: stress urinary incontinence. Unexplained UI: unexplained urinary incontinence. Any LUTS: at least one type of lower urinary tract symptoms. [a]Percentages of bother are rounded to the nearest percent.

(OR = 1.246, 95% CI = 1.076–1.444) and worked more than 40 hours per week (OR = 1.264, 95% CI = 1.175–1.360) were likely to have LUTS. Nurses who were working in a Level A major tertiary hospital were more likely to have LUTS than those working in a Level B major tertiary hospital (OR = 1.226, 95% CI = 1.111–1.352). Compared with nurses who worked in a hospital with a nurse-to-bed ratio less than 0.40, those working in a hospital with a nurse-to-bed ratio of 0.40 to 0.60 (OR = 0.626, 95% CI = 0.503–0.779) and 0.60 and above (OR = 0.647, 95% CI = 0.518–0.808) were less likely to have LUTS.

3.5. Individual Factors Associated with LUTS. Table 4 also presents individual factors associated with LUTS. Female nurses who were aged 40 years and older (OR = 1.147, 95% CI = 1.005–1.309), married (OR = 1.161, 95% CI = 1.015–1.329), and had given birth two or more times (OR = 1.609, 95% CI = 1.388–1.866) are associated with having LUTS. Overweight and obese (OR = 1.208, 95% CI = 1.114–1.311), having chronic disease (OR = 1.564, 95% CI = 1.267–1.930), and alcohol use (OR = 1.258, 95% CI = 1.095–1.444) increase the odds of nurses having LUTS whereas taking part in physical exercise (OR = 0.819, 95%

TABLE 4: Factors associated with lower urinary tract symptoms in female nurses ($n = 13,046$).

Variables	OR	95% CI	p
Age (ref. = <40 years)			
≥40 years	1.147	1.005–1.309	0.042
Race/ethnicity (ref. = Han Chinese)			
Other	1.342	0.926–1.944	0.120
Educational background (ref. = below bachelor degree)			
Bachelor degree or higher	0.944	0.856–1.041	0.251
Marital status (ref. = single, separated, divorced, or widowed)			
Married	1.161	1.015–1.329	0.030
Monthly income (ref. = ≤RMB 6000.00)			
>RMB 6000.00	1.060	0.975–1.153	0.169
Parity (ref. = 0)			
1	1.466	1.283–1.676	<0.001
≥2	1.609	1.388–1.866	<0.001
BMI (ref. = underweight/normal)			
Overweight/obesity	1.208	1.114–1.311	<0.001
Chronic disease (ref. = no)			
Yes	1.564	1.267–1.930	<0.001
Chronic constipation (ref. = no)			
Yes	1.812	1.670–1.967	<0.001
Alcohol use (ref. = no)			
Yes	1.258	1.095–1.444	0.001
Smoking (ref. = no)			
Yes	1.168	0.640–2.132	0.612
Taking part in physical exercise (ref. = no)			
Yes	0.819	0.745–0.901	<0.001
Average fluid intake per day (ref. = ≤500 ml)			
500 ml–1500 ml	0.803	0.726–0.888	<0.001
>1500 ml	0.732	0.652–0.822	<0.001
Working years (ref. = ≤5)			
5–10	1.244	1.112–1.391	<0.001
>10	1.246	1.076–1.444	0.003
Professional title (ref. = senior nurse or below)			
Supervisor nurse or higher	0.998	0.895–1.113	0.970
Work hours per week (ref. = ≤40)			
>40	1.264	1.175–1.360	<0.001
Night shift in the past 6 months (ref. = no)			
Yes	1.065	0.977–1.161	0.153
Hospital level (ref. = level B major tertiary hospital)			
Level A major tertiary hospital	1.226	1.111–1.352	<0.001
Nurse-to-bed ratio (ref. = 0.36 to <0.40)			
0.40–0.60	0.626	0.503–0.779	<0.001
≥0.60 to 0.79	0.647	0.518–0.808	<0.001

CI = confidence interval; OR = odds ratio; ref. = reference.

CI = 0.745–0.901) reduces the odds of nurses having LUTS. Compared with nurses with an average fluid intake of less than 500 ml per day, those who consumed 500 ml to 1500 ml per day (OR = 0.803, 95% CI = 0.726–0.888) and more than 1500 ml per day (OR = 0.732, 95% CI 0.652–0.822) were less likely to have LUTS. Having chronic constipation (OR = 1.812, 95% CI = 1.670–1.967) increased the odds of nurses having LUTS.

4. Discussion

The inaugural survey of NURS in China was launched successfully and has provided important findings about the prevalence, bother, and risk factors of LUTS in a representative sample of female nurses. We found the prevalence rate of LUTS in female nurses to be 51.1%, and more than half of these nurses perceived at least moderate bother from all LUTS except urinary frequency. We identified four work-related risk factors of LUTS in nurses: working more than 40 hours per week, working longer than five years, working in Level A major tertiary hospitals, and working in hospitals with inadequate staffing (bed-to-nurse ratio less than 0.4). In addition, we found that an increase in fluid intake is a protective factor for LUTS in nurses and having chronic constipation is a risk factor for LUTS.

Although the female nurses in this study were relatively young, healthy, had few childbirths, and lived healthy lifestyles, the overall LUTS prevalence rate of 51.1% for this group is much higher than the prevalence rate found for women in general in both developing countries [20] and

developed countries [23]. Our findings validate the conclusion found in small sample studies [8, 9, 24]. In addition, we found that more than 10% of nurses experienced urinary urgency, stress urinary incontinence, nocturia, urgency urinary incontinence, and hesitancy, and the prevalence of urinary urgency (26.1%) and stress urinary incontinence (17.9%) is greater than that found in the general female population both in China [20] and in developed countries [23]. Collectively, the findings from this study corroborate the need for female nurses to be a focus population for LUTS studies.

Symptom perception is an important variable, as it might influence individuals' health-related outcomes [25]. In NURS, the symptom perception of LUTS, i.e., bother, was reported by a large proportion of nurses. Specifically, we found that almost all the nurses in the study had bother perception, and 50% of nurses even perceived moderate bother and more severe bother from having LUTS, excluding urinary frequency. Moreover, more than 30% of the nurses with urinary incontinence reported severe symptom bother. These findings differ from those for women in general who often perceive no bother or minor bother from having LUTS [21]. This discrepancy between female nurses and the general female population might be attributable to nurses' training and work experiences. Nurses are trained at school and in clinical settings to be sensitive to symptoms of various diseases, which might enhance their perceptions of LUTS. Also, LUTS that interfere with nurses' concentration on their work might also be perceived as troublesome to nurses. Collectively, these findings indicate that female nurses bear substantial burden and face significant challenges related to LUTS. To develop a robust nursing workforce, LUTS should be addressed, and in-depth studies of bother may inform the better management of LUTS in nurses.

We found direct evidence that supports significant associations between work-related factors and LUTS in nurses. Heavy workloads of hospital nurses are challenges in many healthcare systems. In this study, we found that the nurse-to-bed ratio ranged from 0.36 to 0.79, which is far below that of most countries [26]. Moreover, we found that 4.0% of nurses in China are working in hospitals with a nurse-to-bed ratio that is under the national minimum ratio of 0.40. Despite years of effort from the government [27], the nurse shortage in China remains more severe compared to that in developed countries. In addition, we found that almost 50% of nurses work overtime, i.e., work more than 40 hours per week, and the mean work hours per week of female nurses is approximately 45 hours, which is much more than the mean work hours of nurses in developed countries such as Germany [28] and the United States [29]. Overtime work is a well-known phenomenon in the academic world [30, 31], but it has not been formally documented in clinical practice, which limits the government's protective measures for employees to function. Both low nurse-to-bed ratios and overtime work are problems that are worthy of attention, as we found that these factors are significantly associated with LUTS in female nurses. In addition, to facilitate the implementation of reporting staffing ratios through a public reporting system, the government should work with medical facilities to develop other strategies to ensure an adequate minimum staffing ratio standard and promote the achievement of the recommended ratio. As for overtime work, the government should require employers to negotiate their work hours and overtime conditions for specific positions and to write them clearly into the labor contract. Local changes, e.g., changing the model of care in individual nursing units, also should be explored.

We also found that working in a Level A major tertiary hospital and working for a long duration (in years) are risk factors for LUTS in nurses. Nurses who work in high-level hospitals in China were reported to be exposed continuously to a large number of hospital visits by patients, high hospitalization rates, more hospitalized patients, and patients with complex health conditions [32]. A long duration of working may also represent the cumulative experiences of nurses in handling patients with various conditions and being assigned complex patients and/or roles, which can lead to stress. Such exposure to stress may result in chronic stress, which has been found to be a validated risk factor for LUTS [33]. Future studies may want to corroborate these findings and test the role of stress on relationships between work-related risk factors and LUTS in nurses.

Multiple intrinsic determinants of LUTS that are found in the general population of women were validated in our nurse sample. Although nurses are knowledgeable with regard to healthy behaviors and health improvement strategies [34], we found that two risk factors, inadequate fluid intake and constipation, are more severe in our sample than in the general population of women [35, 36]. The inconsistency between nurses' knowledge and their behavior indicates that occupational hazards exist in nursing work and nurses' work environments. Nurses are trained to prioritize patients' needs over their own, and when they are busy, they may ignore their personal needs to drink water and go to the restroom. The culture of caring for others at the expense of self needs to shift to a better balance. In a risk-associated working environment, strategies should be developed to empower nurses not only to meet the health needs of the population, but also to take care of their own health.

This study has two primary strengths. First, with the study's representative female nurse sample and high response rate, we were able to examine the LUTS profile of nurses who were working in lower- and middle-income countries, which enriches the evidence of LUTS in nurses in global scenarios. Second, this study adds to the literature by finding multiple modifiable work-related factors that are relevant to LUTS in nurses, which would complement existing interventions to relieve the burden of LUTS for nurses.

This study has several limitations. The first limitation is the inherent limitation of a cross-sectional study in which we could not determine the nature of relationships between work-related factors and LUTS. Using data that will be collected in the NURS follow-up visits, we will be able to look at the incidence and trajectories of LUTS, and such information will help reveal these relationships. Second, the

representative sample is within one province of China, Shandong. Shandong Province has the nation's second largest number of tertiary hospitals, and the number of registered nurses in Shandong is approximately 0.3765 million, representing almost 8.5% of all nurses (4.45 million) across the nation [15]. The sample characteristics are comparable to those reported in the China Health Statistics Yearbook 2020 [15]. Last, the NURS data collection was initiated during the COVID-19 pandemic and, despite the control of the pandemic in China, the mandatory mask policy and visiting restriction policy were maintained in hospitals. The mandatory mask policy may have influenced the need for hydration in nurses and the visitation policy may have increased the workload of nurses. These policies may introduce noise to our findings.

5. Conclusions

A healthy nursing workforce is an essential building block for robust healthcare systems and is the cornerstone for advancing global health. LUTS are prevalent and bothersome for female nurses and create challenges for a healthy nursing workforce to deliver high-quality care. We cannot ask nurses to contribute even more to global health when one of their basic needs as humans, i.e., the normal function of urinary elimination, is ignored. More studies are needed to contribute compelling evidence to reveal the impacts of modifiable individual and work-related factors on nurses' LUTS and associated bother. All such efforts will eventually lead to interventions for mitigating LUTS in nurses.

6. Implications for Nursing Management

The findings from this study have several clinical implications. Nurse managers should be aware that nurses' basic needs as humans are compromised due to LUTS and related bother, and addressing LUTS-related problems requires significant effort on multiple fronts. As the representatives of thousands of nurses, nurse managers should oversee the bladder health of nurses and report the problem of LUTS to stakeholders when necessary. Such efforts may directly mitigate LUTS in nurses. Nurse managers also should explore innovative care models within departments or hospitals to increase productivity and alleviate the negative effects of excessive workloads on nurses as an indirect pathway to mitigate LUTS. In addition, nurse managers may also employ strategies to remodel the nursing culture and encourage positive coping behaviors in nurses. In doing so, clinical nurses will be able to take care of themselves while also providing quality care to patients.

Data Availability

The data in our study are not publicly available because the data contain protected health information, but the research group can provide descriptive data in table form. Requests can be made to Chen Wu or Ke-Fang Wang.

Disclosure

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Jie-Qiong Ren performed conceptualization of the study, data analysis, results interpretation, and prepared the manuscript. Ming Li interpreted the results and prepared the manuscript. Dong-Juan Xu performed data analysis and revision of the manuscript for important intellectual content. Jie Gao performed data analysis and prepared the manuscript. Jun-Tao Chi performed data collection and curation and revision of the manuscript. Min Yuan performed data collection and curation and revision of the manuscript. Xing-Feng Lin performed data collection and curation and revision of the manuscript. Hong-Xia Du performed data collection and curation and revision of manuscript. Chen Wu performed conceptualization of the study, results interpretation, and revision of the manuscript for important intellectual content. Ke-Fang Wang

performed conceptualization of the study, data analysis, results interpretation, revision of the manuscript for important intellectual content, and funding acquisition. The NURS Group Collaborators: All collaborators participated in the implementation of the study, provided guidance on the design of the study, prepared the database, and reviewed the results and the manuscript. All the authors have read and approved the final version of the manuscript.

Acknowledgments

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Research Article

Managerial Competencies Engaged in Innovative Actions in Primary Health Care: A Qualitative Study of Brazilian Nurses

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Aim. To explore the managerial competencies engaged in innovative actions among Brazilian nurses working in primary health care. *Background.* The mobilization of managerial competencies favors environments that are in transformation. There is a lack of studies that recognize the managerial skills which influence the implementation of innovative actions in PHC. *Method.* A qualitative exploratory descriptive approach was developed in the PHC of a municipality in Brazil. A total of 76 nurses who worked in management and care participated with a semistructured script being applied on innovative actions implemented in the service. The data were processed in IraMuTeQ 0.7 and later analyzed by descending hierarchical classification. *Results.* The managerial competencies that influenced the development of innovative actions implemented were as follows: communication and teamwork in planning innovative actions, continuing education for application and implementation, and leadership and people management. *Conclusions.* Managerial competencies were used as strategies by nurses to implement innovative actions and contribute to engagement and generating positive results, emphasizing autonomy and the role of nurses as agents of change. *Implications for Nursing Management.* The identified management competencies contribute to directing and sustaining innovative actions, as well as to identifying critical nodes that need support and innovation.

1. Background

The triple impact of nursing report proposed by the All-Party Parliamentary Group (APPG) of the United Kingdom in 2016 highlighted the relevant contributions of nursing to improve global health. In addition, the report noted that the role of nursing in health systems allows both the improvement of these systems and the development of nursing skills and knowledge [1, 2]. Thus, based on these reflections, it was possible to suggest that universal health coverage is directly related to the investment in the empowerment of the nursing team. Therefore, the APPG realized that the empowerment of the nursing team makes it possible to contribute to the so-called triple impact: to achieve better health, promote gender equality, and sustain economic growth [3]. In this sense, the different health system contexts can be

critical scenarios which enable nurses to fully develop their competencies.

Many nurses often face professional barriers and few opportunities to occupy leadership positions [4]. Among the strategies developed to overcome these barriers were the discussion forums of the "Nursing Now Campaign," which aimed to improve education and development of the profession, as well as to provide better working conditions, share innovative and successful practices based on scientific evidence, and thus develop competencies [1, 2]. One of the important fields for developing competencies and applying innovations to nursing practice is primary health care. In this health context, nurses develop actions aimed at managing health services, research, and teaching to meet the needs of the health team and the population [5]. These actions are evolved and executed based on various managerial competencies such

as communication and planning in the sense of undertaking innovations in the health service and therefore promoting the integral care of the people [6].

Primary health care in Brazil is the gateway to the health system, with nurses acting as health unit managers in this context. Consequently, nurses are responsible for managing material resources and teams, as well as providing comprehensive care to the population [7]. As a result, primary health care in Brazil becomes an important field of observation and development of managerial competencies of nurses as leaders in health care.

On the other hand, evidence within the Brazilian context has shown that nurses face challenges in implementing managerial competencies in their daily work in primary health care [7–9]. These challenges stem from a sense of professional unpreparedness combined with an exhaustive and bureaucratic workload. Thus, in the face of these Brazilian challenges, there is an opportunity to understand managerial competencies in order to promote nurses' engagement.

Thus, managerial competencies are understood as skills exercised by nurses which help in their articulating process in health services [10]. The literature has shown this articulation of services in order to describe the main competencies necessary for good management [11–13]. Therefore, in these studies, it is possible to perceive the focus on managerial elements that can compromise the quality of results or even on specific competencies that enhance results in management in primary care. However, nurses face difficulties in developing these managerial skills, which need to be deepened [11, 13]. The mobilization of internal resources necessary for developing competencies is fundamental for developing innovative strategies during management [14]. Innovative actions in public health, beyond the knowledge about the best skills, result in understanding the difficulties confronted in developing such skills [15]. In this sense, for nursing professionals to reach their full potential in services and the health team, they must develop and improve skills through actions produced in service [3]. Although the nurse has training for managerial practice, it is observed that this role is still in the construction process, which denotes the need for professional qualification and recognition of the difficulties [11].

By recognizing themselves as leaders and managers of health care, nurses will be able to develop innovations in their field of activity based on evidence, the willingness to contribute, and their professional experience [5]. The interface between innovative actions developed by nurses in primary health care (PHC) and their managerial skills will enable developing strategies to support nurses and health care services in the search for organizational results based on innovative actions. The objective of this qualitative study was to explore the managerial competencies engaged in innovative actions among Brazilian nurses working in primary health care.

2. Methods

2.1. Design.
A qualitative exploratory, descriptive approach was used. This approach was chosen to explore the meanings of the managerial experiences of Brazilian nurses in developing innovative activities in PHC. The consolidated criteria for reporting qualitative research (COREQ) tool [16] was used to assess the quality of the research and the trustworthiness of the qualitative approach.

2.2. Theoretical Framework.
The central results of each cluster were analyzed in light of the theoretical framework of Quinn et al. [17], which highlights the reflection on why different managerial competencies are essential, regardless of the activity or function performed. Therefore, it is relevant that leaders apply various competencies in different activities when thinking about long-term success. Its theory is based on modules which include the following: organizational goals, considering the associated management models; the paradoxes encountered by managers when trying to achieve established goals; and competencies, which the manager can use to transcend or combat these paradoxes. Modules collaborate, create, control, and compete and their managerial competencies can be seen in Table 1.

Quinn et al. [17] observe that different managerial competencies are necessary for effective management. Since some institutions use the model of opposites in their activities, whether innovative or not, meaning that at the same time as they desire adaptable and flexible organizations, managers want them to be stable and controlled. In addition, they want to value and respect employees while also wanting to address the demanding plans and goals. This model is known as the Competing Values Framework [17].

For this study, the focus will only be on managerial competencies. However, when performing actions aimed at collaborating, controlling, competing, and creating, there is a need to integrate several managerial competencies. Thus, this framework has the ability to integrate a diverse set of skills as its central purpose, allowing the manager to act effectively in a constantly changing environment [17]. In addition to acquiring knowledge, the development of competencies requires the behavioral capacity of how to act correctly. Therefore, the manager needs to use and develop them to improve their professional practice because "strategies that are effective in one situation are not necessarily effective in another" ([17], p. 13).

2.3. Setting.
This study was conducted in a municipality in southern Brazil. The PHC in this municipality has 111 health units characterized as 64 family health strategy units (*Estratégia Saúde da Família*, ESF) and 47 basic units in the traditional model, totalling an estimated population of 550 nurses in primary health care. The traditional basic units present a service model to the people aimed at medical and nursing consultations, with nurses and general practitioners in their team without specific training in family health. The ESF aims to expand the resolution of the services provided, as well as impact the health situation of people and the community, corresponding to a service model offered by a multidisciplinary team of higher and technical levels, usually composed of at least four members: a general practitioner, or specialist in family health, a general nurse or specialist in family health, nursing assistant or technician, and community health workers. Oral health professionals

TABLE 1: Managerial competencies according to the model Competing Values Framework—collaborate, create, control, and compete adapted from the study by Quinn et al. [17].

Managerial competencies: collaborate, create, control, and compete	
Modules	Managerial competencies
Module 1: collaborate—create and sustain commitment and cohesion	(i) Understanding yourself and others (ii) Communicate honestly and effectively (iii) Guide and develop people (iv) Manage groups and lead teams (v) Manage and encourage constructive conflict
Module 2: control—establish and maintain stability and continuity	(i) Organize information flows (ii) Work and manage across roles (iii) Plan and coordinate projects (iv) Measure and monitor performance and quality (v) Encouraging and enabling compliance
Module 3: compete—improve productivity and increase profitability	(i) Develop and communicate a vision (ii) Establish goals and objectives (iii) Motivate yourself and others (iv) Design and organize (v) Manage execution and seek results
Module 4: create—promoting change and encouraging adaptability	(i) Using the power and kinetic influence and effectiveness (ii) Sponsor and sell new ideas (iii) Stimulate and promote innovation (iv) Negotiate agreements and commitments (v) Implement and sustain change

are also added such as dental surgeons, assistants, or technicians in oral health. The reason for selecting this municipality was because it stands out for implementing innovative actions in the Brazilian reality, with these health units being awarded the seal of quality.

2.4. Participants and Recruitment. The participants were selected through judgment sampling, which involved the researchers' judgment in choosing the participants who met the appropriate information criteria for the research objectives [18]. Eligible interviewees were nurses with experience in the care or management of health units in the last two years and remained in the position until data collection was completed. Theoretical saturation was employed as a sample closure strategy. Within this approach, the insights provided by new research participants would offer little additional value to the already collected data, thus ceasing to significantly contribute to enhancing the theoretical reflection grounded in the data being gathered [19].

2.5. Data Collection. Data collection took place from February to November 2018 through semistructured and audio-recorded interviews. A pilot interview was conducted with a nurse manager and a clinical nurse from a health unit prior to data collection, from which the instrument was improved. The individual interviews were performed by a team of three researchers trained to conduct the interview, two nurses and a fifth-year nursing student. Contact with the participants took place via instant messaging applications and/or e-mail, in which the interviews were previously scheduled. District managers' telephones and electronic addresses were obtained via contact with the institution under study. After

contacting the district managers, they indicated the other nurses according to their territories. It should be noted that the instant messaging application is used as a management tool in the institution, and professionals use it as a communication channel with greater efficiency to exchange information.

The researchers introduced themselves and verbally described the research objectives and the data collection process. Data were collected in the work environment of each participant. Each interview lasted between 10 and 40 minutes. The semistructured script prepared for this study provided questions regarding participant characterization, report on an activity considered to be innovative in their work environment, report on the knowledge and information used, how this information was introduced, and the existence of external influence, as well as a description of the adaptation process and the settings. All interviews were transcribed using an audio management application. The transcript quality was verified by the main researcher.

2.6. Data Analysis. Data processing took place using a textual analysis software program called IraMuTeQ (*Interface de R pour les Analyses Multidimensionnelles de Textes et de Questionnaires*), version 0.7 alpha 2. It is a free software program developed under the logic of open source, licensed by the GNU GPL (v2), which is anchored in the R software program and in the Python language. Thus, it was possible to organize the data and perform statistical analyses on the combined outcome of the transcribed interviews (textual corpus) and on individual/word tables through the software program by simple and multivariate analyses such as descending hierarchical classification (DHC) [20]. In turn, groups of texts from the combined interviews on the same theme were built and then incorporated

into a single text, called the textual corpus. The analyses were carried out through the textual corpus and also through matrices organized in spreadsheets with rows and columns for individuals and words [20].

A DHC presents the relationship between text segment clusters with three lines or more. Furthermore, a set of these text segments divides itself according to their frequency, which enables grouping statistically significant words and qualitative data analysis. Therefore, each corpus presents a text segment (TS) that is considered the central unit of textual analysis illustrating the categories, called clusters in this study. From the corpus, the TS presented in each cluster enables identifying statistically significant words which allow this format of qualitative data analysis ([20], p. 9). First, an exhaustive reading of the TS of each cluster was performed in order to qualitatively understand their meaning. Next, the TSs that best represented each of the clusters were selected to present the results. Accordingly, text segment clusters were obtained in terms of the most frequent words through a dendrogram, which makes it possible to identify the lexical content present in each of the clusters processed by the IraMuTeQ program.

2.7. Ethical Considerations. This study was approved by the Research Ethics Committee of the Federal University of Paraná, Brazil, under protocol number 2,157,244.

3. Results

The number of participants in this study was 76. All the participants were nurses, 60.5% ($n = 46$) were clinical nurses, and 39.4% ($n = 30$) performed managerial functions at the Municipal Health Department of the municipality under study. It was noted (Table 2) that 40.7% ($n = 31$) were aged between 31 and 40 years, and only 1.3% ($n = 1$) had a doctorate degree, while 53% ($n = 41$) of the nurse managers and 28% ($n = 21$) of clinical nurses had a specialization. Regarding the time in the current position, it was evidenced that the nurse managers who worked from one to five years corresponded to 25% ($n = 19$), and 18% ($n = 15$) had remained in the position from 10 to 15 years. Lastly, time over 15 years of an association with the institution presented 30.2% ($n = 23$) for clinical nurses and 15.7% ($n = 12$) for nurse managers.

Data processing from the 76 texts using the IraMuTeQ software program took three minutes and two seconds, resulting in 3,232 TSs with use of 2,595 (80.29%), of which three clusters were generated. Next, DHC was generated through a multivariate statistical analysis of the textual corpus (Figure 1).

All clusters demonstrated the nurses' perception of managerial skills that influenced the development of innovative activities implemented in PHC. It is noteworthy that innovative activities were reported by nurses as not necessarily being created but adapted as innovations according to the reality of the work process. The results pointed to 42 innovative activities.

Cluster 1, "communication and teamwork in planning innovative activities," corresponds to the third column in the

TABLE 2: Demographic characteristics of clinical nurses and nurse managers.

Demographic characteristics	Clinical nurses	Nurse managers
Age group		
21 to 30 years	1	1
31 to 40 years	15	16
41 to 50 years	7	18
51 to 60 years	5	11
61 to 70 years	2	0
Professional qualification		
Undergraduate	5	0
Specialist	21	41
Master's	4	4
Doctorate	0	1
Time in current position		
0 to 1 year	0	12
1 to 5 years	0	19
5 to 10 years	3	7
10 to 15 years	15	7
15 years or above	12	1
Time in municipal health department		
0 to 1 year	0	0
1 to 5 years	0	2
5 to 10 years	12	5
10 to 15 years	11	11
15 years or above	23	12

dendrogram (Figure 1) and presents text segments which highlight managerial competencies related to improvement of the work process. The planning of innovative activities in the report considered the workflow and the organization form of the teams.

> "[...] the team worked together, [...] and she [the local manager] did it now for the whole team, and the whole team commenting on what it was [the innovative activity], how they reached the common goal and we saw their enthusiasm." (DS 8 Manager).

From the dendrogram referring to Cluster 1, the planning of activities brought the need to talk about the characteristics of the work process. This demand-based planning consequently enabled nurses to find a new way of demonstrating their role in the health service.

> "Here, in our reality, it is only the nurse who has the application agenda [implanted innovative activity]. Not the nursing technicians, we realize that it is the nurse who provides this service, that the vast majority resolves the issue there." (HU 12 Manager).

Thus, it is observed that managerial competencies were fundamental for implementing innovative activities by nurses, both in the scope of management and in care management. It was possible that these skills therefore collaborated for a process of autonomy of the PHC nurse.

Cluster 2, "management skills that influenced the role of nurses in innovative activity," corresponds to the second column in the dendrogram (Figure 1). The text segments
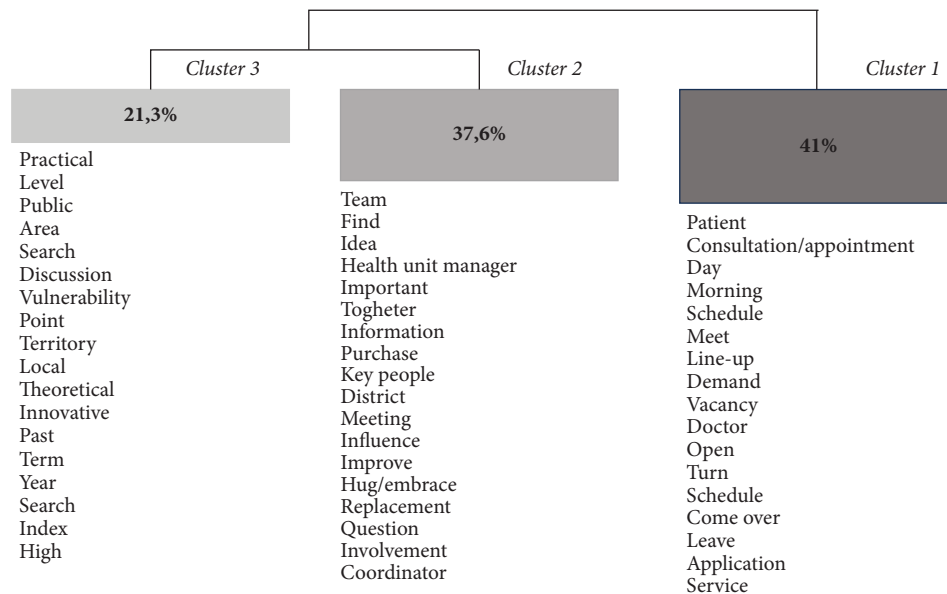
FIGURE 1: DHC dendrogram with clusters based on the corpus of interviews with clinical nurses and nurse managers.

show managerial skills: teamwork, communication, continuing education, and leadership. The relevance of the team's knowledge and its involvement in improving the service according to what had been proposed by the implemented innovative activities is noted in the reports.

"What made it easier, I think, was the involvement and knowledge of the team." (Clinical 2).

Difficulties in communication were also evidenced in the text segments of clinical nurses. We observed the difficulty felt in the dialogue and transfer of information from institutional leaders.

"Currently I see that this dialogue and this exchange have become increasingly difficult, I don't know if it's because of the accumulation. [. . .] so sometimes the way to present this innovation is making some implementation processes difficult." (Clinical 11).

Participants reported the challenges of using continuing education as a team engagement tool.

"It was more knowledge that we got ready; that she [the local manager] brought to us and we began to understand that this process would really make a difference for us." (DS Manager 4).

Leadership seemed to emerge as a managerial competence that contributes to the nurse being the main influencer of the team.

"The first issue is leadership, appropriation of knowledge, belonging. When we say that we want to reach the goal, that we want to serve that community that needs it there." (DS Manager 2).

Cluster 3, "leadership and people management: fundamentals for applying innovative activities," corresponds to the first column in the dendrogram (Figure 1) and emphasized leadership and human resource management for managerial skills. The text segment highlighted both competencies as a reference for developing the teamwork process and for the nurse's role as an articulator of this process.

"The doctor is often not that involved, people who are articulating that go after, inviting, but the nurse is the basis of everything." (Clinical 26).

We observed that leadership and people management are directly modulated by the type of population and territory to be worked.

"They took care of places [referring to the innovative activity: sweeping the territory with ACS and volunteers], for which they collected food to give to people. So, I thought like this: I have this problem, and I don't have human resources, but I know this group that does this work" (HU Manager 5).

Thus, the innovative activities developed for the vulnerabilities of the assisted people need a strategic vision from the leader to confront the indexes that characterize the population, as well as organizing the teams to carry out the activities. Therefore, local leadership and people management are skills which were perceived as pillars in implementing innovative activities.

"It was a very interesting and very gratifying moment [implementation of the innovative activity: Saúde Já application], where we had the freedom to manage the patient and to seek worker satisfaction, value the worker, motivate them to recognize their work in the area." (DS 18 Manager).

4. Discussion

The aim of this qualitative study was to explore the managerial competencies engaged in innovative actions among Brazilian nurses working in primary health care. The findings indicated there was a connection between managerial competencies and the innovative actions developed by nurses in PHC. These innovative actions are evidence of the role of nurses in developing work processes in health services. Thus, valuing nursing actions and creating new strategies for health work improve PHC [14].

As a result, managerial skills, leadership, teamwork, and communication stood out among the three clusters. In this sense, innovative activities, such as those implemented by the participants of this study, go beyond the practices already traditionally performed by nurses. This advance provides the opportunity to reflect and self-assess the work process, as well as to improve their managerial competencies [21]. Therefore, the professional contribution of the nurse as a team leader must generate knowledge, develop skills, and collaborate to implement innovations in the service [22].

It is observed that many performed actions and strategies in PHC are based on the management and care dimensions, whose perspective is to reach beyond the team and service to the community. However, mobilizing some managerial competencies, such as planning, leadership, and people management need to be considered for these to be quality actions [23]. These demands are not always foreseen as job responsibilities, but often arise as demands of the work process. Innovative actions result in transposing an idea from one context to another, with a perspective to improve the work process. Thus, the implementation of innovations is achieved due to the ability of this action to unite people so that together they can execute their best reasoning. In the long term, the organization is expected to become a space where professionals perform innovative activities as a habit, from where all professionals are creators of new ideas and not just the managing leader [17].

Cluster 1 showed innovative activities aimed at improving work processes, such as organizing the service flow and planning and time management being outlined based on communication and teamwork. These are competencies found in both care execution/provision and in the nurse's managerial competencies, further constituting a link between the other managerial competencies [24]. The use of managerial communication competence demonstrated the successful development of innovative activity through dialogue among the team. However, it was up to those involved to use it as a strategy. In practice, communication and teamwork are understood as facilitators of the nurse's leadership process in planning actions [23].

The influence of communication was related to organizing the health service, as it favored consolidating different knowledge held among team members [22, 25], demonstrating that effective communication also requires reflective listening, because when associated, they result in increased interest and trust among team members [17]. As the coordinator of the innovative activity, nurses used communication to negotiate the rational use of various resources with the team to favor the implementation process of the innovative activity. Hence, if the structural dimension of the quality of nurses' work is the basis for executing care actions, communication is observed as the basis for planning structural issues, such as the management of people and material resources.

The institutional barriers of health systems can be better managed in favor of action planning when nurses' communication is previously established and teamwork already has an effective routine. Therefore, the nurse plays the role of the coordinator and planning member of the team's work processes in the context of PHC [26]. In turn, this managerial position contributes to the visibility of their professional role since there is planning in PHC based on the situational diagnosis of this nurse. As a consequence of this visibility, the process of professional autonomy in the services can be built, encouraging the professional to plan, act, and maintain a culture of care quality in PHC as much as possible [5].

In Cluster 2, competence in working in a team was considered particularly challenging, as it means developing a job or activity with motivated professionals focused on the same objective. Therefore, it is not just about having an effective communication process, but constantly dealing with communication difficulties and leadership support. In turn, it is up to the nurse to encourage good teamwork, so that this competence is integrated and continuous as a quality culture in PHC [21], even though communication is considered one of the most challenging skills for new project managers [17]. In this perspective of strengthening the relationship with the team, the nurse develops empowerment in exercising their leadership. There is also improvement in work processes and successful implementation of the innovative activity [24]. As said, the reality of teamwork depends on an effective communication process. When it comes to implementing innovative actions, this communication has constant difficulties. The data of this study converge with what is advocated by the triple impact of nursing when it is observed that management makes it difficult for the nurse leader to share knowledge by following the vertical communication model [4]. In this sense, articulations between professionals can occur informally as long as it is positive, which denotes a good relationship. In addition to involving the team in the activities of PHC services, it is also necessary to integrate the practice of meetings. When communication is safely used, it builds trusting relationships and is considered fundamental for any type of change within the service [17, 27].

In this way, the responsibility of the manager/leader is highlighted in clarifying to each team member their functions given the activities performed. Regardless of their technical or personal skills, which are essential for contributing to the action to be performed, it is relevant that the manager explains what performance is expected from each person on the team to avoid ambiguity and role conflict. Furthermore, the clarity in functions helps the team to understand what to expect from each other. It helps improve communication, which is associated with the collaborate quadrant, that is, attentive listening to members' interests, feedback, and support in conflict resolution [17].

The results demonstrated nurses' difficulties in using the managerial competence in continuing education as a tool for team engagement. As much as everyone was involved, the knowledge about the innovative activity was not built by the team. Despite continuing education being a managerial competence capable of providing services with improved conditions and stimulating the search for knowledge, transforming reality, and qualifying management and care, managerial leaders have the role of guiding and developing the team [17]. This managerial competence still proves to be a difficulty to implement in PHC services [26].

Leadership in Cluster 3 of this study was understood as a pillar for applying innovative activities. Nurses' understanding of the search for knowledge appropriation demonstrates the guarantee of which scientific evidence can effectively support them in their practice [28]. Thus, it is possible to not only ensure leadership and influence in the team but also to optimize the service and care provided, which contribute to improving the results of the implemented actions [10]. Applying innovations requires vision of the processes and critical sense of the results. The nurse's managerial competencies in these dimensions must produce motivation and listen to the team, since the challenge is to be an agent of reality transformation. Nurses have the same perception about how to exercise leadership competence. Thus, the influence exerted on the team contributes to the power figure of the nurse; however, this power occurs due to the relationship of trust that this professional tends to manifest, and not to authoritarianism [10].

Developing and knowing how to share the organisational vision contributes to the organisation's success, as leaders communicate their vision through words and actions. In this way, the team knowing its functions and responsibilities in detail is as essential as the manager's panoramic view [17]. Likewise, institutional leaders converge to the figure of power within the service to nurses, placing them as a protagonist who reflect on their practice and expose their opinion in order to problematize the scenarios discussed in the team. Therefore, the power relationship of healthy leadership is a potential tool to produce innovations fueled by the trust of the PHC team, users, and institutional management [29].

In addition to being considered a managerial competence, leadership is also associated with a cross-cutting theme of the strategic guideline of the region of the Americas. Thus, it also contributes to the objective of strengthening the nursing workforce [30]. In contrast, it is possible to observe some difficulty in developing autonomy in decision-making in certain scenarios, limiting leaders in human resource management [21]. It is therefore important to emphasize the consolidation of nurses' managerial competencies, as they can influence the quality of care for users and their families [15]. Thus, exercising a broad vision of the organization, associated with managerial leadership competence, reflects the concept of visionary leaders. These leaders go beyond managing people and the organization but positively inspire team members, urging them to get involved in the work with extra effort, which results in the consequent likelihood that services will improve [17].

It should be noted that there is still a deficiency in training regarding managerial competencies [31]. However, the link between implementing innovative activities and the managerial competencies developed and used by nurses in PHC demonstrates the commitment by these professionals to the daily improvement of the service provided and the consolidation of PHC attributes.

4.1. Limitations. This study is limited due to the analysis of managerial competencies through the report of innovative actions, in which the competencies that were intrinsic in the nurses' speeches were analyzed. Accordingly, it is suggested to search for data beyond innovative actions to expand the analysis of mobilized managerial competencies, as well as in other areas of the health system.

5. Conclusion

Essential managerial competencies such as leadership, communication, continuing education, and planning were observed in this study. In turn, these competencies helped in developing innovative activities and consequently collaborated to elevate the professional role of nurses working in PHC, with emphasis on professional autonomy and protagonism.

6. Implications for Nursing Management

By reflecting on the managerial competencies developed by nurses in the practice of innovative actions, this study demonstrated the engagement of these professionals in providing an innovative environment in a public sector. Moreover, how much the mobilization of managerial competencies favors management actions was evidenced. In addition to contributing to direct and sustain the proposed innovative actions, they demonstrate that they favor service or care management actions when used as support for practice in identifying critical nodes in the nurse's work process, which need support and innovation. In this perspective, it is reinforced that managerial competencies become facilitating skills to support nurses in directing actions which contribute to their empowerment and to the process of establishing themselves as a recognized and valued profession.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval

The development of this study followed national and international ethical and legal aspects of research on human subjects, according to Ethics Committee of Federal University of Paraná, authorization no. 69590217.3.3001.0101 and Institution Participants Committee no. 2.232.776.

Conflicts of Interest

Acknowledgments

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Research Article

Managing Sustainable Working Hours within Participatory Working Time Scheduling for Nurses and Assistant Nurses: A Qualitative Interview Study with Managers and Staffing Assistants

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Aim. To bring insights into how healthcare managers and staffing assistants work to achieve sustainable working hours within a participatory scheduling system. *Background*. Hospital nurses and assistant nurses often work on rotating shifts, which affects their opportunities for sleep, recovery, and work-life balance. In Sweden, a participatory scheduling approach is commonly used, where working hours are planned in collaboration between employees, managers, and staffing assistants. Influence over working hours is related to positive outcomes among shift workers. However, it also places responsibility on the employee to schedule working hours that promote health and patient safety, i.e., sustainable working hours. Accordingly, the organisation has responsibilities to support the employee in this regard. *Methods*. Semistructured individual interviews were conducted with 11 managers and 9 staffing assistants from four Swedish regions and analysed using thematic analysis. *Results*. Several key factors for achieving sustainable working hours within the context of participatory scheduling were described: distribution and clarity of responsibilities, allocating time for scheduling, establishing shared responsibility, considering fairness, fostering an individual relationship with the employee, managing dissatisfaction, providing support, clarifying guidelines for sustainable scheduling, managing inconsistencies between employee requests and sustainable working hours, and considering recovery opportunities and the competence mix on shifts. Additionally, contextual factors, such as staffing levels, working procedures, working time arrangements for night work, and technological support, were highlighted as important. *Conclusion*. Achieving sustainable working hours within participatory scheduling involves considering the interactions between factors at the levels of the organisation, the individual, and the technological systems. *Implication for Nursing Management*. Nurse managers and staffing assistants must work closely with their employees during participatory scheduling to ensure sustainable working hours. Key goals in this regard include establishing a shared responsibility, clarifying responsibilities and guidelines for sustainable scheduling, and allocating time for the scheduling process.

1. Introduction

Healthcare organisations operate 24/7, which requires shift work. In the European Union, about 40% of healthcare workers are exposed to shift work [1]. Among nurses and assistant nurses, rotating shift work is common, alternating between morning, evening, and night shifts. Working hours affect sleep and recovery [2] and maintenance of a work-life balance [3], which are important factors for employees' health [4] and intention to stay in the organisation [5, 6]. Furthermore, insufficient sleep and recovery cause fatigue which can be a patient safety hazard [7]. Thus, working hour arrangements are an important consideration for healthcare organisations in order to ensure employee health and patient safety, as well as managing the world-wide challenges with recruitment and retention of staff in healthcare [8, 9].

In participatory working time scheduling (hereafter referred to as participatory scheduling), working hours are planned with the aim of meeting both employees' individual preferences and the wards' specific staffing needs. Usually, ward managers, staffing assistants, and employees cooperate in the schedule planning, which often takes place in several steps and in cycles of negotiations and adjustments [10, 11]. Participatory scheduling implementations vary, e.g., regarding how the process is organised, degree of employee influence, and ward-specific scheduling rules. Participatory scheduling is commonly used among shift-working nurses and assistant nurses in Sweden, although there is a heterogeneity in how it is implemented [12].

Influence over working hours has been related to several positive outcomes among shift-working healthcare employees, such as higher job satisfaction [13], improved work-life balance [14], reduced fatigue after work [15, 16], reduced risk of short sleep and poor workability [17], and higher self-rated quality of care [18]. Use of participatory scheduling was also found to be related to decreased sickness absence among nursing staff [19]. Furthermore, satisfaction with schedule flexibility has been related to lower intention to leave the workplace [20], while being forced to work night shifts has been cited as a reason for leaving the workplace [21].

Concerns have been raised that employee influence over scheduling could result in working hours that impair recovery and health, e.g., through prioritisation of social activities over recovery, sleep, and health [22]. While such concerns have been realised in some studies, e.g., an increase of long work shifts [10, 15], other studies have found few such unfavourable effects of participatory scheduling [23]. A similarly mixed picture emerges with regard to the effects of participatory scheduling on job satisfaction [24].

Given some contradictory results regarding the impact of participatory scheduling, it is important to identify which factors are important for the successful implementation of participatory scheduling. Key enablers of implementation, as identified by a recent systematic review [25], were an understanding among the employees that the process will not always run smoothly and changes will become necessary, having a team-based approach involving all employees, continuous support and involvement of the head nurse, assessing the nursing workload before implementation, and using a computerised self-scheduling system. Examples of barriers were when nurses see self-scheduling as an individual entitlement (instead of a joint agreement to enhance both the employee's life and the ward's functioning), organisations underestimating how sensitive the issue of scheduling is for employees, favouritism by the schedulers, and staffing shortage. The review's findings highlighted the importance of the implementation process and contextual issues, for the success of participatory scheduling.

Previous research has indicated that certain shift schedule characteristics are associated with sleep and fatigue problems, such as a high frequency of quick returns (<11 hours between working shifts) [26, 27], many consecutive working days [28], night work [29], and backward rotation of shifts (night-evening-day) [30]. Also, night shifts per se [31], >3 consecutive night shifts [31], quick returns [32], and long working hours [31, 33]

have been related to increased risk for occupational injuries. Among nurses, long working hours (>12 h) [34], a high frequency of quick returns [35], and night shifts [36] have also been associated with a higher risk for medical errors, with fatigue as one plausible mechanism [36]. Furthermore, a single day off after night work seems insufficient to fully recuperate with respect to alertness [37] and cognitive function [38].

Support exists for an association between shift work and future development of chronic diseases (e.g., type 2 diabetes, coronary heart disease, and cancer) with higher risks for shift work including night work, with disturbed sleep and circadian disruption as plausible mechanisms [4]. Regarding night work, >9 h shift duration [39], >3 consecutive shifts [39], and <28 h rest after the last night shift [40] have been associated with increased risk for disease development.

Accordingly, schedule design in shift work has health and safety implications for both employees and organisations. In this article, we define sustainable working hours as working hours that promote both short- and long-term employee health, sleep, and recovery, as well as patient safety. The requirements for sustainable working hours, as identified by previous research, are that the shift schedule should limit the number of consecutive shifts [28] and quick returns [26, 27, 32, 35]; limit the length of shifts [31, 33, 34]; limit consecutive night shifts to a maximum of 3 [39]; enable sufficient (>48 hours) rest time after night work [41]; and feature forward rotation of shifts [30].

Leadership behaviours characterised by consideration and support, and a good quality leader-employee relationship, are positively related to employee well-being and lower stress levels [42]. Recent studies have also suggested that leadership is an important factor in facilitating employees' sleep. The concept of sleep leadership has been defined by a set of behaviours in which leaders both encourage and enable employees to obtain healthy sleep [43]. A series of studies among military personnel indicates that employees' experience of sleep leadership is associated with higher subjective sleep quality and sleep quantity [44], as well as with less sleep disturbance and sleep-related impairment during daytime [45].

The current project uses the human-technology-organisation concept as its theoretical basis, to understand the role of the individual in the complex organisation of healthcare. The concept suggests that work activities can be described, analysed, and understood by describing the interactions between the three subsystems—human (also referred to as "individual" in this work), technology, and organisation [46]. These subsystems play a key role in participatory scheduling, where both employees and the organisation are involved in planning of working hours, often using computerised scheduling systems.

Given the importance of working hours for both employee health and patient safety, and the widespread use of participatory scheduling among healthcare personnel, there is a need to understand how to optimise participatory scheduling models while ensuring sustainable working hours. The aim of this study was to bring insights into how healthcare managers and staffing assistants work to achieve sustainable working hours within a participatory scheduling system.

2. Materials and Methods

2.1. Design.
This qualitative descriptive study examined participants' experiences and thoughts [47], as part of a larger project investigating how healthcare organisations can achieve sustainable working hours. The study adhered to the Consolidated criteria for reporting qualitative research (COREQ) [48], see Appendix 2.

2.2. Context.
Four regions in Sweden (including one metropolitan region) were represented in this study. There were a variety of ways of organising the scheduling process, involving the manager, the employees, one or more staffing assistants, and/or scheduling groups (a group of nurses or assistant nurses who had time designated for work with scheduling). Schedules were planned for between 5 and 12 weeks at a time (up to 16 weeks during summertime). A scheduling period commonly started with a *planning period*, where the employees proposed which shifts they would like to work during the coming period, either using paper and pen, a whiteboard, or a technological system ("Tessa," "Heroma" and/or "Adacta"). There were rules about a minimum number of certain shifts (evening, weekend, and/or night shifts) in each scheduling period which employees had to follow. Also, the employees were allowed to place "vetoes" on shifts they did not want to work (varying between 1 veto/week and 3 vetoes per 10 weeks). After the planning period, the *adjustment process* started and lasted for between 1 and 3 weeks, where staffing shortages and excesses on shifts were identified and shift changes were made to fulfil staffing and competence needs on each shift.

The first part of the adjustment process was carried out by the employees themselves. In some wards, a scheduling group or staffing assistant was responsible for either the whole adjustment process or for making further necessary adjustments after the employees' own adjustments. Final approval of the schedule was given by the manager, or in some cases by staffing assistants, although the manager had the formal responsibility for the schedule. Sometimes the planning and adjustment process was divided into two steps, where planning and adjustment of weekend and/or night shifts were made in a first step, and the remaining shifts in a second step.

2.3. Participants.
Purposive sampling was used to obtain participants from diverse regions in Sweden. Inclusion criteria were first-line managers and staffing assistants who worked actively with working time scheduling and used participatory scheduling. Twenty-seven participants were invited, of whom eleven first-line managers and nine staffing assistants accepted. The participants were 19 women and one man, aged between 28 and 61 years ($M = 46$) and had worked with planning work schedules between 3 and 30 years ($M = 9$). Managers' professions were registered nurses ($n = 7$), specialist nurses ($n = 3$), and midwife ($n = 1$). Staffing assistants' professions were assistant nurses ($n = 7$), behavioural scientist ($n = 1$), and unknown ($n = 1$). Education about working hours and scheduling varied, with participants often being introduced by their predecessor who educated them in the scheduling software and informed them about working time regulations. A few ($n = 6$) had received an education about "healthy working hours." The participants worked at wards with the following medical specialties: neurology, maternity, pulmonary medicine and hematology, orthopedics, medicine, oncology, pediatric emergency, medical emergency, and medical intermediate care.

2.4. Data Collection.
The participants were contacted by the research group through their electronic work e-mail addresses and informed about the aim of the study. After receiving written informed consent, the last author (associate professor with previous experience of qualitative semistructured interviewing and analysis) and a master's student, trained and supervised by the last author, conducted the interviews, which took place during March 2020–October 2021 using face-to-face ($n = 4$), phone ($n = 15$), and video call ($n = 1$) methods. The participants chose the interview method and location (their homes or workplaces). The interviews which lasted between 24 and 73 minutes ($M = 47$) were audio-recorded and transcribed verbatim for further analysis. The interviews were conducted in Swedish, which was the native language of the informants participating in the study and the interviewers.

2.5. The Interview Guide.
An interview guide with semi-structured open-ended questions was designed for the purpose of this study. The guide started with demographic questions, followed by nine (staffing assistants) or ten (managers) main questions about the work scheduling process, follow-up procedures, rules and regulations, challenges and need for support, ideas for improvement, technical support, and eventual conflicts during scheduling. Probing questions such as "please tell more/explain more" were used to deepen the discussions in the interviews. Participants were asked to focus on work procedures during normal operation and not during the peaks of the COVID-19 pandemic. The questions differed slightly between managers and staffing assistants (see Appendix 1).

2.6. Data Analysis.
Data were analysed using the six phases in thematic analysis according to Braun and Clarke [49] (see Table 1). Initial coding and searching for themes were conducted in Swedish. From phase 5, defining and naming themes, and during the rest of the process, English language was used. All authors who analysed data were fluent in Swedish and English in both writing and speech. Experiences referring to the working hours and scheduling during the COVID-19 outbreak and peaks were identified and excluded from this analysis. The first author (MSc, licensed psychologist) coded all the interviews. The second and the last authors coded 50% of the interviews each, independently. The second author is an experienced qualitative researcher (associate professor), who confirmed the coding structure and the analysis process. The final themes are a result of several discussions between all authors. The first interview was treated as a test interview, meaning that

Table 1: Description of the analysis process according to the six phases in thematic analysis as described by Braun and Clarke [49].

Phase 1: familiarisation with data	Data were read through by all authors separately to grasp the whole, which was a reflective phase including writing notes and own reflections
Phase 2: generating initial codes	Data were coded separately, and the authors took notes about their own thoughts
Phase 3: searching for themes	The codes were discussed by all authors and searching for themes started
Phase 4: reviewing themes	The interviews and codes were revised again by all authors, first separately and then in discussion with each other, and the themes were reviewed once again
Phase 5: defining and naming themes	The final themes were identified, and their content was described
Phase 6: producing the report	The content of the themes and subthemes was formed and was checked against the raw data one last time

the participant was asked if he/she understood all questions asked and whether the order of the questions felt relevant. After the first interview, the authors reviewed the interview guide regarding whether answers were received on what was sought by the questions in the guide. As no major changes were made to the interview guide, the first interview was also included in the data analysis. During the last interviews, no new information was identified and the research team considered that data repeated itself in the last interviews.

2.7. Ethical Considerations. This study was approved by the Swedish Ethical Review Authority (2019-05245). The study followed the Declaration of Helsinki regulations [50] and local ethical guidelines and regulations [51].

3. Results

Four themes and fourteen subthemes were identified (see Table 2). The results described are from both managers and staffing assistants' viewpoints. Differences in their experiences are pointed out with subheadings or in texts.

3.1. Organisation of the Scheduling Process

3.1.1. Distributed Responsibilities and Decision Making. Responsibility for the schedule was usually distributed between different persons. Commonly, the staffing assistants and/or scheduling groups did much of the administration, scheduling adjustments, and communication with employees, but it was sometimes undertaken by managers. Participants felt that some employees did not engage sufficiently in the process, e.g., not adjusting the schedule to fulfil staffing needs during specific shifts or not complying with rules during planning. The manager usually had a continuous dialogue with the staffing assistant or scheduling group during the process and was often more directly involved during difficult situations, such as when the staffing assistant and/or scheduling group could not find a scheduling solution or when employees expressed high dissatisfaction.

The views of managers and staffing assistants, respectively, are described below.

(1) Managers' View. Some managers perceived the scheduling groups' work as unsatisfactory, such as planning schedules without enough recovery opportunities. Managers reported identifying working hours with a potential risk for health and/or safety, such as many consecutive shifts or insufficient competence mix on shifts, after the employees' and staffing assistant's adjustments. The managers who did not have a formal staffing assistant reported needing support in the scheduling process due to the large number of employees: "*it is impossible for me as a manager to check a group of 70 people*" (Manager 6). Attitudes towards involvement in scheduling varied. Some felt that this was an important part of their leadership, providing insight into the employee's schedule and having positive effects on the employee-manager relationship, which in turn made the scheduling process smoother. Others felt that responsibility for the schedules should be allocated to staffing assistants: "*I don't think managers should work so much with schedules (. . .) it could actually be done by staffing assistants*" (Manager 8).

(2) Staffing Assistants' View. Staffing assistants often described themselves as intermediaries between employees and the manager. This could be challenging as they received opinions and criticism regarding the schedule from employees, yet they had no formal mandates to meet these, or make final decisions. Moreover, sometimes they were a part of the group of employees that were being scheduled which made it difficult to stay neutral. Some experienced good collaboration and support from managers, whereas others did not: "*you have no answer as a staffing assistant (to give the employees) (. . .) it means that the manager must be engaged and offer support*" (Staffing assistant 3). Often the staffing assistants had the role of asking employees to work extra shifts, which was experienced as emotionally demanding when they knew the employees were tired. In those cases, support from the manager was important.

3.1.2. Time-Consuming. Much time was spent on scheduling, both by managers, staffing assistants, and employees. One manager recounted that "*when you are done with one (scheduling period), you almost have to start with the next, it takes a lot of time*" (Manager 2). A few managers questioned the benefits of participatory scheduling given how time-consuming the process was. Other managers, and staffing assistants, thought the time spent was worth it for the benefits it brought employees having influence over their working hours. It was also discussed that employees and/or scheduling groups did not have enough time allocated for scheduling, which was suggested as one explanation for why the employees' engagement in the scheduling was sometimes insufficient.

Table 2: Overview of main themes and subthemes.

Main themes	Subthemes
Organisation of the scheduling process	Distributed responsibilities and decision making
	Time-consuming
Active leadership	Establishing a shared responsibility framework and fairness
	The individual relationship with the employee: continuous dialogue, mutual problem solving, and adaptations.
	Managing dissatisfaction
	Education, support, and clear scheduling rules
Balancing sustainable working hours, employees' scheduling requests, and competence needs	Official/unofficial guidelines for sustainable working hours
	Employees' scheduling requests versus sustainable working hours
	Considering recovery opportunities
	Competence mix on shifts
Contextual factors	Staffing levels, short-term absence, and solutions
	Working procedure at the wards
	Working time arrangements for night work
	Technological enablers and barriers for sustainable working hours

3.2. Active Leadership

3.2.1. Establishing a Shared Responsibility Framework and Fairness. The importance of establishing a shared responsibility framework in scheduling, between the workplace and the employees, was emphasised. Some perceived that the employees expected to freely choose their working hours, a misunderstanding that was counteracted through continuous communication about the importance of "*giving and taking*" (Staffing assistant 5). The scheduling process could also be made smoother by pointing out to employees that they had ample possibility to influence their working hours and showing them that the workplace aimed to be highly flexible in meeting employees' requests. Other ways of establishing a shared responsibility framework were to gather the whole staffing group to discuss solutions to scheduling issues, e.g., if many employees had applied for vacation during the same weeks.

Respondents also emphasised the importance of fairly distributing unpopular shifts, typically evening, night, and weekend shifts, and public holidays. For example, if a day shift was overstaffed during the adjustment period, the choice of which employee should be moved to the evening shift the same day might be based on who worked the least evening shifts in that scheduling period. Fairness also played a role in determining how many changes were made in the employees' proposed schedules. Some respondents reported that they kept track of how many changes were made in each individual schedule during each scheduling period and tried to even that out in the coming periods. If changes were needed to fulfil staffing and competence

needs on a shift, the process began with the adjustment of schedules of those employees who had not engaged in the scheduling process.

3.2.2. The Individual Relationship with the Employee: Continuous Dialogue, Mutual Problem Solving, and Adaptations. There was an emphasis on the importance of the individual relationship with the employee. This provided insight into individual life circumstances, preferences, and tolerance for shifts and shift combinations, which could be considered in scheduling, for example, making special adaptations in the schedule if the employee had experienced a significant life event, or letting an employee work only day shifts every other week for private reasons. It was considered to be important to have an open dialogue regarding the employees' working hours, as this gave insight into the employees' schedules, workload, and need for recovery. This also facilitated mutual problem solving and discussions about the importance of sustainable scheduling. Participants felt that it was important that the staffing assistants were easily accessible to the employees.

Managers described continuously looking at their employees' schedules and sometimes had to remind them about recommendations for sustainable scheduling. Some managers also reported that they investigated the employee's past and current working hours if the employee seemed to feel unwell, and that they had noted potential associations between compressed working hours and sick leave. Moreover, working hours were discussed during the yearly staff appraisal.

Staffing assistants sometimes had knowledge of individuals' weekly leisure activities and took those into consideration in the planning. However, having a lot of private information about the employees could made the work more difficult: "*it was easier in the beginning when you had no idea, now I know that this person goes riding Monday evenings (...) and he doesn't want to work evening-day, and she doesn't want to work day-evening (...) it is a lot*" (Staffing assistant 4). Moreover, dialogue with employees was described as having positive consequences for sustainable working hours:

"*I have talked to them (...) the schedules are looking much better. They (the schedules) were awful (when I started working here), it was every weekend, and it was many consecutive shifts (...) because nobody had talked to them.*" (Staffing assistant 8)

3.2.3. Managing Dissatisfaction. It was reported that working hours and influence over scheduling were of great importance for many employees and sometimes provoked strong feelings. Dissatisfaction was sometimes expressed by employees when their scheduling requests were not met, and it was described as "*difficult making everyone satisfied with their schedule*" (Staffing assistant 6). An uneven distribution of weekend shifts or unmet scheduling requests could also cause dissatisfaction, and work during public holidays could provoke strong feelings. Dissatisfaction was managed by explaining and giving a rationale for the shift changes. Another approach was to highlight to the employee the

extent to which their scheduling requests had been met. In wards where the technological system made much of the adjustment process automatically, problems with employees' experiences of injustice with scheduling had decreased.

3.2.4. Education, Support, and Clear Scheduling Rules.
New employees were given an introduction to the scheduling process, including information about rights and obligations and the importance of recovery. Sometimes, all employees were offered continuous support from staffing assistants, and scheduling was a recurrent topic in workplace meetings. Communication about rules (e.g., number of weekend shifts, vetoes, etc.) facilitated the scheduling process. It was communicated to the employees that to be fully guaranteed days off, the employees had to use vacation days instead of vetoes, but also vetoes were commonly approved. More education of the employees about scheduling and implications for health was needed, in order to increase "*understanding of the body and the circadian rhythm (in relation to scheduling)*" (Manager 11).

3.3. Balancing Sustainable Working Hours, Employees' Scheduling Requests, and Competence Needs

3.3.1. Official/Unofficial Guidelines for Sustainable Working Hours.
Guidelines for sustainable working hours were communicated to the employees and considered during the adjustment process. A majority had guidelines for a limit of weekly working hours and a maximum number of consecutive work shifts (usually five or six). Other guidelines were for a minimum of two consecutive days off, a maximum number of consecutive night shifts (often three), 48–72 hours off after working night shifts, and forward rotating shifts, i.e., day-evening-night. A minority described a lack of guidelines for sustainable working hours. While some workplaces had stricter guidelines, others let the employees choose how to relate to them, i.e., the guidelines were more unofficial:

"*We have presented research about healthy working hours (. . .) but we give them (the employees) the freedom to schedule as they like (. . .) we have no rules prohibiting them to plan as they want anyway.*" (Manager 3)

Shift combinations with quick returns (usually an evening shift followed by day shift resulting in <11 hours between shifts) were discussed with varied attitudes and recommendations. Some encouraged employees to try to avoid or minimise quick returns and informed them about potentially negative health effects; others lacked guidelines regarding these. Some emphasised the problem with general guidelines about quick returns, referring to individual variances in tolerance.

3.3.2. Employees' Scheduling Requests versus Sustainable Working Hours.
Many participants reported that the employees themselves took responsibility for self-scheduling sustainable working hours. However, examples were given of self-scheduled unsustainable working hours, such as compressing working shifts in order to get longer continuous periods of time off. Several managers and staffing assistants attached importance to the employees' freedom in the scheduling process, stating that potentially unsustainable working hours (e.g., 7–10 consecutive shifts, double shifts, working a day shift the day after leaving the night shift, and quick returns) were accepted if the employee had chosen it. It was stated that "*if they themselves have proposed an unhealthy schedule (. . .) I do not change it automatically, then you have lost the point of having an individual schedule*" (Manager 3), and that tolerance and what is experienced as a healthy schedule could vary between individuals. However, not all had this approach, and some clearly stated that sustainable working hours had the first priority regardless of the employees' scheduling requests.

3.3.3. Considering Recovery Opportunities.
Recovery opportunities were considered important in scheduling. One staffing assistant discussing the adjustment process described having "*a checklist for healthy working hours (. . .) how many consecutive shifts, how much daily rest and weekly rest*" (Staffing assistant 5). To plan schedules with enough recovery in-between shifts for employees working full-time on rotating three shifts was described as a great challenge by staffing assistants. Overstaffing of weekday shifts was sometimes necessary to facilitate an even distribution of recovery among individual schedules.

3.3.4. Competence Mix on Shifts.
Competence mix on shifts was considered during the adjustment process. In some wards, a competence grading based on experience was used, with the aim of covering every shift with a mix of new and more experienced employees. Sometimes, this was difficult due to high staff turnover and that "*new nurses are starting all the time*" (Staffing assistant 2). Sometimes, employees wanted to choose which colleagues to work with, which could result in an insufficient competence mix (e.g., many new employees working the same shift).

3.4. Contextual Factors

3.4.1. Staffing Levels, Short-Term Absence, and Solutions.
Staffing shortage and high turnover rates were described as major barriers for achieving sustainable working hours. Understaffing led to difficulties meeting employees' shift requests, irregularity in individual schedules, less approved vacations, more overtime work, and shifts with insufficient competence mix. Understaffing on shifts also reduced recovery opportunities for employees during shifts. Covering night and weekend shifts was a big challenge. Furthermore, staffing shortage became a serious problem during short-term absence causing shift vacancies, which were described as "*a permanent stressor*" (Staffing assistant 1), and covering night shift vacancies was especially difficult. At the few wards where the staffing level was described as sufficient, the scheduling process also worked better.

Various attempts were made to manage problems with understaffing and shift vacancies, for example, reducing the number of hospital beds, having part-time employees covering weekend and night shifts, having a local nurse/assistant nurse substitute pool, or hiring temporary agency nurses/assistant nurses. Another strategy involved forecasting workload peaks and planning for higher staffing levels in advance. Some interviewees reported sharing staff with adjacent wards. However, regarding employees rotating to other wards, one manager noted that "*it's a disadvantage to not have a full overview of the employees' working hours (including overtime work)*" (Manager 6).

Specific solutions for short-term shift vacancies included borrowing employees from other wards (however, many employees disliked this), moving employees from upcoming overstaffed shifts, asking employees to work the vacant shift instead of a coming shift (i.e., postponing the vacancy), or asking employees to work extra shifts or to stay and work until the vacancy was filled. Working extra shifts could lead to guidelines for sustainable scheduling being breached. Before asking employees to work extra shifts, individual life circumstances and recovery opportunities in the schedule were considered. At some wards, employees could choose not to be asked to work extra shifts. It was reported that employees usually cooperated and were helpful with covering shift vacancies. One staffing assistant thought that it was "*difficult for the employees to say no, when they know how high the workload is when you are understaffed*" (Staffing assistant 1). Sometimes, there were employees who were willing to work many extra shifts. While there was an ambition not to ask employees who had worked many extra shifts recently, sometimes there was no choice: "*but that is very difficult, because if no one wants to work an extra shift, and the patient safety is threatened, you choose the person that says yes*" (Manager 9). Double shifts were avoided, if possible, but they could occur in periods with high workload and/or many shift vacancies, if the employee agreed.

The scheduling process for temporary agency personnel was sometimes organised differently, as they covered the shifts that the ordinary employees opted out of. They tended to work a lot of overtime, double shifts, and inconvenient working hours. One staffing assistant reported having a poor overview of the temporary personnel's working hours:

> "*They (temporary personnel) usually have one or two other workplaces that they go to, it feels like they work all the time. (. . .) what they do in other places, I don't know if they work 31 days in a row.*" (Staffing assistant 8)

3.4.2. Working Procedure at the Wards.
How care was organised influenced the need for quick returns. Continuity of care was facilitated if employees on the morning shift had also worked the evening shift the day before. It was believed that some employees preferred that because "*they want that overview in the morning (. . .) a lot happens in a short time in the morning, and they have to do all their tasks and be prepared for the round, which starts quite early*" (Manager 11). To reduce the need for quick returns, other managers described changes such as efficient procedures for handing over between shifts, i.e., verbal reporting or bedside reporting, and standardised documentation templates stating what was last done and what needs to be done next, thus facilitating working morning shifts without quick returns.

3.4.3. Working Time Arrangements for Night Work.
It was common for employees to get a reduction in their working hours if they worked night shifts. However, it was reported that many employees felt that they had to work a very high number of night shifts to get a satisfying working hour reduction, which some experienced as too burdensome and therefore had left the workplace. In some wards, full-time night workers were hired to cover night shifts. This was experienced as a good solution since working rotating three shifts was seen as strenuous. In some wards, employees who had been identified as having low night shift tolerance were excluded from night work, while other wards shared night shifts among all employees irrespective of tolerance: "*from a safety perspective, the nights are not perfect, especially when you force people to work night shifts (. . .) who have been awake for 24 hours when they come to work*" (Manager 6).

3.4.4. Technological Enablers and Barriers for Sustainable Working Hours.
Technological systems were widely used in the scheduling process and were experienced as time saving and helpful. They could facilitate the creation of sustainable working hours by automatically generating and adjusting schedules based on predefined settings, such as individual general preferences (e.g., avoidance of certain shifts), employees' shift requests, staffing needs and competence, guidelines for sustainable working hours, and working time regulations. Technological systems could also provide an overview of competence mix, vacant or understaffed shifts, and staffing resources both daily and over time. It was found to be helpful when the system could provide an overview of an employee's entire schedule, including details of when the employee had worked in other wards, the amount of individual overtime worked, shift changes, and whether employees had followed rules for scheduling.

The technological systems usually had functions to generate warnings when working time regulations were breached, such as an insufficiently long weekly rest period, a short rest in-between shifts, or too few days off during a scheduling period. While some interviewees always examined the reasons for the warnings and made necessary changes if possible, others reported that most warnings could be dismissed without any further actions. One manager stated that "*there is nothing to do about it (warnings), when they (the employees) have already switched their shifts*" (Manager 1). The reasons for the warnings were also sometimes hard to understand: "*it says that there is not enough weekly rest, and too short, too close shifts (. . .) maybe every week during a 10-week period, and I have to try to understand, why does it say this?*" (Staffing assistant 8).

Some technological systems were described as being sluggish and difficult to navigate. Technological errors were common, with settings and changes suddenly disappearing.

Some interviewees highlighted having insufficient knowledge to use all functions. Another disadvantage was when the systems generated work schedules based on working time patterns from a period with high workload and overtime work, which resulted in unsustainable working hours that had to be adjusted manually. Also, sometimes the systems made unnecessary adjustments, resulting in a suboptimal solution for both employees and the workplace. Another problem was lack of notifications of unsustainable working hours and a poor overview for employees when planning and adjusting their schedule. When only one week at a time was visible, the employees planned too many consecutive shifts by mistake (i.e., continued planning shifts during the beginning of a week although they had worked the preceding weekend). Furthermore, the technological scheduling systems required adequate staffing to work properly.

4. Discussion

The results point to several factors that may be important for achieving sustainable working hours within the participatory working time scheduling process. These include the distribution and clarification of responsibilities and guidelines, leadership factors, considerations of recovery opportunities and competence mix on shifts, contradictions between employee requests and sustainable working hours, and contextual factors (e.g., staffing, work procedures, night work arrangements, and technology). The most important findings are discussed within the context of the *human/individual-technology-organisation* framework [46], which shows the complexity of scheduling in healthcare organisations where employees' *individual* preferences, *organisational* factors (e.g., demands and leadership behaviours), and *technological* solutions are interconnected.

Despite the existence of guidelines for sustainable working hours, these could be breached due to *individual* factors (e.g., employees' requests) or *organisational* factors (e.g., staffing shortage and shift vacancies). This demonstrates that sustainable working hours are not always priorities at the *individual* and *organisational* levels. The results also demonstrate that employees' requests were highly valued and sometimes prioritised over sustainable scheduling. The issue is complex. While employee influence over working hours is important in many aspects [13–20], certain scheduling characteristics are associated with poor employee sleep, health, and patient safety [26–36, 39–41]. Moreover, at the *organisational* level, employers are responsible in law for employees' health and safety at work [52], where working hours play an important role. Hence, when employees are given a high degree of responsibility for their own working hours, the resulting schedules may not be compliant with the law. Future studies are needed to examine the driving forces determining priorities in scheduling, at the levels of the *individual* (employee) and the *organisation*, and to study the consequences with respect to employee health and patient safety.

At the *organisational* level, the results identified ways in which leaders, working together with *individual* employees, could promote sustainable working hours, namely, through establishing a shared responsibility framework, fostering an individual relationship with the employee, providing support, and managing dissatisfaction. Similar to the concept of sleep leadership, that has been related to better sleep outcomes [44, 45], leadership behaviours that enable and facilitate sustainable schedules together with the *individual* (employee) might be important. Challenges for leadership were also identified, such as the difficulties of maintaining an overview of schedules when the group of employees is very large. To achieve and maintain sustainable working hours, scheduling needs to be made a priority issue for managers, with clearly defined responsibilities established within the *organisational* leadership. It was notable that few managers and staffing assistants in the current study had received formal education about healthy working hours. Organisations could benefit from the development of standardised education programs that are made a prerequisite for being responsible for working hour scheduling.

Staffing assistants, rather than managers, were most commonly involved in discussions with employees about scheduling and working hours. This sometimes placed the assistants in difficult positions. They often knew the employees' *individual* preferences and life circumstances and would try to take these into consideration, adding to the challenges of creating schedules. Assistants were often the recipients of employees' requests and complaints but had no formal responsibility for determining working hours or for decision making. Their experiences suggest a need for formal scheduling guidelines with clearer rules for sustainable scheduling, handed down to staffing assistants from higher up in the *organisation*. They also highlight the need to ensure that the staffing assistant's role, responsibility, and mandates are clearly defined.

Employees' perception (*individual* level) of unfairness in scheduling was identified as a source of dissatisfaction and as a hindrance to the scheduling process. Hence, fairness was described as important to take into consideration during scheduling. However, fairness can be a barrier to sustainable working hours, if the more sustainable scheduling solution is not the most "fair." Therefore, *organisational* guidelines for scheduling should also specify what factors (e.g., sustainability, fairness, etc.) should have the highest priority, when staffing assistants and managers plan and adjust the schedules.

Technological systems were both enablers and barriers in scheduling. They often had usability issues such as unclear warnings for unsustainable scheduling that were hard to understand and easy to dismiss. However, some featured technological solutions that facilitated the scheduling process, through the automatic generation and adjustments of schedules, and by providing overviews of schedules. Technological systems have great potential to enhance sustainable scheduling and merit further development, following a user-centred systems design approach that incorporates the users' knowledge, skills, and perspectives into the design process [53]. A technological solution that considers *individual* preferences and *organisational* demands could be a useful means of support for staffing assistants' work during the adjustment process and mitigate employees' perceptions of unfairness or favouritism [25].

With regard to contextual factors, staffing shortage and short-term shift vacancies were identified as especially large barriers to the scheduling of sustainable working hours. Inadequate staffing levels (*organisational* factor) are associated with burnout and low job satisfaction among nurses, and with low patient care quality [54]. At the same time, healthcare organisations face challenges in recruiting and retaining staff [8, 9] which contributes to the staffing problems. In a previous study, including nurses from 10 different countries, satisfaction with schedule flexibility was associated with lower intention to leave the workplace [20]. Also, having flexible work hours has been cited as one reason for choosing to work for a temporary employment agency instead of working as a permanently employed nurse [55]. Hence, offering employees the possibility to participate in scheduling might increase intentions to stay in the organisation. However, it is important that the process is optimised to meet the needs of both the employees and the organisation, and that it does not result in working hours that might jeopardise employee health and patient safety. Optimisation will be supported by taking into account the interactions between individual, organisational, and technological factors highlighted in this study, thereby promoting the retention of nurses.

Sufficient staffing is an essential prerequisite for achieving sustainable working hours within a participatory scheduling system. The use of temporary agency personnel was a common solution to staffing shortages. However, there was a risk of such staff working excessive or unhealthy hours if, for example, managers and/or staffing assistants lacked a full overview of their working hours. Such cases highlight the need to pay special attention to sustainable scheduling for temporary personnel. In addition, mixing temporary and permanent nurses in work teams might trigger social comparisons and envy and affect communication within nursing teams. Organisations should seek to address such issues when using temporary agency staff by, for example, striving for transparency in how resources are allocated, promoting fairness perception, and working to promote exchange of experiences and knowledge to foster mutual learning [56].

The results also demonstrated that working hours are highly intertwined with contextual factors, such as the work procedures on the wards (*organisational* factor). For example, consistent with previous findings [57], quick returns were believed to facilitate work on the morning shift, leading some *individuals* to prefer those shift combinations. Thus, the way in which work procedures are organised can influence preferences for certain shift combinations, while the removal of certain shift combinations may hinder work procedures and diminish employees' satisfaction. Thus, a framework for complex interventions should be used when evaluating changes to working hours that also takes into account what impact the intervention has in addition to its intended outcome and considers how it interacts with the context where it is implemented [58].

A shared responsibility framework (i.e., active engagement by all persons involved in the scheduling process) was regarded as essential for the process to run smoothly.

However, employees' engagement during planning and adjustment of schedules was sometimes felt to be lacking. One suggested explanation for employees' failure to engage was the absence of allocated time within the workday for scheduling activities. Increasing employee engagement in the scheduling process and strengthening the sense of shared responsibility will be challenging, but it is likely that employees' engagement is partly dependent on *organisational* factors (e.g., allocated time, degree of met requests, leadership behaviours, education, and support). Engagement can thus be considered within the context of the interaction between the *human* and the *organisation* [46], highlighting the need for organisational changes or interventions. Further research is needed to identify organisational changes that could motivate employees to take greater responsibility for formulating their own work schedules.

4.1. Methodological Considerations. The findings are based on a rich set of data, with information repeating itself in interviews, indicating that the number of informants was sufficient [59, 60]. One potential limitation is the use of multiple interview methods, although the quality of the interviews does not vary. Trustworthiness [61] in this study was ensured according to the following criteria. (1) Credibility (the fit between researcher's views and the representation of them) was obtained by researcher triangulation. Several researchers conducted the analysis, involving peer debriefing with external checks on the research process and examination of referential adequacy where the results were checked against the raw data conducted as the last step in the analysis. (2) Confirmability was accomplished by explaining and describing the theoretical, methodological, and analytical choices made throughout the manuscript. Moreover, the findings were demonstrably derived from the data, as shown by the provision of quotations. (3) Dependability was assured by the clear descriptions of the analysis process, enabling the reader to evaluate the process. (4) Reflexivity was addressed by involving authors from multiple disciplines in the analyses. All of the authors involved in the analyses were female, two of whom were experts in working hours and participatory scheduling and the third was an expert in the conduct of qualitative research. The fourth author (male), associate professor and an expert in working hours and participatory scheduling, was involved in the conceptualisation of the study and the preparation of the manuscript.

The authors frequently discussed their preunderstanding throughout the analysis process. Professional preunderstanding is necessary for deeper understanding of the context and the interviews, but they carry a risk that familiar facts may be overlooked. The text was read through several times, and our preunderstanding was discussed throughout the analysis process.

4.2. Limitations. Some limitations of this study should be noted. Firstly, the vast majority of the participants were women, reflecting the fact that healthcare is a female-dominated occupational sector in Sweden. Secondly, as only 4 out of 21

regions in Sweden were represented, key issues may have been neglected. However, the sample was drawn from regions of different sizes and locations, thus providing data from a broad range of contexts, suggesting that the results are transferable to other healthcare settings. Finally, as the data collection took part during the COVID-19 pandemic, it is possible that this has affected participants' views, although the focus of the interviews was on normal operations. Experiences referring to scheduling during the COVID-19 outbreak and peaks were excluded from the analysis.

5. Conclusions

Participatory working time scheduling offers potentially significant benefits for healthcare organisations that are facing major challenges in recruiting and retaining staff. However, to ensure sustainable working hours within the context of participatory scheduling, it is important to address a range of factors at multiple levels of the organisation. The factors identified in this study include clarifying responsibilities between employees, staffing assistants, and managers; making working hours a priority issue for leaders; defining clearer guidelines for sustainable scheduling (including adjustments of schedules) that are endowed from higher up in the organisation; allocating time for scheduling; and increasing engagement and involvement of the employees in the scheduling process. In addition, contextual factors need to be addressed, such as adequate staffing levels, working procedures on the wards, working hour arrangements for night work, and technological solutions. Achieving sustainable working hours within the context of participatory scheduling requires targeting multiple levels of the organisation. Future research should investigate the impact that the factors identified in this study have upon realised working hours (e.g., through the study of payroll data) and upon employee health. In addition, research is warranted that addresses participatory scheduling from the employees' perspective.

Data Availability

The authors cannot share the raw data (interviews) since the participants have not agreed to that in the consent form.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

Supplementary Materials

The full interview guide including all questions asked to managers and staffing assistants in the interviews is provided in Appendix 1. This study adhered to the Consolidated criteria for reporting qualitative research (COREQ) [48]. The COREQ checklist is provided in Appendix 2. (*Supplementary Materials*)

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Review Article

Measurement of Work-Life Balance: A Scoping Review with a Focus on the Health Sector

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Background. There is an agreement on the importance of measuring work-life balance, especially after the COVID-19 pandemic. However, the available tools to do so are not sufficient to address all dimensions, contexts, and professions. *Aim.* The article reviews existing instruments that have been widely utilised to tap into the breadth and depth of work-life balance. *Evaluation.* This is a perspective scoping review guided by PRISMA-ScR guidelines. Articles reporting on the measurement of work-life balance were reviewed. The authors performed the review based on agreed-upon search terms, inclusion and exclusion criteria, search databases, and the data extraction process. *Key Issues.* The existing tools appear to have divergent underpinning theoretical models, factors, structural/psychometric properties, and the number of accumulated citations. The existing tools also varied in terms of their target sector, with limited tools available for the analysis of work-life balance among healthcare professionals. We argue that while the existing tools provide a general base for the work-life balance measurement, it would be imperative to adjust those tools to the specific cultural and professional contexts. Future work-life balance measures should consider the changes imposed by atypical or disruptive events that have the potential to alter work-life balance, such as in the case of the COVID-19 pandemic. The onus is on researchers and policymakers to work collaboratively in each context to adapt, implement, and evaluate those tools as they become integrated into the matrix of labour market assessments in the future. *Conclusions.* The article highlighted current gaps and improvement opportunities in the work-life balance measurement field. *Implications for Healthcare and Nursing Management.* The maintenance of work-life balance will remain an issue for years to come. Ensuring comprehensive and context-specific measurements would be essential to guide the evidence-based recommendations necessary to support the workforce across the various sectors of the economy in the future.

1. Introduction

The global pandemic (COVID-19) is likely to act as a catalyst for changes as it has occurred in previous pandemics [1]. For example, there is a suggestion that the "black death pandemic" that peaked between 1347 and 1351 acted as a strong precursor to the "reawakening" or renaissance of societies in Western Europe, a feat that subsequently spread techno-logical and social changes throughout the world [2]. Besides the spread of digital and online technologies, one of the many outcomes of the COVID-19 pandemic is the impact on work-life balance. As a part of the social distancing measures to address COVID-19, populations around the world are increasingly working from home [3]. The world's swift

transition to remote work has obliged a sector of the population to work in an unplanned context and in many cases, without prior experience [4]. A recent study revealed that 22% of individuals living with young children had difficulties concentrating on their jobs all or most of the time [4]. It is evident that working from home increases work intensity as well as work-life conflict, affecting workers' overall well-being [4].

The interest in assessing and maintaining work-life balance has strong historical underpinnings. The first industrial revolution, which took place in Western Europe and North America between 1820 and 1840, partially eroded the traditional mode of living and ethos of life and gradually demarcated the division of labour, gender role, and what constitutes work and nonwork [5]. The cultural and economic lifestyle that was used to sustain the preindustrialised period was replaced by the growth of urbanity and an economy that strongly hinges on manufacturing processes [5]. The work in the manufacturing sections was for a designated time of the day or season. Within such a context, the division between work and nonwork was solidly consolidated. More recently, with the advent of information technology and "Internet culture," work-life balance is increasingly blurred since work could be easily performed in a domestic setting [6, 7]. This paradigm shift calls for a critical appraisal of the current work-life balance research in terms of concepts and measures.

Globally, there has been an increasing interest among researchers and academics in assessing work-life balance [8]. This growing interest is driven by the significant role of work-life balance in overall life satisfaction, which is in turn associated with improved health and professional performance outcomes [9, 10]. Better work-life balance improves organisational productivity and commitment, enhances job satisfaction, and reduces absenteeism and turnover intentions [11]. The published literature has identified several antecedents of work-life balance including but not limited to reduced work support, work schedule, work overload, and role conflicts [12]. The main work-family conceptualisations focus on balance, enrichment, and conflict. Work-family balance is defined as the lack of conflict or interference between the work and family roles [13]. Work-family enrichment is a positive way whereby work and family interact resulting in enrichment between the two domains [14]. Work-family conflict is thus an interrole conflict whereby the pressure from the work and family domains are mutually incompatible [15].

The healthcare industry is one of the most dynamic sectors worldwide. The demographic and epidemiologic transitions are the main driving factors for the growing demands for healthcare services [16]. To meet the increased demands, a skilled and well-trained workforce is essential. Such developments were associated with high workload, long working hours, shortage of staff, and lack of flexibility. This demanding environment has led to an imbalance between work and family demands, resulting in undesirable outcomes at the individual, family, and organisation levels [17]. A recent study from Ireland revealed that 73% of doctors were feeling the strain of work-life imbalance [18].

Crucially, the COVID-19 pandemic has heightened work-life imbalance among healthcare professionals [19]. Given that healthcare professionals are at the forefront of the global fight against the virus, they often do not have time to seek support from family and friends to relief stress and reinforce resilience [19]. As such, international concerns were raised regarding the well-being of healthcare professionals, calling for interventions that enhance the balance between work and nonwork demands [20].

There is no single definition or a unified consensus to measure for work-life balance in the literature [10]. Instead, several definitions and measures are available, including defining work-life balance as multiple roles, equity across multiple roles, satisfaction between multiple roles, the fulfilment of role salience between multiple roles, a relationship between conflict and facilitation, and perceived control between multiple roles [10]. These different conceptualisations have varying degrees of success within the literature [10]. Having multiple definitions affects measurements and, consequently, the corrective measures taken. Furthermore, it will not allow comparing work environment situations in different contexts and countries and thus scatter the efforts to suggest the evidence-based policy and practice improvements that would improve the work environments at the global level.

2. Scoping Review Aim

The present narrative aims to review existing instruments that have been widely utilised to tap into the breadth and depth of work-life balance. Specifically, this present quest is to analyse the tools across various dimensions and critique their strength and limitations, hoping that this will pave the way for more focused discussions and serious efforts to solidify one comprehensive definition and, thus, better measurement tools and effective interventions.

3. Methodology

This is a perspective review guided by a quick narrative review. Articles reporting on the measurement of work-life balance were reviewed, considering the psychometric properties of the scales and their heuristic values.

3.1. Eligibility Criteria and Selection of Sources of Evidence. The inclusion criteria were as follows: articles published in English, articles focusing on work-life balance dimensions and constructs, and articles revealing the development and validation of work-life balance measurements. All available years were searched. Finally, the search included studies investigating work-life balance within the healthcare professional's population. Articles were excluded if they were not in English language.

3.2. Information Sources and Search Process. An initial search was carried out using the keywords: "work-life balance," "work-family conflict," "work-life interference," "work-family balance," "work-family interference," "work-

nonwork balance," and "work-life enhancement." The search was carried out in PubMed, EMBASE, and PsycINFO and covered articles published up to October 2020. Reference lists and keywords of reviewed articles were used to identify additional relevant articles and extend the initial search of the literature.

3.3. Data Charting and Summarizing. The title and abstracts were first assessed by two authors to identify relevant articles. The authors met regularly online to resolve any disagreements about whether articles fulfilled the inclusion criteria. However, in all cases, a consensus was reached. Data extracted from each eligible article included the author(s), the year of publication, the number of items, the target sector, psychometric properties, the country of development/validation, and a brief description of the measure and the main constructs within it. We further categorised each work-life balance measure into one of the eight work-life balance dimensions. The Scopus database was used to determine the number of citations for each of the selected articles as an indicator of the scale popularity and use throughout the literature. Figure 1 illustrates the PRISMA databases search and the article reduction flowchart.

4. Results

Database searches yielded 202 articles related to work-life balance measurements. After the title and abstract review, 46 articles were selected and obtained. Further scrutiny was conducted by the authors according to the inclusion criteria. Our search uncovered the existence of 31 measurement tools dating back to 1983 with the most recent one published in 2020. Figure 1 illustrates the database search results and the article reduction process.

The review revealed that during the early decades of work-nonwork balance research, measures focused on work-family balance as a unidimensional construct [21]. This first generation of scales did not distinguish between the directions of conflict [22]. Later, work-life balance scales evolved from the initial focus on the single direction to two directions, which are work interference with nonwork activities and nonwork activities interference with work. This supported the understanding of the antecedents and consequences of the two different conflict forms [22].

It is important to note that the work-family theme was overemphasised in the literature, which resulted in the confinement of the work-life balance research. Work-life balance measures focused only on the work-family conflict, suggesting that "life" means "family." However, life is segmented into several domains other than family life, including leisure life, social life, community life, and financial life [9]. By the end of the 1990s, researchers argued that the work-family balance is only a subtheme under the umbrella of the work-life balance construct and started exploring new nonwork areas beyond the family [23]. Additionally, this shift in terminology aims at including employees who are not parents but are engaged in different nonwork activities. Subsequent scales measured different constructs, broader
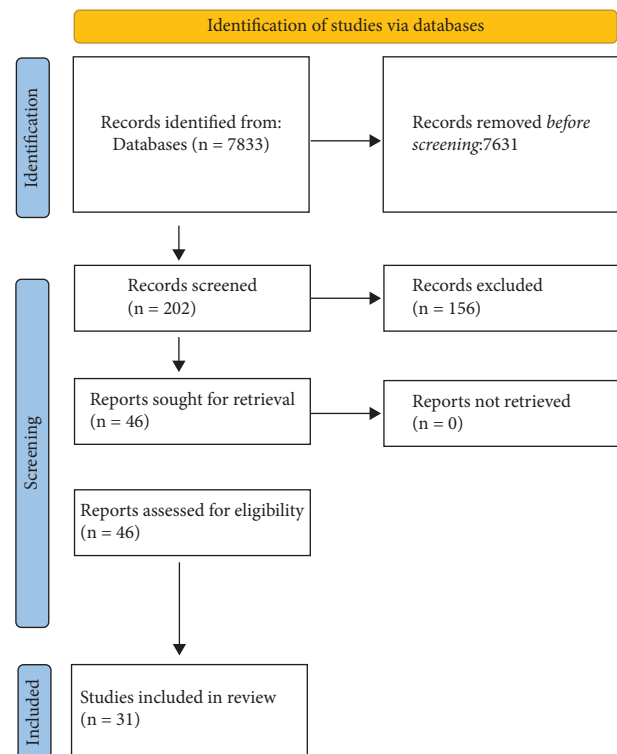

Figure 1: Databases search and the article reduction flowchart.

than work-family balance. This generation of scales includes the domain-level measurement, providing diagnostic information on which life domains are affected by work demands [23]. For example, work might interfere with only one aspect of life such as health or education, but not with other aspects such as leisure and community involvement.

Other scales assessed the work-family conflict from a bidirectional perspective with three different forms of interference: (1) time-based interference which refers to the time devoted to one role, making it difficult to meet demands in other roles [24–26]; (2) strain-based interference refers to the tension and fatigue created by one role, making it difficult to participate in another role [27]; and (3) behaviour-based interference refers to when behaviours required in one role are incompatible with behavioural expectations in another role [28]. A study by Clark, Early, Baltes, and Krenn differentiated between behaviour-based conflict and behaviour role conflict, defining the latter as "the specific instances when work interferes with family or family interferes with work (irrespective of whether the same or different behaviours are expected in each domain)" [27]. However, behaviour-based conflict only occurs when different behaviours are expected in the different roles and the person fails to adjust his/her behaviour to comply with the different expectations of each role [27]. This work-family behavioural role conflict scale provides a better understanding of how individuals perceive their work-family conflict episodes.

One scale by Carlson and Frone has focused on the internal-external dimension of work interference with family and family interference with work [28]. This scale has

differentiated between the internal (psychological) and external (behavioural) dimensions of work-family interference. The internal interference represents internally generated psychological preoccupation with one domain in life while within the boundaries of another domain. The external interference represents externally generated demands in one role which prevents participation in another role.

More recently, researchers included the positive side of the work-life interface and the advantages of achieving a balance between the two, represented in terms such as work-family enhancement, spillover, enrichment, and facilitation [29, 30]. This positive side represents the extent to which experiences in one life domain improve the quality of another domain. Subsequently, work-life enrichment has been differentiated from spillover. Wayne defined spillover as the gains (e.g., values, behaviours, and skills) acquired in one domain and used in the other domain, but do not necessarily enhance the performance in the other domain [31]; whereas, enrichment occurs when the gains from one domain enhance functioning in other domains [21]. Another study suggested measuring work-family balance by using work-family conflict and work-family enrichment scales [32]. This "components approach" captures a variety of types of work-life conflict and enrichment to ensure adequate coverage of all experiences that may contribute to work-life balance. This allows greater clarity and accuracy in describing antecedents of work-family balance, as it is highly unlikely that work-life conflict have identical antecedents as work-life enrichment. Similarly, since it is highly plausible that work-life conflict and work-life enrichment have different consequences, this approach helps in understanding salient outcomes such as workers health [32].

Moreover, scholars differentiated two constructs of work-life balance, the psychological construct which is held in the mind of a focal person or the rational construct which can be observed by others. For example, Grzywacz and Carlson used the rational construct and defined work-life balance as "the accomplishment of role-related expectations that are negotiated and shared between an individual and his/her role-related partners in the work and family domain" [32], whereas Valcour used the psychological construct and defined work-life balance as "an overall level of contentment resulting from an assessment of one's degree of success at meeting work and family role demands" [33].

It seems difficult to measure work-life balance due to the lack of consistency in construct definitions. The diverse conceptualisations of work-life balance ranging from satisfaction with work and family domains to positive spillover have all been labeled "work-family balance" and used interchangeably in the literature. Another concern about work-life balance is that almost one-fifth of the measures are single items that cannot capture complex constructs [34]. Table 1 presents an overview of measurement scales used to survey work-life balance.

4.1. Work-Life Balance among Healthcare Professionals. The most cited scales in studies measuring work-life balance among healthcare professionals are the Work-Family Conflict Scale which constitutes of 10 items measuring the bidirectional perspective of work-life balance [47], the Work-Life Climate Scale which constitutes of 8 items [35], and an 18-items scale measuring the time-, strain-, and behaviour-based work interference with family and family interference with work [24]. Other studies used scales such as the Copenhagen Psychosocial Questionnaire II—Work-Family Conflict Scale [45], the Work-Family Conflict Scale [50], the Work-Life Balance Scale [43], and the Work-Family Positive Spillover [56]. Furthermore, some studies included healthcare professionals in the sample upon the development and validation of the scales (highlighted in Figure 1). These include the Work-Family Conflict Scale [25], the Work-Life Checklist [40], the Quality of Nursing Work Life [38], the Work Interference with Life Domains Scale [23], the Work-Life Balance Measure [36], and the Work-Life Balance Scale [53]. Figure 2 shows number of citations per year for work-life balance instruments.

It was noted through our review that these work-life balance scales failed to represent all healthcare professional groups such as physicians and pharmacists, with few scales focusing on specific groups such as nurses and psychologists. One study showed that out of all healthcare professionals, physicians reported the poorest work-life balance behaviour followed by nurses and physician assistants [57]. Developing work-life balance scales with consideration of the various healthcare professional groups is therefore essential as frontline medical workers are different than behind the desk workers. The health sector is approaching a tipping point as occupational burnout and work-life conflicts are becoming more prevalent among healthcare professionals [35]. Particularly in times of pandemics and crisis, healthcare professionals are the most vulnerable [58]. As such, it is essential to develop more diagnostic and actionable measures for targeted interventions in the healthcare sector. Since work-life balance is closely linked to several clinical and organisational outcomes, including work-life balance surveys in the routine safety culture assessments is crucial [35].

5. Discussion and Future Agenda

The present narrative review suggests that research on the quantification of a work-life balance focusing on healthcare professionals is still nascent. As the traditional dichotomy between work and home is increasingly blurred, more research studies on these endeavours are therefore warranted to keep up with the marching time and evolving social revolution that owes its onset to the technological innovation and social changes entailed. The present narrative review has unearthed the trend in the literature that are described herein in tandem. These points should be seen as groundwork for further scrutiny.

First, there is heterogeneity in the definitions of work-life balance and the approach to quantification. Thus, when

TABLE 1: Overview of measurement scales used to survey work-life balance.

Themes	Names	References	Sample characteristics	Countries
	Work-Life Climate Scale	[35]	Healthcare workers	—
	Work-Life Balance Measure	[36]	Workers from industries such as public service, health, education, finance, manufacturing, and nongovernment organizations	Australia and New Zealand
	Work-Family Balance Measure	[37]	Full-time employees	—
	Quality of Nursing Work Life (QNWL)	[38]	Nurses	—
Unidimensional construct of work-life balance	Work-Life Balance	[39]	Employees from various job categories such as programmers, engineers, services, sales, consultants, project managers, and exempt professionals	United States
	Work-Life Checklist	[40]	Employees from finance, health, and social-service sectors	Britain
	Work-Family Conflict Scale	[41]	Employed students and technical professionals	—
	Work-Life Balance	[11]	Employees of banking and information technology sector	India
	The Work and Family Conflict Scale (WAFCS)	[42]	Working parents	Australia
	Work-Life Balance	[43]	IT professionals	India
	Work-Family Conflict	[44]	Employees from different occupations such as blue-collar, while-collar, self-employed, employed in public sector, or has job authority Applied to various occupations including machinists, cleaners, clerks, mechanics, medical doctors and dentists, physical and occupational	27 countries participated in the survey
Bidirectional (work interference with family and family interference with work)	Copenhagen Psychosocial Questionnaire II—Work-Family Conflict Scale	[45]	therapists, supervisors, media employees, academics, and social education workers	—
	Survey Work-Home Interaction NijmeGen (SWING)	[46]	Workers from a manufacturing company, postal office, a financial consultancy firm, primary schools, and a governmental institute in the service sector	European countries
	Work-Family Conflict Scale	[47]	Sample 1, elementary and high-school teachers and administrators Sample 2, small business owners Sample 3, real estate salespeople	United States
	Work-Family Interface	[48]	Full-time workers	United States
	Interrole Conflict Scale	[49]	Employees from a broad range of occupational categories	United States
	Work-Family Conflict	[50]	Psychologists	—

Table 1: Continued.

| Themes	Names	References	Sample characteristics	Countries
	Work-Family Conflict	[26]	Employees in industries	—
	Work-Family Conflict Scale	[24]	Employees in a division of a state government agency	United States
Bidirectional perspective with separate items for time, strain, and behaviour-based conflict	Work-Family Conflict	[25]	Employees from healthcare and a retail grocery organization, mainly nurses and in-store personnel	—
	Work-Family Conflict Scale	[51]	Employees at a large rehabilitation hospital (management staff and professional rehabilitation staff excluding consulting physicians), at a government agency, and at a scientific testing firm	—
Bidirectional perspective with a focus on behavioural role conflict	Work-Family Behavioral Role Conflict Scale	[27]	Participants held a wide range of jobs, primarily in management occupations (15%), office and administrative occupations (10%), sales (9%), and healthcare (9%)	United States
Domain-level measurement of work-life balance	Work Interference with Life Domains Scale	[23]	Participants represented diverse occupations including management, education, training, library, business and financial operations, healthcare practitioners (8%), arts, design, entertainment, sports and media, and architectural and engineering	—
	Work Spillover into Family Life	[52]	Bank executives	—
	Work-Life Balance Measure	[53]	Study sample included different professions such as architects, doctors, lawyers, lecturers, and scientists	India
Bidirectional perspective with items for work-family enrichment/enhancement	Work-Life Balance	[54]	Employees from a wide range of firms	New Zealand
	Work/Nonwork Interference and Enhancement Scale	[29]	Managers employed in a variety of organizations, departments, and industries	United States
	Work-Life Balance Instrument	[55]	Administrative and professional employees from a large university	Australia
Bidirectional perspective with items for work-family spillover	Work-Family Interface	[30]	Employees from several occupations	United States
	Work-Family Positive Spillover	[56]	Employees working for a large distribution center	United States
Bidirectional perspective with a focus on the internal-external dimension	Work-Family Interference	[28]	Full-time employees, with 53% held white-collar jobs	USA - New York
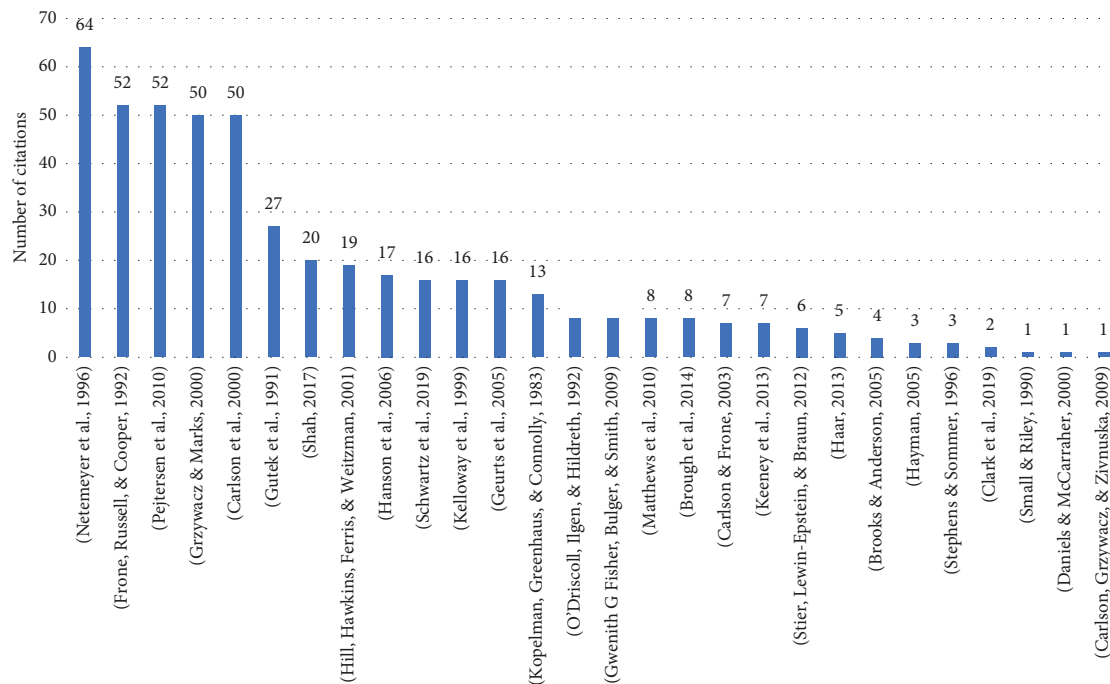
FIGURE 2: Graph showing number of citations per year for work-life balance instruments. *Studies that included healthcare professionals in their sample upon development and validation of the scale.

researchers measure work-life balance, they use different scales that assess different concepts and dimensions. For example, some scales measure work-life balance from a unidirectional perspective such as the "Work-Family Balance Scale [41]." In contrast, other researchers measured the bidirectional construct of work-life balance with a focus on the spillover effect of one to the other. The diverse definitions and conceptualisations of work-life balance are problematic as a precise definition is essential to support proper measurement. Also, the work-family interface has been greatly emphasised in the literature [59], whereas the various aspects of life beyond family have received scant empirical scrutiny. For example, the experiences of individuals without children were not well captured despite the fact that there is a significant growth globally on marrying or cohabitating late despite having a steady career [60]. Little emphasis was placed on linkages between work and other aspects of individuals' nonwork areas as the time one spent out of the realm of work such as community involvement, volunteering, and other aspects of daily routine such as self-care and leisure. As such, future scales should consider a broader conceptualisation that is more representative of employees' experiences at the intersection of work and a variety of life roles that constitute the nonwork domain.

Second, although there are multiple scales available to tap into work-life balance, their application has contextual differences. It was noted through our review that the literature on work-life emanates were mostly conducted among 20% of the global population residing in Western Europe, North America, and the pocket of countries in the Pacific Rim. However, there is a dearth of culturally sensitive scales for 80% of the global population where there is a spurt

of industrialisation, acculturation, and urbanisation, and therefore, traditional modes of living are increasingly untenable [61]. The present narrative review suggests that only a few studies have been developed and validated on work-life in non-Western countries with a few exceptions [62]. The work-life balance scales developed and tested in the US might not be valid in other countries. Norms and cultural values play a significant role in shaping the work-life interface [63]. Societal or national culture would affect an individual's experiences in work and life domains. For example, scales examining the experiences of Indian employees emphasised the effect of gender on the work-life interface. Their arguments were based on a thorough assessment of the Indian culture where the idea of the male provider role is persistent, in contrast to the Western culture. Another important cultural dimension to consider is individualism/collectivism, describing the nature of relationships among people, that is, whether people focus on individual goals and believe they are independent (individualists) or whether they focus on group goals (collectivists). Humane orientation is also a cultural dimension describing the degree to which societies reward and encourage individuals for being friendly, caring, and generous to others. Cultures with a high degree of humane orientation values may provide better support for individuals in managing the work-life interface than members in cultures with a low degree of humane orientation values [62]. Given that the work-life interactions are entrenched in larger societal contexts including gender roles, cultural values, and national policies, the expansion of work-life balance scales is merited. Future scales need to account for the diverse array of cultures and increase understanding of cultural influences on the work-life balance. These culturally sensitive scales would in

turn inform decision makers on the best work-life practices and policies that are culturally appropriate [62, 63].

Third, research on work-life balance supports the existence of a positive spillover effect, arguing that multiple roles can be beneficial [21]. Positive spillover has been significantly associated with improved emotional, mental, and overall health. Several scales have included both ways of spillover, the negative and the positive spillover [21]. However, research on the spillover effect of the work-life interface is less developed than research on work-life conflict. The spillover between work and life domains is inevitable. Therefore, all work-life balance measures should include items that capture the spillover construct of the work-life interface.

Fourth, it was noted that almost all work-life balance scales were tested among a sample of employees from various occupations. We hereby argue that future work-life balance scales should develop items specific for each work sector, taking into account the requirements of each occupation. Certain industries and occupations require long working hours in challenging circumstances such as roles in healthcare and law enforcement, making it difficult to balance work and life domains. It is also evident that healthcare professionals and frontline workers are the most susceptible ones during infectious disease outbreaks, emphasising the need for a specific work-life balance scale for the healthcare sector. Furthermore, this allows organisations to implement targeted interventions and policies to enhance the work-life balance of their employees. Therefore, it would be worthwhile to develop sector-specificwork-life balance scales.

Finally, the emergence of coronavirus disease 2019 (COVID-19) pandemic has resulted in significant changes in peoples' work and personal lives, as well as their roles within their families. During the pandemic, critical measures for COVID-19 prevention and control have been implemented including lockdowns, social distancing, and closing of schools and public institutions [64]. As such, adults and children have been forced to stay at home for an unknown time. As the home became the new workplace, as well as the new school, it is more challenging for families to successfully coordinate work and family obligations. The COVID-19 pandemic had brought back the gendered division of labour whereby women bore the burdens of the household chores, children, and emotional labour. This was evident in Iceland, a country on the top of the Gender Gap Index, where mothers expressed their frustration with the uneven division of labour during the pandemic [65]. In these difficult times and when work-life balance research is surging, an important question arises: how can we shape work-life balance scales to cover the new changes imposed by the pandemic? How can we identify the gendered interactions of work and life domains?

The present narrative review on work-life balance and specifically on its quantification provides some insights from what appears to be nascent research work-life balance and highlights important gaps in research studies that should lay the groundwork for further scrutiny. Specifically, we discussed the heterogeneity of work-life balance definitions and constructs. Eight dimensions of work-life balance have been identified: unidirectional perspective; bidirectional perspective; time-, strain-, and behaviour-basedwork-life conflict; work-life enrichment/enhancement; work-life spillover; internal vs. external work-life balance; domain-level measurement; and bidirectional perspective with a focus on behavioural role conflict. Reducing much of the heterogeneity in work-life balance definitions has important practical consequences for how work-life balance is to be measured and for how scales are to be designed. In addition, it is essential to develop contextualised and sector-specificwork-life balance scales while enhancing international knowledge sharing and collaboration.

5.1. Implications for Healthcare and Nursing Managers. As the conventional barrier between work and home becomes increasingly blurred, healthcare managers and leaders, including nurse leaders, should focus on quantifying and measuring the work-life balance. However, as there is a heterogeneity of work-life balance definitions and quantification methods, managers and leaders in the healthcare sector should tailor the measures to the healthcare system's circumstances and goals. Work-life balance scales should also be constructed to account for unexpected situations such as pandemics and public health emergencies. It should also take different genders and their individual needs into account.

Furthermore, the majority of work-life balance scales were general and targeted employees from a variety of occupations. It is recommended that healthcare leaders develop specific scales containing healthcare-specific items, considering the needs of healthcare professionals. The contextualisation of work-life balance measures is an important exercise that needs to involve nurses, nursing orders, and syndicates in a global discourse. Therefore, it is recommended that the International Council of Nurses endorse this as a priority area in the coming years.

Lastly and perhaps most importantly, listening to the voice of nurses in regard to their work-life balance precipitates a mandate to introduce evidence-informed improvements that would help nurses regain their balance while exercising their full potential. Therefore, it is pivotal that institutional leaders endorse an improvement system that is supported operationally to bridge the voice of nurses to actual changes in their work environments.

Data Availability

The datasets generated during and/or analysed during the current study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Research Article

The Mediating Effect of the Perceived Professional Benefit of New Nurses in Cancer Hospitals on the Nursing Work Environment, Psychological Resilience, and Transition Shock: A Cross-Sectional Questionnaire Survey

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Aim. The aim of this study was to determine whether the relationship among the nursing work environment, psychological resilience, and transition shock was mediated by nurses' perceived professional benefits and to explore the associations among these variables. *Background*. Nurses' transition shock is an important factor in reducing the nursing staff turnover rate. Thus, clarifying the factors influencing nurses' transition shock has become a priority. *Methods*. Cross-sectional research was used in this study. A total of 200 newly graduated Chinese nurses were recruited by convenience sampling in 2022 from three tertiary hospitals in Beijing, Tianjin, and Hebei. Data were collected through questionnaires and included demographic data in addition to the perceived professional benefit scale of nurses, the nursing work environment scale, the brief resilience scale, and the transition shock scale. The data were analysed using SPSS 25.0 and the SPSS PROCESS macro programme, Model 6. *Results*. The perceived professional benefit of new nurses, the nursing work environment, and psychological resilience directly influenced transition shock ($p < 0.01$). The perceived professional benefit of new nurses mediated the relationship among the nursing work environment, psychological resilience, and transition shock ($p < 0.01$). The final model's mediating influence contributed 21.53% and 6.85% to the total influence. *Conclusion*. Nursing managers can improve nurses' perceptions of professional benefits from psychological resilience and the nursing work environment to reduce the impact of transition from school to work for new nurses. *Implications for Nursing Management*. This study provides a reference for the development of intervention strategies and training programmes to assist new nurses in cancer hospitals in effectively navigating the transition into their careers. In the future, appropriate training methods should be used at the individual cognitive, psychological, and organizational levels to improve the physical and mental health of new nurses and their ability to provide high-quality patient care.

1. Background

According to the World Health Organization's State of World Care report issued in 2020, the number of caregivers worldwide increased by 4.7 million between 2013 and 2018; however, there was still a shortage of 5.9 million nursing staff [1]. In China, there were 4.1 million registered nurses in 2018, yet there were only 2.7 nurses for every 1,000 residents.

In 2021, the number of registered nurses in China was 5.018 million according to the Statistical Bulletin of China's Health Care Development 2021 [2]. Although an annual increase was observed, the World Health Report showed a discrepancy between the number of nurses in Europe and the United States [3]. However, the pressures experienced by nursing staff have led to increased loss of nursing professionals and high nursing staff turnover, and these setbacks

have hindered the development of nursing [4]. The recruitment and retention of nursing staff are an internationally recognized priority [5]. As a new force in the health care system, newly graduated nurses play a vital role in the development of nursing quality. However, the soaring attrition rates of newly graduated nurses have resulted in the waste of educational resources and an increase in employment costs, which may have an adverse impact on initiative and instability of the residual nursing staff [6].

Nurses who graduated from school to clinical work in less than a year are defined as new nurses [7]. Due to challenges such as the gap between theory and practice, high workloads, complex relationships, and a lack of nursing skills, the process of recruiting new nurses involves "transition shock" [8]. According to studies, transition shock not only has an impact on the physical and mental health of new nurses but also increases the turnover rate, accelerates the lack of nurses' human resources, and ultimately reduces patient safety and quality of care [9, 10]. Because of transition shock, the turnover rate of new foreign nurses in the first year of their careers due to maladjustment reached 4%-5% [11]. In China, due to the impact of transition shock produced by various challenges that new nurses experience, many nurses may choose to withdraw from the nursing profession [6]; Alternately, these challenges can cause their work engagement and performance to deteriorate, which may directly affect patient safety [12].

Psychological resilience refers to inner strength, optimism, and the ability to cope effectively with adversity and to some extent reflects perseverance, resilience, and adaptability in the face of stress. Studies have shown that psychological resilience is negatively correlated with transition shock [13]. Nurses with good psychological resilience can adjust their mindset when faced with negative emotions, setbacks, difficulties, and adversities and restore their enthusiasm and attitude towards nursing work, which is conducive to team building and career development [14].

The nursing work environment refers to the organizational characteristics that facilitate or limit the professional practice of nursing, including the relationship between nurses and administrators, with physicians, and the status of nursing staff in the hospital hierarchy [15]. Previous studies have shown that an optimal nursing work environment is not only effective in improving nurse outcomes but also in increasing job satisfaction and a sense of professional and organizational identity and job adaptability, reducing the impact of transition shock [16, 17]. New nurses are at the beginning of their careers, and the nursing work environment is critical to their growth during this period.

A sense of professional benefit refers to the emotional state in which individuals perceive the rewards and benefits brought by their occupations and agree that their current occupations can promote their overall growth [18]. Related studies have shown that new nurses experience increased stress. When they change from students to nurses, they face a dramatic change in role and environment and experience feelings of confusion, doubt, bewilderment, and unclear orientation. Their perceived sense of career benefit will

influence their career choice or career development and reduce the pressure and confusion caused by the impact of transition shock [19, 20].

However, since China's standardized system for training new nurses is still in the exploratory stage, training programmes in cancer hospitals frequently place a greater emphasis on theoretical knowledge and clinical practice than on work pressure and the psychological adjustment that accompanies a change in role for new nurses [21]. Faced with cancer patients and their families, new nurses in cancer hospitals feel greater physical and mental pressure and are more likely to experience job burnout and turnover intention [22]. Previous studies have concentrated on general hospitals, while the group of new nurses in cancer hospitals has received less attention [23].

With the increasing incidence and mortality rate of tumours, the demand for high-quality cancer care services is increasing. Currently, new nurses in cancer hospitals deal with a shortage of nursing human resources, demanding job responsibilities, and a variety of stressors associated with the increasing complexity of cancer care, making the transition challenging [24]. Nurses working at cancer hospitals deal with special patients who require prolonged medical care, have numerous complications, and endure significant economic pressure. The high expectations of patients and their families for medical staff places more pressure on nurses in cancer hospitals than those in general hospitals [25].

The transition shock model framework was used as a guide for this study. The model covered three aspects: the source of transformation shock (role, interpersonal relationship, responsibility, knowledge, and skills), the feelings (confusion and doubt), and the level of influence (physiology, emotion, social culture, and development thought) [26]. The theory states that the occurrence of transition shock is affected by several factors. According to research [27–29], improving external factors, such as strengthening clinical teachers' teaching practices, creating a positive working environment, and providing timely support to new nurses, can reduce the impact of transformation. Internal factors such as positive coping styles and self-efficacy are negatively correlated with transition shock, and the relationship between resilience and transition shock is elusive [30–32].

Therefore, this study verified the path mechanism by which the external environment and internal psychological resilience affect the transition shock of new nurses in cancer hospitals and explored the partial mediating role of nurses' perceived professional benefit in managing the nursing work environment, coping with psychological resilience, and experiencing transformation shock. Based on the hypotheses proposed in this framework and previous studies, we formulated the following hypotheses in our study: (1) the nursing work environment (external factors) and psychological resilience (psychological factors) directly influence the impact of transition shock; (2) nurses' perceived professional benefits (personal factors) influence transition shock; and (3) the nursing work environment and psychological resilience affect transition shock through nurses' perceived professional benefit.

Surprisingly, few empirical studies have investigated the impact of nurses' perceived professional benefits on transition shock, including the mediating effects of nurses' perceived professional benefits, particularly in China. However, understanding this link is critical for designing effective ways to minimize turnover intention.

The major goal of our research was to examine the link between transition shock and personal cognitive factors, psychological factors, and environmental factors in new nurses in cancer hospitals. This knowledge can help nursing managers implement effective interventions to reduce transition shock and turnover intentions among new nurses, reduce the loss of nursing human resources, ensure nursing safety, and improve clinical nursing quality.

2. Methods

2.1. Methodological Rigour and Quality of the Study. First, according to the purpose of the study, we chose suitable assessment tools. In addition, our study followed the STROBE checklist for reporting findings.

2.2. Study Design and Participants. This study adopted a cross-sectional design. The convenience sampling method was utilized. In 2022, newly registered nurses from three tertiary cancer hospitals in the Beijing, Tianjin, and Hebei regions were enrolled in this study. Employing the method for calculating the sample size applicable to continuous variables [33], we postulate a variance of 25 for nurses' perception of professional benefit. With a precision δ, defined as the distance from the mean to the limit, set at 3.5, a minimum sample size of 199 is deemed necessary for the study. A total of 212 new nurses working in the three participating hospitals were invited to participate in the study. After checking the questionnaires they completed and removing those with incomplete responses, 200 questionnaires were considered for data analysis. The response rate was 94.33%. The inclusion criteria were as follows: (1) acquiring a nursing qualification certificate and a nursing practice certificate, (2) <1 year of work experience, and (3) voluntary participation in this study and signed informed consent. The exclusion criteria were as follows: maternity leave, sick leave, internship, rotation, and refresher nurses. Newly graduated nurses have different abilities to withstand stress compared to experienced nurses [34], and different levels of stress may affect nurses' perceived professional benefits, transition shock, and psychological resilience [25]. To avoid interference factors, we also excluded new nurses who had worked in two or more hospitals in the past year. Ethical approval for this study was obtained from the Ethics Committee of the Cancer Hospital Chinese Academy of Medical Sciences (21/ 525-3196).

2.3. Variables. General sociodemographic information was gathered through a self-designed questionnaire and included age, sex, marital status, education level, and other information.

The nurses' perception of professional benefit was assessed with a previous questionnaire [35]. The questionnaire was used to assess the perception of the gains and benefits brought by the nursing profession and to identify whether nursing can promote the overall growth of the self. Positive career perception (5 items), family and friend recognition (7 items), team belonging (5 items), good nurse-patient relationships (6 items), and self-growth (6 items) constituted a total of 29 items. The items were rated on a 5-point scale from 1 (strongly disagree) to 5 (strongly agree). The total score was proportional to the nurses' perception of professional benefit. The total Cronbach's alpha coefficient of the scale was 0.958, and Cronbach's α coefficient of each dimension was between 0.821 and 0.893. In this study, the scale's reliability coefficient was 0.953.

The Chinese version of the Practice Environment Scale (PES) was compiled by Professor Lake [36]. After agreement from the original scale author, it was translated into Chinese by Wang and Li [37]. The scale included five dimensions, nurses' participation in hospital affairs (8 items), the basis of high-quality nursing services (9 items), managers' ability and leadership style (4 items), sufficient manpower and material resources (4 items), and medical cooperation (3 items), for a total of 28 items. The items were rated on a 4-point scale ranging from 1 (strongly disagree) to 4 (strongly agree) for a total score of 31–124 points. Higher scores indicated higher levels of the perceived work environment. Cronbach's α of the scale was 0.910.

Psychological resilience was assessed by the Brief Resilience Scale (BRS) [38]. The BRS consists of six items, three positive and three negative scored items. The items are measured on a 5-point scale, with 1 representing "does not describe me at all" and 5 representing "describes me very well." The data collected were recorded prior to analysis since item 2 (I have a hard time making it through stressful events), item 4 (It is hard for me to snap back when something bad happens), and item 6 (I tend to take a long time to get over setbacks in my life) were reverse coded. This scale was specifically used to assess individuals' ability to maintain health when dealing with stress, especially health-related stress or stressful events. The average score of items was divided into three groups: low elasticity (1.00–2.99), medium elasticity (3.00–4.30), and high elasticity (4.31–5.00). Cronbach's α of the BRS was 0.71.

The transition shock scale for newly graduated nurses (TSS-NGNs) evaluates their emotional burden as they move from the school environment to clinical practice [39]. The scale includes four dimensions: shock from organizational culture and climate, shock from knowledge and skills,

psychological shock, and physical shock. There are 27 items in total. The ratings are measured on a 5-point scale with 1 representing "strongly disagree" and 5 representing "strongly agree," for a total score ranging from 27 to 135 points. A higher score indicates a higher level of transition shock. Cronbach's α scale for each domain ranged from 0.86 to 0.94.

2.4. Survey Methods. The researchers explained the background, purpose, and methods of this study to the nurses who met the inclusion criteria. Following informed consent, a 10- to 20-minute online survey was conducted via mobile phone. Participants accessed the questionnaire by scanning the questionnaire's two-dimensional code created by Questionnaire Star. To ensure that the survey data submitted were complete and did not contain missing data, questions could not be skipped.

2.5. Data Analysis. Descriptive statistical analysis, including mean, standard deviation, frequency, and percentage, was performed using SPSS 26.0 software. Using the SPSS PROCESS macro program, Model 6, we tested the mediating effect. Data were tested for normality using the Kolmogorov–Smirnov (K-S) test. A nonparametric correlation method (Spearman's rho) was used to test the relationships among the nurses' perception of professional benefit, nursing work environment, psychological resilience, and transition shock. The structural equation model (SEM) was used to analyse the associations among the nursing work environment, psychological resilience, nurses' perceived professional benefit, and transition shock. The product coefficient test and bootstrap sampling methods were used to test the mediating effect. Multidimensional indicators were used to comprehensively assess the model's acceptability. Therefore, to evaluate the fit quality of the model and data, several goodness-of-fit indicators were employed: chi-square (x^2), chi-square/degrees of freedom (x^2/df), root mean square error of approximation (RMSEA), goodness-of-fit index (GFI), standardized root mean square residual, and nonnormed fit index (NFI). The standard for good model fit was <3, RMSEA <0.1, NFI, and CFI >0.9. The statistical significance level was set at $\alpha = 0.01$. Before proceeding with the regression analysis, we verified that our dataset satisfied the fundamental prerequisites for regression. These prerequisites encompassed the normal distribution of residuals, linearity of relationships, homoscedasticity, and the absence of multicollinearity.

3. Results

3.1. Characteristics of Participants. Table 1 presents the demographic and work-related characteristics of the participants. The effective sample size was 200. Most participants were female (82%). The average age of the participants was 21.82 (3.37) years, and 97% of the participants were single. In terms of education level, 49% of the participants held a college degree. The majority of participants were from a one-child family (72%), and 34% of participants had

a monthly income of more than 4000¥. More details can be found in Table 1.

3.2. Descriptive Statistics of Scales. Table 2 shows the descriptive statistics of the nurses' perceived professional benefit, nursing work environment, psychological resilience, and transition shock. The mean scores on the nurses' perceived professional benefit were 46.25 (24.12), with the highest scores in the self-growth dimension (9.08 (5.16)) and the lowest scores in the family and friends' recognition dimension (7.90 (4.49)). The mean score for the nursing work environment was 95.35 (12.77). The scores of each dimension from high to low are the basis of high-quality nursing services, nurses' participation in hospital affairs, sufficient manpower, and material resources medical cooperation (31.30 (4.41); 26.67 (4.17); 13.58 (2.06); 10.65 (1.60), respectively). The mean score for psychological resilience was 17.07 (3.65). The mean score for transition shock was 51.45 (22.34). The organizational culture and climate dimensions had the highest scores (15.46 (7.02)), and the knowledge and skills dimension had the lowest score (10.41 (4.60)).

3.3. Correlation Test. Table 3 shows the associations among the nurses' perceived professional benefit, nursing work environment, psychological resilience, and transition shock. Nurses' perceived professional benefit was positively correlated with psychological resilience ($r = 0.420$, $p < 0.01$) and the nursing work environment ($r = 0.103$, $p < 0.01$). Nurses' perceived professional benefit was negatively related to transition shock ($r = -0.421$, $p < 0.01$). The nursing work environment was positively correlated with psychological resilience ($r = 0.103$, $p < 0.01$) and was negatively related to transition shock ($r = -0.437$, $p < 0.01$). Psychological resilience was negatively related to transition shock ($r = -0.517$, $p < 0.01$).

3.4. The Mediating Role of Nurses' Perceived Professional Benefit on the Relationships of Nursing Work Environment, Psychological Resilience, and Transition Shock. Prior to assessing the mediation effect, the assumptions of regression analysis were scrutinized. The Durbin–Watson statistic emerged at 1.321, in close proximity to the ideal value of 2, thus suggesting the absence of autocorrelation among residuals. The maximum variance inflation factor was identified as 1.249, less than the critical threshold of 10, further indicating that multicollinearity was not a concern. In addition, the analysis of residuals affirmed the model's linearity and confirmed both the normality and homoscedasticity of errors. Harman's single-factor test was employed to perform an exploratory factor analysis on all measured items associated with the nursing work environment, nurses' perceived professional benefit, psychological resilience, and transition shock, without any rotation. The analysis revealed three common factors with an eigenvalue exceeding 1. The first common factor accounted for 41.55% of the total variance, falling below the 50% threshold. This finding suggests that

TABLE 1: Characteristics of the study sample.

Variables	Categories	n (%)
Sex	Female	164 (82)
	Male	36 (18)
Age	<25	188 (94)
	≥25	12 (6)
Marital status	Married	6 (3)
	Single	194 (97)
Education level	College	98 (49)
	Associate's degree or less	8 (4)
	Undergraduate	82 (41)
	Postgraduate and more	12 (6)
From one-child family	No	144 (72)
	Yes	56 (28)
Monthly income	1000–2000¥	40 (20)
	2001–3000¥	84 (42)
	3001–4000¥	8 (4)
	>4000¥	68 (34)
Home address and work unit in the same city	No	8 (4)
	Yes	192 (96)
Employment relationship	Formal incorporation	8 (4)
	Personnel agency	8 (4)
	Contract employment	184 (92)
Were you ever a class cadre during college?	No	80 (40)
	Yes	120 (60)

TABLE 2: The level of variables ($n = 200$).

Variables	Minimum value	Maximum value	M (SD)
Nurses' perceived professional benefit	29	145	46.25 (24.12)
Positive career perception	5	25	8.49 (4.30)
Family and friends' recognition	5	25	7.90 (4.49)
Team belonging	6	30	9.08 (5.16)
Good nurse-patient relationships	6	30	8.99 (5.12)
Self-growth	7	35	11.79 (5.85)
Nursing work environment	36	112	95.35 (12.77)
Nurses' participation in hospital affairs	8	32	26.67 (4.17)
The basis of high-quality nursing services	9	36	31.30 (4.41)
Managers' ability and leadership style	6	16	13.35 (1.78)
Sufficient manpower and material resources	9	16	13.58 (2.06)
Medical cooperation	4	12	10.65 (1.60)
Psychological resilience	6	30	17.07 (3.65)
Transition shock	27	132	51.45 (22.34)
Physical	6	30	12.03 (6.12)
Psychological	8	40	15.46 (7.02)
Knowledge and skills	5	25	10.41 (4.46)
Organizational culture and climate	8	40	13.56 (6.82)

the research data were not subjected to common method bias.

As depicted in Figure 1, we applied the Sobel stepwise method to estimate the mediation effect size. The term α symbolizes the intensity of the association between the independent variable and the mediator. In this instance, based on univariate regression analysis, both the nursing work environment and psychological resilience were found to enhance nurses' perceived professional benefit, with $\alpha1 = 0.764$ ($p < 0.001$) and $\alpha2 = 0.106$ ($p < 0.001$), respectively. The term β designates the strength of the relationship between the mediator and the dependent variable, while accounting for the influence of the independent variable. In our case, after regressing all variables towards transition shock, we observed a negative effect $\beta = -0.193$ ($p < 0.001$) from nurses' perceived professional benefit to transition shock. Finally, the $\alpha\beta$ term represents the product of coefficients, essentially quantifying the variance in the dependent variable that can be attributed to the independent variable via the mechanism of the mediator. Table 4 demonstrates that nurses' perceived professional benefit plays a partial mediating role in the relationships among nursing

TABLE 3: Correlations of variables.

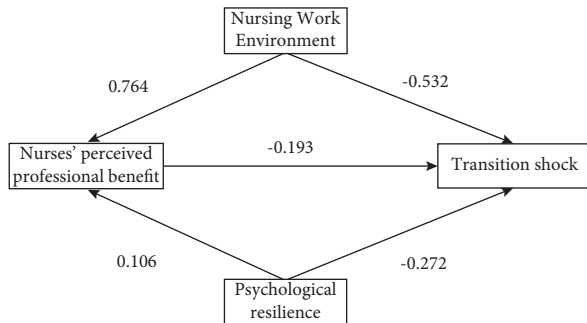|	1	2	3	4
(1) Psychological resilience	1			
(2) Nursing work environment	0.103 ($p < 0.01$)	1		
(3) Nurses' perceived professional benefit	0.194 ($p < 0.01$)	0.420 ($p < 0.01$)	1	
(4) Transition shock	−0.517 ($p < 0.01$)	−0.437 ($p < 0.01$)	−0.421 ($p < 0.01$)	1

(p) value.

FIGURE 1: The mediating role of nurses' perceived professional benefit.

work environment, psychological resilience, and transition shock. The contribution rates of the mediating effect to the total effect were 21.53% and 6.85%, respectively. As illustrated in Table 4 and Figure 1, the nursing work environment had a significant direct impact on nurses' perceived professional benefit ($p < 0.01$) and a significant direct and indirect impact on transition shock ($p < 0.01$). In addition, the outcomes demonstrated that resilience significantly influenced transition shock both directly and indirectly ($p < 0.01$).

4. Discussion

This study concentrated on newly recruited nurses in cancer hospitals and investigated the relationships among the nursing work environment, psychological resilience, nurses' perceived professional benefit, and transition shock. Based on the understanding of transformation shock theory and previous research, a hypothetical model was constructed and the relationships among these variables were verified. The findings of this study confirmed the research hypotheses.

First, our study demonstrated a negative correlation between the nursing work environment and transition shock. This means that the better the nursing work environment is, the lower the transition shock of nurses, which is consistent with previous studies [4]. The working environment is a comprehensive system that integrates physiology, psychology, society, and specialty. It is a place where nurses work and socialize daily, which is inseparable from their behaviour [40]. A good working environment improves the job satisfaction of nurses, enables them to better integrate into their new environment, and reduces the impact of role transformation [41]. The nursing work environment includes five aspects: nurses' participation in hospital affairs, the basis of high-quality nursing service, the

ability and leadership of managers, sufficient manpower and material resources, and medical cooperation. Al Sabei et al. [42] observed that having more people involved in hospital affairs can help reduce the work pressure and turnover intention of nurses. By providing new nurses with more opportunities to participate in the decision-making processes of hospital affairs through high-level organizational support and good cooperative relationships, nursing managers can strengthen nurses' sense of belonging and reduce the risk of new nurses' resignation during the transition period. Benner and Duchess's theory [8] suggests that nurses obtain significant knowledge in their initial 6 months of employment, enabling them to actively participate in clinical work. For nurses in cancer hospitals, clinical knowledge needs to be more systematic and professional. Therefore, to ensure that new nurses are capable of participating in their work, nursing managers can concentrate on developing a knowledge system 6 months prior to the admission of new nurses by developing a planned training programme. They need to also concentrate on improving nurses' knowledge capacity for clinical transformation. A good nursing work environment should meet both physical and psychological needs. According to the American psychologist Bronfenbrenner [43], the theory of human development emphasizes that supportive interactions in the microenvironment promote personal development. Therefore, clinical nursing managers need to pay attention to the psychological and emotional requirements of new nurses to create a positive working atmosphere of mutual assistance.

Second, this study demonstrated a positive correlation between the work environment of nurses and their perceived professional benefit and a negative correlation between nurses' perceived professional benefit and transition shock. Not only did the nursing work environment directly affect transition shock, but it also indirectly affected transition shock via nurses' perceived professional benefit. The nurses' perceived professional benefit played a partial mediating role between work environment and transition shock, accounting for 21.53% of the total influence. This may be due to the knowledge that a healthy work environment can provide new nurses with a sense of safety, belonging, and positivity. In turn, this allows individuals to believe that they can cope with the challenges of their environment and to develop the courage to accept new things. A good environment enhances innovation among nurses and helps them provide quality care to their patients. When nurses are assisted in implementing safe, standard, competent, and compassionate services, they tend to feel a sense of self-identity, thus enhancing their sense of professional benefit [44]. Nurses' perceived professional benefit is a positive and

TABLE 4: Mediation effect size results.

Variables	Total effect (Sobel p)	Direct effect (Sobel p)	Indirect effect (Sobel p)
Nursing work environment $\longrightarrow$ nurses' perceived professional benefit $\longrightarrow$ transition shock	−0.678 ($p < 0.01$)	−0.532 ($p < 0.01$)	−0.146 ($p < 0.01$)
Psychological resilience $\longrightarrow$ nurses' perceived professional benefit $\longrightarrow$ transition shock	−0.292 ($p < 0.01$)	−0.272 ($p < 0.01$)	−0.020 ($p < 0.01$)

(p) value.

pleasant emotional experience that brings them satisfaction in the process of work. It is an internal incentive factor for the career development of nurses that helps them cope with work challenges and reduces the psychological impact [45]. Therefore, healthy working conditions and the environment are crucial for the mental health and work adjustment of nursing staff. A study demonstrated that job characteristics and an interpersonal atmosphere can predict job performance and satisfaction [46]. It is further suggested that nursing managers acknowledge the role that the nursing environment plays in improving nurses' sense of belonging and interpersonal skills while reducing psychological pressure in the transition period to help them better accept and complete their clinical nursing duties.

Third, our study demonstrated that nurses' perceived professional benefit also mediated the relationship between psychological resilience and transition shock, and the mediating effect accounted for 6.85% of the total influence. There was a positive correlation between psychological resilience and nurses' perceived professional benefit, and there was a negative correlation between psychological resilience and transformation impact. That is, the higher the level of psychological resilience, the more nurses feel a sense of professional benefit, and the higher the sense of professional benefit, the lower the transformation impact. Resilience is a coping mechanism that helps individuals deal with challenges and pressures [47]. Therefore, good psychological resilience can help new nurses derive a positive career perception and ease the pressure of transitioning. A study showed that effective emotional control and problem-centered coping strategies can effectively manage stress and improve resilience by providing motivating images and enhancing self-humour [48]. Another study using basic psychological needs theory [49] further explored the underlying mechanisms between resilience and positive psychological functions. The theory proposes that the best state of positive psychology depends on the satisfaction of three basic psychological needs: autonomy, competence, and relationality. Research shows that managers' autonomy support and positive feedback can mobilize the three basic psychological needs of autonomy, competence, and belonging of employees, thus increasing their job satisfaction and reducing the rate of turnover [50]. Therefore, managers can improve the psychological satisfaction of new nurses through encouragement, affirmation, and praise to help reduce psychological pressure.

The results of this study revealed that nurses' sense of professional benefit has an important impact on their transformation. Therefore, nursing managers should pay attention to and improve the work experience of new nurses and take corresponding measures to improve the sense of professional benefit to help nurses complete the transition. To improve the positive benefit to nurses, Rui et al. [51] suggested practising a mindful diet and sharing pleasant or unpleasant events that occurred during daily work, health education, and meditation. These activities ensure that nurses can calmly accept reality, which helps them improve their emotional responses and stress management abilities, experience things from a positive

perspective, and improve their professional values. Dai et al. [52] use the Satir model to train nurses, which can help nurses understand restrictive beliefs and form positive professional cognition. When nurses change their communication mode and improve their relationships with others, they can improve their growth and effectively improve their professional benefit level. The professional benefits of nursing may be realized if the job is accompanied by a stable income, guaranteed work, services for relatives, and flexible working hours. Nursing managers should guide new nurses to rationally and objectively evaluate their professional characteristics from multiple perspectives and dimensions through these practical benefits.

4.1. Study Limitations and Future Research. Although the findings of this study support the initial research hypothesis, there are still some limitations. First, this was a cross-sectional study, which may not illuminate the causal relationship between variables. Therefore, a longitudinal study design can be performed in the future to further investigate the relationship between the variables. Second, although this study selected new nurses from three hospitals in Beijing, Tianjin, and Hebei as the research subjects, the sample size was small due to the limiting factor of new nurses solely from cancer hospitals. A large sample survey can be conducted in the future to improve the universality of the results of this study. Finally, only Chinese nurses participated in the study. Further exploration should include nurses from other countries. We will actively participate in international conferences related to nursing management, further broadening this field of study.

5. Conclusion

This study indicates that increasing the professional benefit of nurses by providing a healthy nursing work environment and improving psychological resilience can reduce the impact of transformation. Therefore, nursing managers should pay attention to the role of the external environment and internal psychological construction during the transition period of new nurses and encourage new nurses to participate in decision-making and nursing practice. It is also necessary to develop and design prejob training programs and intervention measures that are suitable for new nurses working in cancer hospitals and select various implementation strategies based on the actual situation to implement training programs purposefully and appropriately.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

Zhuoheng Lv is the co-first author.

Conflicts of Interest

The authors declare no conflicts of interest.

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Research Article

Novel Designed Surgical Drapes Reducing Fluid Permeability in the Surgical Critical Area of a Sterile Operation Interface: A Randomized Controlled Trial

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Aim. To compare the impact and cost effects of medical long fiber polyester drapes and cotton fabric drapes on operative sterile operation interfaces. *Background.* The comparison of the properties of the commonly used surgical drapes materials in terms of leakage, device slip, and prevention of intraoperative adverse events is not clear. *Method.* A prospective randomized controlled study was conducted in the operating room of a tertiary hospital in Chengdu, China. A total of 400 patients who underwent urology surgery were enrolled and randomly divided into two groups by computer, the study group (200 cases) selected the new long-fiber polyester cloth, while the control group (200 cases) selected conventional cotton fabric surgical drapes during the operation to maintain a sterile operating interface. The impermeability and water absorption of surgical drapes, the rate of device slip and skin scald in surgical patients, and the cost effect of the two kinds of surgical drapes were compared. *Results.* The long fiber polyester surgical drapes were superior to conventional cotton cloth in water absorption (g/m^2) $(835 \pm 15.8$ VS 225 ± 21.0, $t = 328.261$, $P < 0.001)$, preventing surgical site infections (2.5% VS 8.0%, $\chi^2 = 6.081$, $P = 0.014$), device slip (7.5% VS 17.0%, $\chi^2 = 8.396$, $P = 0.004$), patients from burning (0 VS 1, Fisher $P = 1.0$), and total cost per use (\$) (0.83 VS 0.96–1.09). *Conclusion.* Long fiber polyester fabric has a stronger antipenetration ability of fluid and microorganisms thus forming an effective protective barrier. It also has strong hygroscopicity, and its special design can prevent the occurrence of sliding of surface instruments and skin scald in patients. In addition, its cost effect is superior. *Implications for Nursing Management.* Operating room nursing managers can introduce long fiber polyester drapes into the selection of medical textiles to construct aseptic surgical barriers and prevent surgical site infection.

1. Introduction

Surgical site infection (SSI) is one of the most common complications after surgery and a major factor (≥5%) in patients' remorbidity and readmission [1]. It has been reported that approximately 300,000 to 500,000 SSI cases occur annually in the United States, of which 10% to 16% occur after clean-to-decontamination surgery and 2% after

discharge [2]. SSI in Europe is approximately 1.5%~20% [3], and approximately 60,000 to 128,000 cases occur annually in Germany alone [4]. SSI in patients undergoing surgery will prolong their hospital stay, increase their medical costs, and even increase their mortality [5]. A study has shown that over 75% of patients dying after surgery are directly related to SSI [6]. Another study pointed out that SSI ranked first in the incidence of nosocomial infections in surgical patients

(38%) [7]. Therefore, SSI control and prevention are important indicators of operating room quality management.

The operating room is a department for the rescue of all kinds of critical patients and the operation of the whole hospital as well as for the control and prevention of nosocomial infection [8]. Drapes have been used during invasive procedures to maintain the sterility of environmental surfaces, equipment, and patients [9]. A surgical drape is a necessary and frequently used sterile surgical appliance in the operating room, which is mainly used to establish the barrier of the surgical sterile area [10]. Surgical drapes play a pivotal two-way protective role in the barrier system against wound infection, not only reducing the risk of contact with pathogenic microorganisms of medical staff but also blocking the spread of various microorganisms on the clothing and skin of medical staff to the surgical incision and protecting the surgical field from environmental pollution. It is the duty of healthcare workers to provide an infection-free environment for patients undergoing surgery. In the perioperative setting, prevention of contamination for both surgical patients and personnel is a prime objective. The assessment and improvement of materials with appropriate barrier efficacy for consumption in the operating room is still under investigation [11].

The potential of surgical drapes to prevent contamination mainly depends on the physical properties. For instance, the penetration of microorganisms will be smaller through several layers of the same fabric compared to one layer [12]. In addition, using single-layer surgical drapes not only increases the number of laundry and sterilization cycles but also increases bacterial penetration. Hence, single-layer drapes due to the lower barrier index and high cumulative penetration ratio are not suggested for a long time and risky operation. A study's result [13] demonstrated that three-layer materials of surgical drapes have higher protective performance such that even after repeated laundry and sterilization processes, they present a higher barrier index. There are several factors that can affect the protective effect of surgical drapes, including dampness, the number of washings given, the kept environment, the sterilizations given, and the span of surgical operations in which it is used [14]. Researchers found that there should be some specific characteristics in surgical gowns and drapes, such as the capacity to resist scratches, tears, flames, liquid strikes, bacterial strikes, and any kind of discharge [15].

Traditional surgical drapes are mostly made of cotton cloth, which has a relatively short period of validity after sterilization, poor impermeability, and easy infiltration by washing fluid, blood, urine, and sweat [16]. In addition, with the extension of time, cotton threads or loose floc may fall into the wound and even carry bacteria to cause incision contamination. Although disinfection and sterilization technology is currently greatly improved, a study showed that cotton is woven surgical drapes often have a high wear rate and significantly reduced barrier after washing 25 times, resulting in increased surgical infection risk for patients [17]. One of the concerns in applying traditional cotton surgical drapes is the reduction of their resistance to bacterial penetration, especially in the wet state, after repeated

laundering and sterilizing processes [18]. In developed countries, long-fiber polyester cloth has been widely used in clinical practice and has basically replaced cotton-woven surgical drapes in recent years. At present, the raw materials of surgical drapes used are generally cotton cloth in China. The main disadvantage is poor moisture resistance, ease of soaking in blood and water, inability to block bacteria, and self-protection once soaked [19]. A study has illustrated that the positive rate of incision bacterial culture in the surgical group using polyester filament fiber drapes was only 15.6%, which was significantly lower than 45.5% in the cotton group ($P < 0.05$). The infection rate of postoperative incision in the control group of cotton was 12.1%, which slightly higher than that in the polyester filament fiber group (9.4%) [20]. Other study's results implied that compared with traditional cloth surgical drape ($n = 218$), nonwoven surgical drape ($n = 212$) can significantly reduce the bacterial infection of the incision, the rate of dressing wetting in emergency cesarean, and reduce maternal heat loss ($P < 0.05$) [21]. The antibacterial properties of long fiber polyester cloth and traditional cotton cloth surgical drapes were discussed in the relevant studies at home and abroad, which proved the feasibility of their safe use. However, the factors such as antifluid penetration, preventing the instrument from slipping, and preventing the patient from burning have not been researched.

In recent years, with the continuous increase in the number of operations in Chinese hospitals, the use of cotton fabric drapes and cleaning and packaging are facing an increasing number of challenges, which have also become a large part of the hospital operating costs. At the same time, with the increasing incidence of infectious diseases such as HIV, hepatitis B, and hepatitis C, the occupational exposure risk of medical staff has also increased year by year [22]. The choice of nonwoven fabric as nursing materials by many medical institutions is becoming a development trend. However, the use of disposable non-woven fabric will cause more medical waste and increase the cost related to surgery. A systematic review [23] suggests that there is currently no evidence to support a distinction between reusable or disposable surgical towels to reduce the risk of SSI in orthopedic and spinal surgery. At present, cotton fabric and disposable nonwoven fabric are widely used for domestic medical packaging and surgical towel materials. However, they may have some drawbacks, such as poor permeability resistance, high production of medical waste, and high disinfection and disposal costs. Therefore, finding a high-quality reusable new material with relevant surgical drapes standards will become an urgent need for the maintenance of aseptic surgical interfaces.

In this study, we introduce a new surgical towel material, long-fiber polyester surgical drapes, which was intended to be used in the surgical patients of a urology surgery of a tertiary hospital (large doses of surgical rinsing fluid, high waterproof requirements of surgical drapes, etc.), to compare the advantages and disadvantages and the cost effect of cotton woven cloth and long-fiber polyester cloth, such as liquid leakage resistance, water absorption, instrument slip prevention, skin burn prevention, and other properties

during surgery, and the influence on the postoperative infection rate of patients, so as to provide a reference for rationally selecting surgical drapes, ensuring the safety of surgical patients, reducing SSI, and reducing surgery-related costs.

2. Methods

2.1. Study Design. We conducted a prospective, randomized, and controlled trial to analyze and compare the impact and cost effects of medical long-fiber polyester cloth and cotton fabric cloth on operative sterile operation interfaces in the operating room.

2.2. Sample and Grouping. The study was conducted in the operating room of a tertiary hospital in Chengdu, China. The sample size was calculated by comparing the independent sample rates of the two groups, and the postoperative surgical site infection (SSI) rate was used as the main index to calculate the sample size. A study reported that the postoperative SSI rate of patients with long-fiber polyester surgical drapes was 8.82%, while that of patients with cotton surgical drapes was 20.59% [24]. The calculated sample size was each 139 cases in the two groups. Considering the 20% loss to followup rate, the sample size of the study group and the control group was 167 cases, respectively. In view of the feasibility of statistical analysis and sample inclusion, the sample size of the study group and control group was planned to be 200 cases, respectively, for a total of 400 cases. Finally, a total of 400 patients undergoing urology surgery were included as the research subjects from July to October 2022 and were randomly divided into two groups with 200 cases in the study group and 200 cases in the control group by computer. In the study group, the surgical patients used long fiber polyester fabric surgical drapes, while the patients used conventional cotton surgical drapes in the control group. Random numbers were generated by the computer to implement allocation hiding. The serial numbers of the patients to be included in the study were then assigned by a computer. We interviewed patients and their primary caregivers or families and then explained the study protocols on the day before surgery, and the patients were successively enrolled in the study by researchers according to the serial numbers and the order of inclusion. Data analysts were blinded in this study.

The criteria for inclusion and exclusion of subjects were as follows: (1) inclusion criteria: ① the patients undergoing elective surgery under general anesthesia in the urological operating room; ② the patients whose preoperative skin preparation meeting the requirements of surgical disinfection standards and expected to achieve a clean incision standard were evaluated by the surgeon and included; ③ the patients gave informed consent to participate in the study. (2) Exclusion criteria: ① the expected operation time was less than 1 hour; ② patients with central high fever, dysthermoregulatory diseases, infectious fever, and temperature >38°C 3 days before surgery; ③ confirmed infection before

surgery; and ④ suspected infection without definite diagnosis before surgery.

2.3. Materials. The surgical drapes of the study group were long-fiber polyester fiber cloth, which is a plain and rectangular large towel woven material specially designed for medical institutions. It has passed the strict testing of European EN13795 and American AAMI PB-70 specifications, which also meet the pharmaceutical industry standard YY/T 0506.8-2019 of the People's Republic of China. The long fiber polyester fiber has a warp density of 150–170 roots/share and a weft density of 80–100 roots/share, it also has the texture of traditional cotton cloth, with hydrophobicity, without flocculation and dust, excellent waterproof effect, and high strength of resistance tear and burst, material skid resistance designed, and lightweight, not easy to dye, low cost of washing and sterilization, and good air permeability, with conductive fiber inserted every 0.3–0.8 cm of the width of the drapes to make them have an antistatic effect. After 100 reuses, hydrostatic pressure resistance ≥100 cm H_2O can effectively block the penetration of blood, bacteria, and even viruses and cause the hot air or water vapor produced by the skin to be discharged from the inside, maintaining excellent characteristics of physiological comfort. It can be sterilized by high-temperature and high-pressure steam. The critical zone approximately 50 cm from the incision was covered with three layers of the long-fiber polyester fiber cloth, and the noncritical zone was covered with a single layer of this new surgical drapes. These three layers of composite material provide a high level of waterproofing and bacterial protection effects. They are also reusable drapes with a protection level of 4 (according to the manufacturer information), in which the outer layer is woven of microdenier yarns (long fiber polyester fiber), namely, the water-absorbing layer, the rate of water absorption performance is more than 75% of the drop of water, and with softness and draping quality. In addition, it can prevent liquid backflow around the incision during surgery, preventing incision site infection. The middle layer contains a porous membrane with a waterproof layer (polyurethane, polytetrafluoro-ethylene, and microporous film), which possesses antivirus, antialcohol, and other chemical solvent penetration. The inner layer is a knit fabric (long fiber polyester fiber) that is breathable, has no flocculation, and is antistatic. The constituent yarns of both the outer and inner layers are composed of 99% PES/1% carbon fibers (Figures 1–3).

The surgical drapes of the control group were conventional cotton surgical drapes. It is a cotton rectangular towel, which can be used about 20 times under normal circumstances. The pressure steam sterilization method can be used for disinfection and sterilization. The cloth had to be kept dry to be resistant to bacterial penetration and was not waterproof, with a water absorption capacity of 15% (Figure 4).

2.4. Surgical Drapes Laying Methods. After surgical preparation, povidone iodine disinfectant with an effective iodine concentration of 5000 mg/L was used for skin disinfection at
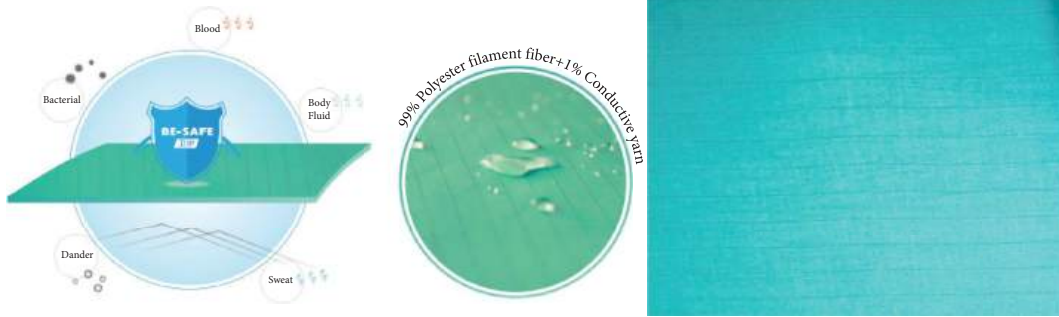
Figure 1: Schematic diagram of the characteristics of long fiber polyester fabric drapes.
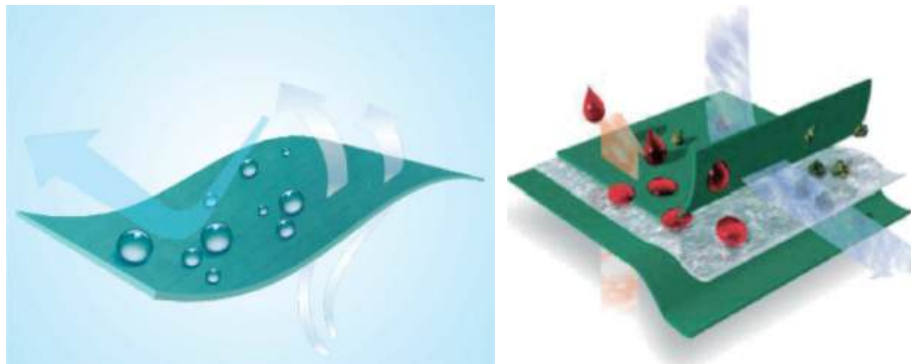

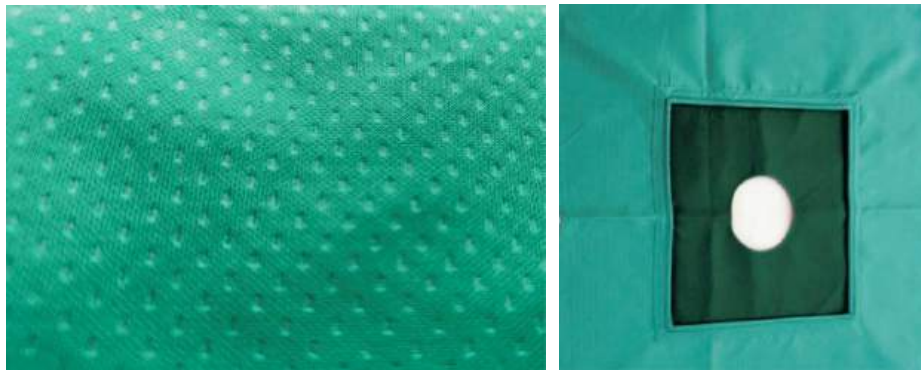Figure 2: Schematic diagram of microporous technology.

Figure 3: Water absorbing and wear-resisting functional materials used in the critical area of the reusable surgical towels.

Figure 4: Diagram of cotton surgical drapes.

the surgical site and prophylactic use of a reasonable dose of antibiotics 30 min before surgery. The study group received long-fiber polyester fiber surgical drapes. Spreading the sterile surgical drapes, and pasting on the contact skin surface using the adhesive (Figure 5). The control group was covered with a conventional cotton surgical cloth, which had three layers of cotton cloth within 20 cm around the incision, and was spread under sterile conditions after sterilization. The laying process of cotton cloth surgical drapes was consistent with the basic method of long polyester fiber surgical drapes; because of its heavy weight and good drapability, it was not pasted on the skin of the surgical patient. Instead, the surgical incision hole towels were clamped and fixed with towel laying pliers or fixed by pasting sterile film. Before the two types of surgical drapes were spread, unified training for surgeons and nurses to spread the drapes during the operation did not cut the surgical drapes due to the extension of the incision or tighten the size of the drape hole due to the shrunken incision. Operating rooms were cleaned with laminar flow purification.

2.5. Measurements

2.5.1. Primary Outcome Measures.
Liquid permeability rate of surgical drapes (whether the surgical drapes were wet with liquid, seepage rate = number of cases of liquid infiltration/total number of cases × 100%).

2.5.2. Secondary Outcome Measures.
Incision infection rate within 1 week after surgery (the diagnostic criteria for surgical incision infection were judged according to the diagnostic criteria for surgical incision infection issued by the National Health Commission of China [25], which detailed the following: redness, induration, or tenderness within 2 cm of the incision site, positive exudate culture, elevated body temperature, elevated white blood cells and neutrophils), cost effect of surgical drapes (calculate the average per use cost, in U.S. dollars), water absorption performance (water dripping on the drapes until dripping/cm^2), antislipping rate of the surgical drapes (surgical instrument drop rate), accidental injury of patients (such as electric scalding) during the surgery, average weight of the drape package (kg), feeling of nursing staff (comfort level of use: very comfortable, general, not comfortable, self evaluation by nursing staff), and average time consumption of surgical drape spreading (min). In addition, the use of antibiotics, duration of operation (min), intraoperative irrigation (ml), length of stay (day), readmission rate within 1 month after operation (%), and hospitalization cost ($) were compared between the two groups.

2.6. Data Analysis.
SPSS 26.0 was used for statistical analysis, a P-value of <0.05 was considered statistically significant. The mean ± standard deviation ($\overline{X} \pm$ SD), median (M), quartile range (QR), frequency, or rate was used for the statistical description. Student's t-test, Wilcoxon test, ANOVA, LSD, Kruskal–Wallis H test, chi-square test (χ^2),

rank sum test, or Fisher's test was used for statistical inference.

2.7. Ethical Approval and Informed Consent.
Ethics approval was obtained from the Biomedical Research Ethics Committee of West China Hospital of Sichuan University on 7 July 2022 (No. 2022–874), and written consent was obtained from every participant. The study was registered at the Chinese Clinical Trail Registry (ChiCTR2200064240) on October 1, 2022. The full study protocol can be accessed at https://www.chictr.org.cn/edit.aspx?pid=169802&htm=4.

3. Results

3.1. Patient Characteristics.
A total of 400 patients were finally included and analyzed in this study, 200 in the study group and 200 in the control group (Figure 6). There were 103 males and 97 females in the study group, with an average age of 48.2 ± 5.7 years. There were 107 males and 93 females in the control group, with an average age of 47.2 ± 6.2 years. There were no statistically significant differences in the clinical data of the two groups, such as body mass index (BMI), diagnosis, number of people in the operating room, number of medical staff on the operating table, operation time, and amount of intraoperative flushing fluid ($P > 0.05$), as shown in Table 1.

3.2. Comparison of the Application Effect of Long-Fiber Polyester Surgical Drapes and Conventional Cotton Surgical Drapes in the Sterile Operation Interface of Surgical Critical Area.
Compared with cotton surgical drapes, the long-fiber polyester surgical drapes had some advantages, the difference was statistically significant ($P < 0.05$). Of which the rate of SSI within one week after surgery, the number and rate of wet surgical drapes, the drop number of surgical instruments from surgical drapes surface, number of skin scald in surgical patients, the average time consumption of surgical drape spreading (min), readmission rate within one month after surgery were all reduced, and the average weight of the drape package (kg) was lighter, while the water absorption performance and the comfort level of use evaluated by the nursing staff were superior. Other comparative items, such as number of skin scald in surgical patients (n), length of stay (day), and hospitalization cost ($) were not statistically significant ($P > 0.05$) (Table 2).

3.3. Comparison of the Use and Disinfection Cost of Different Surgical Drapes.
As shown in Table 3, although the initial cost of long fiber polyester surgical drapes was higher than cotton cloth and disposable nonwoven fabric cloth, the average total cost per use was the lowest, thus providing a cost-effective advantage.

4. Discussion

4.1. Long Fiber Polyester Surgical Drapes is Safer for Patients and Surgical Personnel due to the Better Resistance to Liquid Penetration.
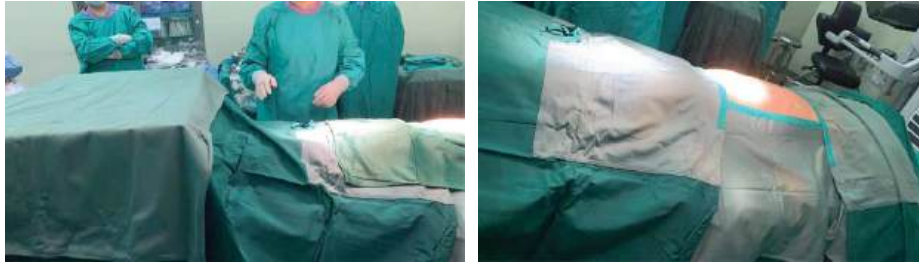As illustrated in Table 2, compared with cotton
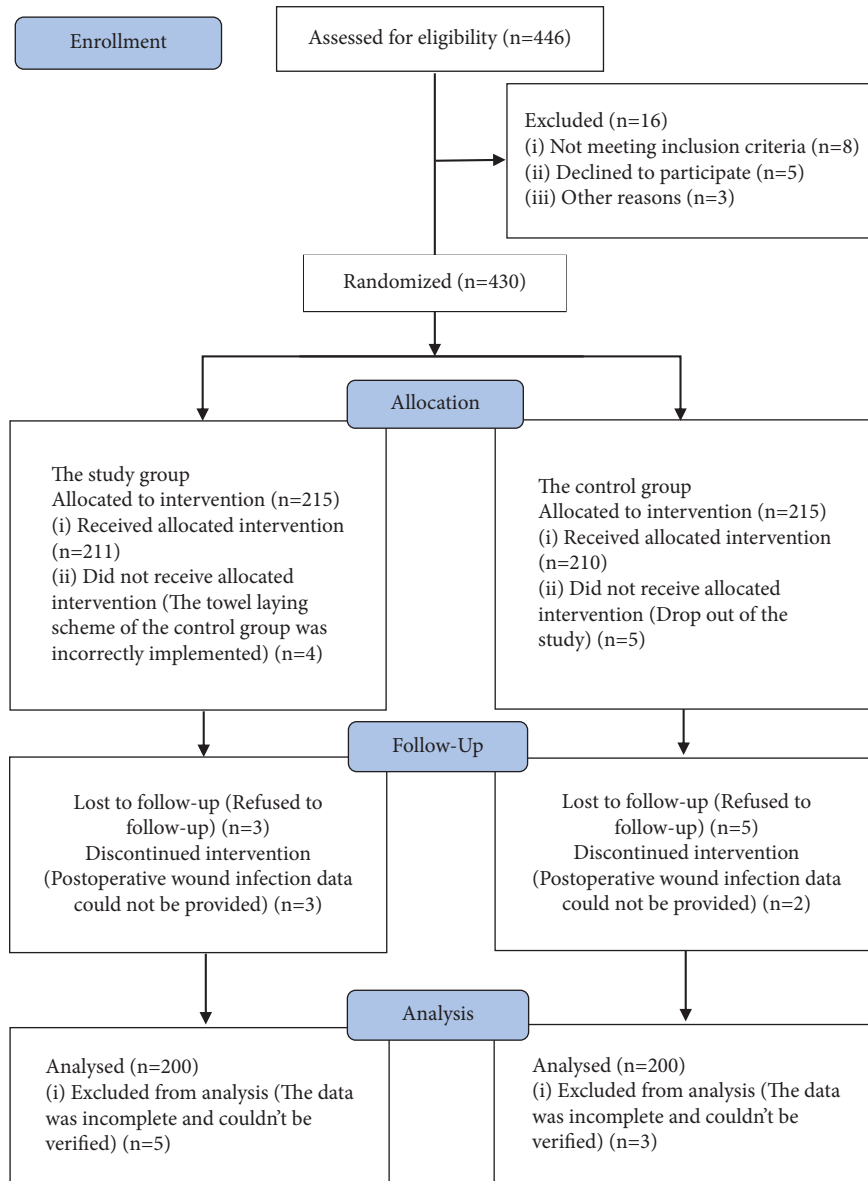
FIGURE 5: Diagram of laying surgical drapes.

FIGURE 6: CONSORT 2010 flow diagram.

surgical cloth, the long fiber polyester surgical drapes had the advantages ($P < 0.05$), which is safer for patients and surgical personnel due to the better resistance to liquid penetration. There were 5 cases of SSI that occurred within one week after surgery in the study group, while it was 16 cases in the control group, rate of SSI within one week after surgery was lower in the long fiber polyester surgical drapes group (2.5% vs. 8.0%, $\chi^2 = 6.081$, $P = 0.014$). Because of its special structure and material properties, the long fiber polyester surgical drapes was made by the high-density weaving

Table 1: Comparison of clinical data between the two groups ($N = 400$).

Comparative items	The study group ($n = 200$)	The control group ($n = 200$)	Statistical value	P value
Gender (n)	Male (107), female (93)	Male (102), female (98)	$\chi^2 = 0.251$	0.617
Average age (years) ($\overline{X} \pm SD$)	65±10.5	63±11.2	$t = 1.842$	0.066
BMI (kg/m^2) ($\overline{X} \pm SD$)	23.42±1.28	23.51±1.15	$t = -0.74$	0.460
Diagnosis (n)	200	200	$\chi^2 = 0.16$	0.689
Kidney cancer	40	38		
Bladder cancer	57	55		
Urethral stones	43	48		
Prostate cancer	35	30		
Ureteral stricture	12	14		
Uterine prolapse	13	15		
ASA score (n)	Grade II (34), grade III (166)	Grade II (27), grade III (173)	$\chi^2 = 0.948$	0.33
The number of people in the operating room ($\overline{X} \pm SD$)	9±1.2	9±1.5	$t = 0.00$	1.000
The number of medical staff on the operating table ($\overline{X} \pm SD$)	5±1.5	5±2.3	$t = 0.00$	1.000
Duration of operation (min) ($\overline{X} \pm SD$)	135±45	142±53	$t = -1.424$	0.155
Amount of intraoperative flushing fluid (ml) ($\overline{X} \pm SD$)	1455±185	1462±152	$t = -0.413$	0.680
Intraoperative bleeding (ml) ($\overline{X} \pm SD$)	126±25	122±28	$t = 1.507$	0.133
Time of preoperative antibiotic use (min) ($\overline{X} \pm SD$)	16±6.0	17±5.0	$t = -1.811$	0.071

Table 2: Comparison of two groups of surgical drapes in the prevention of adverse events in patients undergoing surgery ($N = 400$).

Comparative items	The study group ($n = 200$)	The control group ($n = 200$)	Statistical value	P value
Rate of surgical site infections within one week after surgery (n, %)	5 (2.5%)	16 (8.0%)	$\chi^2 = 6.081$	0.014
The number and rate of wet surgical drapes (n, %)	5 (2.5%)	75 (37.5%)	$\chi^2 = 76.562$	<0.001
Water absorption performance (g/m²) ($\overline{X} \pm SD$)	835 ± 15.8	225 ± 21.0	$t = 328.261$	<0.001
The drop number of surgical instruments from surgical drapes surface (n, %)	15 (7.5%)	34 (17.0%)	$\chi^2 = 8.396$	0.004
Number of skin scald in surgical patients (n)	0	1		Fisher $P = 1.0$
Average weight of the drape package (kg) ($\overline{X} \pm SD$)	3.5 ± 1.6	4.6 ± 1.3	$t = -7.546$	<0.001
The feeling of nursing staff (n, %)	Comfort level of use: very comfortable (135, 67.5%) general (43, 21.5%) not comfortable (22, 11.0%)	Comfort level of use: very comfortable (104, 52.0%) general (65, 32.5%) not comfortable (31, 15.5%)	$\chi^2 = 9.99$	0.002
The average time consumption of surgical drape spreading (min)	9.3 ± 1.5	9.8 ± 1.8	$t = -3.018$	0.003
Length of stay (day) ($\overline{X} \pm SD$)	6.5 ± 1.3	6.7 ± 1.2	$t = -1.599$	0.111
Readmission rate within 1 month after surgery (n, %)	2 (1.0%)	12 (6.0%)	$\chi^2 = 7.402$	0.007
Hospitalization cost ($)	1105.5 ± 112.5	1112.2 ± 121.3	$t = -0.573$	0.567

TABLE 3: Comparison of the use and disinfection cost of different surgical drapes.

Texture of material	Initial cost (dollar/pack)	Useable times	Laundry cost	Packing and sterilization (dollar/time)	Total cost per use (dollar/time)
Cotton	11.86–14.83 ($)	20 times	0.26 dollar/piece	0.08 ($)	0.96–1.09 ($)
Long fiber polyester fiber	59.32 ($)	100 times	0.16 dollar/piece	0.08 ($)	0.83 ($)
Disposable non-woven fabric	2.97–11.86 ($)	1 time	Waste disposal 1.34 dollar/kg (0.42 kg/piece)		3.53–12.43 ($)

method with warp and weft densities of approximately 150–170 and 100 roots/share, respectively [26], which has good water resistance, excellent hydrostatic pressure resistance (the average hydrostatic test index of the long-fiber polyester drapes was $86.52 \pm 0.62 \, \text{N/m}^2$, which was higher than that of the cotton fabric group ($11.53 \pm 0.53 \, \text{N/m}^2$) ($P < 0.001$) [24], and good antipermeability (approximately 10 times that of cotton surgical towels) [19]. Consequently, it can effectively block bacteria and dust particles from the environment into the incision of surgical patients. In addition, because the long fiber polyester surgical drapes have strong toughness, the surface has a certain antisplashing performance, the moist gas and water in the air will not condense and remain on the fiber surface of the material, and there is no water in the gap between fiber bundles, so it is difficult to form bacterial pathways inside and outside the material, resulting in bacteria inhibition [27]. These functions and characteristics enable the long-fiber polyester drapes to form a good microbial barrier.

Prior studies showed that skin bacterial contamination at the surgical site is correlated with incision infection [25, 28]. More than 20% of skin bacteria exist in skin hair follicles and sweat glands, and local skin disinfectants cannot completely remove these bacteria. Surgical drapes are used to prevent the resident bacteria in the skin hair follicles and sweat glands from entering the surgical incision and minimize the contamination by microorganisms [29]. One of the basic principles of the American Association of Operating Room Nurses (AORNs) guidelines for aseptic surgical techniques is to cover the patient's surgical site and necessary medical instruments during surgery with aseptic surgical towels [30]. The Chinese State Food and Drug Administration implemented special requirements for surgical sheets in August 2020, and industry standards for surgical drapes, gowns, and clean clothes for patients, medical staff, and instruments have been developed [31]. They have all emphasized that good surgical drapes can effectively prevent microbial contamination of the surgical site. Traditional cotton surgical drapes have the advantages of good adhesion, drapability, and reusability [32]. However, there are many hydroxyl groups (OH) in the molecular structure of the cotton fiber, which have polarity and easily absorb water molecules and bacterial liquid. Meanwhile, its macromolecular structure is easily hydrolyzed and releases more nutrients to promote the mass growth and reproduction of microorganisms [33]. In contrast to cotton surgical drapes, a study reported [27] that long-fiber polyester surgical drapes have reached the fourth-grade protection standard and have the characteristics of excellent hydrophobicity, good air permeability, and they have a good protective effect against bacterial contamination in surgical incisions compared with cotton drapes [20], which is conducive to the prevention and control of SSI.

In addition, due to the good barrier liquid penetration function of the long fiber polyester surgical drapes, so as to effectively reduce the rate of wet surgical drapes (835 ± 15.8 vs. 225 ± 21.0, $t = 328.261$, $P < 0.001$), thus reducing the penetration of bacteria, viruses, and other microorganisms in the wet environment and because of the liquid penetration bring away the patient heat to reduce the patient's body temperature, which can effectively reduce the rate of SSI within one week after surgery (2.5% VS 8.0%, $\chi^2 = 6.081$, $P = 0.014$) and readmission rate within one month after operation (1.0% VS 6.0%, $\chi^2 = 7.402$, $P = 0.007$). The flushing fluid can carry the patient's blood and body fluids, which soaked patients, surgery clothes, and bed units, thereby increasing the risk of cross-infection. In our study, the penetration rate of long-fiber polyester surgical drapes was significantly lower than that of cotton surgical drapes (2.5% VS 37.5%, $\chi^2 = 76.562$, $P < 0.001$). Yu et al. [34] study showed that the use of long-fiber polyester surgical drapes was superior to cotton cloth in reducing the incidence of hypothermia and the postoperative infection rate of patients. A study illustrated that compared with traditional cotton surgical drapes, long-fiber polyester surgical drapes can significantly reduce the rate of dressing wetting in emergency cesarean and maternal heat loss [21]. Liquid blocking protection helps prevent hypothermia, further preventing the occurrence of postoperative incision infection.

Surgical drapes are applied throughout the surgical process to ensure the safety of patients and medical staff and avoid cross-infection [35, 36]. The quality of surgical drapes will directly or indirectly affect the risk of infection [37]. China's GB/T19633 final sterilized medical device packaging [38, 39] and YY/T0698 final sterilized medical device packaging material [40] have specific requirements for the performance of medical packaging materials: (1) the material itself should not have floc; (2) materials in dry and wet conditions should have the ability to block microbial penetration; (3) the material should have certain air permeability; (4) the pH value of the material after treatment is neutral, and there should be no chemical residue and fluorescence. Long fiber polyester cloth has the characteristics of waterproof, breathable, high strength, and no floc production, which meet the above-mentioned specifications and requirements [27]. The results of our study confirmed that long-fiber polyester surgical drapes have a better barrier effect on bacteria in the same operating environment and mode. In addition, triple-layer surgical drapes were used in the critical zones to meet various desired objectives: the

outer layer was designed to resist abrasion and puncture, the middle layer provided exceptional barrier resistance to fluid penetration, and the soft bottom layer added comfort in addition to another layer of protection [41]. A study has shown that storage of long-fiber polyester surgical drapes at an appropriate temperature has a longer validity period than cotton surgical drapes [42]. Chen et al. [43] study showed that cotton surgical drapes were prone to droop in the process of laying surgical drapes but increased the number of dust particles in the air, while long fiber polyester surgical drapes had the characteristics of being smooth and soft, having a high filtration rate, effectively controlling SSI, which was similar to the results of our study. This proved that long-fiber polyester surgical cloths are more suitable for surgery.

4.2. Using Long Polyester Fiber Surgical Drapes Can Improve the Efficiency and Cost Effect of Surgical Towel Placement. The long fiber polyester surgical drapes were used, the drop number of surgical instruments from surgical drapes surface (7.5% VS 17.0%, $\chi^2 = 8.396$, $P = 0.004$), number of skin scald in surgical patients (0 VS 1, Fisher $P = 1.0$), and the average time consumption of surgical drape spreading (min) (0 VS 1, Fisher $P = 1.0$) were all reduced, and the average weight of the drape package (kg) was lighter (3.5 ± 1.6 VS 4.6 ± 1.3, $t = -7.546$, $P < 0.001$), while the water absorption performance and the comfort level of use evaluated by the nursing staff (67.5% VS 52.0%, $\chi^2 = 9.99$, $P = 0.002$) were superior (Tables 2 and 3). Whether disposable or reusable of surgical drapes, is considered a protective barrier to prevent infection from spreading. The selection of disposable or reusable drapes should be based on the protection performance, environmental impact, and economics [13]. Long fiber polyester drapes can be used repeatedly more than 100 times [44], and the environmental benefits of using reusable drapes due to their reprocessing ability enable minimization of the quantity of clinical waste, which can achieve substantial cost savings both in terms of incineration and is essential to maintain a stock of single-use materials [45]. Although the initial cost of long fiber polyester surgical drapes was higher than cotton cloth and disposable nonwoven fabric cloth, the average total cost per use was the lowest (0.83 VS 0.96–1.09, dollars), which can be reused repeatedly to reduce the cost of hospital use and post-treatment, thus providing a cost-effective advantage. In addition, the long fiber polyester surgical drapes were used can reduce the number of towels spreading layers, improve the fixation method, simplify the drape spreading steps on the premise of following the principle of sterility, save the time of drape spreading, save human and material resources to a certain extent, and improve work efficiency [46, 47].

Meanwhile, a conductive carbon fiber is inserted into the long-fiber polyester drapes every approximately 0.5 cm so that it has the high antistatic ability. Besides, the elimination of static electricity on the surface of the material can prevent static electricity from absorbing suspended dust and foreign matter in the air and ensure the clean surface of the surgical drapes [48]. In our study, there was no skin scald of surgical

patients in the long fiber polyester surgical drapes group, but in the cotton cloth group, because the electric knife was placed on the surgical drapes, the surgeon mistakenly activated the electric knife, leading to the skin scald of one surgical patient. The reason for the analysis is mainly the doctor's careless wrong operation, followed by the long fiber polyester cloth due to the addition of conductive fiber in the fiber layer of the cloth, has electrical conductivity and antistatic effect, while cotton cloth does not have these functions, especially under the wet condition is easier to conduct electricity, the cotton cloth surgical drapes is relatively less safe for patients. On the other hand, the surface of long fiber polyester surgical drapes has a special design of coarse grain small squares (Figure 3), resulting in uneven material surface, friction coefficient increases, so it has a certain degree of nonslip, can effectively prevent slipping of the surgical instruments on the drape surface, thus the drop rate of surgical instruments from surgical drapes surface was decreased in the study group (7.5% VS 17.0%, $\chi^2 = 8.396$, $P = 0.004$). They all proved that the long-fiber polyester drapes was more safer to be used.

Under the condition of the same protective effect, the number of the layer was reduced, so the weight of long fiber polyester surgical drapes was lighter than that of cotton cloth surgical drapes, which was convenient for surgical personnel to lay towel and reduced the work burden of the surgical personnel. Besides, surgical care staff prefers to use long polyester fiber surgical drapes because of their antifluid penetration and air permeability, the surgical nursing staff self-rated comfort of use was very comfortable at 67.5% VS 52.0% ($\chi^2 = 9.99$, $P = 0.002$). To sum up, it shows that long fiber polyester fiber surgical drapes have advantages: safety, convenience, economy, and comfort.

4.3. Limitations. There are some limitations in our study: (1) this study was conducted in a tertiary hospital and a surgical department, thus the extrapolation of its conclusions is limited. The reference of this study's results should be based on the cultural and economic conditions of each hospital. (2) Because bacterial sampling and analysis at surgical incisions were not performed and bacterial species at surgical incisions were not analyzed, only the incidence of SSI during the first week after surgery was analyzed in this study, failing to conduct an in-depth exploration of the research results. In the future, it is necessary to conduct a bacterial community analysis of samples around the incision to further explore the bacteria-blocking effect of different surgical towels and the protective effect on patients and surgical staff.

4.4. Implications for Nursing Management. Laundry and sterilization processes lead to the destruction of the single-layer drape structure and enhance its pore size, followed by barrier index reduction. While the long fiber polyester cloth was superior to conventional cotton cloth in water absorption, preventing device slip and preventing patients from burning, and which has a stronger antipenetration ability of microorganisms and forms an effective protective barrier to ensure the sterility of surgical drapes, and its cost

effect is superior. Operating room nursing managers can introduce long fiber polyester drapes into the selection of medical textiles to construct aseptic surgical barriers and prevent SSI, and it is important to surgical staff and patients to reduce the cross-infection, providing a better surgical towel scheme, rationally selecting medical wrapping cloths, and reducing surgery-related medical costs.

5. Conclusions

Compared with cotton fabric, long-fiber polyester fabric has a stronger antipenetration ability of microorganisms and forms an effective protective barrier to ensure the sterility of surgical drapes. It also has strong hygroscopicity, and its special design can prevent the occurrence of adverse events such as sliding of surface instruments and burns of patients, can effectively ensure the safety of patients and medical staff in the process of surgery. In addition, its cost effect is superior. Therefore, long-fiber polyester surgical drapes are more suitable for clinical use and can be used repeatedly with good application prospects.

Data Availability

The data used to support the study are available from the corresponding author upon request. The data are not publicly available because of privacy or ethical restrictions.

Ethical Approval

Ethics approval was obtained from the Biomedical Research Ethics Committee of West China Hospital of Sichuan University on 7 July 2022 (No. 2022-874), and written consent was obtained from every participant.

Consent

Not Applicable.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

CQ L designed the study, collected the data, analyzed and interpreted the data, and drafted and revised the manuscript. HF. R, C. W, J. L, JJ. A, and L. T contributed to animal model construction, conducted experimental work, and helped with the data collection, analysis, and interpretation. K. L and YL. L made substantive intellectual contributions to the interpretation of the data and the drafting of the manuscript. All authors read and approved the final manuscript.

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Research Article

Nurse Leadership Development: A Qualitative Study of the Dutch Excellent Care Program

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Aims. To understand how nurses perceived the contributions of the Dutch Excellent Care Program, the development of nurses' leadership, and their ability to positively influence their work environment. *Background.* Research shows that the nursing work environment influences job satisfaction, retention, and quality of care. Many countries have created programs such as the Excellent Care Program to improve nurses' leadership and facilitate a positive work environment. *Methods.* A descriptive qualitative study based on 17 semistructured group interviews (participants $N = 52$) and directed content analysis using thematic coding. *Results.* Four program processes contribute to leadership development: (1) nurses taking responsibility for their knowledge and skills development; (2) strengthening organizational structures to improve nursing governance; (3) challenging the status quo with quality-enhancing projects; and (4) enhancing awareness of the supportive role of the nurse manager. *Conclusions.* The program supported nurses' leadership development for a positive work environment. The interrelatedness of the four processes enhanced the nurses' ability to solve day-to-day problems and challenge the status quo that influenced working practices. *Implications for Nursing Management.* The findings support making improvements to healthcare organizational strategies to encourage nurses to show leadership in their work environment.

1. Introduction

Many countries face difficulties in attracting and retaining nurses [1–4]. Previous studies have indicated the vital role of the work environment in retaining staff [5–8]. The literature shows that improving the work environment results not only in higher job satisfaction and nurse retention but also in better quality of care and patient outcomes [5, 9, 10]. In contrast, staff shortages negatively influence care quality [8, 11] and create a less healthy workforce suffering from psychological (e.g., emotional exhaustion) and physical problems (e.g., heart disease and diabetes) [10, 12].

Thus, it is imperative for healthcare organizations to have a positive work environment (e.g. healthy, supportive, and stimulating). A positive work environment is defined as the inner setting of the organization in which employees

work and is the result of respect and trust between employees at all levels, getting recognition for good work, getting support from management, effective collaboration and communication, a safe climate, and a healthy workplace [13, 14]. Although several studies have measured the nurses' work environment [15], research is sparse on how nurses not in designated leadership positions can influence their environment.

Nurse leadership appears crucial to creating a positive work environment [5–8, 14]. According to Wei et al. [8], leadership and the work environment are interdependent. Cummings et al. [16] state that leadership helps nurses ameliorate their work environment. Several authors mention healthcare organizations putting emphasis on improving nurse leadership [17, 18] and investing in leadership development [19] to improve the work environment and nursing practices. Many countries have enhancement programs such as "Magnet Recognition" [20] which is used in many countries (e.g., Australia, Canada, China, Saudi Arabia, Belgium, and the United States) and "Healthy Workplace, Healthy You" [21]. Most programs focus on designated leadership positions, that is, nurse executives and managers [8, 22–25]. Often, they focus on transformational leadership in management [16, 17, 26]. However, nurses not in designated leadership positions (i.e., bedside nurses) also exhibit leadership in practice. This is often described as "clinical nurse leadership" [27–30]. Clinical nurse leaders are able to *"display their beliefs and values related to the quality of care and they interact with patients in a "hands-on" fashion, living out their values in the delivery of clinical interventions"* [29]. In their review, Mianda and Voce [28] illustrate the qualities of clinical nurse leaders and their impact on standards of care. The qualities include their ability to promote change, communicate effectively, and gain support to influence others, as well as their role modeling, approachability and availability to support, advise, and guide. In addition, as Uhl-Bien et al. [31] point out, *"leadership is a collective process flowing through networked interactions", instead of "only a management function occurring in formal leadership roles and hierarchical structures"*. Therefore, supporting, developing, and stimulating leadership of nurses not in designated positions deserves attention both in practice and in science [31].

The Excellent Care Program (ECP) focuses on nurses working directly in patient care, not in management positions [32]. Developed by the Dutch Nurses Association (V&VN), the ECP aims to help Dutch healthcare organizations create a positive work environment by developing nurses' leadership (Box 1). Between 2009 and 2020, 28 healthcare organizations participated in the ECP, beginning with baseline measurements of (1) nurses' perception of their work environment, (2) organizational structures, and (3) nurse-sensitive patient outcomes [33].

Following the baseline measurements, the organizations received the results of the measurements and recommendations to create a plan for improving the nurses' ability to develop their work environment (see e.g., in [34]). During this process, the Dutch Nurses Association supported the healthcare organization and facilitated an ECP-learning community.

Because ECP has never been studied in terms of nurse leadership, it is not clear if it contributes in any way to the development of nurse leadership. This study aims to fill the gap in the literature by describing how the ECP, according to nurses, contributes to the development of leadership and the ability to influence their work environment.

2. Methods

Applying a descriptive qualitative study design [35], we collected data in semistructured group interviews. Group interviews are suitable for exploring a research area as they elicit similar types of information from each participant [36] and give all the participants the opportunity to respond to each other's statements and thus establish a shared opinion. Hence, engagement in the discussions is crucial [37]. We used the COREQ (consolidated criteria for reporting qualitative research) checklist to report methods and findings in this study [38].

2.1. Setting. All organizations involved in the ECP were invited to participate ($N = 28$). After four weeks, nonresponding organizations received a reminder by email and were contacted by phone. Organizations willing to participate (17/28) were included in the study (Table 1). Reasons for nonparticipation were as follows: all members steering the local ECP were no longer employed (5); there was no time (2); and an organizational merger or financial hardship caused a stop to the ECP (4).

2.2. Sample. Interview participants were selected through purposeful sampling based on a predefined set of inclusion and exclusion criteria. Participants were included if they (1) had an overview of the local ECP and implementation progress; (2) were familiar with nurses' views and experiences of the local ECP; or (3) had close experience with the program. Participants were excluded if they were not involved in the ECP. The organizations invited participants in person or by email, as they knew best who was involved. We asked them to select a heterogenous group of (1) nurses responsible for the local ECP (ECP managers, assistants, expert panel members, and/or members of the nursing advisory board); (2) nurses with different levels of education (vocational degree, bachelor's degree, and master's degree) working at the bedside [39]; (3) nurse managers or directors involved in the ECP (unit managers, staff managers, or nurse directors); and (4) nurses working in other functions (researchers, HR advisers, trainers, or policy advisers) (Table 2).

2.3. Data Collection. Referring to the literature, we developed with the whole research team an interview guide (Appendix A) that included organizational factors [6], the "Essentials of Magnetism" [40], and various leadership styles [16]. Two researchers (EdK and KJ or PB) held the first three interviews, which allowed us to evaluate the interview process, the role of the interviewer, and the interview guide. The results provided guidance for further data collection and

The Excellent Care Program is a model comprising three pillars (Figure 1): Each pillar addresses a number of aspects important to a positive nurses' work environment (Figure 1) [14, 40]. All pillars can be measured by a validated questionnaire [60–63].

The program starts with a baseline measurement of the healthcare organization. After receiving the outcome of the baseline measurements and recommendations, an organization develops an action plan for creating a positive nurses' work environment. The organizations could use workshops, lectures, and interventions in various themes especially those developed by the Dutch Nurses Association. In addition, healthcare organizations develop their own interventions based on the outcomes to start working on different themes themselves. After 2-3 years, organizations often measure the effects of their developmental efforts. Bloemhof et al. [34] provide a nice example of the way an organization that took the ECP approach went about its work.

The Dutch Nurses Association facilitates a network for participating organizations. Conferences and meetings are organized to share experiences with interventions and postbaseline measurements. An online platform ensures that ECP organizations can ask each other questions and share solutions. ECP organizations can also rely on the support of employees of the Dutch Nurses Association throughout the program.

Box 1: Description of the Excellent Care Program.
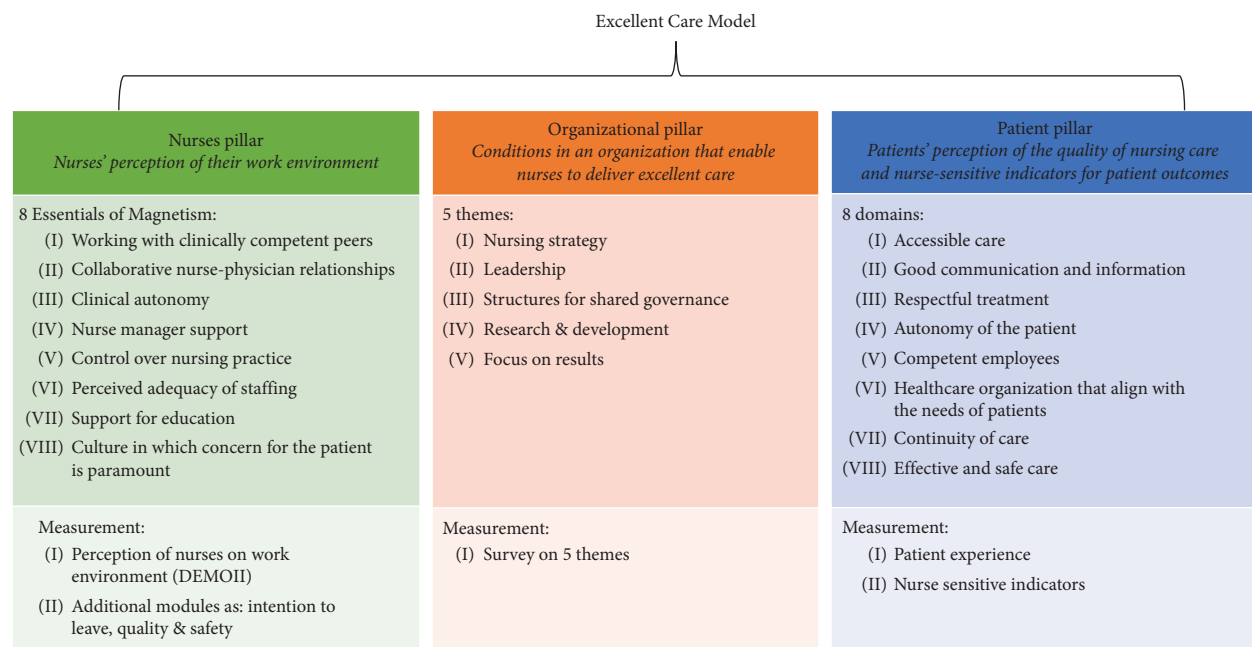
Figure 1: The excellent care model.

Table 1: Demographics of healthcare organizations.

	Organization	Environment	Nurses	Start of Excellent Care Program (ECP)
1	Hospital 1	Urban	1349	2016
2	Hospital 2	Urban	1618	2015
3	Hospital 3	Urban	737	2010
4	Hospital 4	Urban	1043	2010
5	Hospital 5	Urban	763	2016
6	Hospital 6	Urban	1034	2010
7	Hospital 7	Urban	290	2011
8	Hospital 8	Urban	625	2010
9	Long-term care organization 1	Rural	2208	2009
10	Long-term care organization 2	Rural	958	2015
11	Long-term care organization 3	Rural	135	2010
12	Long-term care organization 4	Rural	452	2011
13	Long-term care organization 5	Rural	42	2010
14	Psychiatric organization 1	Urban	157	2016
15	Psychiatric organization 2	Rural	210	2013
16	Psychiatric organization 3	Urban	347	2010
17	Rehabilitation center	Urban	98	2016

TABLE 2: Demographics of participants.

Participants (position at start of the ECP)	N	Participants (current position)	N	Responsibility during the ECP				
				ECP manager/assistant/expert panel	N	Member nursing advisory board	N	
Bedside nurse	23	Bedside nurse	14	ECP manager	15	Member	15	
Nurse practitioner	4	Nurse practitioner	4	ECP assistant	4	Vice president	4	
Nurse assistant	1	Nurse assistant	1	Member expert panel	5	President	8	
Unit manager	8	Unit manager	8					
Staff manager	7	Staff manager	8					
Policy adviser	6	Policy adviser	12					
HR adviser	1	HR adviser	1					
Trainer	1	Trainer	1					
Program manager	1	Nurse director	1					
		Program manager	1					
		Researcher	1					
	52		52			24		27

analysis. One researcher (EdK) held the other 14 interviews. All 17 group interviews consisting of 2–7 participants lasted 60–90 minutes and were held at each healthcare organization. The interviews were audio-recorded and transcribed verbatim. One participant from each organization did a member check of the transcripts. Field notes describing the setting and the observations and thoughts of the researcher were also added to the transcripts to reflect and prevent biases and support memory recollection. Data saturation was reached after 15 interviews.

2.4. Data Analysis. We used the thematic coding steps of Braun and Clark [41] to conceptualize collected data, exposing every single sentence, and observation. We began familiarizing ourselves with the data by reading and rereading the transcripts (EdK and KJ). Two researchers (EdK and KJ) independently generated initial codes from the transcripts and discussed these up to consensus with and between researchers (EdK, KJ, and AW). We aimed to formulate codes in the same context as the transcripts to stay closely linked to the data (an inductive approach). Next, two researchers (EdK and KJ) refined the initial coding list by adding new codes or reconstructing existing codes. After this, three researchers (EdK, KJ, and AW) discussed and reconciled coding differences. Next, the codes were merged into clusters and defined in themes and subthemes, still aiming to stay strongly linked to the data. Finally, the researchers (EdK, KJ, and AW) interrogated the themes in-depth and reflected critically on their interrelationships [42]. To ensure rigor and enrich data interpretation, we analyzed the field notes in the same way. Data analysis was conducted in Dutch, using Atlas.ti version 8.2.0 software (ATLAS.ti [43]).

2.5. Ethical Considerations. Prior to the semistructured group interviews, participants were informed by letter about the research aim, the voluntary nature of the study, their right to withdraw at any moment, and the confidentiality of the collected data. Before the semistructured group interviews began, participants signed an informed consent form. The Medical Research Ethics Committee of the University Medical Center Utrecht (number 19–183) approved the study. Data were stored according to the Dutch General Data Protection Regulation.

3. Results

The ECP baseline measurements gave organizations and nurses insight into perceived characteristics of a positive environment, such as clinically competent peers, clinical autonomy, and control over nursing practice and nursing strategy. This information fed discussions between nurses and management about the baseline outcomes and subsequent recommendations that emphasized the need for ongoing development of a positive work environment. The ECP provided a framework for this. Each organization used its outcomes and recommendations to make an individual plan to enhance nurses' leadership skills to enable them to improve their work environment. Nurses worked on this plan with colleagues, including managers of policy departments (e.g., quality and safety and human resources). Despite individual differences in the plans, four common processes were perceived that, according to the participants, contributed to the development of nurse leadership. We describe these four processes in the following sections:

3.1. Taking on Responsibility for Continuous Knowledge and Skill Development. Continuous knowledge and skill development was seen as the most important factor contributing to the leadership that would allow nurses to initiate change, make decisions, and deploy strategies to improve their work environment. Nurses realized that if they wanted to have control over their work environment, they needed the necessary knowledge and skills. They also recognized that if they wanted to focus on gaining knowledge and skills, they would have to take the ongoing development in their own hands. Basing their conclusions on the outcomes of the baseline measurements, management often acknowledged that nursing education should receive more attention in their organizations. They also recognized they could support nurses in organizing this.

Most ECP organizations (11/17) began investing in continuous knowledge and skill development, establishing education and training programs. Team-level education mainly gave nurses information about occupational-specific topics related to nursing practices (e.g., nutritional deficiency risks or palliative care). Organizational-level programs, often conducted by in-house training units or professional training institutes, were deployed to refresh and update nurses on clinical reasoning, guideline development, and communication skills. Clinical leadership was observed in both nursing teams and multidisciplinary group meetings.

Our analysis showed that improving evidence-based practice knowledge and clinical reasoning skills was regarded as the most essential component in developing nurse leadership. According to participants, better knowledge and skills enabled nurses to conduct better conversations on the balance between adhering to standardized procedures versus deviating from them to benefit care quality, for example. Gaining this competence taught nurses how to change practices by challenging the status quo to benefit the patient:

"We'd agreed to enter the alarm score three times a day for all patients. Last week I heard from a doctor that a nurse had wondered if this was necessary for a certain patient category. The doctor thought so because it was the set rule. Pointing to the literature, the nurse backed up her claim that it wasn't needed for this patient category. She discussed it with her nursing colleagues and ultimately the protocol was adjusted."

(RN, researcher and ECP manager, hospital).

3.2. Strengthen Organizational Structures to Improve Nursing Governance.

ECP baseline measurements enabled organizations to improve nursing governance. Also, the nurses' increased knowledge and skills helped them see their impact on relevant topics, such as e-health solutions, infection prevention, and on-the-job learning. In most organizations, participants felt that nurse involvement in nursing topics deserved more attention. One member of the ECP expert panel noted, "*Nurses were often talked about instead of with.*" These insights made nurses realize they had to show leadership and strengthen their governance to have a greater influence on their work environment. According to the nurses, improving their position increased their professional autonomy and influence:

"If we want to say something about [patients' length of stay], we'll make sure that we have our say. We will not necessarily discuss it with the board of directors [. . .]. We'll do it informally through our network or we'll find another way to ensure that we get our message across."

(RN, nursing policy adviser, hospital).

Existing structures were reinforced and/or new ones were established in nursing governance, such as nursing advisory boards, platforms, and committees. The ECP framework helped nurses address relevant topics in the governance structures and monitor whether their organizations invested in these topics (e.g., time and money for training programs or nursing research). If the nurses felt that corporate investment could be improved, they spoke up or started projects themselves to realize these topics. Nurses felt it was their responsibility to act and had the professional discretionary space to do so.

As the active participation of nurses increased in the governance structures that influenced their work environment, their visibility also increased in organizations:

"I've noticed that we're being taken more seriously. [. . .] Far more nurses are interested in our work on the nursing [advisory] board because we're getting more and more people wanting to act as key figures. I think this is because of all of those projects on the wards. Nurses want to know more about what's going on at a higher level. So, you notice that people are really busy with professionalization and thinking about how they can improve their work. I think that's an incredibly good development."

(RN, clinical nurse specialist, psychiatric organization).

Working on nursing governance structures was an incentive for nurses to build on their formal and informal networks to rally colleagues' involvement in nursing-related projects. These networks supported the exchange of knowledge, enabling nurses to share best practices and the outcomes of quality-enhancing projects and discuss such issues as retaining nurses, patient-centered quality improvement, nursing research, and education. According to the participants, nurses found these networks inspiring. They learned from each other how to show leadership in daily practice and felt supported in collaborating on nursing-related improvements.

"We achieved this through the nursing platform. It brings people together. Nurses know each other better now. You used to work only in your own department, and that was it. Now people from other departments work together on [improving the work environment and patient care]."

(RN, policy adviser and ECP manager, hospital).

3.3. Challenging the Status Quo with Quality-Enhancing Projects.

The insights into the nursing environment, knowledge and skills, and governance structures stimulated the organizations' effort to develop nurses capable of challenging the status quo. Nurses began leading small improvements on the ward level and became involved in organization-wide projects. Nurses not only identified problems; they also suggested how to solve them. For example, a nurse wanted to improve the patient handover process. Apparently, doctors were careless in completing the handover forms, which meant that nurses often had to ask them to clarify postsurgery treatment. Discussing the issue with the doctors had no effect, so this nurse took a different approach. She made a new form that required doctors to fill

in more information. This caused an uproar, and the new form was immediately abolished. But now the doctors filled in the old form properly. With this devious act, the nurse solved a longstanding problem that had caused extra work and distress for nurses unable to provide the best patient care:

"A bit deviating, yes, but sometimes you have to encourage doctors differently."

(RN, unit manager and ECP assistant, hospital).

Successful experiences with quality-enhancing projects gave nurses the confidence, motivation, and validation to continue:

"Now nurses are more concerned with their further professionalization and think more about how they can improve care. That's nice because I feel like we're constantly reinforcing each other. As an organization, we've ended up in a positive flow."

(RN, staff manager and ECP manager, psychiatric institute).

Moreover, organizations became more aware of their vital role in quality-enhancing projects. Now, policy departments (e.g., quality and safety, HR) began collaborating more with nurses, offering more support for their quality-enhancing projects, such as developing formats to help nurses initiate a project or by organizing educational meetings about project management. Hence, they facilitated nurses to take responsibility for managing improvement projects in their work environment instead of merely taking part in projects managed by the policy departments.

3.4. Becoming Aware of the Supportive Role of the Nurse Manager. Through their participation in the ECP, all 17 organizations became more aware of the supportive role of the nurse manager in the development of nurse leadership. Participants noted that nurse managers substantially influenced the preconditions of a positive work environment. They could clear budget for quality improvements, create opportunities for continuous knowledge and skills development, and support nursing collaborations throughout the organization.

"At the very least, the role of the manager is to facilitate so that their nurses can work on improving processes."

(RN, nurse and ECP manager, hospital).

For example, managers stimulated nurses to reflect on their work routines, improve work rosters, and enhance capacity management.

According to the participants, the degree to which nurses felt supported depended on the manager's confidence-building behavior. For example, involving nurses actively in decision-making processes and standing up for them in hard conversations with colleagues had a positive effect. Some participants mentioned the importance of having

a learning organization culture which allows nurses to make mistakes and learn from them.

"If you limit nurses and keep them on edge, it gets stressful for them. But if you give them space, you'll see them showing valuable qualities, which otherwise might not come up."

(Staff manager, long-term care organization).

Overcontrolling managers who do not give nurses space hindered nurse leadership. However, nurses took alternate paths when they experienced managerial obstacles. The first path sought collaboration with colleagues across departments and/or other nurse managers willing to support their aims. The second path involved experimenting with new routines or interventions that were invisible to their managers. For example, a nurse on the nephrology ward introduced a smaller glass to help patients with their fluid restriction without first discussing the change with her manager. She knew she first had to collect evidence for why implementing the new size glass would make a difference before financial constraints would stop the change (RN, manager and ECP assistant, hospital). Not being open gave nurses the space to experiment and avoided discouragement in their attempts to show leadership.

4. Discussion

In this study, we investigated how the ECP contributed to the development of nurses' leadership to improve their work environment. In the process, we assessed whether the stated intention of the ECP to stimulate leadership of nurses not in designated leadership positions was achieved [19]. In our assessment of the plans of the 17 healthcare organizations involved, we noticed that the ECP fosters four processes that influence how nurses, who are not in designated leadership positions, take on leadership in their work environment. The nurses began taking the lead on their knowledge and skill development, the nursing governance structures, and nursing-related quality-enhancing projects. Besides this, the growing awareness of the supportive role of nurse managers helped both organizations and nurses understand the preconditions needed for undesignated nurses to demonstrate leadership.

Based on our qualitative data, we cautiously conclude that the ECP contributes to nurses' leadership development to facilitate a positive work environment. We cannot compare our findings to other programs on nurse leadership, such as Magnet Recognition [20] or "Healthy Workplace, Healthy You" [21], because these programs focus on developing leadership of nurses in designated leadership positions [22–25]. However, we can compare our findings with a quasi-experimental, empirical study in one hospital that also found the ECP "positively affects the nurse work environment, job satisfaction and quality of care" [34]. In recent years, leadership of nurses not in designated leadership positions has gained interest, especially after the review by Cummings et al. [44] on nurse leadership styles,
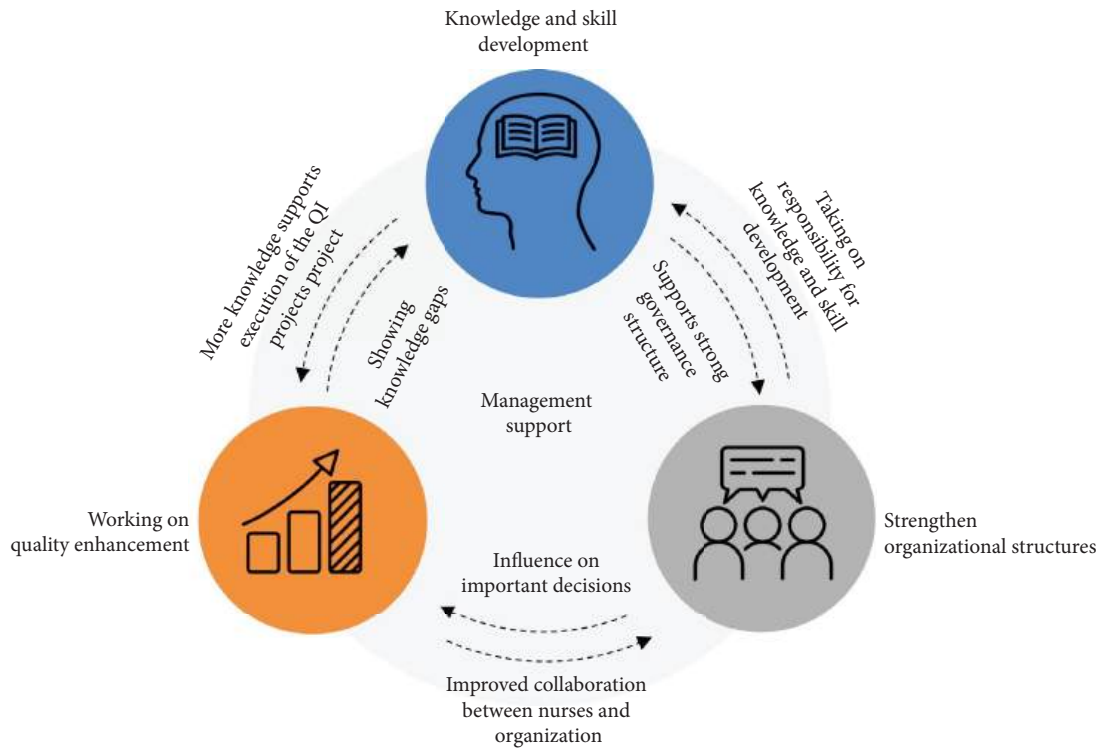
Figure 2: Interrelatedness of processes.

other stands on clinical leadership (e.g., [27, 29, 45, 46], and leadership as practice (e.g., [47–49]).

Our study adds to the literature on how nurses develop leadership competence with the ECP to benefit their work environment. Wei et al. [8] also show the relation between nurse leadership and a positive work environment. Previous research confirm the importance of single elements in the development, such as continuous knowledge and skills development [17, 26], the influence of nursing governance structures [50, 51], working on quality-enhancing projects [52], and the role of management [30, 53].

The four processes identified in this study probably strengthen each other. Figure 2 depicts their interrelatedness as a heuristic model that may need further study.

As nurses gained knowledge and skills, their understanding of the extent to which they had governance over their work environment grew and that helped them develop stronger nursing governance structures. Nurses collaborating on quality-enhancing projects revealed the gaps in their knowledge and skills so that education strategies could be adapted on the organizational level, which in turn gave impetus to their leadership in the work environment. This causality between the findings of our study shows the importance of nurse leadership as it fosters processes directed at a positive work environment [14] that are crucial for job satisfaction and retaining nurses. Keyko et al. [54] state that this leadership provides a higher level of autonomy which correlates positively with work engagement and ultimately improves patient outcomes.

Our study found the supportive role of nurse managers to be a precondition for nursing leadership. However, nurses

were not discouraged if they did not get management support. Then, they reflected on their work environment and the line between patient-centered care and organizational regulations. They took the initiative to find practical solutions, challenge set rules, and initiate quality-enhancing projects. They promoted discussion of nurse governance structures and built networks of like-minded nurses. This behavior aligns with the concepts of Gary [55] about "positive deviants" (2013), Meyerson [56] about "tempered radicals," and Bevan [57] about "healthcare rebels." All three concepts describe nurses pursuing their nursing ideals to give the best quality of care and the need for deviating behavior when organizational rules/regulations prevent this. The systematic review by Kok et al. [58] finds these interesting concepts for further study. Ethnographic studies would benefit, especially since this behavior is invisible to the rest of the organization [59]. Learning from deviating practices is harder when they are invisible, even if this behavior could have a positive effect on the nurses' work environment and patient outcomes [55, 59].

4.1. Strengths and Limitations. This is the first study to provide insights into the contribution of the ECP to nurse leadership development and its constructive effect on the nurses' work environment in Dutch healthcare organizations. The study applied a precisely transparent qualitative method. However, two limitations must be noted. First, as we did not do an effect study, we do not know if the ECP alone contributed to the positive results. Other conditions could have been beneficial, such as changes in financial support or organizational strategies. We tried to overcome

this limitation by interviewing ECP participants still working in the organization. However, an effect study on ECP outcomes could shed light on improvements to nurse leadership, retainment, job satisfaction, and care quality.

Second, at the time of the interview, some participating nurses had grown into ancillary functions or designated leadership positions, which can be seen as a result of the ECP. This may have biased the results for nurses who are not in designated leadership positions. These participants could have formed a different view of their organizations than their colleagues working only at the bedside. However, at the beginning of the ECP, most participants worked primarily as bedside nurses. Through the ECP, they took on more responsibility and their leadership might have led to their gaining these ancillary or designated functions.

5. Conclusion

According to the experiences of nurses, the ECP contributed to developing the leadership qualities by which nurses influenced their work environment. Nurses took on responsibility for (1) continuous knowledge and skills development, (2) strengthening governance structures, (3) challenging the status quo with quality-enhancing projects, and (4) becoming aware of the supportive role of the nurse manager. The interrelatedness of these processes supported leadership development and its positive effect on the work environment. Nurse leadership development can be stimulated and enhanced diversely by applying several processes at once. This study shows the particular contribution of the ECP to develop nurses who are not in designated leadership positions.

6. Implications for Nursing Management

This study shows that a program like the ECP seems useful in helping nurses and organizations create a positive work environment, providing insights into crucial aspects and shedding light on areas of concern. It stimulates nurses who are not working in designated leadership positions to show leadership and enhances collaboration in the organization [34]. Therefore, we recommend investing in developing the leadership of nurses who are not in designated leadership positions [14] to create a positive nursing environment that will also benefit staff attraction and retention [8, 10].

This study reminds nurse managers of their influential position in creating a positive environment [24, 26]. They can ensure that nurses are involved in decision-making, break down the silos in the organization, and develop structures that influence mechanisms that affect patient outcomes [24]. Knowing their strong impact, nurse managers can help nurses develop their knowledge and skills, encourage nurses to cooperate throughout the organization, and engage them in quality-enhancing projects.

Appendix

A. Interview Guide

Start of the interview:

(i) *Background questions on demographics including the function and role of the Excellent Care Program.*

Excellent Care Program experience:

(i) *What did the Excellent Care Program bring to your institution?*

(ii) *Why did your organization start the Excellent Care Program?*

(iii) *What was the work environment of nurses like before the Excellent Care Program started?*

(iv) *What did you do with your baseline measurement results in the Excellent Care Program?*

(v) *What interventions did you implement during the Excellent Care Program?*

(vi) *What was the work environment of nurses like at the end of the Excellent Care Program, after the interventions were implemented?*

(vii) *What do you think has helped your organization move toward excellent care?*

(viii) *After the Excellent Care Program ended, did the quality of care and job satisfaction for nurses improve in any way?*

Nurse leadership experience:

(i) *What do you understand by nursing leadership?*

(ii) *What are nurses doing when they show leadership?*

(iii) *What do you see happening in the organization when nurses show leadership?*

(iv) *What is your own role in promoting nurse leadership?*

(v) *What has the Excellent Care Program done in terms of nurse leadership?*

(vi) *Has the Excellent Care Program helped the organization stimulate nurse leadership?*

(vii) *Which factors do you think have contributed to the development of nurse leadership?*

(viii) *Are any factors a barrier to the development of nurse leadership?*

(ix) *What advice would you give to an organization if they want to start stimulating nurse leadership?*

Closing questions:

(i) *Have we missed asking any other questions that could help us better understand the outcome of the Excellent Care Program or the development of nurse leadership?*

(ii) *What was it like for you to take part in this interview, and do you have any questions for us?*

Data Availability

The data supporting the findings of this study are available on request from the corresponding author. The data are not publicly available because of privacy and ethical restrictions.

Consent

Informed consent was obtained from all individual participants included in the study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

EdK, KJ, and AW designed the study. EdK and KJ conducted the semistructured group interviews. PB conducted one pilot interview. EdK, KJ, and AW analyzed and interpreted the data. EdK, KJ, and AW prepared the manuscript. PB and LS commented on the manuscript. All authors approved the final version for submission.

Acknowledgments

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Research Article

Nurses' Experiences of Conflict Management at a Teaching Hospital in Namibia: A Qualitative Study

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The purpose of this study was to explore nurses' experiences of conflict management at a central hospital in Namibia. Conflict in nursing practice is inevitable and experienced regularly. Understanding how nurses experience conflict is at the centre of the successful handling of conflict, which may enhance teamwork and quality of patient care. A phenomenological transcendental (descriptive) phenomenology design was used in this study. Fifteen nurses were purposively selected at the teaching hospital and interviewed to generate data, which were analysed thematically between June and November 2021. Five themes were generated from a rigorous analysis process: understanding of conflict and conflict management; development of conflict; conflict management approaches; consequences of conflict; and in-service training. Conflict situations that nurses face during their practice may remain unresolved or inappropriately resolved if they lack the necessary education and skills in conflict management. Nursing education and continuous education on conflict management should thus be provided to all nurses to empower them to manage conflict situations, which could improve their nursing practice and quality of patient care. There is a need to strengthen conflict management education in both undergraduate and continuous education programmes for nurses.

1. Introduction

Conflict is defined as the actual or perceived opposition of needs, values, and/or interests between two or more people, which is caused by individual or organisational factors, resulting in unwanted stress, tension, or negative feelings between the disputants [1]. In conflict, there is a continuous process of disagreement and antagonism within or between social groups, including professionals [2]. A conflict can be a result of actual threats, or when people think that there is a threat to their interests [3]. When there is a conflict, there is an obvious need to manage it, especially in the context of nursing care which relies on effective team work for quality patient care.

Extant research on conflict management has largely focused on nurses in leadership and managerial positions, yet practicing nurses are typically at the centre of most conflicts in the workplace. According to Jerng et al. [4],

nurses report conflictual encounters more than any other professional, making management of nurses a challenging task. By its nature, nursing practice predisposes nurses to conflict situations that can emanate from practice differences, cultural divergences, organisational problems, distinct competencies, and a shortage of resources, among others [5–8]. In Namibia, nurses make up approximately 80% of the healthcare workforce, due to a lack of other healthcare professionals. This leaves nurses at a high risk of job stress [9]. With this burden of work, coupled with the factors mentioned above, nurses in Namibia commonly experience burnout [10]. While burnout has been reported as a potential outcome of conflict, it is also possible that nurses who are burnt out are avoiding managing conflict [11]. The situation described above suggests that conflict is ever present, unavoidable, and sometimes necessary in the practice of nursing [12, 13]. There is a particular need to focus on conflicts among staff members who are on a similar

level, as this type of conflict is likely to affect the quality of patient care more than others [14, 15]. Managing conflict is thus necessary to ensure the promotion of teamwork in patient care, as well as to enhance nurses' leadership skills [16, 17].

The experience of conflict can be positive or negative leading to a variety of outcomes [8, 13, 17]. There is evidence that some junior nurses lack conflict management skills, and when conflict is unresolved, it creates a toxic working environment with negative consequences for the quality of patient care [18–21]. On the other hand, when conflict is managed successfully, it generates a conducive working environment with good teamwork among nurses and other healthcare professionals [22].

Nurses apply different styles when managing conflict, which can result in both positive and negative outcomes [23, 24]. Some researchers suggest that avoidance is the most commonly used conflict management style [6, 18], yet others argue that avoidance is considered the least used style [8, 14]. According to Saridi et al. [12], nurses typically opt to compromise in conflict situations, while other studies reveal that although nurses do collaborate in conflict solving, there is also a tendency to accommodate [25]. There is thus no conclusive evidence regarding the conflict management styles used by nurses and their managers, making it an important area for further research. It is also critical to assess the human experience of the conflict management process, the findings of which could form the basis of better and more constructive conflict management [26].

According to Moeta and Du Rand [24], most nurse managers are competent in managing conflict, but non-managerial nurses lack this capacity; hence, they require support to improve in this regard. While all nurses globally are educated on conflict management, it is not clear to what extent it prepares junior nurses and nonmanagerial nurses [14]. In Namibia, conflict management is part of the nursing curriculum; however, as a soft skill, there is no evidence of how the development of this skill is fostered in Namibia beyond theoretical knowledge. In terms of research, conflict and conflict management are areas that have not been sufficiently explored; hence, there is a need for further studies in the context of nursing. In their study, Labrague et al. [8] asserted that practicing nurses need education and team-building activities to improve their conflict management skills, while a study by Sexton and Orchard [22] showed that training on conflict management predicts healthcare professionals' perceived ability to resolve conflicts. Similarly, Ylitörmänen et al. [27] explained that there is a need to develop nurses' conflict management skills if they are to resolve conflicts constructively.

In order to help nurses develop conflict management skills, it is necessary to explore how they experience the conflict process. People's experiences are important because they shape their perceptions and their future behaviours. By using experience as the basis for educating nurses about conflict, there is likely to be alignment in what they need and education they get. The purpose of this study was thus to explore nurses' experiences of conflict management at a central hospital in Namibia.

2. Methods

2.1. Approach and Design.
A qualitative phenomenological transcendental (descriptive) phenomenology design was used in this study. This research approach focuses on describing a phenomenon as it is lived [28, 29]. The emphasis is on describing the way in which people comprehend a phenomenon, what they experience, how they experience it, and the meaning that the phenomenon gives to their experience [30].

2.2. Sampling Strategy.
The study was carried out at a university teaching hospital in Windhoek, Namibia, which is also a referral hospital. The hospital has a bed capacity of 830 beds. It acts as a general referral hospital for the country and the main teaching hospital admitting pediatric and adult patients with medical, surgical, and maternal-related conditions. The hospital has a capacity to employ at least 1000 nurses of different categories and specialisations. The researchers assumed that all of the hospital's nurses had experienced conditions that exposed them to conflict at some point in their work environment; hence, all of them were considered eligible for the study. The researchers then purposively selected participants to generate a sample of maximum variation in terms of years of experience, gender, qualification, and department. This type of sampling was suitable because it helped the researchers to identify common and variable features of the phenomenon of conflict, as experienced by a variety of nurses in various departmental contexts [31]. The sample size was determined by data sufficiency, which was reached with 15 participants of mixed gender, age, experience, and department. Three researchers were involved in an iterative data analysis process, which allowed for an adequate interpretation of the data [32]. In reality, the size of a sample is not as important as the quality of the data collected and their ability to answer the research questions and ultimately generate meaningful interpretive themes [33].

2.3. Ethical Issues.
Ethical clearance was obtained from the University of Namibia School of the Nursing Ethics Committee and the Ministry of Health Research Ethics Committee (So NEC 07/2021 and 17/3/3 MAA), and permission to carry out the study was received from the teaching hospital. Since experiences of conflict may include sensitive issues that could personal, the researchers gave participants an option to be referred for psychosocial support if they wished so.

2.4. Data Collection Methods.
The author (MA) who was working at the hospital approached the nurses in charge of the different units to seek access to the practicing nurses. Information about the study was shared, and those who expressed an interest in participating went through the informed consent process and physically signed an informed consent form. A total of 25 nurses agreed to participate in the study, but ultimately, only 15 were interviewed because data saturation was attained. In-depth,

face-to-face individual interviews were used to collect data between June and November 2021. All the interviews were conducted in English as the participants were comfortable with the language. Each interview was tape-recorded using a voice recorder. Private rooms at the hospital were used as the venue for the interviews as they provided privacy and were quiet.

The first interview was a pilot interview, which was analysed to test the suitability of the interview guide to generate relevant data as well as to create the initial coding framework. No significant changes needed to be made to the questions in the interview guide; thus, the pilot interview was retained as part of the main data. Suggestions were made to add more probing questions to capture additional aspects of the nurses' experience of conflict management.

Subsequently, one interview after another was conducted, with each interview being transcribed and analysed by the three researchers (MA, TM, and NT) before the next interview was conducted. This was done to ensure that rich data were collected and to detect initial evidence of data saturation, which was reached at the 12th interview. Three additional interviews were conducted for confirmation of data saturation. Data sufficiency was evidenced by the participants' interviews not providing any new information that was significantly different to the data provided in previous interviews. Furthermore, the concurrent data collection and analysis enabled the researchers to detect code sufficiency, as the interviews were no longer generating any new codes. Last, the researchers' interpretation was also used to determine sufficiency, where all three researchers independently coded and interpreted the data by looking at the same interviews at different times and blindly coding the data. When there were no substantial new codes or interpretations, saturation was considered to be reached.

2.5. Data Collection Instruments and Technologies.

A semi-structured interview guide was used to guide the interviews (supplementary file 1), which was developed by the researchers based on the research objective. There were two sections: section A included questions on the participants' demographics, while section B included open-ended questions to allow the participants to express themselves as much as they could. The main question was as follows: "What were your experiences in resolving conflict situations you encountered in your workplace?"

While this was the key question, follow-up questions were asked to explore the whole structure of the experience in detail. These included the following: "What actions did you take? Explain how you reacted? What emotions were you going through? How did these emotions influence your actions or reactions in the short and long term?"

The development of these questions was guided by the literature, which was clearly lacking information regarding the experience of conflict and its management among nonmanagerial nurses.

2.6. Data Processing.

Soon after each interview, the data were transferred to the password-protected computer of one of the researchers, who then transcribed the data verbatim and shared the transcript with the other researchers. These emails were permanently deleted, and the documents were saved onto password-protected personal computers. The interviewees were named using codes that were not identifiable.

2.7. Data Analysis.

The data were analysed using content analysis. The steps of this analysis were decontextualisation, recontextualisation, categorisation, and compilation [34]. Following the verbatim transcriptions, the researchers independently read the transcripts and listened to the interviews while making notes of their general impressions. During the decontextualisation process, the researchers read the data in order to extract meaning units based on the participants' descriptions of their experiences (actions, reactions, feelings and thoughts, and changes in these over time). Based on these meaning units, the researchers generated codes that were a mixture of both the participants' exact words (manifest analysis) and the researchers' interpretations (latent analysis) [34]. In the second stage, recontextualisation, the codes were compared with the original interview transcripts to ensure that they were supported by the data. The researchers discussed their codes, which included providing explanations for how each reached their decisions. During the discussions, some new codes emerged, which were added to the existing codes.

After agreeing that the researchers had generated sufficient codes, more latent analysis was applied with a focus on uncovering the underlying meaning of the data related to the nurses' experiences of conflict (categorisation process). This process resulted in the grouping of codes based on similarities or some linkages in terms of explaining the nurses' experiences of conflict management. Further critical analysis resulted in the formation of categories and themes, which were named and explained with supporting quotations. The researchers deliberately promoted divergence throughout the data analysis process to ensure that there was a move towards analysis saturation. While the authors do not claim that meaning unit, code, category, and theme saturation were reached, some form of data sufficiency was attained, and realistic conclusions were reached based on the data (see supplementary file 2 for sample data analysis).

2.8. Trustworthiness.

The study applied Lincoln and Guba's [35] criteria for ensuring trustworthiness, i.e., credibility, confirmability, and dependability. Credibility was ensured through researcher triangulation during data analysis and member checking, while confirmability was attained by using the participants' own words to support the created themes. To ensure dependability, the Standards for Reporting Qualitative Research (SRQR) tool was used, which created an auditable trail of the methods and processes applied in this study [36]. In terms of reflexivity, one researcher was an employee at the hospital where the study was conducted, while the other two were employed at the

teaching institution. The researcher (MA) who was working with the participants collected the data; hence, it is possible that some relationships may have influenced the data collected despite the researcher's attempt to avoid this. The other two researchers may have influenced the data and analysis, and therefore the findings, during the analysis process and ultimately the writing of the findings. The authors therefore declare that the data and findings of this study are not only based on the participants' views but also on the authors' philosophical assumptions and interpretations of the data. It is impossible to entirely exclude the researchers in qualitative research, as they drive it from conceptualisation to conclusion [37, 38]. Two of the authors (TM and NT) are experienced researchers in qualitative research, with previous training in interviewing and data analysis. MA was trained in data collection before starting the data collection process, which was supervised and monitored from interview to interview.

3. Results and Discussion

3.1. Participants' Characteristics. Of the 15 participants who were interviewed, eight were female and seven were male. Of the 15 participants, 12 fell into the age group of 21 to 30; the remaining three were aged between 31 and 40. Twelve of the participants had degrees in nursing science, while three had diplomas in nursing. Each participant had work experience of at least two years.

3.2. Nurses' Experiences of Conflict Management. The findings of this study are diagrammatically presented in Figure 1. These findings are then discussed in detail below the diagram.

3.2.1. Theme 1: Understanding of Conflict and Conflict Management. This theme focused on the participants' understanding of conflict, i.e., what it is and what it means to them. While understanding conflict is not an experience, ascertaining this was important because the way someone experiences something can be influenced by their understanding of it. Therefore, in interpreting the participants' experiences of conflict, their understanding of the subject could help provide some explanation. The participants understood conflict as a misunderstanding or disagreement between two or more people who fail to agree or reach an understanding on a certain issue, who may need the assistance of a third party to resolve the matter. In these disagreements, arguments may occur which can be verbal or physical, resulting in a loss of peace and harmony within the work environment.

"*Conflict is a misunderstanding between two or more people, or it can be a misunderstanding between a group of people whereby they can't reach an agreement on something, or maybe they don't get along due to a certain problem they come across.*" (P3)

"*Well in my own understanding, conflict simply means the disagreement between, for instance, two or more parties*

with different opinions, needs or interests. Conflict can actually result into major arguments, so to say physical abuse or definitely loss of peace and harmony within the work environment; that's how I understand it." (P9)

Regarding conflict management, some participants understood it as a peace-making process that can be achieved through negotiation in a fair manner. On the other hand, some considered avoiding conflict as a way of conflict management.

"*Okay, well, I was actually prepared for any kind of reaction when I approached her so I knew she might react in a good or bad way, but then I felt I was at a position where I need to avoid unnecessary confrontations*" (P4)

This theme confirmed that the participants were knowledgeable about what conflict is. The subsequent themes described their experiences of conflict management.

3.2.2. Theme 2: Development of Conflict. The collaborative nature of nursing care predisposes nurses to the development of conflict between themselves, their managers, other healthcare professionals, patients, and relatives of patients. The nurses felt that conflict is inevitable in a nursing working environment but argued that it is not always a bad thing in the end. They stated that how one interprets the actions or motives behind another person's actions can result in conflict.

"*Conflict is unavoidable because there are situations [in which] people need to correct each other or act for the good. However not everyone will interpret the actions in a good way, hence leading into some conflict.*" (P15)

"*Conflict or disagreement will never make you feel good, but as long as you know you are doing it for a good cause….*" (P3)

"*It was very sad and emotional for me because you are being blamed for things that are totally not your fault and something that is out of your control.*" (P2)

Conflict can arise when nurses are correcting each other, as some people are unhappy when they are corrected or if someone uses a negative approach to correct them. Such disagreements, when not solved, can build momentum towards conflict. Sometimes it is not that nurses do not accept being corrected, but there is poor communication, which may lead to conflict when people either explicitly display their emotions or do so through subtle actions.

"*Okay, let me see if I can mention one that I had; it's a disagreement about drug recording. My colleague was failing to record or she was not recording the drugs that she uses on the patient and when I informed her about it, or to improve on her record keeping, she disagreed with me that she is doing her job and she is recording her things.*" (P9)
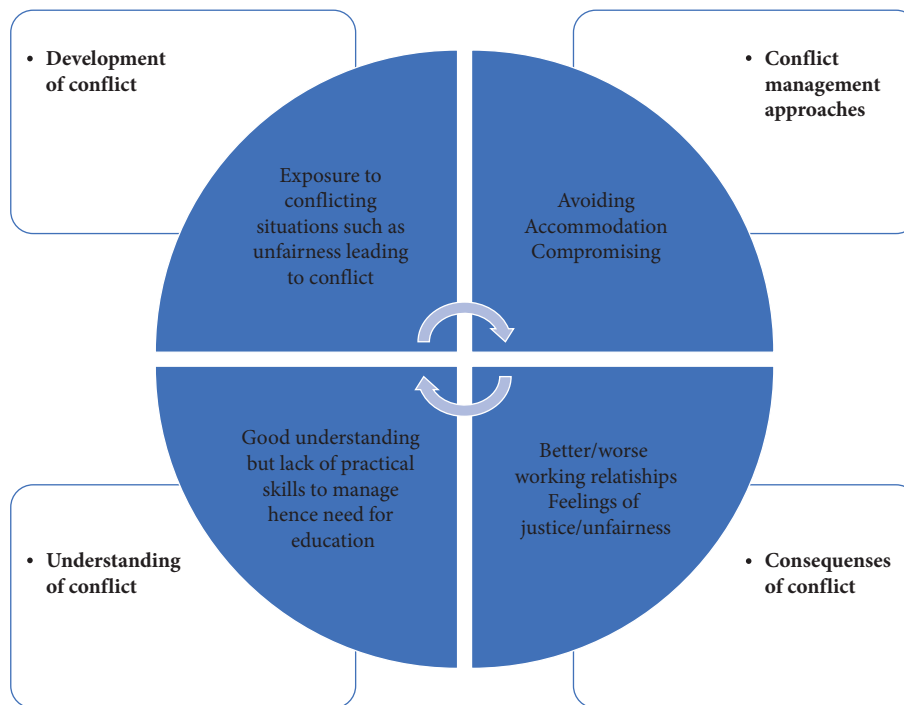
FIGURE 1: Nurses' experiences of conflict management.

"Poor communication skills of nurses lead to interpersonal conflicts, and in most cases, we are afraid to express our opinions out of fear of being condemned, so we engage in contrary actions." (P1)

Feelings of being treated unfairly and a lack of transparency can make those who are excluded from certain activities or decision-making feel bitter and be silently conflictual. As reported in the excerpt below, the aggrieved party started to act in negative ways to attract attention and display their displeasure. This is an avoidance of the situation, but it attracts attention, which can result in confrontation and hence expose the conflict.

"Actually, what I have figured out. . . most causes of conflict can be maybe when people are going through something and they are not speaking out, probably, favouritism at the workplace, poor communication or selective listening, or. . . maybe poor or bad attitudes." (P12)

"So, one of the nurses I found already working there started constantly coming late to work and then when I approached her, she reacted defensively and claimed that I was made the acting matron out of favouritism." (P3)

"I had a disagreement with a co-worker over delegation; this specific co-worker felt like she was overworked or she was given too many tasks that she could not handle." (P12)

3.2.3. *Theme 3: Conflict Management Approaches.* The nurses' experiences of conflict management revealed that a range of approaches can be applied to deal with conflict, including avoiding it and confrontation. When avoiding

conflict, some nurses do not see the issue as not being important, but they would rather avoid talking about it, so they stop talking to the person they consider has wronged them, and the other person does not do anything in return.

"I remember I had a conflict with one of my colleagues and it's kind of brought hatred, whereby the person stopped talking to me just because I made the off duty the way he didn't want the off duty to be made, regardless of whatever reason that I gave." (P15)

One nurse's experience demonstrated an accommodating way of dealing with conflict. By listening to why one nurse was always late, it made her understand the situation better but did not necessarily solve the problem.

"In my conflict situation I asked her how I could assist her improving maybe her time managing, so she actually calmed down and told me that she doesn't have a nanny at home so she was actually getting late with regards to kids' preparation for school and so forth." (P4)

There seems to be an understanding among some nurses that conflict can be solved through compromises, where both parties have to take some responsibility for the problem.

"You have to compromise; you have to listen to other parties and you both parties have to compromise; to come to one conscience whereby you agree." (P13)

"Yes, well, the conflict was resolved as we all came to an agreement or a conclusion; we just came to an adjustment

that we were both wrong since we were both supposed to be responsible in this case." (10)

Other conflict management circumstances had the nurses failing to resolve a conflict as each side wanted to be a winner and disregarded the interests of the other side. There was a denial of responsibility regarding the cause of the conflict, with the blame being pushed towards the other side. In cases where third parties were involved, one nurse viewed them as biased. Such conflict management processes created bad situations and left some nurses disappointed and feeling a sense of injustice.

"There was one colleague of mine that was not really happy with the off duty, she felt like some people are favoured and she is overworked, so it was not easy; it was really bad and we had a fight; that is one of the conflicts I was involved in." (P1)

"In most of the conflicts that I was involved in, I wasn't at fault; I am just trying to do what is right to be done, so I don't really feel bad about it because you know at the end of the day it is just work-related things–I do my job at work." (P10)

In some situations, the parties involved felt they were respected and given an opportunity to talk to each other and explain their sides of the story regarding the conflicting matters. The participants described their feelings as good and positive and said that they were satisfied with the conflict resolution process.

"She let everyone of us to talk; she was really not taking sides, she listened attentively and she was trying to rule out or to figure out where the problem really came from. The other thing she was also not interrupting between our conversations, she made sure that everyone had a say and everyone had to explain what really happened." (P1)

"When we started the conflict management process I felt good; I was feeling positive because of the fact that we were all willing to listen to each other, we were all willing to find a solution that can work for both of us." (P12)

However, in some cases, the conflicting parties felt the process was unfair because the negotiator took sides. While in the long run the conflict was resolved, having a negative experience during the process could discourage participants from engaging other parties to solve conflicts.

"It was a bit disappointing; somehow, we also thought that the management were siding with our superiors so we felt like we were not being heard. It wasn't an easy experience throughout the process. . . but luckily in the end we reached consensus and we agreed upon one thing. It felt better and we are good now." (P13)

3.2.4. Theme 4: Consequences of Conflict.

The nurses had experienced both negative and positive outcomes with conflict management. In cases where the resolution process went smoothly, the parties felt good and motivated to engage in dealing with the conflict. However, in some circumstances, the conflict management process resulted in hatred, leaving the parties in a worse working relationship than before.

"I actually felt bad because I personally don't like to be in conflict; I don't like to be involved in conflict because it's also emotionally draining but it is part of life. We encounter conflict almost on daily basis." (P15)

"You find that you get in a conflict despite you being right, the person will hate you or you find that somebody will love you for correcting them or for bringing up something, but in my experience it's really a harsh one." (P13)

The experiences of the nurses suggested that conflict is unavoidable. When conflict occurs and is resolved appropriately, however, it can culminate in new and better ways of understanding work and improved working relationships. The nurses' experiences suggested that when a common understanding exists, some causes of conflict such as supportive supervision can lead to improved quality of work.

"My experience is to say, I can say conflict is not always something to fear. . . it is not really always a bad thing because when resolved properly it can lead to better ideas; you know better understanding or even better working relationships." (P5)

"She improved, I showed changes, she kept up her recording and if you remind her she does not get angry like she used to do before, meaning she understood why we have to do our record keeping and record our drugs." (P3)

Some nurses experienced conflict as an opportunity to get to know each other in terms of how one thinks or feels about different situations; it is only through understanding others that good relationships can develop. Although this should happen in better ways than conflict, sometimes it takes conflict for it to happen.

"It is very good to have disagreement in order for you to understand the ground of another person and the views of another person, because this gives you also the opportunity to open up and talk to the person openly about how you feel about a situation that you don't like." (P13)

3.2.5. Theme 5: In-Service Training.

Conflict experienced by nurses is rooted in the nursing care activities and how these are handled among the nurses. Participants in this study suggested that there is a need for training on aspects of managing emotions such as anger, as well as education on carrying out nursing activities such as delegation. Conflict management should be part of the nursing education, they argued, not only at school but in the workplace. The approach to conflict management education should include role plays showing the necessary steps needed to resolve conflict.

"So, for instance, let me say nurses need probably in-service training or workshops on anger management and doing tasks such as delegating effectively." (P6)

"Definitely my point. I think if it starts from school, like if there could be content about conflict management at school, and we continue with it at the workplace through in-service training." (P7)

". . .this training if it's possible maybe to be done as short role plays just on conflict or misunderstandings between two people, whereby steps are given or certain procedures are being given to sisters on how to come about and how to solve the problem." (P10)

4. Discussion

4.1. Understanding of Conflict and Conflict Management. In general, the interviews showed that the nurses had a good understanding of conflict and conflict management. However, in this qualitative study, the purpose was not to objectively quantify their knowledge but rather to use their understanding to help explain how they experience conflict and conflict management.

4.2. Development of Conflict. The way the nurses described their experiences of conflict management in this study suggests that differences in personalities and how people interpret the actions or motives of others are at the centre of conflict. It is this nature of conflict that supports the assertion that conflict is always present and inevitable in the practice of nursing [12, 13]. In addition, situations that likely evoke people's emotions or expose their weaknesses are experienced as sources of conflict. This is in line with the findings of Gi and Ki [5], who noted that differences in competency between nurses become sources of conflict. While fairness is a subjective construct, the way nurses feel about being treated fairly was reported as one of the causes of conflict in this study. For this reason, conflict management education should include understanding nurses' emotions on the matter of fairness in nursing activities and opportunities at work. These findings support the assertion by Freedman [39] that fairness, given its complicated and subjective nature, is a source of conflict. This study showed that tasks such as duty rosters, which directly affect nurses, can cause conflict if nurses are not involved in their development. According to Lee et al. [40], the high involvement of staff in work practices helps to improve relationships and reduce conflict.

4.3. Conflict Management Approaches. The literature highlights how nurses apply different conflict management styles and classifies them into different categories. The findings of this study confirm that nurses do use different conflict management styles, as presented in previous studies [8, 14]. Some of the nurses' experiences of conflict management suggest a continuum, where nurses start dealing with conflict by avoiding it before managing it through collaboration. The findings of this study have added additional details regarding nurses' use of conflict management styles; for example, avoidance was reported as the most common conflict management style [6, 18] as the nurses want to keep the peace, so they tolerate what they are not happy about. According to Leodoro et al. (2018), accommodation is another style used by some nurses.

This study demonstrated that empathy is the reason behind some nurses' use of accommodation in conflict management. One nurse described putting themselves in another person's shoes and ending up tolerating what would otherwise not be acceptable to them. These styles seem to keep the peace without solving the conflict; however, the more differences persist, the more likely there is to be confrontation. This could result in either direct competition or accommodation. Such outcomes in conflict management are similar to those reported by O'Toole et al. [41], who argued that the ways in which conflict is handled can result in conflict being managed, resolved, or transformed.

4.4. Consequences of Conflict. Nurses' experiences of conflict management in this study showed that conflict is not always solved and that the process could actually result in more conflicts. This is as per some previous studies, which have demonstrated that not all conflict is successfully resolved [23, 24]. Based on the findings of this study, it can be said that nurses' management of conflict is not based on which style to use, but it is entrenched in their experiences of encountering and dealing with conflict. By understanding the nurses' experience of the conflict process, the focus on conflict management styles should shift to understanding the underlying processes that inform the way nurses deal with conflict.

The findings in this study show than even when nurse managers act as negotiators in conflict management, the outcome is not always positive. While the need for training, as suggested by Labrague et al. [8], cannot be ignored, there are additional underlying reasons for poor conflict management than a lack of education. A root cause analysis of the contributing factors to the development and mismanagement of conflict should be conducted as a holistic approach to conflict management education, thereby controlling the outcome of the conflict management process.

4.5. In-Service Training. The findings of this study suggest that nurses need formal education on conflict and conflict management. Using strategies such as role playing can improve their knowledge and skills. This is as per Arveklev et al. [42, 43], who noted that through drama, nurses' skills in conflict management could be improved. The need for education on conflict management, especially among non-managerial nurses, was also emphasised by Moeta and Du Rand [24], while Wigert et al. [15] suggested that conflict management should be used as a learning strategy in nursing. While education alone has been shown to help improve nurses' perceptions of their ability to solve conflict [22, 27], it is not adequate if nurses continue to fail to practice fairness and competence in performing some of duties. In addition, the nurses' experiences revealed that

conflict and its management trigger emotions that are not controlled by education but emotional intelligence. A study by Hadman et al. [44] proposed that educating nursing managers about emotional intelligence could improve their conflict management skills. While emotional intelligence will not automatically improve conflict management [45], it is a tool that can be used in the constructive management of conflict. Ultimately, nurses need more education on conflict and managing conflict situations [42].

5. Conclusion

Conflict situations that nurses face during their practice may remain unresolved or inappropriately resolved if they lack the necessary education and skills to manage them. Nursing education and ongoing education on conflict management should thus be provided to all nurses to empower them to manage conflict situations..

6. Implications for Nursing Education and Practice

Nurses are prone to conflict situations due to the nature of their job, among other factors; thus, there is a need for educational interventions—both in undergraduate curricula and in continuous professional education—to foster development of their conflict management skills.

Data Availability

The data that support the findings of this study are available at reasonable request from the authors and with permission from the ethical bodies.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

TM, AMM, and NT were responsible for conceptualisation and methodology. TM, AMM, and NT were responsible for data curation and writing of the original draft. TM, AMM, and NT were responsible for investigation. TM and NT were responsible for supervision. TM was responsible for writing, reviewing, and editing.

Acknowledgments

Supplementary Materials

(1) The interview guide is attached as the supplementary file. (2) The data analysis sample shows quotations and codes generated and how codes were grouped into categories and ultimately a theme. (*Supplementary Materials*)

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Research Article

Nursing 12-Hour Shifts and Patient Incidents in Mental Health and Community Hospitals: A Longitudinal Study Using Routinely Collected Data

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Shifts of 12 hours or longer are common in nursing services within general hospital wards. Concerns have been raised about their safety, but previous research has mostly used staff-reported measures of quality and safety and has occurred in general hospital settings only. This study aims to measure the association between the use of 12+ hour shifts in nursing staff (including registered nurses, healthcare support workers or nursing assistants, and nursing associates) and the rate of patient incidents in mental health and community hospitals. This is a longitudinal study using routinely collected data from two mental health and community NHS trusts in the South of England. We accessed rosters of nursing staff and patient incident data from April 2018 to March 2021. We extracted 1,018,971 shifts and excluded those not worked by nursing staff, with a final sample of 898,143 shifts. We extracted 53,078 incidents. We only included incidents that involved patients and that occurred in wards. Our final sample consisted of 38,373 patient incidents. We linked all patient incidents and nurses' worked shifts at the ward-day level. Depending on the distribution of incident rates, we used either negative binomial mixed-effects models or Poisson mixed-effect models to investigate the association between the proportion of 12+ hour shifts and all patient incidents, violence against staff, falls, self-injury, disruptive behaviour, and medication management incidents at the ward-day level. We found a relationship between 12+ hour shifts and the incident rate. Compared to days in wards with no long shifts, increasing the proportion of long shifts was initially associated with a small increase in the overall rate of incidents, but the rate increased sharply as the proportion of long shifts was above 70%. Rates of self-injury increased more steadily as the proportion of long shifts increased. The mandatory implementation of long shifts should be discouraged.

1. Introduction

Despite concerns about its implications for patient safety and quality of care, shift work in hospital nursing remains a reality because healthcare needs to be provided 24-hour a day. Concerns arise due to shift work causing circadian disruptions among workers, leading them to experience fatigue and lower alertness and vigilance [1–4]. In a sector where decreased staff vigilance and monitoring have major implications for patient safety, [5, 6] and where workforce shortages are increasingly high [7], healthcare managers face the challenge of planning shifts in a way that is both safe and efficient.

Shift work can be organised in a variety of ways [8, 9]. However, in many countries, including in England's NHS inpatient general hospital settings, long shifts of 12 hours or longer have become the norm for nurses [10–12]. When long shifts were first introduced, the assumption was that they would save money and allow deploying the workforce more efficiently by reducing overlaps between shifts while increasing quality and safety of care. This was due to the belief that by scheduling two 12+ hour shifts instead of three 8-hour shifts, patients would benefit from increased continuity of care across 24 hours [13–15]. This shift pattern would also lead to reduced handovers, which are critical information-

passing moments where miscommunication can occur and has the potential to damage patient care [16].

After their introduction in the late 70s' in the US, 12+ hour shifts increased steadily in the UK and several other countries in Europe, but there was little if any robust evaluation of their impact [17]. It is only recently that more rigorous studies using large samples and objective roster data have started to shed light on the effect of long shifts [18]. The overall emerging picture points to a negative effect on nurses' health and well-being [19], including sickness absence [10, 11], burnout [20, 21], and intention to leave their job [22]. Far from enabling staff to perform more productively, these long shifts have also been associated with higher rates of errors and patient safety-related outcomes [12, 23, 24]. The hypothetical link between 12+ hour shifts and jeopardised patient safety is the inshift fatigue increase [2]. Since fatigue during the shift increases exponentially after the first 8 hours and accumulates over consecutive shifts [4, 25], and fatigue is linked to accidents and performance impairments [26], the consequences for patient safety could be serious. Nonetheless, most evidence around the safety of 12+ hour shifts is largely based on self-reported measures derived from surveying nurses [18]. Such evidence should not be entirely discounted, as some studies demonstrated the correlation between staff ratings of quality and safety and objective indicators [27]. However, the common method variance bias associated with subjective measures remains [28].

With the increasing availability of routinely collected data for research purposes, studies relating objective work hours to patient incidents have started to emerge. However, all these studies have considerable limitations. In one instance, incident data were aggregated at the hospital level and related to the hospital's most typical shift length [29]. The average shift length at the hospital level gives little indication of what happens to patient incidents on a daily basis, at a ward level, depending on shift patterns nurses work. Another small-sample study used objective data and focused on the number of shifts worked prior to a patient experiencing hypoglycemia [30]. However, it did not consider patient acuity or any patient characteristics in their analysis. While the association is plausible, other mechanisms due to patient acuity/characteristics cannot be discounted. A further study considered the number of staff working overtime per shift in relation to seclusion incidents in a forensic setting, but no data on staff total worked hours per shift were available [31]. Another study focused on compliance with vital sign observation protocols. It found that when healthcare assistants were working 12+ hour shifts, vital sign observations were more likely to be delayed [32]. However, a delay in completing and recording vital sign observations did not necessarily lead to incidents.

In addition, the available evidence comes from general acute care hospitals, but the effects of shift length are likely to be context-specific, and neither the uptake of 12+ hour shifts nor the impact on outcomes is known in mental health and community inpatient hospitals. Therefore, our study aimed to measure the association between the use of 12+ hour shifts on each ward-day and the rate of patient incidents in mental health and community settings.

2. Methods

This was a longitudinal study using routinely collected data from two large community and mental healthcare providers in the South of England. Community hospitals in this context are smaller hospitals that do not offer acute inpatient care or emergency services. Inpatient services in these hospitals support the rehabilitation and recovery of patients, who are often admitted after being treated in general acute care hospitals for acute episodes. The two trusts comprise 23 hospitals and sites spanning across a wide geographical area providing care to more than two million people. Because our main variable of interest was shift patterns, we focused on the 49 wards that provided inpatient care. We obtained NHS Health Research Authority approval (20/HRA/3881) and ethical approval from the University of Southampton Ethics Committee (Approval ID: 57489.A4).

We related repeated measures of shift and staffing configurations from the 49 wards and the number and type of incidents occurring on those wards on the same day. We retrospectively analysed our data for three years in total; we extracted shift patterns worked by nursing staff from the trust electronic rostering systems' from April 2018 to March 2021. By nursing staff or "nurses," we mean registered nurses (who completed a training programme approved by the Nursing and Midwifery Council, usually a three- to four-year university degree), nursing assistants (also known as healthcare support workers/healthcare assistants, who assist with hygiene, feeding, and other aspects of fundamental nursing care), and nursing associates (staff who completed a formal two-year diploma and help bridge the gap between registered nurses and assistants/support workers). In total, we extracted 1,018,971 shifts. We then selected shifts worked in inpatient wards only, and we excluded all shifts that were not worked due to sickness absence and any other leave. This resulted in a sample of 898,143 shifts.

Patient incident data were derived from the trust incident reporting system from April 2018 to March 2021, for a total of 38,373 incidents. We only included incidents that involved patients and that occurred in wards. We excluded any incidents that involved staff only or occurred outside of the ward, for example, in the car park or during patient transfer to other facilities. In the patient incident reporting system, each incident was labelled to describe its impact: no harm, low/minimal harm, moderate harm, and major harm, and we retained this information for analysis. Patient incidents had no patient identifiers, including demographics, attached to them. We collected the number of occupied beds for each day and ward from the patient admission dataset using the midnight census. By the midnight census, we mean the number of beds in each ward that are occupied at midnight.

Our primary outcome was the total number of patient incidents per ward day. We also calculated the number of incidents with any harm. We then focused on the five most recurring incidents separately: violence against staff, falls, self-injury, disruptive behaviour, and medication management incidents. We calculated the total number of each respective incident per ward day. To account for different

ward sizes, when reporting the volume of incidents, we calculated incident rates. Incident rates were calculated as the number of incidents per 1000 bed days.

Our main variable of interest was the proportion of 12+ hour shifts in each ward day. We also calculated staffing levels by dividing the total number of nursing staff by the number of occupied beds at midnight, the proportion of shifts worked by bank/agency nurses, and the proportion of shifts worked by registered nurses. All these variables were calculated at the ward-day level, and ward day was the unit of analysis.

We first conducted a descriptive analysis to determine the frequency of incidents, overall and at the ward level, to identify the five most frequently recurring incidents. We also described the distribution of 12+ hour shifts across each trust and by ward. For both incidents and shift patterns, we checked the distribution across years.

We measured the association between the proportion of long shifts and the number of patient incidents with negative binomial mixed-effects models, with the number of occupied beds as the offset. We then modelled the association between the proportion of long shifts and the number of incidents with any harm and for the most frequently occurring patient incidents (i.e., violence against staff, falls, self-injury, disruptive behaviour, and medication management incidents). Due to the absence of overdispersion (i.e., when accounting for all predictors, the variance equalled the mean), some models used Poisson mixed-effects models.

As previous research found nonlinear associations between shift patterns and outcomes [11, 33], we added quadratic and cubic terms to the models to model nonlinear effects. We used the Akaike information criterion (AIC) and Bayesian information criterion (BIC) to compare fit between models, preferring models with lower AIC/BIC. In all models, we controlled for the proportion of shifts worked by bank/agency, the proportion of shifts worked by registered nurses, and staffing levels, because these variables have been previously associated with variation inpatient outcomes [7, 34]. We also controlled for setting (physical health ward, adult mental health, and child mental health) because some incidents were more relevant to mental health settings and because incident rates were higher in children's wards. All analyses included ward as a random effect and were at the ward-day level. We checked the variance inflation factor (VIF) to ensure there was no or little (i.e., VIF <5) multicollinearity. Analyses were conducted in R 4.1.3 [35] using package lme4 [36].

3. Results

Our sample consists of 50,499 ward days. There were 38,373 patient incidents (25% incurring in no harm) occurring over 19,074 ward days, while there were no incidents in the remaining 31,425 ward days. The overall incident rate was 55.72 incidents per 1000 occupied bed days. Considering figures published at the time of the study, this is in line with the average incident rate across England in mental health and community trusts (i.e., 57.26 incidents per 1000 occupied bed days) [37]. The incident rate was higher in mental

health wards (74.62 incidents per 1000 occupied bed days) than in physical health wards (22.93 incidents per 1000 occupied bed days). The incident rate increased every year, with 46.88 incidents per 1000 bed days in year 1 (2018-19), 54.26 in year 2 (2019-20), and 68.16 in year 3 (2020-21).

There was considerable variation in the distribution of 12+ hour shifts. On average, in each ward day, 26.5% of the shifts were long shifts, and the median was 20%. There were 8,543 (17%) ward days with no long shifts, and most ward days ($n = 10,154$, 20%) used between 1 and 10% of long shifts. On 578 ward days (1%), there were only long shifts.

The use of 12+ hour shifts varied between and within wards, as shown in the box plot in Supplementary Material Figure 1.

The use of long shifts varied across mental and physical health wards (Figure 1). Shifts of 12+ hours were used more frequently in mental health children wards (mean: 60%) and physical health (mean 37%) than in mental health wards (mean: 18%). The use of 12+ hour shifts at the ward-day level increased across years. Specifically, in year 1, on average, long shifts represented 15.4% of all shifts, 20% in year 2, and 25% in year 3.

The mean proportion of shifts worked by substantive staff was 78%, while 19% and 3% of shifts were worked by bank and agency staff, respectively. The mean nursing staff-per-bed ratio was 1.52. The mean proportion of hours covered by RNs was 41%, and 58% were worked by healthcare support workers and nursing associates.

Table 1 reports the unadjusted and fully adjusted estimates for the long shift linear, squared, and cubic terms from the negative binomial and Poisson mixed-effects regressions. The full models including the covariates are available in Supplementary Material (Table S1).

We found a statistically significant association between the proportion of long shifts and patient incidents across both adjusted and unadjusted regression models. Focusing on specific incident types, we found statistically significant associations for violence against staff, self-injury, and disruptive behaviour.

Because nonlinear effects are difficult to convey based on point estimates only, we produced graphical representations from the B coefficient of the cubic term of 12-hour shifts, focusing on outcomes where one or more of the 12+ hour shift terms was statistically significant (Figure 1). We categorised the proportion of 12+ hour shifts in 10% bands.

For all outcomes, we found that high proportions (i.e., 70% or above) of 12+ hour shifts are associated with higher incident rates. For self-injury, there was evidence of a linear relationship, while for patient incidents and disruptive behaviour, the relationship was nonlinear with substantial increases only happening with high proportions (i.e., 80% or above) of 12+ hour shifts. For violence against staff, there was a different relationship, with the risk decreasing as the proportion of long shifts increases up to 80%. The lowest risk of such incidents occurs when between 60 and 70% long shifts are used at the ward-day level. Then, the relationship reverts: the risk of violence against staff increases exponentially between 80 and 100% but remains lower in comparison to ward days when no long shifts are used.
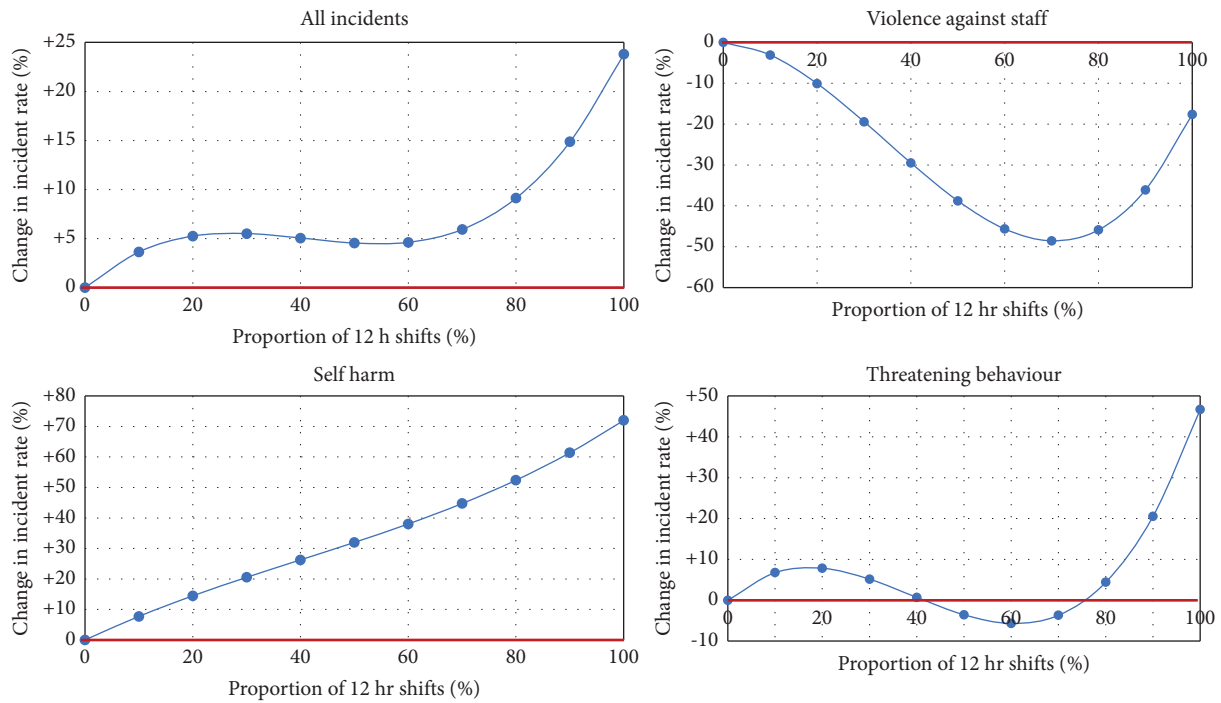
Figure 1: Risks of incidents and use of 12+ hour shifts.

Table 1: Negative binomial and Poisson mixed-effects regression coefficients for the association between 12+ hour shifts and patient incidents.

| | Negative binomial mixed-effects regressions | | | |
| | Patient incidents (unadjusted) | | Patient incidents (adjusted[‡]) | |
	B	SE	B	SE
Proportion of long shifts	0.34*	0.19	0.48*	0.20
Proportion of long shifts squared	−1.02*	0.54	−1.33*	0.57
Proportion of long shifts cubic	0.73*	0.40	1.08*	0.43
	AIC	BIC	AIC	BIC
AIC/BIC	101212.7	101265.6	100938.8	101027.1
	Patient incidents with any harm (unadjusted)		Patient incidents with any harm (adjusted[‡])	
	B	SE	B	SE
Proportion of long shifts	−0.09	0.30	0.01	0.32
Proportion of long shifts squared	0.76	0.86	0.54	0.95
Proportion of long shifts cubic	−0.47	0.64	−0.23	0.70
	AIC	BIC	AIC	BIC
	54659.9	54712.9	54609.8	54698.0
	Violence against staff (unadjusted)		Violence against staff (adjusted[‡])	
	B	SE	B	SE
Proportion of long shifts	−0.33	0.41	−0.06	0.47
Proportion of long shifts squared	−2.38	1.32	−2.74	1.54
Proportion of long shifts cubic	2.17*	0.95	2.63*	1.12
	AIC	BIC	AIC	BIC
	32452.7	32505.7	32323.0	32411.3
	Self-injury (unadjusted)		Self-injury (adjusted[‡])	
	B	SE	B	SE
Proportion of long shifts	0.77*	0.45	0.83*	0.48
Proportion of long shifts squared	−0.49	1.43	−0.66	1.54
Proportion of long shifts cubic	0.31	0.98	0.54	1.06
	AIC	BIC	AIC	BIC
	28105.2	28158.2	28007	28095.3

TABLE 1: Continued.

	Disruptive behaviour (unadjusted)		Disruptive behaviour (adjusted‡)	
	B	SE	B	SE
Proportion of long shifts	0.75	0.57	1.03*	0.55
Proportion of long shifts squared	−4*	1.82	−3.83*	1.77
Proportion of long shifts cubic	3.09*	1.24	3.27*	1.22
	AIC	BIC	AIC	BIC
	23062	23115	22879.1	22967.4
	Poisson mixed-effects regressions			
	Medication management incidents (unadjusted)		Medication management incidents (adjusted‡)	
	B	SE	B	SE
Proportion of long shifts	0.36	0.52	0.54	0.58
Proportion of long shifts squared	−0.59	1.51	−0.72	1.75
Proportion of long shifts cubic	0.12	1.22	0.13	1.41
	AIC	BIC	AIC	BIC
	21903.3	21947.5	21856.9	21936.3
	Falls (unadjusted)		Falls (adjusted‡)	
	B	SE	B	SE
Proportion of long shifts	0.23	0.55	0.19	0.56
Proportion of long shifts squared	−0.50	1.72	−0.63	1.72
Proportion of long shifts cubic	0.16	1.49	0.37	1.49
	AIC	BIC	AIC	BIC
	25211.8	25256.0	25207.4	25286.9

*$p < 0.05$. ‡Controlled for the number of nursing staff per bed, proportion of substantive shifts, skill-mix (registered nurses hours/registered nurses + healthcare support worker + nursing associate hours), and type of ward (physical vs. mental health).

We conducted additional sensitivity analyses. Since testing for interactions between the proportion of long shifts as cubic terms and setting meant the model did not converge, we did a sensitivity analysis with children and mental health settings only, and we found that the relationships did not differ from those derived from models with three settings in.

Since the incidence rate of violence against staff was considerably higher in one ward (i.e., mean incident rate = 409 vs. mean incident rate across other wards = 18), likely due to different reporting practices and a patient population substantially different from other wards, we excluded this ward for total incidents and violence against staff. Adverse effects of very high and very low proportions of 12-hour shifts were eliminated in the sensitivity analysis. B coefficients and standard errors from the negative binomial mixed-effects models and a graph to display associations are attached in Supplementary Material (Table S2 and Figure S2).

4. Discussion

To our knowledge, this was the first longitudinal study using nursing shift and patient incident data derived from hospital systems to measure the association between the use of long shifts and the risk rate of patient incidents in mental health and community inpatient settings. After controlling for relevant variables that could influence the patient incident rate, we found that using long shifts at a ward-day level is significantly associated with the rate of patient incidents. Variation in the use of long shifts was also associated with three specific incident types, namely, violence against staff,

self-injury, and patients displaying disruptive behaviour. We did not find statistically significant associations for falls or medicines management incidents.

Higher proportions of long shifts were associated with higher incident rates for all incident types, with the highest risk when 12+ hour shifts represented 70–100% of the shifts on a ward day. While previous studies found that the association between long shifts and other outcomes is not linear [11, 33], these nonlinear relationships with incidents linked to the daily proportion of 12+ hour shifts on a ward were not observed before. It is nonetheless consistent with the hypothesised mechanism that high proportions of long shifts lead to higher staff fatigue, and this in turn leads to higher patient incident rates [2, 25].

For two incident types (i.e., violence against staff and disruptive behaviour), we found that a proportion of between 20 and 70% of long shifts was associated with a lower incident rate. These mixed patterns may permit staff to work the shift of their choice, where those most able to tolerate long shifts choose to work this shift pattern, adapting to it. Nonetheless, the adverse effects of long shifts cannot be eliminated, and we found negative consequences on patient safety when all shifts in a ward are 12 hours or longer. This finding has also been observed in relation to sickness absence when entire wards were moved to 12+ hour shifts [10]; however, it has never been observed in relation to patient incidents. While the degree of choice and self-selection might be likely mechanisms underlying the association between long shifts and some patient incidents, our current data do not allow us to test this.

Our results indicate that associations for different outcomes differ, suggesting that aggregating all incidents together might have hidden diverse effects. Using high proportions of long shifts at a ward-day level was also associated with an increase in the risk of disruptive behaviour from patients. While patient acuity is likely to be the main determinant of these types of incidents, decreased staff vigilance due to higher fatigue resulting from working long shifts [4, 25] might also play a role. Future studies that indirectly monitor inshift fatigue could shed light into this hypothesised mechanism [38].

4.1. Limitations. Across years, both the incident rate and the proportion of long shifts increased, meaning that it is impossible to rule out that any association between incidents and the proportion of long shifts is simply a result of changes in incident rates over time.

A further limitation is that the study was conducted in two trusts. Although these were large trusts made up of several hospitals dispersed over a wide geographical area in England, the results might not generalise to other hospitals in other geographical locations or other inpatient settings. In addition, we included diverse patient populations, which influenced the variation in incident rates, although our sensitivity analyses reassure us that the association between 12+ hour shifts was not influenced by the ward setting and underlying patient population.

In addition, there is much debate in the literature around the appropriateness of using incident reporting data due to dubious quality in the reporting and variation in staff attitudes towards incident reporting [39, 40]. While this limitation cannot be easily addressed, and the real incident rate is difficult to estimate, incident reports from hospital systems remain the most widely used measure of patient safety when using routinely collected data. In recent years, incident reporting has become standard practice in many healthcare settings [41]. Moreover, we did not collect any data relating to the nursing staff's experiences of shift work and quality of work as perceived by them, including whether they had access to any hospital-wide interventions to support their fatigue and psychological wellbeing. There is evidence that such interventions can improve workforce wellbeing and performance [42].

5. Conclusions

The consequences of patient incidents such as self-injury and disruptive behaviour are serious [43], and using high proportions of long shifts is associated with higher risk rates of such incidents in mental health and community hospitals. While giving staff choice and flexibility over their shift patterns might lead to lower incident rates for violence against staff and disruptive behaviour, all benefits appear to be lost when wards run with 12+ hour shifts only. Nurse managers and those in charge of creating rotas for nursing staff should avoid implementing 12+ hour shifts as a blanket intervention for all staff. Further studies are needed to shed light on whether staff choice acts as a moderator between shift length and patient incidents.

Data Availability

The data are available from the corresponding author upon request.

Disclosure

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Acknowledgments

Supplementary Materials

Figure S1 reports the use of long shifts at the ward level. Table S1 reports the full outputs of negative binomials mixed-effects and Poisson regressions for the association between 12+ hour shifts and patient incidents. Table S2 reports the outputs of negative binomial mixed-effects regressions for the association between 12+ hour shifts and patient incidents, sensitivity analyses excluding outlier ward. Figure S2 reports the sensitivity analysis, associations between the proportion of 12+ hour shifts and all incidents and violence against staff. All specific items of Supplementary Material have been referenced at appropriate points within the manuscript. (*Supplementary Materials*)

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Research Article

Nursing Workforce Retention in Rural Ghana: The Predictive Role of Satisfaction, Rural Fit, and Resilience

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Introduction. High turnover of nurses in rural healthcare settings contributes to challenges in healthcare delivery. Various incentive packages have been introduced in rural healthcare settings to curb this phenomenon, but the canker still exists. The study aimed at assessing the predictive role of job satisfaction, rural fit, and resilience on nurses' retention in rural Ghana. *Materials and Methods.* A multicentre cross-sectional design was adopted to collect data from 462 nurses. Analysis through descriptive statistics, one-way ANOVA, Pearson moment product correlation, and multiple regression was done. *Results.* There was low resilience and rural fit among nurses with higher turnover intention, which was predicted by average daily attendance ($\beta = 0.108$), rural fit ($\beta = -0.144$), resilience ($\beta = -0.350$), satisfaction with prospects ($\beta = -0.187$), and satisfaction with prospect and pay ($\beta = -0.171$) at the significance of 0.05. *Conclusion.* Policymakers can be assured that not just improving financial incentives to nurses, but the integration of nurses to rural settings, commensurate workload and improving pay and prospects for professional growth and resilience are needed for rural retention. Implications for nursing management, nurse managers, and policymakers have a role to develop sustainable strategies to integrate rural fit, resilience, and job satisfaction to help reduce turnover among nurses.

1. Introduction

Human resources for health care are among the six pillars of the health system. Health systems can significantly be effective when there is a satisfactory health workforce, thus, the key to improving health service coverage and outcomes, although multifaceted, depends on the adequacy and skill mix of the workforce [1].

Globally, there is an increasing worry about human resource shortages in rural healthcare settings, especially, in low- and middle-income countries (LMICs) with Sub-Saharan Africa (SSA) experiencing the severest form. The capacity of the health workforce in these regions is insufficient to meet the population's health objectives [2]. The health system is confronted with health workforce shortages, and this disparity is an important limitation in realizing the health-related sustainable development goals (SDGs) [3]. Meanwhile, the need for more

workforce is projected to significantly go up due to multiple factors: adolescent-related challenges, ageing of the current generation, changing distribution of diseases, high incidence of noncommunicable diseases (NCDs) resulting from a sedentary lifestyle, overpopulation, and high pace of the technology-induced world [4]. The strain on the workforce is imminent if the challenges on the workforce are not addressed, and therefore, plans are needed for the management of human resources in the health sector [5].

In the interim, there has been an estimated shortage of nine million nurses, and this figure is projected to increase further by two million by 2030 with a disproportionate effect on the SSA [6]. Moreover, the problem of the low number of nurses in rural areas is further aggravated by absenteeism, with its glitches of shortages, skill mix disparities, and unfair distribution [7], increased turnover [8], inadequate specialised knowledge-base of some providers [9], and poor work environment [10].

The uneven human resource distribution in rural areas is the foremost problem that is most noticeable in the nursing workforce which is considered the linchpin of the health system responsible for providing the bulk of healthcare services to its clients [11].

The major contributor to this shortage is workforce turnover; which is expressed as the percentage of the workforce that has stopped their job. Park and Yu [12] highlight the multidimensional factors that impact the turnover of nurses in rural health facilities. Turnover is noted to have a significant impact on the health system, as an average of $37,000 to $67,000 is paid for replacements [13] while retention minimizes financial costs and boosts good patient outcomes [14].

Nurses' turnover intentions are influenced by so many factors [15]. The COVID-19 pandemic has worsened the situation as a result of increased migration due to the global shortfall. There is a range of reported cases of job dissatisfaction, challenges to patient and workforce safety, burnout, and unfavourable scheduling in rural settings [16] with regions with low densities of workforce producing the worst health outcomes [17].

The challenge of retaining nurses in rural areas of Ghana still poses a challenge [18]. To improve the status of overworked nurses and patient outcomes, effective execution of human resource management methods is required [19]. Though many strategies [20] have been instituted in the past to address the problem of workforce disfavouring in rural areas in Ghana, there are still challenges to the rural retention of nurses. The study, therefore, assessed the predictive role of job satisfaction, rural fit, and resilience on nursing workforce retention in rural areas.

2. Materials and Methods

2.1. Design. A cross-sectional descriptive survey was employed to determine factors that predict nursing workforce retention in rural healthcare settings in Ghana.

2.2. Study Setting. The study was conducted in selected facilities in the Ashanti region, a region which lies in the middle belt of Ghana. According to the 2014 Demographic Health Survey conducted by the Ghana Health Service (GHS), almost half of the inhabitants reside in rural areas [21]. The region has 530 facilities, comprising government (170), mission (71), private (281), and quasi-government (8) facilities, with 48.7% of the facilities found in rural districts. It has a nursing workforce of 11,412, with about half in rural districts [22]. A district is considered rural and deprived if it lacks basic amenities for its populace, has low-performing health indicators and human resource retention, and is also difficult to reach through transportation and Internet connectivity. Out of the 43 districts in the region, fourteen (14) have a rural population exceeding the urban population and, therefore, classified as rural [21].

2.3. Study Population. The population included registered nurses (RNs)—general nurses and specialist nurses in rural healthcare facilities. All RNs with permanent postings to their facility were included in the study while RNs who had not worked for at least 6 months at the present post were excluded. The data collection was carried out between May and August 2022.

2.4. Sampling and Sample Size. Based on Slovin's formula, a total of 571 RNs was estimated, using a margin of error of 4% and a confidence level of 95% and recruited for the study [23]. The participants were sampled through a multistage sampling approach. Five districts out of the 14 rural districts were selected randomly once they satisfied the criteria for the classification in the region. A simple random sampling was done to select five health facilities from each of the five selected districts (25 facilities overall). A proportionate stratified sampling approach based on the numerical strength of the nursing workforce of the 25 facilities was done. Convenience sampling was used in recruiting the participants throughout the 25 facilities by the researchers.

2.5. Measures. Sense of Community Index II, the Brief Resilience Scale, three subscales of the Measure of Job Satisfaction Scale, and the Turnover Intention scales were used to measure the variables under study.

2.5.1. Rural Fit. A 24-item Sense of Community Index II (SCI II) was used to measure the rural fit of RNs and; thus, how RNs felt about their location of work [24]. Responses for items ranged from 1 = *strongly disagree* to 5 = strongly agree on a 5-point Likert-type scale. A composite mean score of 2.5 and above indicated higher levels of rural fit. Studies have used the tool and have reported Cronbach's alpha between 0.75 and 0.85 [25]; in this study, it was 0.79.

2.5.2. Resilience. The Brief Resilience Scale (BRS), which is a 6-item self-report measure, was used to assess RNs' resilience [26]. The scale measures the ability to bounce back or recover from stress. Participants rated each item on a Likert scale of 1-Strongly disagree to 5-Strongly agree. The score is computed through the average of the six (6) items. Composite mean scores above 2.5 indicate RNs' high resilience among RNs. BRS has been used in many studies and has reported Cronbach alpha scores of 0.80 to 0.95 [27], the BRS presented a high internal consistency (Cronbach's $\alpha = 0.88$) in this study.

2.5.3. Satisfaction. The study used three subscales (satisfaction with workload (8 items), satisfaction with professional support (8 items), and satisfaction with pay and prospects (10 items)) from the Measure of Job Satisfaction scale [28]. Items were scored on a 5-point Likert scale (1 = very dissatisfied and 5 = very satisfied). A score for the scale was done by summation of individual items. Composite scores above 2.5 were considered as higher job satisfaction. The scale has been used in many studies and has reported higher reliability coefficients between 0.80 and 0.93 [29]. The internal consistency in the present study was 0.89

TABLE 1: Registered nurses' sociodemographic and professional information.

Variables	Categories	Frequencies ($N = 462$)	Percent
Age group	30 and below	307	66.5
	31–40	139	30.1
	41 and above	16	3.4
Gender	Male	108	23.4
	Female	354	76.6
Marital status	Single	267	57.8
	Married	184	39.8
	Others	11	2.4
Highest qualification	Certificate	132	28.6
	Diploma	270	58.4
	Bachelor degree	60	13.0
Unit of work	RCH unit	38	8.2
	Maternity unit	53	11.4
	Emergency unit/OPD	164	35.5
	Ward	207	44.8
Level of salary	Below $500	320	69.3
	$500–$750	139	30.1
	$750	3	0.6

(overall scale), 0.91 (satisfaction with the workload), 0.78 (satisfaction with professional support), and 0.84 (satisfaction with pay and prospects).

2.5.4. Turnover Intention.
A six-item Turnover Intention scale designed from scales by Mobley et al. [30] and Ganesan and Weitz [31] was used to measure RNs' turnover intention. The items were measured on a five-point scale; from 1 = "Strongly disagree" *to* 5 = "Strongly agree." A score above 15 indicated higher turnover intentions. The internal consistency coefficients for the scale in other studies ranged between 0.80 and 0.90 [32]. The Cronbach's alpha for the scale after the pre-test was 0.84.

2.6. Data Analysis.
The data was analysed using SPSS version 26 through descriptive and inferential statistics at a significance of 0.05. Descriptive statistics were conducted on participants' demographics. Associations between turnover intention, average patient attendance, rural fit, resilience, and RN satisfaction were analysed using Pearson's moment product correlation, while differences in turnover intention scores between certificate, diploma, and bachelor degree nurses were tested using one-way ANOVA. A multiple linear regression analysis using the standard approach was conducted to predict nurses' turnover intention in the rural setting.

2.7. Ethical Consideration.
Ethical approval was sought from the Institutional Review Board of Noguchi Memorial Institute of Medical Research (IRB-NMIMR CPN 012/21-22). Permission was obtained from the management of the selected facilities. Additionally, participants' anonymity and confidentiality were assured.

3. Results

3.1. Sociodemographic Characteristics of Participants.
A total of 462 participants responded to the scale (response rate of 80.9%). The results on socio-demographic characteristics of participants in the study showed that the majority of the participants (66.5%) were below 30 years, unmarried participants (60.2%), had a diploma (58.4%), worked at the wards (44.8%), and were paid below US$500 as a monthly salary (69.3%). Details on sociodemographic data are provided in Table 1.

3.2. Job Satisfaction, Rural Fit, Resilience, and Turnover Intentions among Nursing Workforce.
The findings on the nursing workforce's satisfaction, rural fit, resilience, and turnover intention in rural healthcare settings are presented in Table 2. The composite mean score of RN's satisfaction was 2.81, satisfaction with professional support ($n = 3.13$), satisfaction with pay and prospects ($n = 2.01$), and satisfaction with workload ($n = 3.28$). Moreover, the composite mean scores of resilience ($n = 2.33$) and rural fit ($n = 2.10$) meant "low resilience" and "low rural fit," respectively. On the extent of nursing workforce turnover intentions in rural healthcare settings, a composite mean of 2.83 indicated a high turnover intention.

3.3. Comparison of Turnover Intention among Categories of the Nursing Workforce.
A between-subjectone-way ANOVA was performed to compare the turnover intentions among nursing workforces' highest qualifications (certificate, diploma, and bachelor degrees). The results as shown in Table 3 which showed a statistically significant difference in turnover intentions ($F_{(2,459)} = 12.635$, $p < 0.001$) among the various categories of the nursing workforce in rural healthcare settings. A follow-up post hoc analysis using Tukey's HSD ($\alpha = 0.05$) showed that the nursing workforce with bachelor's degrees had higher turnover intention compared to those workforces with a certificate [MD = 3.783, $p < 0.000$] and diploma (MD = 3.704, $p < 0.000$). Although nurses with diplomas had high turnover intentions than certificate holders (MD = 0.075, $p > 0.05$), the difference was not statistically significant.

Table 2: Nursing workforces' satisfaction, rural fit, resilience, and turnover intentions.

Variables	Mean	SD
Satisfaction	2.81	0.88
Satisfaction with professional support (8 items)	3.13	0.88
Satisfaction with pay and prospects (10 items)	2.01	0.87
Satisfaction with workload (8 items)	3.28	0.88
Rural fit (24 items)	2.10	0.58
Resilience (6 items)	2.33	0.63
Turnover intentions (6 items)	2.83	0.92

3.4. Relationship between Work Characteristics, Rural Fit, Resilience, Satisfaction, and Workforce Retention in the Rural Health Setting. The Pearson product-moment correlation determining the relationship between turnover intention, average daily attendance, rural fit, resilience, and satisfaction of the RNs in the rural healthcare setting is shown in Table 4. There was a significant positive correlation between turnover intention and average daily attendance ($r = 0.131$). There was, however, a statistically significant but negative correlation between turnover intentions and resilience ($r = -0.357$), rural fit ($r = -0.168$), and satisfaction with pay and prospects ($r = -0.187$). This implies that nurses turn to quitting their job or profession when resilience is low. Similarly, inadequate rural fit and dissatisfaction with pay and prospect are linked with increased turnover intentions.

3.5. Predictive Effects of Satisfaction, Resilience, and Rural Fit on RNs' Turnover Intention in the Rural Healthcare Settings. Multiple linear regression was used to evaluate the effect of average daily attendance, satisfaction, resilience, and rural fit on nurses' turnover intention in rural settings. The result predicting turnover intention is shown in Table 5. The model was significant, predicting 21.9% of the turnover intention among RNs ($R^2 = 0.219$, $F_{(5,456)} = 25.59$, $p < 0.001$). When all variables were considered in a single model; average daily attendance by RNs ($\beta = 0.108$), rural fit ($\beta = -0.144$), resilience ($\beta = -0.350$), and satisfaction with pay and prospects ($\beta = -0.187$) remained significant predictors.

4. Discussion

The purpose of the study was to investigate the relationship between rural fit, resilience, and satisfaction of the nursing workforce on nurses' turnover intentions in rural healthcare facilities. The findings indicate that several strategies have significant correlations with subsequent rural retention. Nurses' satisfaction, rural fit, resilience, and average daily attendance of patients contribute to future rural retention, and policymakers can be confident of overcoming the challenge if these determinants are addressed.

The study findings indicated that nurses with bachelor's degrees are more likely to leave their jobs than their counterparts with diplomas and certificates, and this position is supported by Fontes et al. [33]. This may be due to inefficient communication about conditions that enhance personal fulfilment, professional success, and the delivery of high-quality nursing care. Moreover, the high workload in rural settings combined with low pay and lack of prospects for professional growth could be blamed for the phenomenon [34, 35]. Additionally, the fact that most rural hospitals have local conditions where nurses are exposed to poor working conditions and few career chances influences turnover intention [36].

Consistent with Holland et al. [37], the findings of this study posit that a perceived workload had a detrimental effect on nurses' satisfaction, with a resultant increase in turnover intention. The results show that workplace policies that prioritize the workload of nurses can reduce turnover.

In other domains, nurses believe that the combination of financially viable incentives, such as hardship allowances and free transportation are adequate to cover the opportunity costs related to working in remote locations [38]. The finding of this study indicated that satisfaction with pay and prospect by most nurses serves as a motivation to remain at the post. While the staff are encouraged to stay in rural places, it is important to prioritize higher compensation and benefits [12]. The major challenge, however, is the disregard for the WHO recommendations on rural incentives for health worker motivation in rural areas [20], which are not being implemented. Although in individual countries, there are policies for rural incentives in the form of allowances; they are either not paid or insufficiently paid [39]. Salary and allowances are two of the major elements that affect health professionals' decisions to remain in rural employment. However, overreliance on financial incentives to curtail high turnover among rural nurses may be a smokescreen as other important strategies should equally be considered [40]. Yong et al. [41] found that nurses in rural settings are not influenced to remain by financial incentives, and suggested that any monetary incentives should be targeted only to those whose decisions to practice in rural settings are persuaded by money. Increasing wages and good working conditions are significant inducements for nurses to stay in the health industry in many LMICs, raising wages in environments with limited resources has, however, been a challenge; it is therefore, critical to employ a variety of solutions to solve the shortage of nurses in LMICs [42].

Moreover, the findings of the study highlighted that nurses who find themselves rurally fit are willing to remain in the post. Graduates' likelihood of returning to practice in rural areas is increased by their rural upbringing as personnel from rural backgrounds continue to work in rural areas for a decade or more years on average after passing out [43, 44]. In a similar vein, recruiting staff for their home region has yielded a positive response, as support from family and friends has benefited them and increased retention [45]. When considering models of rural nursing retention, this finding offers additional help for understanding how the nurse is integrated into the community environment. The results highlight the significance of rurality's cultural aspects as nurses are not content with their work unless content with the rural setting. Unfortunately, people who like the leisure activities and lifestyles of urban locations are likely to have increased turnover intentions [46].

TABLE 3: Comparison of nursing workforce turnover intention in terms of the highest qualification.

		Sum of squares	df	Mean square	F	Sig
Turnover intention	Between groups	727.784	2	363.892	12.635	0.000
	Within groups	13219.169	459	28.800		

Post hoc analysis					
Variable	(*I*) highest qualification	(*J*) highest qualification	Mean difference (*I-J*)	Std. error	Sig
	Certificate	Diploma	−0.07593	0.56995	1.000
		Bachelor degree	−3.78333*	0.83557	0.000
Turnover intention	Diploma	Certificate	0.07593	0.56995	1.000
		Bachelor degree	−3.70741*	0.76594	0.000
	Bachelor degree	Certificate	3.78333*	0.83557	0.000
		Diploma	3.70741*	0.76594	0.000

p value <0.05.

TABLE 4: Correlation between turnover intention, average daily attendance, rural fit, resilience, and satisfaction of the nursing workforce.

Variables	1	2	3	4	5	6
(1) Turnover intention	1					
(2) Average daily attendance	0.131**	1				
(3) Rural fit	0.168**	0.014	1			
(4) Resilience	−0.357**	−0.035	−0.289**	1		
(5) Satisfaction with pay and prospects	−0.187**	−0.014	0.101*	−0.042	1	
(6) Satisfaction with workload	−0.127	−0.036*	0.328	0.163**	0.238	1
(7) Satisfaction with professional support	−0.230	0.038	0.201	0.288**	0.312*	0.025

**Correlation is significant at the 0.01 level (2-tailed). *Correlation is significant at the 0.05 level (2-tailed).

TABLE 5: Multiple linear regression model testing the relationship between rural fit, resilience, satisfaction with pay and prospect, and turnover intentions of the nursing workforce.

	B	SE	B	T	Sig
(Constant)	27.688	1.570		17.635	0.000
Average daily attendance	0.034	0.013	0.108	2.602	0.010
Rural fit	0.057	0.018	−0.144	3.190	0.002
Resilience	−0.510	0.063	−0.350	−8.059	0.000
Satisfaction with pay and prospects	−0.196	0.047	−0.187	−4.146	0.000

Model summary: $R^2 = 0.219$, $F_{(4,457)} = 25.59$, $p < 0.001$. a. Dependent variable: turnover intentions.

As a means of improving rural retention, policymakers should consider the development and implementation of the professional programme as recommended by the WHO on rural retention. Thus, nurse managers can assist nurses to advance their careers through study leave policies and flexible training schedules. Such arrangements have been successful as reported in other settings, which discovered that employment in the rural public sector was more alluring given the possibility of receiving health sponsorship or scholarships [47]. However, to encourage nurses' trust in the system of career advancement, strong adherence to the policy's implementation is required, such as establishing open procedures to end corruption in administrative promotion would inspire providers to follow this course for their professional advancement.

Constraints of rural practice, such as poor infrastructure, lack of recreational activities, limited lodging facilities, work overload, and feelings of isolation, may serve as unfavourable indicators of retention [48]. The capacity to put up with these constraints is the panacea for the retention of nurses. People with high levels of resilience can endure these constraints and make meaning out of the situation [49]. The results of this study accordingly support the idea that traits of resilience are likely to help nurses' ability to survive and remain in rural settings for long periods. These findings are significant for workforce initiatives in rural areas because they give us a foundation for understanding resilience. The idea has been suggested in the past that building resilience assists nurses to overcome burnout and lower turnover expenses [50]. On contrary, it is also likely that nurses who find it difficult to recover from work stresses may consider quitting to solve their issues. If this is the case, encouraging nurse resilience might be one tactic to reduce turnover. Additionally, a poor nurse-job fit could weaken the resilience of nurses [47]. Posting of nurses to rural areas should be done cautiously taking into account all the factors enumerated in this study to enable the retention of RNs.

5. Limitation

The cross-sectional nature of the study makes it difficult to infer causal relationships. Again, the data was all gathered by self-report, and this could have exaggerated the connections between the variables. Only part of the Measure of Job Satisfaction scale was used; this made a comparison with previous studies that used the whole scale problematic. The researchers, however, discussed the job satisfaction of RNs based on the individual subscales. Future research should consider a qualitative study to explore the nature of resilience and job satisfaction among nurses, and this can help the course of rural retention.

6. Conclusion

Though there is a growing corpus of research available on strategies to increase nurses' retention in rural settings, policymakers can be assured that not just improving financial incentives to nurses who work in rural settings, but taking into account the background of nurses, improving the prospects for professional growth, nurses' resilience, and removing obstacles connected with a longer stay in rural areas can improve nurses' retention.

6.1. Implication for Nursing Management. The retention of the rural workforce depends on activities to integrate rurality into health staff living conditions, increase nurse-job satisfaction, and build resilience. These findings give decision-makers more assurance and broaden their arsenal of potential actions to increase retention, offset significant financial and human costs and promote nurses' interests to better fit their communities. We contend that effective management of the nursing workforce, specifically through a satisfactory practice environment and the provision of organizational assistance via professional support, should be a key component in the development of a skilled nursing workforce in the healthcare industry.

Nurse managers should also come up with practical solutions to aid their nurses in blending in well with the rural environment as turnover intentions will ultimately depend on nurses' capacity to meet the demands of their work environment. Nurses succeed greatly when managers provide practical assistance, including flexible work hours, professional support, work-life balance, and support for overcoming obstacles in life. Additionally, initiatives to increase nurses' resilience, such as training programmes and cultivating a pleasant workplace culture are other successful ways to further reduce turnover intentions in rural settings. The development of healthcare policies that improve the job satisfaction of nurses (pay and prospects) and support the development of resilience and working conditions in rural settings are recommended to enhance rural integration among nurses.

Data Availability

The data are made available from the first author upon reasonable request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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Review Article

Organisational Strategies for Women Nurses to Advance in Healthcare Leadership: A Systematic Review

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Aim. We aimed to undertake a systematic review focusing on organisational strategies that specifically advance women nurses in healthcare leadership. *Background.* Despite nursing being the largest health workforce and being dominated by women, they face significant barriers in career progression and have limited leadership opportunities, with a need to move from a focus on individuals to organisational level change. *Methods.* Methods for our overarching systematic review are published and follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist. Databases searched include MEDLINE via OVID; MEDLINE in-process and other nonindexed citations via OVID; PsycINFO; and Scopus. Any study describing a strategy that was not implemented for nurses and all non-peer-reviewed studies were excluded. Included studies were appraised using CASP checklists. A thematic analysis approach was employed to facilitate the systematic generation of themes. *Results.* Findings were reported under two main themes: leadership barriers and enablers and organisational strategies for advancing women nurses to leadership. The latter included: mentorship, leadership training, career planning and coaching, opportunities for networking, sponsorship, and targeted recruitment processes for increasing gender diversity in leadership roles. *Conclusion.* This review synthesises organisational-level strategies that advance women nurses in healthcare leadership. Barriers and individual-level strategies for advancing women nurses in healthcare leadership have been extensively studied in the current literature. Systems and organisational strategies are less studied yet show that they can advance women in nursing into healthcare leadership. *Implications for Nursing Management.* This paper suggests that optimising women nurses' leadership attainment needs to shift focus from individual strategies to systemic level and organisational strategies and use tailored evidenced-based approaches.

1. Background

Nursing constitutes the largest healthcare workforce, and despite being majority women, there is an underrepresentation of women nurses in healthcare leadership [1, 2]. The global nursing workforce includes nearly 27 million nurses and midwives, or 50% of health professionals [3]. Importantly, however, there is very little representation of nurses in leadership positions. United States shows that nurses represent only 2–6% of the healthcare boards [4]. Yet nurses in leadership have been shown to offer benefits and unique perspectives in "strategic planning, critical thinking,

communication, quality and process improvement, human resources, finance, and complex problem solving" [5]. Extensive evidence demonstrates the impactful role of nurse leaders in various healthcare outcomes for patients, organisations, the nursing profession, and the wider community [6–8]. Nurses are central to achieving the Sustainable Development Goals of achieving universal health coverage for all [2, 9]. Having gender equity in nursing leadership offers benefits by breaking down gender stereotypes and demonstrating the capacity of women to lead in healthcare [1]. It can benefit organisations by increasing diversity, bringing different perspectives to the decision-making

process, and promoting greater gender equality in society at large [6, 10]. This highlights the need to explore the constraints present in the healthcare sector that hinder women nurses from participating in healthcare leadership.

Leadership is often traditionally viewed as masculine traits and values such as "agency, assertiveness, and decisiveness." The medical dominant model of healthcare leadership also disadvantages women nurses [1, 10], impacting "perceived credibility, capability, and capacity" for women nurses in leadership roles [11]. The positions of nurse leaders are typically seen as distinct from clinical roles, and leadership and management terms are used interchangeably [12]. The concept of nursing leadership is now shifting beyond the traditional authoritative style to a more collaborative and people-centred approach that encourages and empowers peers and drives change. Nursing leadership involves a more collaborative approach at different levels rather than being in silos within a physically demarcated unit. Nursing leadership is not defined by a physical landmark as a ward or unit and is not limited to the head nurse, nurse-in-charge, or director of nursing titles; it entails leadership at all levels, including clinical leadership, middle-level clinical managers, nurse executives, academic leaders, the public sector, and policy-level leaders, allowing nurses to practice to the full extent of their education and training [6, 9]. In this study context, nursing leadership entails fostering a culture of excellence that supports the best possible patient outcomes. It is about driving change, fostering collaboration, and empowering nursing professionals to thrive in a rapidly evolving healthcare landscape. Furthermore, nursing leadership is thought to be a key determinant of job satisfaction among nurses [13].

The nursing profession itself is gendered, impacting perceived value, recognition, and leadership identity. As a traditionally perceived caring role, nursing is often stereotyped as feminine work with fewer men choosing a career in nursing and with the profession itself being gendered [1]. The intersection of nursing and women gender contributes to unconscious gender bias, both leading to inequitable broader leadership opportunities in healthcare for women nurses [1, 2, 14]. In this context, the "*glass escalator*" also sees men nurses ascend the leadership ladder faster than their women counterparts [1]. An example of this can be seen in research from developed countries such as Australia where, despite making up only 9% of the nursing workforce, men represent 14% of mid-level managerial roles (e.g., nurse supervisor, nurse unit manager, or charge nurse) and 12% of policy roles [15]. The nursing workforce is also often ethnically diverse, bringing additional intersectional barriers to leadership attainment [1].

While strategies for women's career advancement have been studied, they often focus on individual fixes rather than addressing systemic organisational issues as highlighted in the Lancet special issue on *Advancing women in science, medicine, and global health* [10, 11, 16, 17]. Organisational culture is often created by men for traditional men-gendered roles, and women are expected to function and flourish on their own in a system that is not well suited to advancing women's careers [10, 18]. Organisational reform is

increasingly understood to be essential to tackling gender-related systemic issues [16, 18]. Strategies for nurses to attain leadership positions are studied and reported on without a specific gender lens [19, 20] and are studied in other healthcare disciplines, including medical disciplines and the broader healthcare sector [18, 21]. However, unique barriers and facilitators affecting women nurses and organisational-level strategies to improve women nurses' leadership are understudied. Therefore, knowing the organisational strategies and the systemic-level constraints present in the nursing profession and within an organisation will help identify remedies and resolutions to targeted problems. Exploring the organisational strategies and systemic-level barriers will help identify and guide enablers for change. These priorities were also established with the National Health and Medical Research Council (NHMRC)C project partners including large health services and nursing organisations. Stakeholders highlighted that creating conducive culture organisations can optimise empowerment of women nurses to achieve their full potential and lead in healthcare. This systematic review explores the evidence for organisational-level strategies that advance women nurses to higher leadership.

In this context, we build on a recent systematic review [21], focusing on organisational-level strategies that advance women nurses in healthcare leadership. We aim to identify evidence-based organisational strategies relevant to the nursing profession through a systematic review and narrative synthesis. We also aimed to capture documented barriers and enablers to women nurses' advancement in healthcare leadership.

What are the barriers and facilitators that are shaping the implementation of strategies?

What are the organisational-level strategies that advance women nurses in healthcare leadership?

2. Methods

Methods for our overarching systematic review are published and follow the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) checklist (Table S3 and Table S4) [22]. Databases searched include MEDLINE via OVID; MEDLINE in-process and other nonindexed citations via OVID; PsycINFO; and Scopus. Terms included leadership, OR career mobility, OR career progression, OR career advancement, AND academia, OR health services, AND female, OR women. Here, articles were included only if they (1) examine a strategy implemented for the healthcare workforce, which includes women nurses; (2) describe organisational strategies and practices; (3) report any strategy designed for women healthcare professionals, that included nurses, for advancing leadership; (4) report on a measurable outcome; and (5) were published in English between January 2000 and March 2021. We excluded all non-peer-reviewed studies and any study describing an intervention that was not implemented for nurses and not focused on leadership. Based on CASP checklists, the included studies were graded 2, 1, or 0 based on methodological rigor and

rated high, moderate, and low quality (MM and MP). No studies were excluded based on the quality. Risk of bias assessment at the study level is provided in Supplementary Table 2.

2.1. Data Extraction and Analysis.

Due to the heterogeneity of data, meta-analysis was not possible and a narrative synthesis was undertaken. Narrative synthesis summarises and explains findings by using words and text synthesis from multiple studies to understand "the effects of interventions and/or the factors shaping the implementation of interventions" [23]. The stages outlined in the Guidance on the Conduct of Narrative Synthesis in Systematic Reviews was followed for the preliminary analysis [24]. Key study data were extracted and tabulated, including author, year of publication, country, journal, methodology, population characteristics, and methods of data collection and analysis (see Supplementary Table 1). This was followed by data synthesis and analysis.

The initial analysis was performed by one of the authors (MP) and derived codes were discussed among coauthors. Initial codes were inductively identified using a data-driven process where data are not forced into a preexisting framework or researcher's analytical presumptions [25]. Types of interventions were colour coded by using highlights. Organisational strategies were extracted and Table 1 created to vote count reported organisational strategies. A code sheet was developed in Microsoft Excel. The deductive approach was used in subsequent papers and was open to capture new codes that emerged from the data. Similar codes were clustered into groups to identify potential themes. For this substudy, only studies related to nursing were extracted. Any additional codes related to nursing were extracted by MP, and a dedicated narrative synthesis was completed and confirmed with other authors (MM, BG, and HT).

3. Results

The overarching systematic review by Mousa et al. [21] identified 5517 articles for screening, with 4757 titles and abstracts screened after removing duplicates, 567 full reviews, and 91 selected studies. This substudy included six studies focused on nursing. Six studies met the eligibility criteria and were included in the review. Data were extracted on barriers and facilitators to leadership and potentially effective organisational-level strategies, and the data were reported under these themes (Figure S2). Supplementary Figure 1 shows the PRISMA flowchart for retrieved, excluded, and included papers. Across all professions, six studies met inclusion criteria in nursing leadership. Table 2 shows key results.

3.1. Description of Included Studies

3.1.1. Study Characteristics. The focus of the included studies was nurses ($n = 3$) or healthcare with nursing involvement ($n = 3$). Included studies were qualitative ($n = 3$) and mix-method ($n = 3$) studies. No quantitative studies were found. Two out of six included studies were conducted in the USA, three were from the UK, Australia, and Canada respectively, and one was an international study where participants represented 68 countries. Of the three nursing studies, one focused on early career academic nurses' barriers to advancement, the second focused on clinical mid-career nurses' leadership training, and the third investigated mentors' insight into the mentorship program. The three studies that were healthcare with nursing involvement were conducted on advancing women in global healthcare leadership, leadership development, and women Chief Executive Officer's (CEO) career inflection points.

3.1.2. Participant Characteristics. Sample sizes ranged from 12 to 405, totalling 620 participants across all studies with 90% ($n = 557$) women and 10 ($n = 63$) men. Participants included mental health nurses ($n = 24$), Chief Executive Officers (CEOs) ($n = 20$), early career nursing academics ($n = 23$), healthcare workers and healthcare leaders from 68 countries ($n = 405$), graduates from faculty leadership development program ($n = 136$), and mid-career nurses ($n = 12$).

3.2. Leadership Barriers and Enablers

3.2.1. Leadership Barriers. Barriers for women nurses to reach leadership roles were reported among early career academics, senior clinicians, and in global nursing across all levels [27, 28, 31]. The reported barriers were categorised into systemic- and individual-level barriers.

> "Women face unique barriers to advancing to positions of global health leadership compared to men." [28]

Senior clinicians experienced a glass ceiling for higher leadership roles and also noted dependence on the culture and organisational leadership [31]. Furthermore, intersections within nursing and normalisation of men leadership styles were also reported barriers for middle and lower-income countries [28]. Halcomb et al. [27] reported dearth of available leadership training and mentoring programs focusing on nurse academics. Additionally, senior women clinicians felt frustrated due to the inability to implement change, inability to take issues forward, less clarity over career pathway for management positions, and unavailability of internal leadership training [31]. In terms of global nursing leadership, lack of mentorship, gender bias, lack of women mentors, feeling less confident, and lack of assertiveness were reported among early, mid-, and senior nurses, regardless of country income level [28]. In addition, in lower- and middle-income countries, nurses experienced a lack of leadership opportunities and training, less funding and networking opportunities, higher workload, and challenges with travel requirements and safety concerns [28].

In terms of individual-level barriers, even though early career nurse academics held clinical leadership roles, they did not view themselves as leaders in their new academic roles [27]. Additionally, early career nurse academics were

TABLE 1: Core themes identified from qualitative and mix-methods studies investigating organisational strategies for women nurses' leadership development.

Organisational strategies	[26]	[27]	[28]	[29]	[30]	[31]
Mentorship		✓	✓	✓		✓
Leadership development programs/training		✓	✓	✓	✓	
Leadership opportunities		✓	✓	✓		
Sponsorships				✓		
Career planning/career coaching	✓					
Providing networking opportunities						✓
Targeted recruitment to improve women representation in leadership roles				✓		
Orientation to leadership role		✓				

perceived as less confident and less autonomous in their transitional role [27]. Furthermore, lack of assertiveness, poor understanding into teaching-learning practices, and role and expectations as academics were also reported as barriers [27]. Women nurses were also challenged with work-life balance at an individual level.

3.2.2. Leadership Enablers. Three studies reported leadership enablers [27, 29, 31]. Providing leadership opportunities at the early career stage facilitated leadership advancement [27, 29]. Having broad experiences in a variety of settings was reported as a facilitator [29]. Management training and formal training for mentors were identified as lead facilitators for senior clinical women nurses [31]. Having a professional graduate degree/leadership training/executive coaching, mentorship, sponsorship, networking, family support, career planning, and taking risks were individual factors that are positively associated with healthcare leadership advancement in women nurses [29].

3.3. Organisational Strategies for Advancing Women Nurses to Leadership. "We have largely focused on individual-level interventions to overcome (women's barriers to advancement) rather than looking at how we can change organizations, systems, and policies to better overcome these barriers. We need systemic interventions if we are going to make an impact." [28]

Systemic-level strategies rather than individual-level strategies were highlighted as key for changing organisations, systems, and policies to make an impact and overcome barriers to women's advancement to leadership [28]. Systemic strategies such as mentorship, leadership development programs, and networking opportunities were found to be potentially effective across most levels and settings [27–31].

Table 1 shows the core interventions captured in this systematic review, across mentorship, leadership development and training, sponsorship, networking opportunities, and interventions to create opportunities. Mentorship and leadership training in particular were identified across numerous studies.

3.3.1. Mentorship. Out of six included studies, four reported mentorships as a potentially effective organisational-level strategy for advancing women in healthcare leadership

[27–29, 31]. Woolnough et. al. [31] found that mentors also benefited from an organisational perspective with "increased understanding of the mentoring role, increased awareness of career barrier for female mental health nurses, improved ground-level insight in relation to nursing staff and the patient they cared for, improved professional reputation, increased networks, new insights into organisational issues, personal enjoyment and fulfilment, and desire to implement organisational change." Mentoring offered during the early career stage profoundly impacted executives' career trajectories and provided incentives for mentorships and for selectively recruiting women nurses into training programs by providing networking opportunities to women nurse leaders [28, 29].

3.3.2. Leadership Training. Four studies reported leadership training and educational strategies as potentially effective organisational-level strategies for advancing women in healthcare leadership [27–30]. Leadership training designed for women helped address women nurses' perceived lack of assertiveness [28]. Additionally, Tsoh et. al. [30] noted that leadership training went beyond covering leadership models and focused on models such as "Coro Northern California (Coro) Experiential Training," highlighting the individual, interpersonal, and institutional level impact of leadership.

Additionally, career assistance, orientation programs, shared experiences, and stories of successful senior nurse academics were reported to be supportive organisational-level strategies for early career nurse academics [27]. Donner and Wheeler [26] argued that to retain mid-career nurses, organisational-level strategies are required focusing on their personal and professional development such as providing opportunities for their career planning and structured career coaching. Executive training programs were found to be potentially effective leadership development intervention for senior clinicians [29]. The necessity for available leadership training via healthcare organisations is highlighted in some studies [27, 28].

4. Discussion

In terms of organisational strategies for advancing women nurses in healthcare leadership, mentorship, leadership training, leadership opportunities, sponsorship, career planning/coaching, providing networking opportunities, targeted recruitment to improve women's representation in

TABLE 2: Organisational strategies and leadership barriers and facilitators by career stage and setting.

Career stage	Study ref	Risk of bias	Organisational strategies	Barriers	Facilitators
Early career nursing academia	[27]	Moderate	(i) Career assistance (ii) Orientation programs (iii) Mentorships (iv) Leadership training; educational interventions such as small group work with the experienced leader/case scenario presentations	*Systemic barriers* (i) Available nursing leadership training and mentoring programs are focusing on clinicians rather than academics *Individual barriers* (i) Not viewed as leaders in a new role (ii) Not being assertive (iii) Lack of confidence and autonomy (iv) Poor understanding of teaching-learning practices, role, and expectations as academic	(i) Providing leadership opportunities
Senior-level nursing academia	[30]	Low	(i) Leadership development program	Not reported	Not reported
Mid-career clinical care	[26]	High	(i) Career planning opportunities aiming at mid-career nurses' personal and professional development (ii) Structured career coaching	Not reported	Not reported
Senior-level clinical care	[31] [29]	Moderate Low	(i) Mentorship (ii) Providing networking opportunities Leadership development programs Mentorship and sponsorships	*Systemic barriers* (i) Glass ceiling for higher leadership roles (ii) Inability to implement change results in frustration (iii) Unable to take issues forward (iv) Lack of clear career pathway/no internal training Not reported	(i) Management training (ii) Formal mentoring training for mentors (iii) Professional graduate degree/leadership training/executive coaching/fellowship training (iv) Mentorship (v) Sponsorship (vi) Networking (vii) Family support (viii) Leadership experience (ix) Career planning (x) Taking risks

TABLE 2: Continued.

Career stage	Study ref	Risk of bias	Organisational strategies	Barriers	Facilitators
Early career Mid-career Senior level in global health	[28]	Low	(i) Incentivising mentorships (ii) Implementing targeted recruitment to improve women representation in leadership roles (iii) Providing funding for travel (iv) Family friendly policies to address work-life balance issues (vi) Blinding recruitment and unconscious gender bias training to eliminate system/culture/gender bias for leadership roles (v) Leadership training	*Systemic barriers* (i) Lack of mentorship/sponsorships (ii) Gender bias for women for leadership (iii) Lack of women mentors *Individual barriers* (i) Lack of confidence/assertiveness (ii) Work-life balance *Low and middle-income countries* *Systemic barriers* (i) Lack of opportunities (ii) Lack of funding for meetings and networking (iii) Workload (iv) Travel requirement (v) Lack of leadership training (vi) Intersection for women of colour for leadership (vii) Normalisation of male leadership styles *Individual barriers* (i) Safety concerns	Not reported

leadership roles, and orientation to leadership roles were found to be potentially effective [26–31].

Mentorship is an established leadership enabler [1, 10, 21, 32]. Mentoring is an active process that occurs between two people: mentee and mentor. The aim of the mentee is to acquire new knowledge, skills, and opportunities to flourish in a new professional environment. Mentorship is considered a top-down or peer-to-peer process where it can be formal or informal (Keogh, 2015). Mentoring offers benefits for both mentor and mentee including enhancing skills, career growth, and nurturing professional advancement [32]. While it can be done individually, uptake of mentoring can be limited and hence can be enabled by organisational strategies and approaches as noted here. Mentorship was found to be effective at all career levels: early, mid-, and senior levels in academia, clinical care, and global health [27–29, 31]. According to van Dongen et al. [33], the postdoctoral participants of the *Leadership Mentoring in Nursing Research Programme* successfully incorporated new knowledge, abilities, and perspectives into their routine activities. This led to improved leadership techniques, wise career decisions, productive research projects, and international collaborations in research, academia, clinical practice, and management.

Leadership training is also a potentially effective intervention for advancing women into leadership. Here we note when implemented at an organisational level, targeting women nurses in healthcare leadership can enable leadership advancement. Tsoh et al. [30] have identified six core leadership competencies that are potentially effective for leadership training in order to have an individual, interpersonal, and institutional-level impact. These core competencies are "self-awareness, critical thinking, effective communication, inclusion, collaboration, and empowered professionalism" (p. 2). This is consistent with broader literature [1, 20]. Leadership training alone is ineffective without providing leadership opportunities to apply learned knowledge and skills [1]. Hence, the context of organisational change to ensure both training and opportunity is key.

The nursing profession, gender, and other intersectional issues are unique challenges to leadership advancement in nursing [1]. Here we report on current barriers to women nurses' advancement in healthcare leadership. The nursing workforce is primarily constituted of women, and how women are treated in a culture typically reflects how nurses are regarded there [9]. These included a lack of confidence and assertiveness, a dearth of leadership training, fewer opportunities for mentorship and networking, limited career pathways, and a poor understanding of role expectations [1, 27, 28, 31]. Mentoring and leadership development can be utilised as tools to promote self-awareness and engagement. In addition, unconscious gender bias, the glass ceiling for women nurses' career advancement, and power imbalances were noted [1, 28, 31] and were consistent with broader literature [1, 21]. The chance of failure increases when women are given opportunities to develop their ability without being supported in meeting their capacity needs to take advantage of those possibilities [18].

4.1. Limitations.
The focus of this systematic review included organisational strategies specifically within nursing. It did not capture interventions targeting individuals. Further research is needed to investigate nursing academia career pathways and early career nursing insights into barriers, facilitators, and tailored interventions, alongside implementation strategies to implement and scale effective interventions at the organisational level.

The included studies were observational studies. The content of the mentorship and training has not been reported in detail. Future research is needed to further investigate intervention characteristics.

5. Conclusion

In this systematic review, organisational-level strategies for advancing women nurses in healthcare leadership have been captured. Mentorship, leadership training, career planning and career coaching, sponsorships, and networking opportunities were found to be effective organisational-level strategies regardless of nurses' career stage. The necessity of focusing on strategies and interventions at the organisational level was also emphasised to improve women nurses in healthcare leadership, as was capturing but moving beyond the barriers to enablers and implementation. This work contributes to a competitively funded project by the NHMRC, which aims to facilitate systems and organisational change to advance women into healthcare leadership.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

Supplementary Materials

Table S1: overview of the included studies. Table S2: risk of bias assessment at the study level. Figure S1: PRISMA flowchart. Figure S2: organisational strategies for advancing women nurses in healthcare leadership by career stages. Table S3: PRISMA 2020 for Abstract Checklist. Table S4: PRISMA 2020 Checklist. (*Supplementary Materials*)

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Research Article

Pandemic Lessons for Future Nursing Shortage: A Prospective Cohort Study of Nurses' Work Engagement before and during 16 Months of COVID-19

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Aim. To measure how nurses' work engagement developed during the first three COVID-19 waves and to compare this with the data collected just before the outbreak. *Background.* The shortage of nurses is a threat to population health. COVID-19 posed nurses with personal and professional challenges that affected their work engagement. Insights into how the pandemic affected their work engagement may help hospitals retain and recruit nurses in the future. *Methods.* A single centre prospective survey study was conducted using the UWES-9. *Results.* In total, 1,697 nurses (90.5% female, mean age 41 years) completed four assessments. Each assessment showed a significant decrease in work engagement compared with that before COVID-19. Work engagement stabilized in the last two assessments. *Conclusion.* Work engagement decreased significantly compared with that in March 2020, just before the outbreak. Although the decrease stabilized from the 8th month to the 16th month, it did not return to pre-COVID-19 levels. Whether this stabilization was the beginning of a recovery in work engagement or reflected a permanent decline needs to be established. *Implications for nursing management.* Nurse leaders should facilitate nurses' self-regulation processes and encourage them to develop resources in order to maintain work engagement at a high level.

1. Background

Nurses have an important role in population health and wellbeing [1]. They interact directly with patients, and their performance has a great impact on the quality of care and patient outcomes [2], with more nursing staff being associated with better patient outcomes [3]. However, there is a global nursing shortage [4]. The nursing workforce is ageing and experiencing high levels of work-related stress, which has led to early retirement and nurses leaving the profession to pursue a different career [4].

During the COVID-19 pandemic, nurses faced an unprecedented number of professional challenges such as caring for critically ill patients, fearing becoming infected and infecting relatives, coping with a limited availability of personal protective equipment, and changing nursing and care protocols, which led to a massive increase in the demands of work [5, 6]. Working under stressful conditions for long periods of time with little time for recovery poses a serious risk to one's physical and psychological wellbeing [7, 8]. Long-term strategies to safeguard the wellbeing of nurses under similar conditions are essential to prevent

deterioration in the quality of care provided, exacerbation of nurses' intention to leave the profession, and deterioration of nurses' work engagement, which is essential because work engagement protects against emotional fatigue and burnout [6, 9, 10]. Engaged employees perform better, as they are more likely to experience positive emotions, develop their resources, have better health, and transfer their engagement to others [11].

Work engagement, a term introduced by Bakker and Schaufeli, is described as a positive, fulfilling, and work-related state of mind that is characterized by three sub-categories, namely, vigour, dedication, and absorption [12]. The overall concept of work engagement refers to a persistent and pervasive affective-cognitive state that is not focused on any particular object, event, individual, or behaviour [13]. The subcategory vigour is characterized by high levels of energy and mental resilience while working, the willingness to invest effort in one's work, and persistence even in the face of difficulties. Dedication refers to being strongly involved in one's work and experiencing a sense of significance, enthusiasm, inspiration, pride, and challenge. Absorption is characterized by being fully concentrated and happily engrossed in one's work, whereby time passes quickly and one has difficulty detaching oneself from work [12].

Nurses' work engagement has been widely studied to gain a better understanding of how to improve their performance, patient care and outcomes, and nurse retention [14–16]. Research on work engagement in professional nursing practice often uses the job demands-resources model (JD-R) as a theoretical framework [2, 17]. The JD-R theory uses two categories of job characteristics to characterize a work context, namely, job demands and job resources [18]. Job demands are those aspects of the job that require physical and/or psychological effort (e.g., cognitive demands, work pressure, and others) and are associated with physiological and/or psychological costs [19]. In essence, job demands consume energy because they must be addressed [20]. High or unfavourably designed job demands impair health, resulting in exhaustion and health problems (e.g., anxiety, depression, and post-traumatic stress disorder) [21]. Job resources are functional aspects of the job that are important for achieving work goals, and they reduce job demands and stimulate personal growth, learning, and development (e.g., opportunities for growth and social support) [22]. In essence, job resources are motivational and increase employee work engagement and performance [20].

Did nurses' work engagement change during the COVID-19 pandemic? Many studies have investigated work engagement in relation to psychological distress or risk [5, 6, 9, 23], often based on a single measurement. However, multiple measurements are needed to obtain an understanding of how work engagement changes during a health crisis. There are six longitudinal trajectories in response to stressful events, which are as follows: resistance, resilience, recovery, relapsing/remitting, delayed dysfunction, and chronic dysfunction [24]. An insight into these changes may present opportunities for interventions to increase the work engagement of nurses. To the best of our knowledge, there have been no studies of how nurses' work engagement changed during the first three waves of the COVID-19 pandemic relative to that before the pandemic started.

1.1. Objective. The objective of this research was to measure the work engagement of nurses during the first three COVID-19 waves, from just before the first COVID-19 patient was admitted (March 2020) to the last assessment, 16 months later (July 2021). Given the need for multiple measurements to understand the change in nurses' work engagement in health crises, our research questions were further specified as follows: (1) how do the work engagement scores of nurses differ just before and at three measurement points during the following 16 months of the COVID-19 pandemic? (2) What are the scores of the subdomains vigor, dedication, and absorption at these measurement points?

2. Methods

2.1. Study Design. This single-centre prospective cohort study measured the work engagement of nurses before and during three COVID-19 waves, a total of 16 months. Figure 1 shows the study design with assessments in March, July, and November 2020 and July 2021. The first assessment was just before the first COVID-19 wave broke, when only one patient had been admitted.

The timing of the measurement points could not be predicted precisely due to the great uncertainty of the pandemic. To give an example, nobody predicted such a long second wave. Usually the yearly employee measure is just before the summer holiday (July). In 2020, due to worries about health professionals' wellbeing, additional measures were taken.

2.2. Variables. The primary study outcome variable was the total score of nurses' work engagement. Secondary outcomes were the subcategories of work engagement, namely, vigour, dedication, and absorption. Predictor variables were age and sex and the number of hospitalized COVID-19 patients (patients per day) over time.

2.3. Setting and Study Population. The study was conducted at the Jeroen Bosch Hospital (JBH), a teaching hospital in the Netherlands. All nurses registered at the human resources department were eligible to participate; there were no exclusion criteria. The level of education was not directly measured. However, at all measurement points, only registered nurses worked in the JBH. Therefore, all included participants were registered nurses. At those measurement points, data from the human resources department were used to identify the level of education. Over the measurement points, this was stable, namely, one-third of all nurses (32.3–33.6% over 4 measurement points) have had a higher professional education, while two-thirds have had a secondary vocational education.
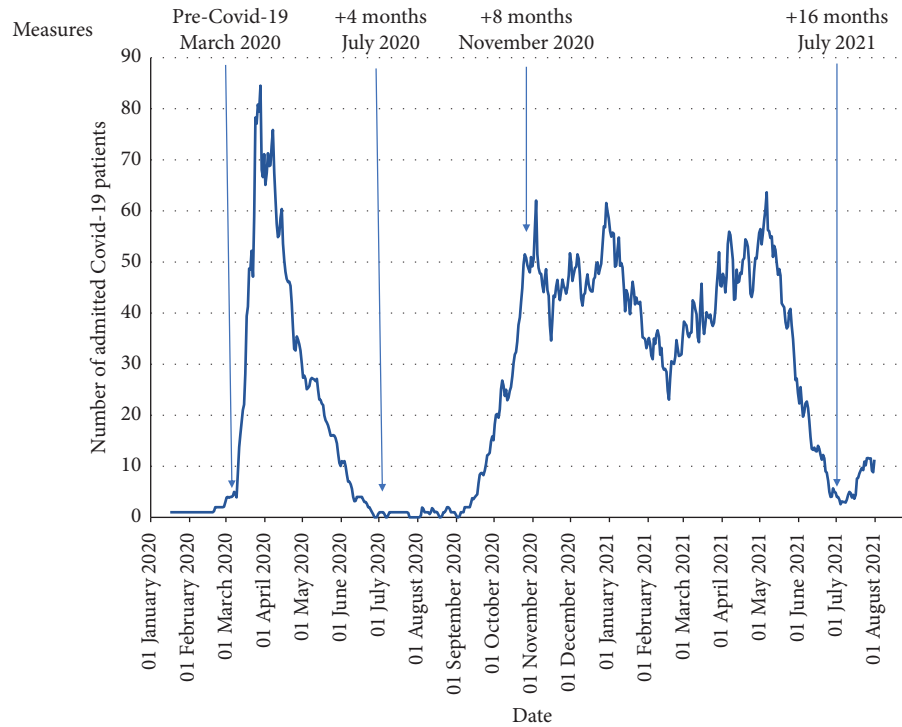
FIGURE 1: Study design with work engagement assessed before the pandemic (pre-COVID: March 2020) and during the subsequent 16 months (July and November 2020 and July 2021), in relation to the daily number of COVID-19 patients admitted to the Jeroen Bosch Hospital.

Nurses were approached by email and asked to participate. All nurses were asked to complete questionnaires at all assessment times to prevent selection bias. An exception was the first assessment in March 2020, when a random sample of clinical nurses was selected by a blind employee of the human resources department, ten nurses per department. This was done because at that time, multiple surveys were being carried out among nurses.

2.4. Data Collection and Tools. All data were collected by an anonymous survey using the online tool (enalyzer.com) [25]. Nurses were sent a link to the online survey by email and, if necessary, they were sent a reminder after 10–14 days of the first email. The data were converted to SPSS version 25 for analysis. Baseline survey characteristics were collected with an open question on age and a dichotomic question on sex. Work engagement was measured with the Utrecht Work Engagement Scale 9 (UWES-9) [12]. It consists of nine questions, covering vigour, dedication, and absorption, scored on a 7-item Likert scale, ranging from 0 "never" to 6 "always." Work engagement may be considered a one-dimensional (total score of work engagement) as well as a three-dimensional construct (its subscales are vigour, dedication, and absorption). The internal consistency of the three scales of the UWES is good as in all cases, values of Cronbach's α are equal to or exceed the critical value of 0.60 [12]. The mean scores were calculated for work engagement overall and for the subcategories in Table 1.

TABLE 1: Norm scores for the UWES-9 [12].

	Vigour	Dedication	Absorption	Total score
Very low	≤2.00	≤1.33	≤1.17	≤1.77
Low	2.01–3.25	1.34–2.90	1.18–2.33	1.78–2.88
Average	3.26–4.80	2.91–4.70	2.34–4.20	2.89–4.66
High	4.81–5.65	4.71–5.69	4.21–5.33	4.67–5.50
Very high	≥5.66	≥5.70	≥5.34	≥5.51

The exposure variable was the daily number of hospitalized COVID-19 patients (over time), as retrieved from the hospital's data management system (Figure 1). The number of admitted COVID-19 patients per day influenced the organization of COVID-19 wards and reallocation of nurses towards these COVID-19 wards.

2.5. Statistical Analysis. Respondents with missing UWES-9 data were excluded. Participants had to complete at least one subcategory of UWES-9 answers in order to be included in the analysis. The baseline characteristics were compared with a one-way ANOVA for age and a chi-square test for sex. Any significant differences in the baseline characteristics were added to the main analysis as covariates of adjustment for potential confounders.

The primary outcome work engagement (dependent variable) was analysed on the basis of the total mean and subcategory scores. Different measurement points (independent variables) were compared by linear regression, first a crude analysis, then in an adjusted analysis. Those

TABLE 2: Participants' characteristics.

	Pre-COVID March-20	+4 months July-20	+8 months November-20	+16 months July-21	p value
Employed nurses that were invited (n)	286	1052	1065	1040	
Number of nurses employed	1009	1052	1065	1040	
Total surveys received (n)	170	691	454	382	
Response rate (%)	59.4%	65.7%	42.6%	36.7%	
Complete and used in analyses (n)	170	601	384	344	
Age, mean (SD)	37.6 (13.1)	41.8 (12.9)	42.1 (13.1)	41.0 (12.6)	0.001*
Female (%)	95.9%	91.7%	84.4%	92.4%	<0.001†
Contractual hours (h/wk), mean (SD)	29.4 (6.0)	28.7 (6.1)	28.7 (6.3)	28.6 (6.0)	0.604*

*ANOVA, †chi-square.

variates that significantly differed in their characteristics were added as covariates to correct for potential confounding effects. The following comparisons were made: the score before the pandemic was compared with the scores on the other three measure points. Because the only comparisons of our interest were comparisons with the first measurement, data on other between group comparisons, e.g., coefficients of the regression analyses, were not given; just the intercept (constant) was given as a mean (CI). *P* values were shown between crude and adjusted analyses to correct for possible confounding effects; otherwise, does any difference found in intercept still exist after correction for possible confounders?

The dataset was checked for missing data (<30%) before all analyses. For analyses, SPSS version 25 was used. Significance was set at 0.05.

2.6. Ethical Approval. The Medical Ethics Committee Brabant gave permission for this study under number NW2020-83. They declared that no human intervention was involved.

3. Results

3.1. Participants' Characteristics. As shown in Table 2, a total of 1,697 surveys were returned, of which 1,499 could be used for analyses after checking for completeness. The mean age of the participants was 41.2 years and 90.5% were female. Differences in age and sex over the time points were significant and thus added as covariates of the main analyses.

3.2. Exposure. We used the number of hospitalized COVID-19 patients per day as a proxy for exposure (Figure 1). The first wave (end of March 2020) was high and steep, with a maximum of 76 COVID-19 patients, and lasted 11 weeks. The second and third waves were lower and longer, with a maximum of 62 COVID-19 patients, and lasted 38 weeks.

3.3. Main Results on Overall Work Engagement. Work engagement among nurses decreased significantly at all times compared with March 2020 (Table 3). This decrease remained significant at all times after adjustment for potential confounders, namely, age and sex.

3.4. Subcategory Analyses. Figure 2 and Table 3 show data for the work engagement subcategories vigour, dedication, and absorption. The subcategory vigour first remained stable (March 2020 mean 4.0 vs. July-2020 mean 3.9, $p = 0.257$), but it declined thereafter in comparison to before the pandemic (March 2020). A similar pattern was observed for the subcategory absorption: in the first months, it remained stable (March 2020 mean 4.0 vs. July 2020 3.9, p 0.118) but decreased later. In contrast, scores for the subcategory dedication decreased immediately.

4. Discussion

We found that nurses' work engagement decreased steadily during the 16 months of the COVID-19 pandemic compared with that measured just before the outbreak in March 2020. Table 2 and Figure 2 show that vigour and absorption remained stable in the second measurement, whereas dedication had already declined significantly. In the third and fourth measurements, all subcategories declined significantly compared to the first measurement before the pandemic.

4.1. Assessment of the Work Engagement Scores before COVID-19. The UWES manual [12] identifies five qualifications for scoring categories, which are as follows: very high, high, average, low, and very low. The overall work engagement score in this research is classified as "average." The average score can be found between the 25th and 75th percentiles, and its range is 2.89–4.66 in the UWES norm table. As can be seen, both crude and adjusted scores are in the upper part of the range (4.28 crude and 4.57 adjusted). Many other studies on the work engagement of nurses before COVID-19 have reported comparable average scores (3.3–4.0) [15, 26–29].

4.2. Decrease in Work Engagement during the Pandemic. Our results show that work engagement declined significantly and persistently during the COVID-19 pandemic relative to that before the outbreak in March 2020 when nurses were confronted with a wave of seriously ill patients. This is of importance as work engagement is correlated with the three dimensions of burnout—exhaustion, cynicism, and professional inefficacy [30]. Dedication is strongly negatively correlated with cynicism. The correlation between vigour

TABLE 3: Primary outcome work engagement: before COVID-19 versus during the 16 months of subsequent COVID-19 waves by linear regression.

	Pre-COVID March-20	+4 months July-20		+8 months November-20		+16 months July-21	
	Mean (CI)	Mean (CI)	July-20 vs pre-COVID p value	Mean (CI)	Nov-20 vs pre-COVID p value	Mean (CI)	July-21 vs pre-COVID p value
Overall work engagement							
Crude	4.28 (4.15–4.40)	4.10 (3.83–4.38)	0.022*	3.86 (3.58–4.15)	<0.001*	3.88 (3.59–4.17)	<0.001*
Adjusted	4.57 (4.34–4.80)	4.42 (4.03–4.80)	0.041†	4.19 (3.80–4.58)	<0.001†	4.19 (3.80–4.58)	<0.001†
Subcategory vigour							
Crude	4.00 (3.86–4.15)	3.91 (3.60–4.89)	0.257*	3.54 (3.21–3.86)	<0.001*	3.62 (3.29–3.95)	<0.001*
Adjusted	4.08 (3.82–4.35)	3.11 (3.55–3.64)	0.258†	3.62 (3.18–4.06)	<0.001†	3.70 (3.25–4.14)	<0.001†
Subcategory dedication							
Crude	4.83 (4.69–4.97)	4.53 (4.23–4.83)	<0.001*	4.32 (4.00–4.63)	<0.001*	4.30 (3.98–4.61)	<0.001*
Adjusted	5.06 (4.80–5.31)	4.78 (4.36–5.19)	<0.001†	4.57 (4.14–4.99)	<0.001†	4.54 (4.11–4.97)	<0.001†
Subcategory absorption							
Crude	3.99 (3.84–4.14)	3.85 (3.52–4.18)	0.118*	3.69 (3.35–4.02)	0.001*	3.70 (3.36–3.14)	0.003*
Adjusted	4.55 (4.28–4.82)	4.45 (4.00–4.75)	0.253†	4.31 (3.58–4.27)	0.011†	4.29 (3.83–4.11)	0.007†

*Crude: dependent: work engagement; independent: measure points. †Crude analyses with adjustment for age and sex.
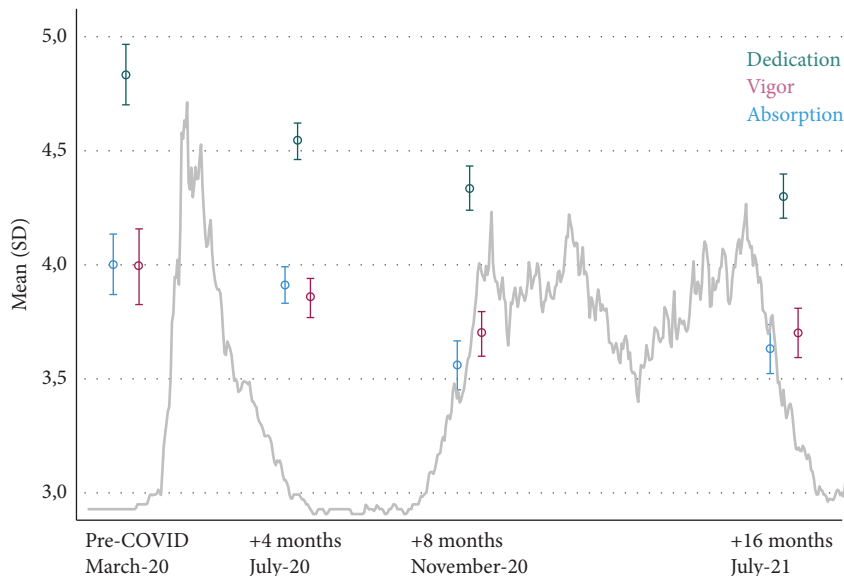
FIGURE 2: Subcategories (dedication, vigor, and absorption) scores of nurses' work engagement: pre-COVID-19, +4 months, +8 months, and +16 months.

and exhaustion is relatively low, and absorption is the least correlated with the burnout scales [12]. The significant decline in dedication after four months should therefore be highlighted as it is the first item to drop and is highly correlated with burnout. In the next measurement of November 2020, vigour declines significantly as well, adding to the risk of burnout.

Work engagement is regarded as a motivational outcome of an individual's ability to regulate demands and resources [20]. Using the job demands-resources model as a theoretical framework [21], we identified a number of specific job demands during the epidemic, namely, wearing personal protective equipment (PPE), rapidly changing protocols, more patient admissions, caring for critically ill patients, increasing bed capacity, and entering unfamiliar settings

[31, 32]. The most important personal and organizational factors associated with nurses' work engagement are workload, mental health, and practice environment [33, 34]. During the pandemic, job demands were associated with psychological challenges such as worry, confusion, nervous mood, and restlessness [32, 35] although COVID-19 pandemic training was found to act as a buffer [36, 37]. Another study found that caring for COVID-19 patients and the situation at work (job demands), transformational leadership, and preparedness (job resources) as well as indicators of strain (chronic fatigue and work satisfaction) were significant determinants of nursing staff turnover [10]. These findings show the impact of specific job demands and resources at a single measurement point in the pandemic but give insufficient insight into the effects of the long duration

of the pandemic on work engagement. In a recent article, Demerouti and Bakker, using the job demands-resources model, concluded that in times of crisis, the demands and resources come from various life domains, namely, personal, family, work, and organizational [20]. These demands are interconnected, and individuals continuously have to keep them in balance. The authors formulated an extended demand-resource model based on all life domains which centralized self-regulation processes [20].

We found that, in the early phase of the epidemic, nurses were confronted with high demands and an interplay of job, personal, organizational, and home demands, demands that they found hard to cope with during their long-term exposure to a high number of COVID-19 patients. With an ageing workforce and a high intention among nurses to leave the profession [4], the future will impose more stress on nurses, necessitating organizational support.

4.3. Stabilization of Work Engagement after 8 Months. The work engagement score had stabilized between November 2020 and July 2021. This could suggest that nurses' self-regulatory processes had become more effective. Another explanation for this stabilization might be found in the event systems theory [38]. The strength of an event is reflected in its novelty, disruption, and criticality. Before the first wave, the virus was unknown and thus novel [39]. The exponential increase in cases disrupted health care and society [40], and it was a critical event because of its transmission mechanism and the need to act directly [1]. After 8 months, the strength of the event (the pandemic) may have diminished somewhat because the virus was no longer novel and nurses were better prepared after the first two waves [10] and they had a better understanding of how to treat patients and to cope with work disruptions. This could have led to stabilization of work engagement.

A third explanation involves longitudinal trajectories of responses to stress. There are different hypothetical courses of a stress response to bring a system back to the predisaster state, which are as follows: resistance, resilience, recovery, relapsing/remitting, delayed dysfunction, and chronic dysfunction [24]. Resilience and recovery are probably relevant with regard to the stabilization of work engagement. Resilience is defined variously as the process of, capacity for, or outcome of successful adaptation after trauma or severe stress [41]. Recovery characteristically involves a period of dysfunction lasting several months or more, followed by a gradual return to pre-event functioning [42]. The recovery pattern is a gradual resilience pattern as it takes more time [24]. The pattern we see in our results is a significant decline on all measurements compared to before COVID-19 with a stabilization of this decline after 8 months. This stabilization may indicate some recovery, so it might be the case that we are looking at a recovery pattern.

Resilience is regarded as a personal resource in the job demands-resources model [43], and by becoming resilient, employees can become more engaged as they may have greater ability to control their work environment [44]. It is thus important to help nurses become resilient by balancing their individual mix of demands and resources.

When extrapolating these three COVID-19 waves, with an excessive number of patients combined with a nursing shortage, to the future of the nursing profession, we can perhaps conclude that the pandemic was just a general rehearsal. Given that the work engagement of nurses is an important determinant of patient outcomes and experiences, the pandemic highlighted the importance of helping nurses balance the demands of a crisis situation and understand which job resources contribute to their work engagement. Nurse leaders and management should individualize policies to support nurses in this situation.

5. Future Research

Whether the work engagement of nurses will bounce back to levels before COVID-19 needs to be established. Given the importance of the self-regulation of job demands and job resources, further research is needed to better understand this process and how it can be facilitated.

6. Limitations

This is the first longitudinal study of nurses' work engagement before and during three waves of the COVID-19 pandemic. However, it had some limitations. For legal reasons, it was not possible to ask for employee numbers, so we could not perform a paired analysis. It was a single-centre study, which raised questions about the generalizability of the findings. However, the Jeroen Bosch Hospital had an average UWES score before COVID-19, as had been found in other studies and hospitals, which suggest that the findings are applicable to other hospitals. Lastly, not all nurses were included in the first assessment, before the pandemic broke, which could have led to selection bias even though nurses were selected at random.

7. Conclusion

The work engagement of nurses significantly decreased compared to that in March 2020, just before the outbreak. Although the decline stabilized in the period between November 2020 and July 2021, work engagement did not return to prepandemic levels and it was in a recovery trajectory. Whether elements of the disruption of care associated with the pandemic are common to future scenarios needs to be investigated. If so, lessons from this challenge can be used to prepare for future growth in the number of patients and a decline in the number of available nurses. Resilience, a personal job resource, supports work engagement, and this aptitude needs to be developed in nurses by means of organizational support, training, and development [44].

7.1. Implications for Nursing Management. Delivering quality care with engaged nurses under challenging circumstances requires that nurse leaders facilitate nurses' self-regulation processes and stimulate different types of job resources in order to maintain work engagement at a high level.

Data Availability

The data that support the findings of this study are available on request from the corresponding author.

Ethical Approval

The study was conducted according to the principles of the Declaration of Helsinki (version November 2013) and the medical ethical review board of the region. Noord-Brabant declared that this study did not involve human intervention according to the Dutch Law on Medical Research (WMO).

Disclosure

This research was performed as part of the employment of the authors, namely, the Jeroen Bosch Hospital, Tilburg University, and Amsterdam UMC.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this article.

Authors' Contributions

The authors confirm contributions to the paper as follows: MP, SdG, MvL, FS, and CK were involved in the study conception and design. MP, MvL, and CK were responsible for data collection. MP, SdG, MvL, EdV, FS, and CK performed the analysis and interpretation of results. MP, SdG, MvL, EdV, FS, and CK were responsible for draft manuscript preparation. All authors reviewed the results and approved the final version of the manuscript.

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Research Article

Perspectives of Executive Nurse Leaders on Advanced Practice Nursing in Saudi Arabia: Challenges to be Overcome and Opportunities to be Seized

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Aim. To explore the perception of executive nurse leaders regarding the implementation of advanced practice nursing in Saudi Arabia. *Design.* An exploratory, descriptive, and qualitative design was used. *Methods.* Purposive sampling was used to recruit chief nurse officers and executive nurse directors from government, private, and military health systems in tertiary, secondary, and primary settings. Data were collected from July to November 2022 using virtual semistructured interviews, which were recorded and transcribed. Thematic analysis was conducted manually. *Results.* Eleven participants were included in the study. The following themes were identified: unique characteristics of advanced practice nursing, impacts of advanced practice nursing in nursing profession, challenges to utilize the advanced practice nursing roles, opportunities to foster the proper implementation of advanced practice nursing, and recommendations to move forward with fitting advanced practice nursing in Saudi health system. Participants characterized advanced practice nursing as specialized, advanced, and autonomous and reported that it increases access to care, provides efficient and cost-effective care, and expands nursing career pathways. The lack of job description, fragmentation of implementation efforts, lack of training programs, and resistance from physicians, nurses, and patients hinder its implementation. The Saudi Vision 2030, gaps in health care, the growing population, and the familiarity of the healthcare system with advanced practice nursing were viewed as opportunities. The following subthemes emerged under recommendations: establish, train, and implement. *Conclusion.* Executive nurse leaders perceived advanced practice nursing as a promising initiative to improve healthcare delivery and the nursing profession. Several opportunities make "now" the right time to implement it.

1. Introduction

Healthcare systems continue to transform and expand access to healthcare and improve quality of healthcare services and population health outcomes worldwide [1]. In many countries, the role of nonphysician providers, such as advanced practice nursing (APN), was introduced to reach the objectives for universal health coverage [1, 2] and improve patients' health outcomes [3–6]. However, the implementation of APN in many countries faced challenges and, thus, necessitated actions to facilitate proper implementation [7–9]. An international study sought to examine the implementation status of advanced practice nursing regulations globally, and they found wide variation in

educational requirements, regulations, and scope of practice in 26 countries from North America, Europe, Asia, South America, and Africa [9]. Out of 16 countries that implemented nurse practitioner (NP) role, 9 countries had the NP role regulated. Out of 13 countries that implemented clinical nurse specialist (CNS) role, only 6 countries had the CNS role regulated [9]. Out of 10 countries that implemented general APN roles without specifying whether it is NP or CNS, only 5 countries had the APN regulated [9].

The APN is evolving in the Middle East countries [8], including Saudi Arabia [10], and there is no clear evaluation of potential impacts of the APN roles on organizational and patients' health outcomes. According to Almukhaini et al. [8], who summarized evidence regarding advanced practice nursing roles in Arab countries located in the Eastern Mediterranean region, the main drives to implement the APN were the shortage of physicians, increasing incidences of chronic diseases, to expand cost-effective access to primary care, and promote the nursing profession. The main barriers to implement the APN in the Middle East were "a lack of recognition of roles at national levels, role ambiguity, lack of clear scope of practice, resistance from male physicians, low involvement of nurses in policy-making, and low status of nursing as a profession" [8].

In Saudi Arabia, little is known about facilitators and barriers to implement APN. Previous studies tried to unveil different aspects relevant to facilitating the implementation of APN in the Saudi healthcare system [10–12]. In contrast to some findings from Almukhaini et al. [8], a recent study found that physicians in Saudi Arabia support the implementation of nurse practitioner roles in primary care settings [12]. For instance, another study identified that APN tasks and activities are existing in Saudi Arabia, which warrant regulatory delineation actions to facilitate the implementation of APN roles [10].

Executive nurse leaders are nurses in "executive practice who set the vision for nursing practice in the delivery of safe, timely, efficient, equitable, and patient-centered care" (p.2) [13]. Executive nurse leaders play a significant role in facilitating the implementation of APN in healthcare systems by identifying and advocating for organizational and national health policy reforms [14, 15]. Various studies that exist on the perspectives of nurse leaders regarding the implantation of advanced practice nursing roles internationally have shown that nurse leaders can better evaluate the potential of fitting APN roles within their healthcare system and overcome potential barriers and challenges [16, 17]. To the best of our knowledge, the perspectives of executive nurse leaders regarding the feasibility of implementing APN have not been investigated in Saudi Arabia. Insights from executive nurse leaders regarding the current situation and progress toward implementing APN in Saudi Arabia can guide efforts to facilitate effective implementation and reduce potential barriers at organizational and practice levels. The perspective of executive nurse leaders in Saudi Arabia can contribute to the international dialogue on best practices for the APN roles' implementation. Thus, this study explored the perception of executive nurse leaders regarding APN definitions, impact,

challenges, opportunities, and facilitators for implementing APN in Saudi Arabia.

2. Materials and Methods

2.1. Design. This study utilized an exploratory, descriptive, and qualitative design. The consolidated criteria for reporting qualitative research (COREQ) were followed to report the findings of this study.

2.2. Setting and Recruitment. This study was conducted from July to November 2022 and recruited executive nurse leaders from government, private, and military health systems in tertiary, secondary, and primary healthcare settings in Saudi Arabia.

2.3. Inclusion and/or Exclusion Criteria. This study recruited nurses serving as top-level nurse leaders, such as chief nurse officers and executive nurse directors, who are usually involved in shaping future directions of nursing in their health organizations. Thus, middle-level nurse administrators, such as nurse supervisors and head nurses, were excluded from the study.

2.4. Data Collection. Virtual individual semistructured interviews were conducted (Supplemental Table 1). First, email invitations, including an introduction to the study, were sent to eligible participants. The email invitation asked participants to suggest convenient time slots for the conduction of interviews. Those who agreed to participate in the study received another email confirming the interview time and a secure link for a virtual meeting (Zoom or Microsoft Teams). At the beginning of each interview, participants were informed that the interview would be recorded for data analysis purposes and that they needed to speak in English for more accurate transcription. In addition, participants were identified using a study code which they used to complete the demographic survey. The participants were provided with a survey link for demographic data, which included gender, highest level of education, country of education, overall years of experience, years of experience in leadership, presence of APN degree and executive leadership qualifications, type of work institution, and whether their institution implemented APN. This was followed by interviews using seven open-ended questions. Data saturation was reached with seven participants; however, additional participants were recruited so as to include different systems and cities, which resulted in 11 participants.

2.5. Data Analysis. Descriptive statistics were used to describe the demographic characteristics using SPSS version 28 (SPSS Inc., Chicago, IL, USA). Thematic data analysis followed Braun and Clarke's approach [18]. All recordings were deidentified, saved on secured cloud storage, and transcribed verbatim by a professional transcription agency. Two authors, including the first author, checked the transcripts against the recordings for accuracy. Two authors read and

reread the transcriptions individually to draw codes. One author used NVivo (QSR International, 2020), and the other conducted manual coding. The two authors grouped the generic and main codes into broader themes. Subsequently, the two authors met to discuss the findings and agreed on 95% of the codes and themes. The remaining 5% were integrated into other broader themes. The interpretation of findings and relevant quotes were discussed with other authors not involved in data collection, transcription, and analysis.

2.6. Ethical Considerations. This study was approved by the appropriate Institutional Review Board at King Saud University (IRB Reference number: 22/0594/IRB, IRB approval date: April 25th, 2022, Research project no. E-22-6845). Individuals who indicated their interest to participate in the study received an email including the informed consent and the demographic data survey links. The informed consent included an introduction to the study, a description of the data collection methods, the description of the risks and benefits of participation in the study, and the participants' option to withdraw from the study at any time. Participants were requested to open the link and indicate their agreement to participate in the study before they started to complete the demographic survey and before the beginning of the interview.

2.7. Rigor and Reflexivity. The study followed several structured steps to maintain the credibility and confirmability of the analysis and findings. First, most authors were experts and specialized as APNs, whereas others were experts from regulatory and clinical fields. Second, the authors' expertise facilitated the development and refinement of the interview questions to address the regulatory and operational aspects of implementing APN. Third, initial findings were discussed to reach a consensus on the codes and themes which emerged from data collection. Fourth, study findings were reported according to the COREQ guidelines [19]. Lastly, the authors provided rich, detailed descriptions of all aspects of the phenomenon under investigation to address transferability.

3. Results

The sample's demographic characteristics are presented in Table 1.

The following themes were identified: unique characteristics of advanced practice nursing, impacts of advanced practice nursing in nursing profession, challenges to utilize the advanced practice nursing roles, opportunities to foster the proper implementation of advanced practice nursing (Table 2), and recommendations to move forward with fitting advanced practice nursing in the Saudi health system (Table 3).

3.1. Unique Characteristics of Advanced Practice Nursing. Most participants only identified the NP role when describing the APN, and they used the two terms interchangeably. However, few participants could list additional APN roles, which were mainly nurse specialist, nurse anesthetist, and nurse practitioner (NP). Participants described APN as more specialized, requiring advanced education, training, and skills such as decision-making, diagnosing, interventions, and collaboration, and with the ability to practice with more autonomy compared to registered nurses. One participant described APN as follows:

"Who deliver a care to a patient with specialized care, requiring high technical skills, someone who is more specialized in his specialty from either program or experience." #116

Moreover, participants referred to APNs as a link between the physician and the registered nurse. One participant described this as follows:

"The one who is between a registered nurse and the physician." #0114

Participants viewed APN roles as distinct as they fill specific gaps in care rather than replace physicians, as one participant stated

"Not because we have a higher number of NPs, we will not hire MDs, nurse practitioners have different roles than physicians." #0111

3.2. Impacts of Advanced Practice Nursing in Nursing Profession. Participants reported several positive impacts of APN on patients, organizations, and nursing if implemented in Saudi Arabia. Participants reported that implementing APN can increase access to care and reduce waiting time, as one participant stated

"As you can see, we have many patients coming, sometimes waiting for hours to see the doctors. But if we have a nurse practitioner, at least they would see those patients much faster." #0115

Participants described that APN roles are stemming from nursing background, so a holistic care approach across lifespan and a range of conditions was described, by participants, as an impact of APNs. One participant stated that

"NPs can provide holistic nursing care to any population." #0118

Participants identified several positive impacts on organizational outcomes. For instance, participants indicated that implementing the APN can enhance as patient satisfaction, experience, and safety, as one participant explained

"So, they would be very close to the patient because it would improve their satisfaction and patient experience." #0110

In addition, executive nurse leaders, in line with the literature, thought that the APN roles are efficient and cost-effective for hospitals, yet not a midlevel and undervalued service, as participants stated

TABLE 1: Demographic characteristics ($n = 11$).

Variables	Category	Frequency (%)
Gender	Male	7 (63.6)
	Female	4 (36.3)
Highest level of education	BSN	1 (9)
	Diploma	1 (9)
	Master	7 (63.3)
	PhD	2 (18)
MSN country	USA	3 (42.8)
	UK	1 (14)
	Australia	1 (14)
	Saudi Arabia	2 (28)
PhD country	UK	2 (100)
Overall years of experience	10–20	2 (18)
	20–30	6 (54)
	>30	3 (27)
Years of experience in leadership	≤5	1 (9)
	6–10	3 (27)
	11–20	3 (27)
	≥20–30	4 (36)
APN degree	Yes	3 (27)
	No	8 (72)
Type of APN specialty	Pediatric and adults (dual)	1 (33)
	Geriatric	2 (66)
Executive degree in leadership	Yes	6 (54)
	No	5 (45)
Country of education	USA	3 (50)
	UK	1 (16)
	Others	2 (33)
Work institution type	Private	1 (9)
	Tertiary	7 (63)
	Health cluster	3 (27)
APN role implemented	Yes	5 (45%)
	No	6 (54)

Note. APN: advanced practice nursing; BSN: Bachelor of Science in Nursing; MSN: Master of Science in Nursing.

"Yes, you can have a great impact in the organization because of the cost effectiveness." #0119

"We are not a second-class service." #0117

Moreover, participants shared the perspective on a potential impact that APNs can relieve physicians from the load of seeing low-acuity patients to focus on critical cases, as a participant stated

"We would complement physicians" role so they can focus on more serious cases." #0117

Additionally, participants revealed that APNs could fill several gaps in healthcare related to the shortage of physicians, as a participant stated

"In some parts of the world where there is a significant shortage of physicians, the only way to fill the gap was looking for APNs." #0115

Participants suggested that the establishment of APN will expand nursing career pathways and attract more students to the nursing profession. A participant explained

"The number one desire for nurses is the ability to grow, and to professionally develop. . . this would definitely provide an opportunity that has never been available to them before." #0115

3.3. Challenges to Utilize the Advanced Practice Nursing Roles. Participants had mixed viewpoints regarding the readiness of the current healthcare system to implement APN. Few participants viewed the system as "not ready now, but has the capability to" (#0110), whereas others viewed the system as "ready" (#0112). However, all participants agreed on common regulatory, professional, academic, and cultural challenges hindering APN implementation. Furthermore, participants reported registration and credentialing-related challenges. They discussed that regulatory bodies do not

TABLE 2: Characteristics, impacts, challenges, and opportunities for implementing APN ($n = 11$).

Themes	Subthemes	Codes	Subcodes
Unique characteristics of advanced practice nursing	Specialized	Depth in knowledge and experience in a specific area	Cardiac, oncology, midwifery,
	Advanced	Education	A postgraduate diploma / A master's degree, doctorate in nursing practice
		Training	Clinical training
		Skills	Diagnoses, health assessment, ordering diagnostic tests, and prescribe medications
	Autonomous	Run their own clinics, practice independently, privileges	
	A link between physicians and nurses		
	Distinct role	Not replacing physicians	
Impacts of advanced practice nursing in nursing profession	Access to care and reduced waiting time	Emergency room, outpatient	
	Patient satisfaction and experience		
	Patient safety		
	Holistic care and efficiency	Patient-provider relationship / Adequate health education / Follow-up	
	Relief physicians	Focus on critical cases and subspecialties	
	Cost-effective	APN are paid less than physicians APNs will be revenue makers / Do not provide low-quality care / Do not abuse the role	
	Fill gaps in care	Primary, rural, school health, chronic disease management	
	Expand nursing career pathways	Retain and attract nurses / Concerns regarding worsening shortage of registered nurses	
Challenges to utilize the advanced practice nursing roles	Regulatory		
	Professional	Resistance from physicians and nurses	
	Academic	Lack of programs / Existing programs lack clinical training	
	Cultural	Resistance from patients	
Opportunities to foster the proper implementation of advanced practice nursing	Saudi Vision 2030	Enhance the quality and quantity nursing profession / Existing gaps in care / Privatization	
	North American models	Training / Hospital accreditation	
	COVID-19 pandemic		

TABLE 3: Recommendations for implementing APN.

Subthemes	Codes	Subcodes
	Who?	Involve all stakeholders
	How?	Integrate efforts
		Utilize existing APN
		Utilize data from existing models
Establishment of APN roles		Introduce the APN role to the community
	What?	Role description
		Scope of practice
		Competencies and credentialing
	Academic programs (international, hybrid, or local)	Clinical/specialty based
Training required for proper implementation	Standardize admission requirements	Minimum years of experience
	Establish partnerships	Universities and hospitals
		Nursing and medicine
	Establish APN organizational structure	Reporting, training, evaluating, and credentialing
	Set guidelines for financial compensation	Pay, reimbursement, and malpractice insurance
Implementation approach of APN	Establish partnerships	To establish clinical training and jobs
	Utilize existing APN	To develop programs and train
	Start with most needed specialties	Primary care

Note. APN: advanced practice nursing.

recognize the APN title in Saudi Arabia and do not have core competencies for credentialing or scopes of practice, as one participant stated

"We do not have a standardized job description for APN, each institution creates their own, but it is not approved by higher management. So, it is not clear, not certain." #0111

As such, participants indicated that current APN implementation was institution-based, informal, inconsistent, and provided unfair pay and no malpractice insurance. A participant explained

"If the role privileges are based on an internal agreement within the organization, they can be impacted by any change. But if it is based on the regulatory body, such privileges will be consistent." #113

Moreover, most participants indicated that the current nursing professional classification framework is generic (classifies nurses based on their level of education rather than their specialty), which limits the expansion of nursing specialties, a core characteristic of APN. One participant explained

"A nurse with a diploma or a bachelor's degree will be classified as a specialist, a nurse with a master's degree will be classified as a senior specialist, and those with a doctorate degree will be classified as consultants, there is nothing else." #0114

Participants highlighted the efforts of several clinical and academic entities to facilitate the implementation of APN. However, such efforts were viewed as fragmented, inconsistent, down-top, and lacking the involvement of all stakeholders, as one participant stated

"I think we have fragmentation in our regulatory body. We have full body, with arms and legs and so on, but everything is working on his own way." #0111

Several participants indicated that there was a need for more local APN academic programs. A few local academic institutions have developed APN programs; however, due to the lack of senior APN nurses and physicians available to train and the lack of standard credentialing requirements, the competency of the graduates was questioned. A participant stated

"They have the theoretical, but they did not have the practice knowledge." #0116

Resistance from physicians and nurses offered APNs a challenge, as one participant explained

"You are perceived as a threat to physicians and some nurses felt that we are above them." #0117

Some participants indicated that APN might face resistance from patients since APNs will assume roles that are conventionally known to be physicians' roles. One participant explained this as follows:

"I think the level of acceptance by patient will probably be one of the challenges because until today, all aspects of care are under the physician." #0118.

3.4. Opportunities to Foster the Proper Implementation of Advanced Practice Nursing. Participants identified several opportunities that may catalyse the implementation of APN. Saudi Vision 2030 was viewed as an opportunity to implement APN, as one participant explained

"We can have the changes and the 2030 vision will have a positive impact on this." #0113.

Participants viewed the gap in primary care as an opportunity, and APNs will fill the gaps, as one participant explained

"The biggest piece of the model is going to be focused on primary care. . ., all physicians go for sub-specialties. . . So, this is where the role of APN comes. . .." #0115

From an organization perspective, participants viewed the care provided by APNs as efficient and cost-effective, as one participant explained

"Once you have highly qualified APN, nurses will be recognized as revenue generators." #0115

Physicians were perceived to be less resistant to APN due to their North American training, as one participant explained

"I have here a number of our medical team were trained in Canada and the States, and they know about the role and everything, and the majority of them are supporting." #0112

In addition, participants viewed North American hospital accreditation standards as enforcers of APN, as one participant explained

"We do not have a nurse practitioner, but we are midway in our journey to get to Magnet recognition. So, one of the initiatives within the organization is to have a clear regulation on nursing practitioner." #112

Furthermore, participants viewed the COVID-19 pandemic as an opportunity to expedite the implementation of APN, as one participant stated

"I think if we had nurse practitioners during the COVID-19 pandemic, they would have been a great relief to the system, and it would have been the best facilitator to implement the APN role." 0113

3.5. Recommendations to Move Forward with Fitting Advanced Practice Nursing in Saudi Health System. Participants agreed on several recommendations to facilitate the implementation of APN in Saudi Arabia. These emerged under three main subthemes: establish, train, and implement (Table 3).

3.5.1. Establishment of APN Roles. Participants agreed that establishing APN at the regulatory level is the first step toward implementing APN. Participants indicated that the efforts of all stakeholders, such as nursing clinicians, academicians, and policymakers (i.e., Saudi Commission for Health Specialties, Ministry of Health, Ministry of Education, Ministry of Human Resources, Scientific and Professional Councils) need to be integrated to establish APN roles. A participant explained this as

"I think there has to be some type of an advisory committee, with all different parts of legislative and education, come together as a group, not fragmented." #0115.

In addition, participants reported that data from current APN implementation models could help guide the effective implementation of APN. A participant stated

"There is a lot of evidence showing the positive impact of having a nurse practitioner, we can present this evidence to leaders." #0113

Participants highlighted the need to introduce APN to the community as one participant indicated

"I need to educate the community, also the healthcare providers and the organizations from leadership starting from our regulatory bodies (i.e., The Saudi Commission for Health Specialties)." #0113

Stakeholders need to develop clear and standard APN job descriptions, scopes of practice, core competencies, and credentialing requirements. One participant noted

"We need to define scope with competencies, certain privileges, certain protocols." #0110

3.5.2. Training Required for Proper Implementation. Participants recommended the continuation of international scholarships to train APNs:

"We can't stop scholarships; we need to go on that." #0110

In addition, participants suggested establishing academic partnerships with international academic institutions to offer APN training programs:

"We need to look into blended learning or collaborative learning, where students can be taught by international institutions in national universities through academic partnerships." #0110

Moreover, participants suggested developing local APN education programs utilizing the qualifications and experience of existing APNs to train:

"There are nursing colleges in the kingdom and are working to establish APN programs. Their professors were already trained in North American facilities, and they were exposed to having such program within the academic and with collaboration with hospitals." #0112.

Participants agreed that admission requirements for APN programs need to be standardized such as a minimum of a Bachelor of Nursing degree, as one participant stated

"Someone who has graduated with a bachelor of nursing degree and is registered as registered nurses." #0112

Furthermore, there should be a minimum number of years of experience, as one participant stated

"It is pretty important that they have the clinical experience before they are admitted to APN degree." #0112

Most participants indicated that 2 to 3 years of experience in a specific nursing specialty should be the minimum requirement to be accepted into an APN degree as one participant stated

"Two years of experience in a specific role, I think, is enough for a person to be given a key to go for a specialized role as an APN." #0116

However, some participants expressed concerns regarding the limited ability to ensure that years of experience alone reflect the experience required for APN, alluding to the discrepancy in nursing roles across institutions and settings across the country. One participant stated

"But how can we validate the experience, we have discrepancies here which could be different from one hospital to another." #0112

Most participants recommended that academic programs be clinically based in parallel to theoretical education, as one participant stated

"I would not recommend somebody go off and sit in a classroom and to practice on a mannequin. No, they need to be doing it within the clinical area." #0117

"It must include 60 to 70% clinical training." #0111

Moreover, participants recommended the establishment of partnerships among clinical and academic settings to build the capacity to train and hire APNs.

3.5.3. Implementation Approach of APN. Participants indicated the need to establish a clear organizational structure incorporating APN. While all participants indicated that

APN should be under nursing administration, the reporting, credentialing, and evaluation of APNs in an organization should be a joint task between nursing and medicine, as one participant stated

"I believe they should report to advance practice nursing department which should report to the chief nursing officer, with involvement of the medical side." #0111

Participants stressed the need to set clear and standardized payments, reimbursements, and liability insurance guidelines. Additionally, participants highly stressed the need to establish a collaborative agreement with physicians and seek their support to facilitate the implementation of APN as one participant stated

"You will need to collaborate and establish partnerships with physicians to be able to do your role." #0114

Furthermore, participants indicated that utilizing the qualifications and experience of existing APNs in role development is essential, as one participant stated

"We have those groups of nurse practitioner already graduated; they are available to assume the role immediately." 0111.

Participants suggested that APN can be initially implemented in primary care settings:

"We can start on a specialty basis. So, we can start with primary care." #0115

4. Discussion

This study explored the perception of executive nurse leaders regarding APN, the major finding themes were the following: unique characteristics of advanced practice nursing, impacts of advanced practice nursing in nursing profession, challenges to utilize the advanced practice nursing roles, opportunities to foster the proper implementation of advanced practice nursing, and recommendations to move forward with fitting advanced practice nursing in the Saudi health system. Participants in our study provided inconsistent identifications of APN roles, and the majority referred to APN as nurse practitioners (NPs). In addition, participants provided inconsistent entry-level training requirements for APN. This finding was consistent with previous reports indicating longstanding inconsistencies in the definitions of APN, their scope of practice, and entry-level training requirements worldwide [9, 11, 15, 20]. Such inconsistency was viewed by the International Council of Nurses (ICN) as one of the most significant challenges hindering the implementation of APN and called for the need to standardize definitions, scope of practice, and clear entry-level education for APN [21]. Nevertheless, participants agreed on the main characteristics of APN such as advanced training and skills, specialized knowledge and experience, and autonomous practice. Such

characterizations agreed with the APN definitions of the Canadian and the American Nurses Association [22, 23].

Consistent with previous reports [24, 25], this study indicated that some forms of APN were implemented in Saudi Arabia. The current implementation model involves the development of institution-specific role descriptions and credentialing requirements. Such an implementation model needs to be more structured, consistent, and recognized by regulatory bodies. While it has been viewed as a promising effort, such unclear delineation of APN raises several health, professional, organizational, financial, and legal concerns [10, 24].

Nevertheless, participants identified several patient-related, organizational, and professional positive impacts of APN in Saudi Arabia. Similar findings were reported in recent studies in Saudi Arabia [25–27] and worldwide [28–31].

Several challenges facing the implementation of APN in Saudi Arabia were identified in this study. Similar to previous studies, participants indicated that the lack of legislation hinders efforts to implement APN in Saudi Arabia [9, 10, 15]. Moreover, participants highlighted the need for well-developed local academic APN programs with adequate clinical training for safe and independent practice. While the American Association of Nurse Practitioners [32] indicated that a master's degree is required at the entry level to APN, consensus on educational programs was not easily achieved [33]. In addition, participants indicated that APN may face resistance from physicians, nurses, and patients, which was consistent with previous studies [34]. However, recent studies revealed that physicians [12] and nurses [26, 27] in Saudi Arabia supported the implementation of APN. To the best of our knowledge, no studies have explored the patients' experiences with the care provided by APNs. Future studies on this topic are therefore recommended.

Participants in this study identified several opportunities that could catalyse the implementation of APN in Saudi Arabia. The Healthcare Transformation Program (HTP), one of the Saudi Vision 2030 programs, aims to restructure the healthcare system to improve healthcare delivery and the population's health [35]. Several objectives have been set to reach such goals, such as improving the quality and quantity of the Saudi nursing workforce. As such, participants believed that implementing APN would expand career pathways and increase the attractiveness of the nursing profession [33]. In addition, the HTP aims to enhance access to primary healthcare. Moreover, the prospective increase in the geriatric population in Saudi Arabia will create additional demands on the existing healthcare system. Therefore, existing gaps in care will be magnified, and APNs may fill such gaps in care [31].

Furthermore, the HTP aims to expand the privatization of healthcare. Participants viewed the care provided by APNs as efficient and cost-effective, making employers eager to hire them [30]. As such, APNs can be utilized to help achieve the objectives of the HTP.

Many physicians in Saudi Arabia were trained in the USA and Canada and are familiar with APN. Hence, participants viewed physicians as less resistant to implementing

APN, consistent with previous reports from Saudi Arabia [12]. In addition, hospitals in Saudi Arabia have been recently moving toward obtaining institutional accreditation by North American organizations such as Magnet [36], and such movements may lead to the development of national regulation for APN by regulatory bodies.

Pandemics can reveal potential opportunities to expand the access to care. For instance, participants in this study viewed the COVID-19 pandemic as an opportunity to expedite the implementation of APN. Many institutions reviewed and restructured their care delivery systems to meet the shortage of healthcare providers triggered by the pandemic. APN can be implemented to meet similar needs. A similar situation was reported in the USA [37], accelerating APNs' licensing and expanding their scope of practice [38].

The implementation of APN in Saudi Arabia warrants crucial planning as recommended by participants. They indicated that the first step toward implementing APN was establishing their role through regulatory bodies using a top-down approach. A similar approach was utilized in other countries where APN was not well developed [39], and the ICN has recently called for such an approach [21]. Participants viewed existing efforts by regulatory, clinical, and academic entities as fragmented and counterproductive. They recommended integrating efforts from all stakeholders (i.e., Ministries of Health, Ministry of Education, Ministry of Human Resources and Social Development, and the Saudi Commission for Health Specialties) through an APN advisory board. The development of clear and standard APN role descriptions, scopes of practice, core competencies, and credentialing requirements is necessary toward fitting the APN within the Saudi healthcare system. When policies defining APN roles and scopes of practice need clarity, healthcare administrators will be skeptical and resistant to implementing the role [31]. Clear policies guide role implementation and education establishment [40].

The entry requirements for APN need to be standardized to ensure the quality of potential practitioners in the APN roles. For instance, most participants agreed that admission requirements for APN programs must be standardized, such as a minimum of a Bachelor of Nursing degree and 2 to 3 years of experience in bedside nursing [32]. In addition, they stressed the need to ensure that academic programs include intense clinical training in parallel to theoretical education. However, participants indicated that measuring clinical experience using hours and/or years of clinical training is not enough to reflect the quality of training required for APN. Previous reports indicated that the current APN educational model using credit hours of clinical training is no longer effective. Instead, competency-based training is recommended with the utilization of simulation when specific learning experiences are not available in clinical settings. Such an approach ensures standardization and consistency in training and evaluation [41, 42].

The establishment of partnerships between clinical and academic settings to build the capacity to train and hire APNs was also recommended by participants. Partnerships between nursing and healthcare institutions ensure clinical placement, facilitate faculty practice, and connect students with potential employers [43]. Moreover, administrative policies and procedures regarding whom APNs report to, who credentials them, and who evaluates their performance need to be established. While all participants indicated that the APN roles should be under nursing administration, the reporting, credentialing, and evaluating of APNs in an organization should be a joint task between nursing and medicine. Implementing distributed leadership is a practical management approach for interconnected jobs such as APN and medicine [44]. In addition, such an approach effectively sustains collaborative relationships between nursing and medicine.

As part of the implementation of APN roles, there is a need to set clear and standardized guidelines for payment, reimbursement, and liability insurance for APN, as the lack of such guidelines hinders the implementation of APN [45]. Moreover, as there is a shortage of physicians in primary care, physicians in Saudi Arabia supported the implementation of APN in primary care [12]; hence, participants suggested that the APN role can be initially implemented in primary care. Increasing emphasis on primary and community health care stimulated the appearance of the APN role in the USA and Canada [33].

Community awareness about the potential benefits of APN on health outcomes can play a significant role in fostering the implementation of APN roles. Thus, it is important to introduce APN to the community to prepare them for the expected paradigm shift in care delivery if APN was to be implemented [46]. Nursing societies can conduct national awareness campaigns with the Ministry of Health and the Saudi Commission for Health Specialties. Such awareness campaigns should be guided by available international evidence related to the positive impact of APN [34, 47].

Overall, participants highlighted the role of three interconnected factors behind change in large organizations such as healthcare suggested by Pettigrew et al. [48], the presence of environmental pressure (e.g., Vision 2030, COVID-19), a supportive organizational culture (e.g., North American Trained Physicians and hospital accreditation standards), and effective managerial-clinical relationships (e.g., collaboration and partnership) [49].

To the best of our knowledge, this is the first study to examine the perceptions of executive nurse leaders in the Arab region regarding the feasibility of implementing APN. Our study included leaders from diverse healthcare systems in Saudi Arabia, including public, private, and military systems in primary, secondary, and tertiary healthcare settings. This diversity increased the credibility of our findings. However, this study has some limitations. Only some hospitals partially implemented APN in Saudi Arabia which may have affected our ability to capture all the possible challenges facing the implementation of APN. Future research should consider including nurses from different levels of leadership to obtain a clearer understanding of the perception and readiness of the hospitals in Saudi Arabia to implement APN. In addition, exploring the patient's experience with the care provided by APN may enhance the

understanding of the benefits and challenges of implementing APN in Saudi Arabia. Further research is needed to better understand the readiness of primary healthcare centers to implement APN.

5. Conclusions

Executive nurse leaders perceived APN as a promising initiative to improve healthcare delivery, promote professional development, and improve patient care. Opportunities such as the Healthcare Transformation Program under the Saudi Vision 2030, gaps in healthcare magnified by the COVID-19 pandemic and the growing population, and the familiarity of the Saudi healthcare system with APN roles due to the North American training of the physicians and the adoption of North American hospital accreditation standards make it an ideal time to implement APN. Therefore, integrating efforts from all stakeholders through a national board for APN is essential to develop and standardize regulations for APN in Saudi Arabia.

Data Availability

The data that support the findings of this study are available on request from the corresponding author and are not publicly available due to privacy or ethical restrictions.

Additional Points

Implications for the Profession and Patient Care. Implementation requires establishing advanced practice nursing at a regulatory level, developing a standard job description and training programs, incorporating it in organizational structures, and implementing advanced practice nursing in primary care. *What does this paper contribute to the wider global clinical community?* This study may guide advanced practice nursing implementation efforts in countries where advanced practice nursing is not well developed.

Disclosure

Arwa Alhamed and Monir M. Almotairy are co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest regarding the publication of this paper.

Authors' Contributions

A.A., M.M.A., A.N., H.M., F.A., and A.E.A. conceptualized and validated the study, wrote the original draft, and performed review writing and editing; A.A. and M.M.A. supervised the study and performed the methodology, investigation, data curation, and formal analysis; and A.A. performed project administration. All the authors have read and agreed to the published version of the manuscript.

Supplementary Materials

Supplementary Table 1 presents the qualitative questions and prompts used during the interview. The questions and prompts are presented sequentially according to the role implementation-related domains. (*Supplementary Materials*)

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Research Article

Perspectives on Nurse Retention in Hospitals in the Netherlands: A Qualitative Study

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Aim. To explore hospital nurses' perceptions of working conditions that affect their retention and to identify preconditions for retention across nursing subgroups and informants directly involved in the work that nurses do. *Introduction.* Understanding why nurses want to stay in their job is essential for hospitals to improve retention and develop policies to combat nursing shortages. Retention barriers are known, but mostly pre-COVID-19 and in specific nursing subgroups, while nursing teams are diverse in life phase, education, and expertise. *Materials and Methods.* A qualitative study with semistructured focus group interviews with nurses from different hospitals. We held interviews with nursing students and with newly graduated, experienced, specialized, and master-educated nurses. In addition, we held interviews with informants directly involved in the work that nurses do. *Results.* Three themes concerning the perceptions of working conditions and retention preconditions were identified among subgroups: (1) nurses finding their personal pathway, indicating work that fits individual challenges during the life course and work that matches personal motives and authority and control over professional practice; (2) constructive collaboration within the nursing team and with their manager and physicians; and (3) availability of supportive facilities, e.g., development, professionalization, working environment, and rewards. *Conclusion.* Elements for retention occur at individual, team, and organizational levels. Nurses find it important that their profession aligns with their personal pathway and are motivated by constructive collaboration in a stimulating team. They emphasized organizational support in realizing career tracks and in active participation in decision-making. These themes are consistent across subgroups and encompass multiple interacting elements. *Implications for Nursing Management.* By recognizing and understanding what takes place at these different levels, policymakers and managers can develop effective strategies to promote nurse retention and improve healthcare quality. While implementing and monitoring a broad retention program, managers must remain attentive to nurses' perceptions of retention preconditions amidst changing demographics and the impact of COVID-19.

1. Introduction

Although today's nursing workforce is growing and the professional scope is expanding, this is insufficient to meet the rising demand for care [1]. Nowadays, patients are facing more and different forms of disorders and chronic conditions, possibly at the same time [2]. To cope with this changing healthcare demand, it is crucial to have enough well-trained nurses to provide safe and appropriate care.

According to the World Health Organization [1], there was a global shortage of nurses amounting to 5.9 million in 2018, which has been exacerbated by the COVID-19 pandemic. Nashwan et al. [3] report that nurses' intentions to leave their jobs were higher during the pandemic than before. The World Health Organization [4] predicts an increase in healthcare workers leaving their jobs due to COVID-19-related burnout, illness, and dissatisfaction. Shortage of nurses can result in poor outcomes for nurses, patients, and organizations, e.g., higher workload and work stress, lower quality of patient care, lower productivity, higher rates of absenteeism, and human capital depletion as intellectual capital exits the organization [5–7].

As a consequence, this can reduce the morale of the remaining staff [8]. Furthermore, nurse turnover is associated with an increase of costs [9, 10]. Turnover intentions play a crucial role in predicting the likelihood of nurses staying in their jobs [11]. Turnover intention is considered to be one of the stages in a complex decision-making process that results in turnover behavior [12]. Research shows that there are many factors related to retention of nurses, such as job satisfaction, work environment, work demands, social support, demographic factors, and opportunities to learn and grow [13–15]. Research more specifically focused on nurse retention in hospitals found factors like nursing management and leadership, personal influences, professional issues, staffing, relationships, appreciation, and financial remuneration [16, 17]. While it is known that all these different elements play a role, it is not known which of these elements hospital nurses consider as important from an overall perspective, including all relevant areas.

It is vital for hospital organizations to know what nurses themselves see as relevant, unambiguous elements for retention and to understand these reasons to detect early signs of nurses' intention to leave in order to develop retention strategies. However, current available studies mostly examine the perspective of one specific nursing subgroup, e.g., new graduate nurses [18], midcareer and older nurses [19], specialized nurses [20, 21], nurse educators [22], and nurse managers [23]. Yet, nursing teams tend to be diverse in formation, with variation in age, gender, and (additional) education. Furthermore, studies have been conducted from different perspectives, such as health [24], human resources, economics [25, 26], and management [27, 28]. Literature that explicitly includes what various nursing subgroups themselves believe is important for retention in hospitals is scarce and does not reveal differences between these subgroups. This knowledge is paramount for hospitals to develop policies to retain various types of nurses. In addition, many studies were conducted before the COVID-19 pandemic. Given the ongoing demographic changes and the impact of COVID-19, there is a need for new research in this area to enhance understanding of nurses' perspectives on retention within diverse nursing populations in the hospital. Examining multiple relevant subgroups in one study aids direct comparison and contributes to a more profound understanding of the factors influencing retention.

2. Aim

This study aims to explore how hospital nurses perceive their working conditions that affect their retention and to identify preconditions for retention across nursing subgroups and informants directly involved in the work that nurses do. The study findings will enhance our current knowledge of relevant elements of retention according to nurses with various backgrounds and levels of experience. This understanding will aid in the development of retention interventions in hospital settings and may guide nurses, managers, and policymakers to prevent nurses to actually leave the hospital.

3. Materials and Methods

We conducted a qualitative study using semistructured focus group interviews. Focus groups capture collective insights and interactions among diverse subgroups. We followed the four phases for focus groups outlined by Stewart and Shamdasani [29]: planning, recruitment, implementation, and analysis. Focus group interviews were held from February to April 2021. The reporting of this study complies with the consolidated criteria for reporting qualitative research (COREQ) recommendations [30].

3.1. Sampling and Recruitment. The study population comprises registered hospital nurses, nursing students, and informants directly involved in the work that nurses do. We added this latter group of participants due to their multifaceted, external perspectives on the nursing profession, from their roles in nursing advisory boards, management, research, and education. A small subgroup of informants consisted of physicians, human resource professionals, and business managers. Our sampling strategy is grounded in the recognition that nurses operate within a complex organizational system. Therefore, we consider informants as integral components of this system rather than isolating them as separate entities. Participants were purposefully recruited through an e-mail invitation distributed by contacts (mostly nurses of nursing advisory boards or nurse advisors) from academic hospitals, teaching hospitals, an employment agency, Universities of Applied Sciences, and a foundation that focuses on increasing the labor potential of nurses. When potential participants were willing to participate, they received an invitation for a focus group meeting as well as an information letter by mail with information about study background, privacy, and informed consent.

3.2. Data Collection. Semistructured focus group interviews were conducted between February and April 2021 by AS (MSc, background in social-cultural sciences),

NR (MSc, background in quality and safety in healthcare), and JB (MSc, background in healthcare management), all former nurses with training in conducting interviews. The interviews were held online with Zoom (software) due to the COVID-19 situation. Participants were invited to a focus group interview that matched their background. We used homogeneous groups to ensure explicit attention to the perception of all nursing subgroups and avoid hierarchies in age or education level during focus group interviews: (1) nursing students and newly graduated nurses (<3 year after graduation), (2) experienced nurses (>3 year working as a nurse), (3) specialized nurses with supplementary training, (4) nurses with an additional master education (i.e., nursing science), and (5) informants directly involved in the work that nurses do; former nurses working in positions outside direct patient care, such as management, education, research, policy, or nurse advisory boards, added with physicians, human resource, and business managers.

At least two focus group interviews were organized per subgroup. Participants were required to have their video on during the call, and the recordings of the interviews were both video and audio. Each focus group interview lasted 90 minutes and started with the question: "What are your perceptions of working conditions that affect attractive work and retention of nurses in hospitals." In the focus groups, moderators facilitated active engagement, creating a dynamic, inclusive atmosphere.

The moderators used an interview guide. This guide included auxiliary phrases to monitor that all respondents expressed themselves and general questions about nurses' perceptions on attractive work and retention, as well as specific preconditions for their own retention.

Prompts were used to explore participants' comments further during the interviews.

3.3. Data Analysis. Thematic analysis was used to identify common themes that motivate nurses to continue working in their hospital [31]. The analyses were discussed with the research groups who have extensive experience in qualitative research. The joint effort of the research team contributed to the study's credibility and dependability [32]. Of note, the researchers had no formal hierarchical relationship with the participants. The audio recordings of all focus groups were transcribed verbatim. First, three researchers (AS, NR, and JB) read and re-read the transcripts to get familiar with the data. Then transcripts were coded inductively. The first focus group was coded by all three researchers, and the interpretation of segments and codes was discussed until consensus was reached. Since consensus was high, the remaining focus groups were coded separately by two researchers (AS and NR or AS and JB) and then compared. During this comparison, the selected text segments and summary of the meaning of these text segments were reflected. A third researcher was consulted if there was no agreement. Once the initial codes were generated, the subsequent phase involved searching for themes. To accomplish this, the researchers (AS, NR, and JB) sorted the different codes into potential themes and linked all the relevant coded data extracts to the identified potential themes. Sticky notes were used to help sorting the different codes into potential themes. The phase ended with a collection of candidate themes and subthemes. The next phase consisted of reviewing the themes. Two levels of review and refinement were conducted for the candidate themes. The first level involved examining the coded data extracts, while the second level encompassed the entire data set. The fifth phase in the process, intended to define and name the themes, consisted of fine-tuning and making a more nuanced coding framework. The draft summary of the focus groups was then shared with all participants of the focus group interviews to enhance the credibility of the study [32]. Participants were asked if they recognized their perspective in the summary. Participants were also asked whether the content of the focus groups was correctly presented, whether things were missing, and whether the chosen quotes could be used anonymously.

3.4. Ethical Approval. The study was exempt from the Medical Ethical Review. Participation in the focus groups was voluntary. Each focus group started with consent of all participants for permission to record the interview. The transcripts of the interviews were stored and coded in accordance with the Dutch Personal Data Protection Act.

4. Results

4.1. Participants. Ninety-three participants from twelve different organizations within the Netherlands were present to join a focus group interview, and eight persons canceled their attendance or were absent. In total, thirteen semi-structured focus group interviews were conducted (Table 1).

Participants ranged in age from eighteen to sixty-seven. Nine participants were male. There were seventy-four participants from academic hospitals, eight from teaching hospitals, eight from universities of applied sciences, one from an employment agency, and two from a foundation focused on enhancing the labor potential of nurses. Discussions were lively, with participants complementing one another, promoting the exploration of shared and differing viewpoints. This interaction yielded a rich exchange of experiences, albeit with variations in perceived importance.

4.2. Overview of the Findings. Analysis of the interviews led to three main themes: nurses finding their personal pathway, constructive collaboration, and availability of supporting facilities. These themes comprise of twelve elements that are relevant for retention of hospital nurses (Figure 1).

The three main themes including twelve elements were identified by every subgroup of nurses and consistently present across all groups. Master-educated nurses and nurse-trained professionals who currently work (partly) outside of direct patient care provided more specific and detailed insights into the necessary preconditions and their perceptions of working conditions. In contrast, nursing students and newly graduated nurses mentioned fewer retention preconditions per element compared to the other groups.

TABLE 1: Number of participants per nursing subgroup.

Target group	Number of focus group interviews	Number of participants
Nursing students and newly graduated nurses	2	12
Experienced nurses	2	10
Specialized nurses with supplementary training	2	13
Master-educated nurses	2	18
Nurse-trained professionals currently working (partly) in positions outside direct patient care, such as management, education, research, policy, or nurse advisory boards (28), including physicians (2), human resource professionals (6), and business managers (4)	5	40
Total	13	93
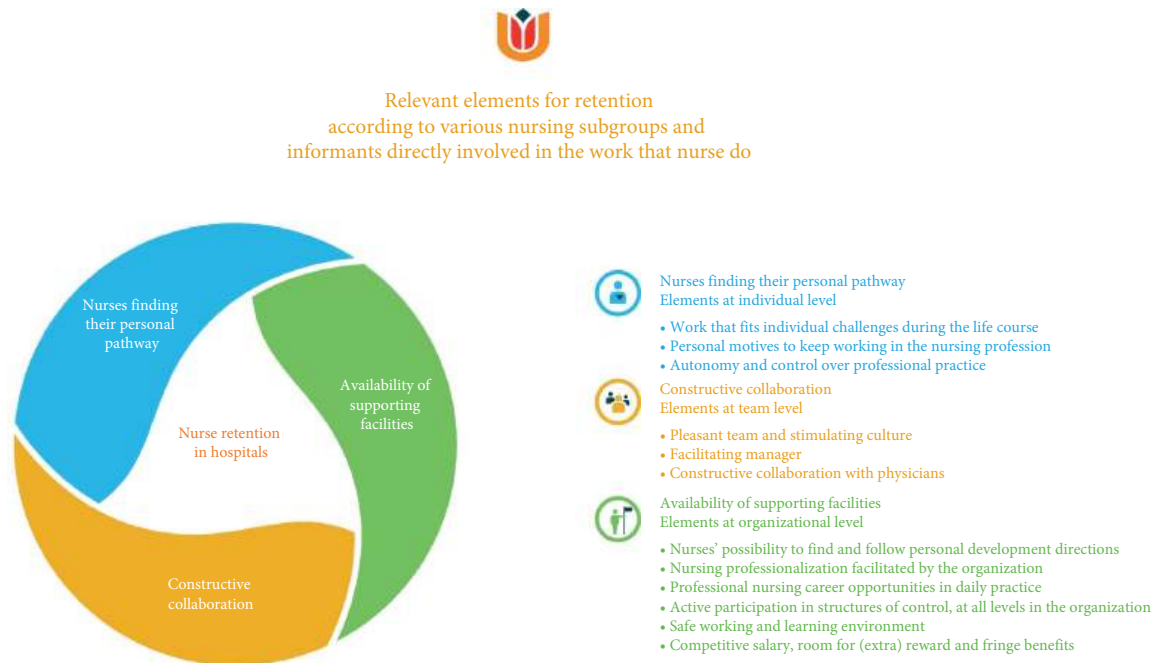
FIGURE 1: Relevant themes for retention in hospitals according to various nursing and informants directly involved in the work that nurse do.

4.2.1. "Nurses Finding Their Personal Pathway," Elements at Individual Level. Nurses highlighted that work that aligns with their personal career path is critical for retention. This included elements such as accommodating individual life course challenges, personal motivations to continue working in the nursing profession, and having autonomy and control over their professional practice.

(1) Work That Fits Individual Challenges during the Life Course. The significance of having work aligned with individual life challenges was emphasized by nurses. This included a schedule that accommodates the work-life balance, a manageable workload, emotional and physical well-being, and financial stability. In addition, the ability to adjust the formation or nurse-to-patient ratio for increased workload (e.g., due to task reallocation) or patient care complexity and intensity, as well as administrative tasks, was identified as crucial for retention. Nurses highlighted the necessity of schedule flexibility, self-scheduling, and regular

work hours during certain life phases for retention. However, nurses experienced that these flexible options were increasingly limited due to staff shortages. A nurse with a master's degree from focus group 8 remarked:

> "We want to be embraced by the hospital at different life stages. We want to feel supported if you have children, that it is life stage dependent or situation dependent and therefore not "one size fits all." So that the vitality of the nurse is considered."

(2) Personal Motives to Keep Working in the Nursing Profession. Nurses expressed their motivation to improve patient and family situations and contribute to the nursing profession. They strive to enhance the quality of life of their patients and offer support to patients and relatives during a vulnerable period like hospitalization. Nurses also seek opportunities to improve their nursing practice by sharing

knowledge and experiences. They mentioned that they like to experience a challenging and versatile profession, which they described as working with different colleagues and disciplines to provide complex patient care. In the words of a clinical nurse specialist from focus group 8:

> "For me, nursing is really the most beautiful profession there is, it gives me all the opportunities to be able to really be there for the patient, and also the fact that as a nurse specialist, as a directing clinician, I can really do the process guidance of the patient, but also secure the patient journey by being next to the patient, and making sure that the patient moves through the healthcare system." The next participant also identified with this sentiment, stating, "What's really beautiful about our profession is that we can make an incredible difference in people's lives during what are arguably the worst moments."

(3) Autonomy and Control over Professional Practice. Nurses emphasized the significance of autonomy and responsibility in carrying out daily tasks, care, and ancillary duties for retention. They also desired the possibility to be responsible for (the improvement of) the quality and organization of nursing work. Nurses wanted time to develop, share, and implement ideas for nursing care improvement at and around the bedside. Nurses noted the need for organizational agreements concerning time allocation for quality improvement and care organization development. This was perceived as a challenge, whereas in the current situation, where patient care cannot be postponed, priority is given to care delivery over development.

According to a nurse and PhD candidate participating in focus group 7:

> "For me, the very lack of autonomy in the nursing department was the reason I wanted to do something besides working as a nurse, because actually, I am fresh out of work, I have just been working for two years. The thing in doing research is that it enables me to decide things myself, have more responsibilities and figure things out on my own."

4.2.2. "Constructive Collaboration," Elements at Team Level. Nurses identified three essential elements for constructive collaboration that contribute to retention: a pleasant team and stimulating culture, facilitating manager, and constructive collaboration with physicians.

(1) Pleasant Team and Stimulating Culture. To ensure optimal patient care, nurses emphasized the importance of team engagement and collaboration. They referred to this as achieving equality within the team when carrying out tasks, valuing everyone's contributions, and appreciating each other's strengths and weaknesses. Nurses stressed the significance of personal development and having the ability to assume their respective roles within the team. They underlined the need for respect, equal treatment, and

space for initiative and self-expression. Nurses accentuated the importance of a stimulating culture where all involved disciplines, including physicians, physiotherapists, and dieticians, support each other to deliver the best patient care and encourage each other's professional growth. From the perspective of an experienced nurse in focus group 8:

> "How nice it is to stand shoulder to shoulder together as a team, as the whole hospital, and all the nurses. That's ultimately the main reason you stay in your profession, I think."

This sentiment was echoed by a specialized nurse in focus group 6, who emphasized the importance of a stimulating culture:

> "Building a culture where professionalism is allowed to be there, where there is room for innovation, and where you also dare to stand out en speak up, without the manager or the team chopping your head off."

(2) Facilitating Manager. Nurses stated that a facilitating manager is vital for retention. They pointed out the importance of personal attention, individual support, and recognition from their manager. This included a manager who is accessible, knows what is happening, cooperates and intervenes when necessary, and is able to improve team cooperation. Nurses believed that a facilitating manager comprehends the essential task requirements, has a vision for nurses' development and training, and knows how to improve nursing care's quality and efficiency. The strength of a facilitating manager is demonstrated by his or her executive power: getting things done effectively. A newly graduated nurse in focus group 1 expressed:

> "What I really notice with us is that my manager keeps a very close eye on who likes what and who wants to do what. And so she also tries to organize a bit so that everyone gets his or her opportunities. Even if you haven't really thought about it yourself, she has suddenly thought of a project somewhere."

(3) Constructive Collaboration with Physicians. Nurses emphasized the importance of having approachable contact with physicians and their recognition of nurses' contributions to the quality of care. They indicated that recognition, acknowledgement, and exploitation of each other's roles and responsibilities are critical preconditions for constructive collaboration. Moreover, joint, multidisciplinary efforts to work on care improvement plans are also essential. Nurses reported that it contributes to their retention when physicians support their needs for professional development, through discussing ideas, providing guidance, and sharing their network and resources. A master-educated nurse from focus group 7 mentioned:

"What also really helps is a strong network, setting up things with the medical discipline to improve care. Then you notice that things run faster, that there are more possibilities. That gives energy, that's together."

4.2.3. "Availability of Supportive Facilities," Elements at Organizational Level. According to nurses, the availability of supportive facilities for retention can be grouped into six relevant subthemes.

(1) Nurses' Possibility to Find and Follow Personal Development Directions. Nurses recognized the importance of personal and professional growth in their work environment, as it contributes to their overall job satisfaction and retention. They value organizations that encourage continuous learning and provide accessible training and development opportunities with support. This begins with an invitation to express their training and development needs, ensuring proper execution of their profession. In addition, nurses found it essential to have approachable access to development and training opportunities within the organization (e.g., participation in projects, attending conferences, clinical classes, training, courses, retraining, and follow-up courses). To enable such opportunities, nurses suggest that certain preconditions must be in place, such as facilitating development plans, availability of individual (training) budget and time and extension of opportunities to combine patient care and training (such as agreements on irregular shifts, planned development, and study time). An experienced nurse from focus group 3 articulated:

"What keeps me in this hospital, despite the distance from home, are the development opportunities and the possibility to make use of an orientation internship at every ward for graduated nurses. It would be nice if there was a good overview of development directions and an annual personal budget, just like physicians. They can choose which congress or training they want every year."

(2) Nursing Professionalization Facilitated by the Organization. Nurses expressed the importance of working in hospitals that adhere to current protocols and guidelines as a standard. They require hospitals to organize the possibility to be and stay competent and skilled in the profession by education. Nurses stressed the need to collect data on the care provided, generate knowledge, and organize evidence to support nursing care when needed. Additionally, hospitals should allow sufficient time for nurses to deliver high-quality care and encourage and value nurses' improvement ideas and innovations. The availability of space and resources to continuously improve nursing care is also crucial, linked to an improvement cycle for implementing improvement ideas. A nurse director from focus group 13 stated:

"We are a university hospital, education and research are definitely part of that, and that is pretty much underexposed among nurses. I think we should indicate that more

strongly together. As a hospital, we have to live up to what we propagate."

(3) Professional Nursing Career Opportunities in Daily Practice. According to nurses, clear job descriptions that align with daily needs and practice are pivotal for retention. They highlighted the importance of facilitating professional growth in their career through support from managers, collaboration with physicians, and the provision of preconditions such as time and budget. Specifically, nurses with specialization and master training expressed a desire for varied job descriptions, particularly in daily practice, such as combining teaching or research with their nursing role. A nurse-trained professional currently working as business manager from focus group 12 expressed:

"The highest a physician can achieve is to become a top specialist or professor, which is a job-related career prospect. The highest you can achieve now as a nurse is to take off your suit, leave the profession to become a full time lecturer, researcher, administrator or manager. Professional career opportunities I find seriously lacking for nurses, and that makes people say at some point, I've seen it now, let's do something else. Either outside care or within care. But at least no longer in the profession itself."

(4) Active Participation in Structures of Control, at All Levels in the Organization. To retain nurses, nurses emphasized the significance of receiving relevant information from the organization and having clear decision-making procedures in hospitals where nurses are involved.

Additionally, nurses stated that they want to be recognized as valuable partners in policy development and decision-making at the organizational level, including discussions on key developments and changes. To achieve this, nurses indicated that their opinions should be valued and incorporated into decision-making processes. They believe that by being able to influence others, feeling valued, and having the possibility to apply resources when needed, they can make a meaningful contribution to the success of the hospital. A nurse-trained professional currently working as manager from focus group 12 stated:

"What is completely normal abroad, and abnormal in the Netherlands, is that the nursing line is mandatory in the leadership structure, right up to the board of directors."

(5) Safe Working and Learning Environment. A safe working environment is essential for nurses to perform their duties effectively and remain committed to their profession. According to nurses, this environment is established through open and transparent communication, where constructive feedback and accountability are encouraged. Mistakes must be accepted and treated as learning opportunities, while compliments should be given when due. A supportive learning climate should take into account

differences in working styles, levels, ages, experiences, and cultural backgrounds. A climate that is fostered by colleagues who are open to everyone's input and who learn together. A nurse-trained professional currently working as lecturer at the University of Applied Sciences from focus group 9 remarked:

"We train our students on the principle that you are at the steering wheel of your own development and that it is necessary to formulate your own learning goals for that purpose. When young graduates find themselves in an environment where you don't feel you can hold on to that enough, it's more than a disappointment. Former students tell me that it influences their intention to stay at that ward."

(6) Competitive Salary, Room for (Extra) Reward, and Fringe Benefits. Salary is considered a crucial element in retaining nurses, a salary that is on par with other sectors and healthcare professions with comparable responsibilities and educational levels. Nurses expressed that the current labor market has provided them with many opportunities, including the option to obtain an immediate permanent contract, training, extra salary, or other benefits elsewhere. To provide a sustainable solution, remuneration should take into account (extra) responsibilities, education levels, and years of experience, along with transparent employment conditions. In addition to regular salary, irregularity allowance, travel distance and costs, housing near the hospital, and vitality facilities (such as nutrition during night shifts, power nap benches, and eye protection) should also be taken into consideration. In the words of a nurse-trained professional currently working as lecturer at the University of Applied Sciences from focus group 9: "Nurses are service-oriented people, they never look that much at salary. But if you then compare what a nurse earns when she is bachelor-qualified with, say, bachelor-trained physiotherapists, dieticians, and occupational therapists graduates. Nurses start one or two salary scales lower. So you immediately feel put down then." A nurse, part of the nurse advisory board, immediately replied: "I'd like to respond to this because I have reservations about whether salary truly serves as the main incentive for people to leave, especially among younger individuals. In my case, that is not the determining factor."

5. Discussion

5.1. Key Findings. This qualitative study revealed three themes that influence how various nursing subgroups perceive their working conditions in the hospital in relation to retention and essential preconditions: how nurses can find their personal pathway, constructive collaboration, and the availability of supporting facilities. The main themes and elements were consistent across all nursing subgroups. Master-educated nurses and nurse-trained professionals provided more detailed insights, while nursing students and newly graduated nurses mentioned fewer retention preconditions per element. This is reasonable considering their stage of professional development and future aspirations.

The three main themes occur at multiple levels: individual, team, and organizational levels. By understanding what takes place at these different levels, policymakers and managers can develop effective strategies to promote nurse retention and improve healthcare quality.

Marufu et al. [16] also distinguish various domains that impact nurse retention. Chan et al. [13] recognize this, addressing nurse retention as a complex task because it requires interventions to occur at multiple levels. Although there is ample research on organizational factors and factors at the individual level, research on how the team level is associated with retention is scarce. In previous studies, the focus was primarily on individual and organizational levels [13, 16]. Certain elements, such as salary, are typically associated with the organizational level. It should be noted that in some countries, regulations and standards at the national or regional level govern the determination of these elements.

The three themes comprise of twelve elements that are relevant for the retention of hospital nurses. These elements are highly varied, encompassing individual fit, motivation, autonomy, teamwork, leadership, professional development, career opportunities, organizational support, participation, safety, and remuneration. Literature on nurse retention acknowledges the significant diversity of relevant elements [16, 17, 33]. During the focus group interviews, nurses mentioned several elements. De Vries et al. [33] state that retention factors are multifactorial and propose a model with intercorrelations derived from the considered retention literature on EU countries. This seems to demonstrate that factors influencing retention are closely interrelated and implies that implementing interventions on a particular theme or element can trigger consequential changes on other aspects as well. Despite the mention of this aspect by various nurses in the focus groups and its support in the literature, most studies only enumerate the relevant elements without demonstrating any correlation.

When exploring nurse retention from various perspectives such as themes, elements, and levels, the significance of nurses' autonomy and control becomes apparent. Ajzen [34] states that nurses' attitudes, subjective norms, and perceived behavioral control are the underlying factors influencing both intentions and actual behaviors. Self-efficacy, which reflects personal beliefs about one's ability to achieve specific goals, has been shown to reduce turnover intentions among nurses [35]. Literature supports the importance of nurses' autonomy, decision authority, control over tasks, and organization of the working day [36, 37]. In addition, extents to which working conditions provide nurses with opportunities for advancement and make full use of their skills and abilities [38]. Furthermore, organizational empowerment, a concept based on Kanter's structural empowerment model, is also positively associated with nurse retention. This includes employees' access to relevant information, support, and resources needed to perform their job, as well as opportunities to learn and grow [21, 39].

The results also demonstrate the significance of managers in the retention of nurses. Managers, and also policymakers, can potentially still influence intentions in order to prevent nurses from actually leaving the workforce [40]. Management support and appreciation play major roles in job satisfaction and retention [41–43], as managers have direct influence on nurses' development, professionalization, working environment, and rewards [20, 40]. In summary, the structural empowerment of nurses within the organization and the presence of supportive management are crucial factors that contribute to the retention of hospital nurses.

5.2. Implications for Nursing Management. When assessing the findings of this study, it is important for nurse managers and hospital leaders to recognize the themes identified as important for the retention of nursing subgroups. These themes are composed of multiple interacting elements that should be taken into account when designing policies or interventions to improve nurse retention and healthcare quality. Marufu et al. [16] also distinguish various domains that impact nurse retention and emphasizes that these factors can be influenced by different stakeholders, not only nurses and their employers. A broad range of interventions targeting these elements at individual, team, and organizational levels is necessary, considering that the impact of each intervention may vary. Structural organizational empowerment of nurses and supportive management are critical factors for implementing effective interventions. A retention program with diverse interventions targeting the identified subthemes at various organizational levels is necessary within hospitals. Implementation of these interventions can help to reduce the likelihood of nurses leaving their jobs, leading to positive effects such as enhanced quality of care, reduced financial costs, and improved morale among the remaining staff. To determine the effectiveness of the chosen interventions, it is essential to carefully monitor and evaluate the job satisfaction and retention of nurses in the hospital. Due to demographic shifts and the influence of COVID-19, managers must also stay attuned to nurses' perceptions of essential preconditions for retention.

5.3. Strengths and Limitations. A strength of our study was that we succeeded in including nurses from various subgroups. This diverse sampling strategy was implemented to ensure a broad acquisition of knowledge, reinforcing the reliability and trustworthiness of our findings. There was a great willingness to participate. Interviewed nurses indicated that they were pleased to contribute because the angle of enquiry was to find out what nurses themselves find important for retention. Each focus group interview was conducted with hospital nurses from only one subgroup. This was done deliberately to ensure explicit attention to the perception of all nursing subgroups and avoid hierarchies in age or education level during focus group interviews. Our approach enabled direct comparisons among multiple relevant subgroups and a profound understanding of the factors influencing retention. Participants recognized the findings, but

discussion between groups might have led to different results. We did not organize focus group discussions with nurses who left the hospital as an indication of a failure in retention. Although this group may have additional viewpoints, our focus was on exploring elements that are important to motivate nurses to continue working in the hospital.

New research could examine nurses' perceptions of the critical or most relevant elements for retention, as well as identify which factors are lacking in specific hospital settings. Although all retention-related elements have been identified, further studies are needed to elucidate their interrelationships and potential synergy, which can inform the development and prioritization of effective interventions.

6. Conclusion

Our study has illuminated that nurse retention in hospitals is influenced by numerous factors that were recognized across multiple relevant subgroups. These factors encompass working conditions on individual, team, and organizational levels. Nurses find it important that their profession aligns with their personal pathway and are motivated by constructive collaboration in a stimulating team. They emphasized organizational support in realizing career tracks and in active participation in decision-making. These themes are consistent across all subgroups and encompass multiple interacting elements. It is important to devise a strategy and a retention program within the hospital targeting these themes. The challenge of managing nurse retention lies in the interplay of desired working conditions and the life phase of nursing subgroups. Meanwhile, managers, hospital leaders, and HR professionals must stay attentive to nurses' perceptions of essential retention preconditions throughout the implementation of this program, particularly in the context of demographic changes and the influence of COVID-19.

Data Availability

Due to the nature of this research, participants of this study did not agree for their personal data to be shared publicly, so supporting data are not available. Author elects not to share data.

Disclosure

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Predicting Critical Care Nurses' Intention to Use Physical Restraints in Intubated Patients: A Structural Equation Model

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Aims. To identify the factors influencing critical care nurses' intention of physical restraint in intubated patients. *Background.* Physical restraint reduction has been advocated by many international institutions, nurses are the main physical restraint decision-makers, and it is critical to identify the factors influencing physical restraint intention from nurses' perspective. *Methods.* A cross-sectional study was conducted among critical care nurses in China from February 2022 to March 2022. *Results.* The model showed a good model fit ($\chi^2/df = 2.57$, RMSEA $= 0.07$, GFI $= 0.94$, CFI $= 0.89$, and AGFI $= 0.90$). Attitude ($\beta = 0.29$, $p < 0.05$), subjective norm ($\beta = 0.25$, $p < 0.05$), and perceived behavioral control ($\beta = 0.32$, $p < 0.001$) directly influenced the intention to use physical restraint in intubated patients. Ethical conflict ($\beta = 0.04$, $p < 0.05$) indirectly influenced the intention. *Conclusions.* The study revealed that ethical conflict, attitude, subjective norm, and perceived behavioral control were positive predictors of physical restraint intention among intubated patients from nurses' perspectives. *Implications for Nursing Management.* This provides a theoretical perspective to develop effective interventions to reduce physical restraints in critical care settings. Nursing managers should enhance ethical education and physical restraint knowledge and skill training.

1. Introduction

Critically ill patients often rely on a series of life support equipment and invasive treatments (e.g., endotracheal intubation and central venous catheterization) throughout the intensive care unit (ICU) stay, which may result in agitation, pain, and delirium [1]. Unfortunately, these disturbing symptoms could lead to adverse events including self-extubation and medical device removal [2, 3], compromising patient safety seriously.

Physical restraint (PR) is commonly perceived as a routine solution to avoid self-extubation empirically [2, 4].

PR is defined as "any action or procedure that prevents a person's free body movement to a position of choice and/or normal access to his/her body by the use of any method, attached or adjacent to a person's body that he/she cannot control or remove easily" [5]. According to a prospective observational study, mechanical ventilation was an independent risk factor for PR use [6]. Compared to non-intubated patients, PR use is more pervasive (35.8% in Jodan [7] and 75% in Japan [8]) among mechanically ventilated patients in critical care settings [2, 6, 9].

However, there is growing evidence identifying the association between PR and deleterious effects both physical

and psychological [10–12]. Besides, PR itself is regarded as a violation of autonomy and dignity [13, 14]. Furthermore, it remains to be a controversial issue whether PR could ensure patients' safety effectively, and previous studies [12, 15, 16] have indicated that PR may exacerbate unplanned extubation and medical device removal conversely.

Due to the abovementioned potential hazards, how to facilitate minimizing programs of PR has become a global issue, and PR reduction has been advocated by many international institutions including the Registered Nurses' Association of Ontario (RNAO), the American Nurses Association (ANA), and the British Association of Critical Care Nurses (BACCN). As we know that critical care nurses are the main decision-makers in PR practice, so a profound understanding of nurses' intention to use PR is an essential prerequisite in the development of PR reduction.

Previous studies have revealed the process and nurses' experience of decision-making of PR. Shen et al. [17] proposed a four-stage process of PR including perceptions of risks, hesitation, implementation, and reflection. The safety of patients and staff is seen as the core element in the process. In addition, it is conventionally believed that the application of PR is an infallible guarantee of security. Patient safety was being prioritized in the clinical context but at the expense of ignoring human rights including autonomy and dignity [18].

Despite the existence of numerous studies concerning PR practices, most of them are focused on describing the experience of nurses, knowledge, attitude, and practice of PR, lacking a theoretical framework to analyze the intention of PR. The theory of planned behavior (TPB), developed by Ajzen [19], is a widely recognized psychological framework applied in various fields, including healthcare. In the context of critical care, the TPB has been previously used in several studies to understand and predict human behaviors related to healthcare practices. For instance, O'Boyle et al. [20] used the TPB-based theoretical model to explain the self-reported and observed handwashing behavior of critical care and postcritical care nurses. Another study conducted by Tanguay et al. [21] aimed to examine the factors that influence nurses' intentions to practice oral care with intubated clients in intensive care settings using the TPB. These research contexts indicate that the TPB can assist in enhancing our understanding of the decision-making processes within the fields of intensive care and offer guidance on how to improve their practical behaviors. Besides, the rationale for applying Ajzen's TPB specifically in critical care settings lies in its ability to capture the complexity of nurses' intention formation processes from three dimensions, including attitudes, subjective norms, and perceived behavioral control. Critical care settings are characterized by high-stress levels, time constraints, and life-threatening situations where quick decision-making is required. In such circumstances, understanding the determinants of nurses' intentions towards PR becomes crucial as it directly impacts patient safety and quality of care. By taking into account these various dimensions of intention formation, the TPB model provides a new perspective in understanding the decision-making process of PR and patient care management through the lens of critical care nurses. It states that an individual's behavior is determined by his or her intention, and the behavioral intention is determined by three main dimensions: (1) attitude (the extent to which an individual has a favorable or unfavorable evaluation of the behavior), (2) subjective norm (SN perceived social pressure to perform or not to perform the behavior), and (3) perceived control of the behavior (PBC perceived ease or difficulty when performing the behavior) [19]. These factors are highly relevant in critical care nursing, where the decision to use PR is influenced by a complex interplay of individual beliefs, professional guidelines, and organizational culture. Considering these factors together makes it possible to predict the likelihood of an individual performing a specific behavior. And Via-Clavero et al. [22] developed the Physical Restraint Theory of Planned Behavior (PR-TPB) based on the TPB. Besides, from critical care nurses' perspectives, ethical conflict is regarded as an undeniable difficulty when practicing PR because the conflict between maintaining patients' safety and violating patients' autonomy and dignity often places nurses in awkward predicaments [23, 24]. Though critical care nurses have realized the adverse effects of PR, they have no choice but to use it to ensure patient safety.

Thus, we aimed to investigate the effects of TPB constructs (attitude, SN, and PBC) and ethical conflict on physical restraint intention in this study. The research question of this study is as follows: to what extent can the TPB constructs and ethical conflict predict ICU nurses' intention to use physical restraint in intubated patients?

What is new in our study is that ethical conflict was introduced as a predictor of PBC because ethical conflict is regarded as difficulty in the PR decision process. In previous studies, we found that ethical dilemma, an essential factor influencing PR practice and nurses, have reflected on the experiences of ethical dilemmas due to violations of nonmaleficence and beneficence [14]. Thus, the proposed framework is illustrated in Figure 1.

2. Methods

2.1. Design. A cross-sectional survey was conducted among critical care nurses in China from February to March 2022. In this study, structural equation modeling (SEM) was applied to establish models to predict critical care nurses' intention to use PR in intubated patients. Integrating the conceptual framework of the Theory of Planned Behavior and ethical conflict, the hypothetical model is shown in Figure 1.

2.2. Sample and Setting. The typical method of SEM sample size is based on the general rule of 10 : 10 observations per indicator [25–27]. In this study, it was calculated by the following equation: $(4 + 2 + 3 + 3 + 19) * 10 = 310$ while according to Hair [28], the minimum acceptable sample size should be 300 for a model with seven or fewer constructs and factor loadings larger than or equal to 0.45. To obtain more statistically robust results, the target sample size was selected as 310 after considering both two calculation approaches. And a total of 313 critical care nurses were included in this
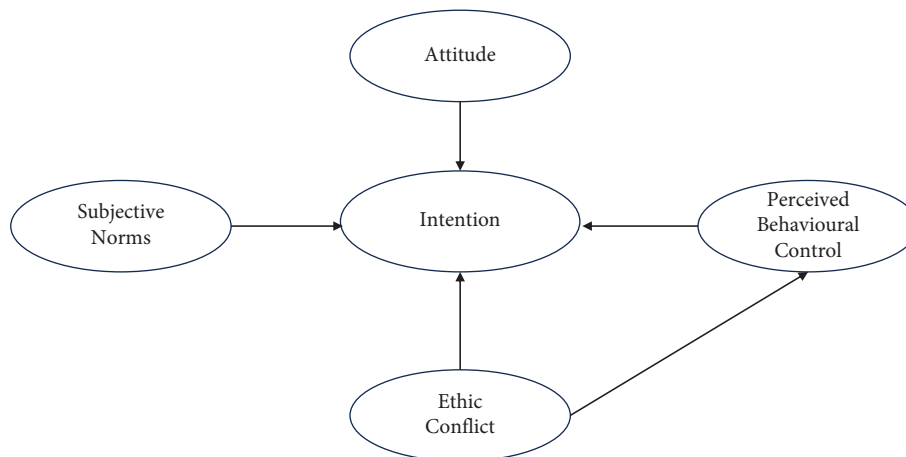
FIGURE 1: Hypothetical model.

study ultimately. Participants were recruited from critical care units covering Yunnan, Chongqing, Zhejiang, and Guangdong provinces in China via convenience sampling. The inclusion criteria of participants were (1) registered nurses who worked in intensive care units and (2) voluntary participation and informed consent to this survey. And the intern nurses were excluded.

2.3. Data Collection.
Data were collected using a self-report questionnaire composed of three parts: (1) the Physical Restraint Theory of Planned Behavior (PR-TPB), (2) the ethical conflict in nursing questionnaire-critical care version (ECNQ-CCV), and (3) demographic information form. The data collection included two stages, Stage 1: three critical care nurses who were not involved in this study were invited to fill out the pretested questionnaires to eliminate any ambiguous or incomprehensible expressions and estimate the required time. Based on the pretest feedback, some inappropriate expressions were revised and significant words were marked. Stage 2: the researchers contacted and explained the aim of the study to the head nurses of each department and sent the revised questionnaires to the participants via an online web-based platform (https://www.wjx.cn/vm/h7e0uOF.aspx). With the assistance of the head nurses, the eligible participants were identified and organized to fill out the questionnaires. At the same time, participants were provided with a phone number to ask any questions about the study. And all of the participants were instructed to complete the questionnaire voluntarily and anonymously. To ensure the quality of returned questionnaires, the questionnaires were set as follows: (1) the questionnaire began with a concise introduction about the purpose of the study and the notes for items needing more attention were in bold and marked in red. (2) To avoid missing responses, all items were set as required questions in the submitting process and the platform will send alarms automatically if there are any missing questions. (3) To prevent repeated participation, each IP address was limited to filling out the questionnaire once only. A total of 441 questionnaires were distributed, and 316 were returned (response rate: 71.7%). In addition, 3 questionnaires with response time less than 3 minutes were excluded, and 313 valid questionnaires were selected ultimately ($n = 313$).

2.4. Instruments

2.4.1. The Physical Restraint Theory of Planned Behavior (PR-TPB).
The PR-TPB [22] consists of the following 4 subscales: (1) attitude, (2) subjective norm, (3) perceived behavioral control, and (4) intention. All the answering formats were 7-point Likert scales ranging from 1 to 7. In this study, attitude, subjective norm, and perceived behavioral control were measured by corresponding subscales, respectively. The attitude was measured using 4 items with opposite adjectives (unsafe/safe, unnecessary/necessary, harmful/beneficial, and unacceptable/acceptable) placed on the poles of a 7-point Likert scale. The total score ranges from 4 to 28. Subjective norm was measured by 2 items describing the social pressure by the individual perceived from the working team when performing physical restraint. The score of each item is rated from 1 (strongly disagree) to 7 (strongly agree). Perceived behavioral control was measured with 3 items reflecting self-efficacy and controllability toward applying physical restraint in intubated patients. Participants rated each item from 1 (strongly disagree) to 7 (strongly agree). The intention was evaluated by 3 scenarios in ICU settings, rated from 1 (in no case) to 7 (in all cases).

Cronbach's α of each construct ranges from 0.6 to 0.88 [22]. Total Cronbach's α was 0.766 in this study.

2.4.2. Ethical Conflict in Nursing Questionnaire-Critical Care Version (ECNQ-CCV).
ECNQ-CCV [29] includes 19 scenarios that may produce ethical conflict among critical care nurses, and each scenario contains three questions to measure ethical conflict: "frequency," "degree of intensity," and "type." Frequency is measured with a 6-point Likert scale ranging from 0 (never) to 5 (at least once a week). The degree of intensity is measured with a 5-point Likert scale ranging from 1 (no problem at all) to 5 (highly problematic) and the type of ethical conflict is measured by six categories.

In the current study, ethical conflict was measured by the index of exposure to ethical conflict (IEEC). IEEC was a concept developed to reflect levels of exposure to ethical conflict, which multiplies the frequency and degree of intensity of each scenario with a range of 0 to 25. The total score of IEEC ranges from 0 to 475, with a higher score indicating higher levels of ethical conflict.

The instrument was tested for validity and reliability among 205 critical care nurses in Spain, which reported Cronbach's α of 0.882. The Chinese version of ECNQ-CCV has been validated and found to have good reliability (Cronbach's $\alpha = 0.902$ and McDonald's ω 0.903) and validity [30]. Cronbach's α was 0.923 in this study.

2.4.3. Demographic Information Form. The demographic information form included 7 questions about gender, age, work year, job title, education, training in physical restraint, and training in ethics.

2.5. Ethical Considerations. Ethical approval was obtained from the Second Affiliated Hospital Zhejiang University School of Medicine (SAHZU, no. 2020131). All the participations in this survey were voluntary and anonymous, and a completed questionnaire was recognized as informed consent. Participants were informed about the authorship and purpose of the research and were told that all data would remain anonymous and confidential.

2.6. Data Analysis. IBM SPSS Statistics version 25 software and IBM SPSS AMOS version 24 software were used in the analysis of the study. Categorical variables were described by frequency and percentage, and continuous variables were described by using means and standard deviations. The structural equation model was composed of two major elements: the measurement model and the structural model. Step one: confirmatory factor analysis (CFA) was performed to assess the reliability of the measurement model. And the correlations of constructs were calculated using Pearson's correlation coefficient. Step two: A structural model was constructed, and the model fitness was measured by the chi-square test/degree of freedom (χ^2/df) <3, the comparative fit index (CFI) >0.9, the goodness of fit index (GFI) >0.9, the normed fit index (NFI) >0.9, and the root mean squared error of approximation (RMSEA) <0.08 [31, 32]. The maximum likelihood (ML) estimation was used as the parameter estimation method to find the best-fitting model because skewness and kurtosis of the involved variables were within the acceptable range (absolute value of skewness <3 and absolute value of kurtosis <10), satisfying the assumption of normality [33]. And direct effects and indirect effects of the constructs were calculated by bootstrap estimates. Besides, a two-sided p value of 0.05 was set for statistical significance.

3. Results

3.1. Sample Characteristics. 313 critical care nurses participated in the survey, and the characteristics of participants are listed in Table 1. The mean age and work year of the participants were 30.44 (SD = 6.21) and 7.42 (SD = 6.00) years, respectively; 13.7% were male and 86.3% were female. In the aspect of job title, 74.5% held a junior title, 23.6% with an intermediate title, and 1.9% with a senior title. 82.7% of participants had a bachelor's degree. Over 70% of the participants had received training in physical restraint and nursing ethics.

3.2. Structural Equation Modeling

3.2.1. Measurement Model. In the process of confirmatory factor analysis, reliability was assessed for the measurement model. Table 2 provides an overview of the factor loadings and composite reliability of constructs. The reliability of the measurement model was evaluated by factor loadings, composite reliability (CR), and Cronbach's alpha. The factor loadings of items varied from 0.46 to 0.84, meeting the threshold of 0.45 [34]. The values of composite reliability were above 0.5 (the criteria of CR [35]), suggesting stable composite reliability. Cronbach's alpha for all items was 0.74, which was higher than the 0.7 threshold. The preceding data confirmed the measurement model's acceptable reliability. Table 3 shows the correlations, the mean score, and the standard deviation of each construct. Attitude ($r = 0.26$, $p < 0.01$), SN ($r = 0.27$, $p < 0.01$), and PBC ($r = 0.29$, $p < 0.01$) were positively associated with intention. IEEC was positively associated with SN ($r = 0.12$, $p < 0.05$) and PBC ($r = 0.13$, $p < 0.05$).

And the goodness of fit index of the measurement model was χ^2/df = 1.34 (<3), RMSEA = 0.03 (<0.08), GFI = 0.97 (>0.90), CFI = 0.98 (>0.90), and AGFI = 0.94 (>0.90). All the goodness of fit indexes indicated a satisfactory model.

3.2.2. Structural Model. The final structural model is shown in Figure 2. The model was assessed by the following goodness of fit indices (χ^2/df = 2.57, RMSEA = 0.07, GFI = 0.94, and AGFI = 0.90); these indexes indicated a satisfactory model fit. The standardized direct and indirect path coefficients of the model are presented in Table 4. The results revealed the fact that attitude ($\beta = 0.29$, $p < 0.05$), subjective norm ($\beta = 0.25$, $p < 0.05$), and perceived behavioral control ($\beta = 0.32$, $p < 0.001$) had a direct effect on the intention to apply PR in intubated patients. And the index of exposure to ethical conflict has a direct effect on perceived behavioral control ($\beta = 0.13$, $p < 0.05$). At the same time, IEEC had an indirect effect on intention ($\beta = 0.04$, $p < 0.05$) via perceived behavioral control. All the paths were significant at the level of 0.05. All the variables accounted for 29% of the variance in intention to use PR in intubated patients ($R^2 = 0.29$).

4. Discussion

The structural equation model revealed that ethical conflict, attitude, subjective norm, and perceived behavioral control were significant predictors of PR intention in intubated patients. Besides, this research provides a theoretical basis and new perspectives for follow-up research in the field of developing PR guidelines [36, 37].

Table 1: Characteristics of the sample.

	n	(%)
Gender		
Male	43	13.7
Female	270	86.3
Age 30.44 (SD = 6.21)		
20–25	74	23.6
26–30	117	37.4
31–35	62	19.8
36–40	44	14.1
>40	16	5.1
Work year 7.42 (SD = 6.00)		
0–4	114	36.4
4–8	93	29.7
8–12	54	17.3
12–16	19	6.1
>16	33	10.5
Job title		
Junior	233	74.5
Intermediate	74	23.6
Senior	6	1.9
Education		
College	45	14.4
Bachelor	259	82.7
Master or above	9	2.9
Training in physical restraint		
Yes	225	71.9
No	88	28.1
Training in ethic		
Yes	229	73.2
No	84	26.8

n = 313.

Table 2: The standardized factor loading and composite reliability.

Construct	Item	Unstd	SE	Z	p	Std	CR
Attitude	AT1	1.00				0.52	0.79
	AT2	1.07	0.13	8.05	***	0.70	
	AT3	1.64	0.20	8.26	***	0.74	
	AT4	1.28	0.15	8.48	***	0.82	
SN	SN1	1.00				0.67	0.60
	SN2	0.93	0.13	6.92	***	0.64	
PBC	PBC1	1.00				0.74	0.77
	PBC2	1.02	0.09	11.24	***	0.84	
	PBC3	1.01	0.11	9.29	***	0.59	
Intention	IN1	1.00				0.53	0.50
	IN2	1.03	0.22	4.77	***	0.51	
	IN3	0.79	0.17	4.59	***	0.46	

Unstd: unstandardized factor load; SE: standard error; Z: regression weight estimate; ***$P < 0.001$; Std: standardized factor load; CR: composite reliability; SN: subjective norm; PBC: perceived behavioral control.

Ethical conflict seems to be a common issue in the process of PR decisions due to the complexity of scenarios in critical care settings. As the previous study reported, nearly one-third of the nurses have confronted with ethical dilemmas in the process of physical restraints [14]. According to the results of this study, there was a positive association between ethical conflict and the intention to use PR in intubated patients, revealing that when exposed to a higher level of ethical conflict, ICU nurses are more likely to apply PR in intubated patients. The phenomenon might be explained by the flowing reasons: (1) uncertainty and depressing feelings often come with ethical conflict, and PRs may be a means to ease ethical conflict and cope with frustrating feelings. Some nurses have noted that the application of PR provides an inner sense of security and relieves the pressure of maintaining patients' safety [23]. (2) Despite violating human rights and restrictions on bodies, the security of patients is always regarded as the priority. Nurses may rationalize the implementation of PR by informing themselves that it is inevitable for security reasons. (3) Furthermore, long-term exposure to a high level of ethical conflicts may lead to a more indifferent attitude towards patients' human rights, thus turning to PR thoughtlessly. And in this study, we found out that nearly one-third of the nurses have not received ethical education. As for clinicians and policy-makers, this finding emphasized the need to cover ethical education and continued education programs among critical care nurses. At the same time, we noticed that part of nurses may be confronted with depressing moral conflict and the hospital managers need to take staff's ethical conflict into consideration and provide clinical nurses a stage to release their inner emotional burden. In the future, the effective way to identify and relieve the ethical conflict in the PR decision is needed to be explored.

In the current study, the attitude has a positive effect on the intention to use PR in intubated patients, which means the more favorable the attitude, the stronger the intention to perform the behaviors. The mean attitude was 25.32 of 28, approximately 90% of the total score, indicating a favorable attitude towards the application of PR in intubated patients among critical care nurses. Consistent with the previous study [2], such a positive attitude towards PR in intubated patients may be associated with the empirical belief that PR could prevent self-extubation and medical device removal regardless of its deleterious effects. Thus, from this perspective, more systematic and comprehensive education and training of PR are essential in reconstructing nurses' perceptions and attitudes concerning physical restriction. Several cross-sectional studies in Turkey [38], Jordan [39], and China [40] have also pointed out inadequate education and knowledge of PR. Unfortunately, despite being aware of the harmful effects of PR, some nurses are still likely to apply PR in intubated patients out of the responsibility to protect patients' safety or for a lack of other effective alternative methods. Thus, in this way, the concept of minimizing PR is needed to be advocated in critical care settings among all the medical staff.

Subjective norm has a positive effect on the intention to apply PR in intubated patients, and the mean score was more than twice as much as in Spain [41], indicating the high level of perceived social pressure to perform PRs in China compared to Spain. A qualitative study [24] has shown that PR was regarded as a routine practice in the workplace norm, and physical restraints in intubated patients were engrained in the security culture of critical care settings. Nurses, as safeguard to critically ill patients, face the burden of responsibility and pressure from the workplace. The practice of PR may be driven by expectations of the workplace other than the clinical guidelines and critical

TABLE 3: Correlations, means, and standard deviations of constructs.

	1	2	3	4	5	Min–max	Mean	SD
(1) Attitude	1					4–28	25.32	2.92
(2) SN	0.17**	1				2–14	10.40	2.82
(3) PBC	0.14*	0.47**	1			3–21	13.81	4.32
(4) Intention	0.26**	0.27**	0.29**	1		3–21	16.59	3.39
(5) IEEC	−0.02	0.12*	0.13*	0.06	1	0–475	66.44	62.83

*$P < 0.05$**$P < 0.01$; SD: standard deviation; SN: subjective norm; PBC: perceived behavioral control; IEEC: Index of Exposure to Ethical Conflict.
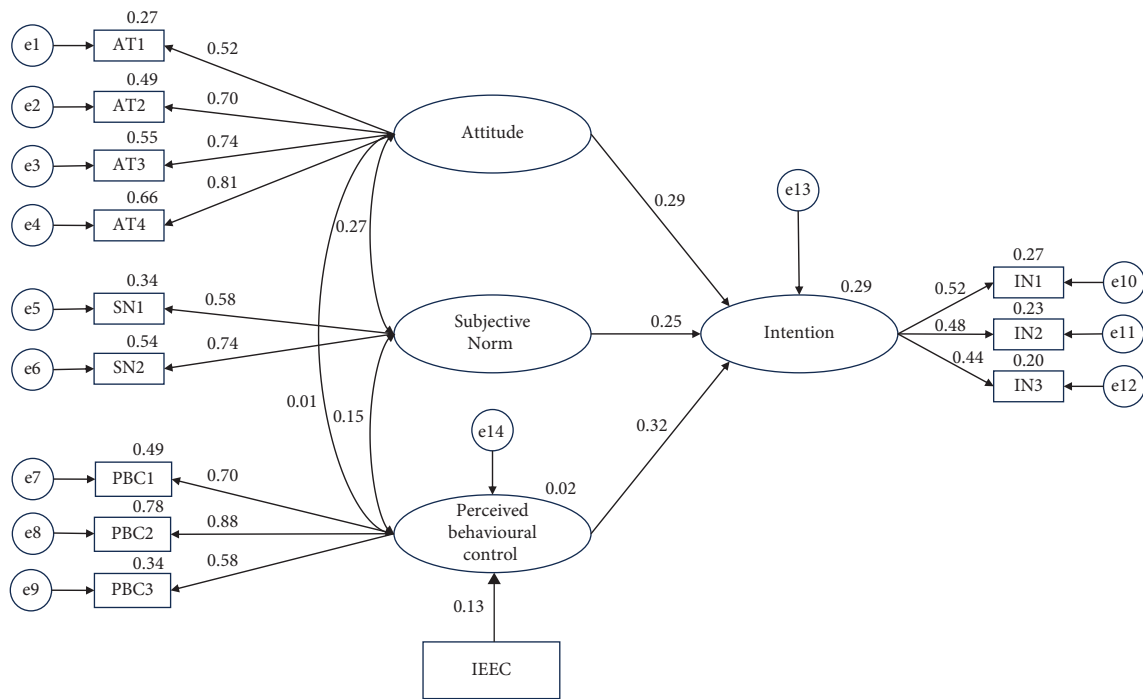
FIGURE 2: Structural model.

TABLE 4: Standardized path coefficients.

Path	β	p
Attitude-intention	0.29	0.005
Subjective norm-intention	0.25	0.025
Perceived behavioral control-intention	0.32	***
IEEC-perceived behavioral control	0.13	0.038
IEEC-intention	0.04	0.017

***$P < 0.001$; IEEC: Index of Exposure to Ethical Conflict.

thinking of nurses. Consequently, how to reestablish evidence-based PR guidelines in Chinese hospitals and stimulate self-reflection thinking patterns are crucial issues to be examined in the development of PR reduction.

Regarding perceived behavioral control, it is the strongest positive predictor of the intention in this study. This finding infers that those nurses with higher self-efficacy and controllability toward PR are more inclined in applying PR in intubated patients. In general, senior nurses should be more proficient in PR and have higher PBC scores. However, in this study, we found an interesting thing that nurses who worked for 0–4 years had higher PBC scores than those who worked for more than 12 years.

Similar to a previous study, Perez et al. [24] also found that novice nurses are more likely to use PR in intubated patients compared to senior nurses, which means there is an evident gap between the self-evaluation and the true PBC. Lacking comprehensive understanding and formal education of PR, novice nurses may overestimate their controllability of PR, thus resulting in excessive PR intention in intubated patients. In addition, due to the burden of ensuring patients' safety and a lack of other alternative methods, novice nurses are compelled to use PR. This showed that we should focus on the novice nurses' PR education, and the critical care units could assign senior nurses to guide the novice nurses in clinical PR practice.

This study has some limitations. First, the study was conducted among critical nurses in four provinces of China, the generalizability of our conclusion to other populations might be considered with caution. Another limitation lies in the fact that the TPB permits valid predictions solely when the behavior is entirely governed by volitional control, but some external factors may constrain nurses' ability to exercise full control over their PR use (e.g., patient acuity and availability of alternative interventions). Furthermore, it may not fully capture the dynamic and context-dependent

nature of critical care nursing practice because it focuses on rational decision-making and the assumption of stable preferences.

In addition, the cross-sectional study cannot reflect the changing process of PR intention, and a longitudinal investigation design is needed in the future.

5. Conclusion

To our knowledge, this is the first study to predict critical care nurses' PR intention in intubated patients using a structural equation model. This study revealed that ethical conflict, attitude, subjective norm, and perceived behavioral control are positive predictors of PR intention in intubated patients.

6. Implications for Nursing Management

The present findings provide a novel theoretical standpoint for examining PR intentions within critical care environments. To mitigate PR utilization in critical care nursing, it is vital to implement a holistic approach that encompasses not only ongoing education and training on physical restraint and ethical considerations but also organizational management aspects that could affect nurses' attitudes, intentions, and actions. This may involve evaluating existing work resources, infrastructural conditions, occupation-related framework conditions, and disseminating the concept of PR reduction in clinical contexts. Moreover, it is essential to account for the accessibility of technologically sophisticated equipment. In addition, recognizing the potential impact of nursing management in promoting alternatives to PR, such as non-pharmacological approaches and patient-centered care strategies, is of utmost importance. By contemplating these wider contextual elements and fostering a more intricate comprehension of the factors influencing PR application in critical care nursing, valuable insights can be gained for the development of efficacious interventions aimed at enhancing patient safety and care quality.

Data Availability

The datasets used and/or analyzed during the current study are available from the corresponding authors on reasonable request.

Ethical Approval

This study has been approved by the Clinical Research Ethics Committee of The Second Affiliated Hospital Zhejiang University School of Medicine (SAHZU, no. 2020131). The study was conducted in accordance with the Helsinki Declaration for the protection of human subjects.

Disclosure

Yajun Ma and Nianqi Cui are the co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

YM, NC, and JJ contributed to the conception of the study, data analysis, and data interpretation. YL, NC, YM JL, and YZ contributed to the data collection. YM took the lead in writing the manuscript with critical input from NC and XL. All authors approved the final version of the manuscript. Yajun Ma and Nianqi Cui contributed equally to this work.

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Review Article

Preventing Violence against Healthcare Workers in Hospital Settings: A Systematic Review of Nonpharmacological Interventions

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Aims and Objectives. To evaluate nonpharmacological interventions for preventing patient and visitor-perpetrated violence against healthcare workers within hospital settings. *Background*. Up to 92% of health workers experience some form of patient-perpetrated violence. The highest risk environments include emergency departments, acute care settings, and mental health units. Given such elevated rates of violence, current interventions have questionable efficacy or implementation challenges. *Design*. We conducted a systematic review conforming to PRISMA reporting requirements. We searched PubMed, CINAHL, PsycINFO, Scopus, and the Cochrane Library. Studies reporting interventions to prevent patient-initiated violence against healthcare workers in hospitals were included, and findings were synthesised. *Results*. Based on meeting eligibility criteria, twelve studies were included in the review. Most interventions reported an effect with eleven of the twelve studies describing changes in the incidence of violence postintervention. Most studies were evaluations of education and training programs ($n = 7$), followed by action plans ($n = 2$), and a reporting instrument, risk assessment tool, and legislation ($n = 1$). *Conclusions*. Insights into effective strategies to prevent hospital patient and visitor-initiated violence are necessary to develop guidelines for better aggression/violence deterrence. Violence prevention requires strong, evidence-based, and clinically applicable interventions that promote the safety and satisfaction of all healthcare workers. *Relevance to Clinical Practice*. Formulating effective and appropriate strategies that aid in early recognition, prevention, and management of aggression/violence will benefit all health workers. Patient and staff satisfaction will rise; healthcare workers will regain a sense of preparedness, and higher levels of safety will be achieved. Without these effective interventions being established, the magnitude of adverse outcomes from patient-perpetrated violence will continue in healthcare.

1. Background

The World Health Organisation (WHO) defines violence as "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either results in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment or deprivation" [1]. WHO reports that violence in healthcare settings represents about a quarter of violence in all workplaces and that violence against healthcare workers is a worldwide problem [2]. More than 50% of those responding to this seven-country study reported at least one incident of physical or nonphysical violence in the preceding year. A more recent systemic review indicated that the 12-month prevalence of any form of physical or nonphysical violence against healthcare workers was 61% globally [3].

Healthcare workers experience patient- or visitor-perpetrated violence at some stage in their careers [4], resulting in minor to major physical injury, death, psychological trauma, mental health concerns, and/or emotional burdens such as anger, sadness, fear, and disgust [5–7]. Likewise, the healthcare environment poses a risk of exposure to violence like frontline police personnel, with the healthcare sector accounting for more than half of all violent incidents reported in workplaces [8, 9]. Workplace violence in healthcare predominantly occurs in "high risk" areas including emergency departments, psychiatric units, intensive care units, obstetrics and gynaecology, and acute medical/surgical units [10], yet the epidemiology of violent patient behaviours varies greatly. Contributing factors associated with heightened aggression include the haemodynamic instability of patients, their impaired neurological status, employee workloads, lack of experience, and burnout and environmental demands in hospital contexts [4, 10–13].

With such a range of patient, professional and organisational factors arguably inherent or inevitable in healthcare contexts, it is important to better understand and prevent violence by reporting and responding to it. Nonetheless, actual rates of violence may be higher than evidence suggests, as many studies indicate an underreporting phenomenon due to numerous factors including confusion over what constitutes violence [8], time constraints preventing disclosure [8, 14, 15], fear of repercussions [5], and the belief that violence is merely "part of the job" [16].

Recently, serious incidences of violence in healthcare have been covered broadly in the media, and in some instances, fatalities have been reported. For example, an Australian surgeon was fatally punched by a patient [17], an American mental health patient was charged with the manslaughter of a nurse [18], in China, a doctor was stabbed to death by a patient's family member [19], and in South Africa, an anaesthetist was fatally shot in an apparent revenge attack following the death of a child during surgery [20]. Likewise, serious assaults are also common. An Australian nurse was knocked unconscious and required cardiopulmonary resuscitation following a patient attack [21]; in the United States, a nurse had their stethoscope wrapped around their neck and was forced to defend herself [22], and England's chief nurse called for an end to physical and verbal assaults on nurses as they worked through the COVID-19 pandemic [23].

Physical injuries such as bruising, cuts, and abrasions are the most reported injuries from violence in hospitals [5], although the psychological burden on healthcare workers following an assault includes fear, anger, anxiety, guilt, shame, self-blame, reduced job satisfaction, increased desire to change employment, and a reduction in health-related quality of life [6, 7]. Organisationally, violence is also associated with an increased risk of absenteeism, lowered morale, and decreased productivity amongst healthcare workers [24–26]. The economic cost of violence in healthcare is significant with treatment, leave expenses, staff burnout, compensation, increased turnover, and security, litigation, and property repair expenses burdening the sector [8, 9, 11, 27].

Despite its impacts, few studies have explored the efficacy of interventions to prevent violence. Whilst some studies have explored the role of pharmacological strategies like sedating or restraining violent patients [5, 8, 15, 28], drug-based therapeutic solutions [5, 15, 28] are not a leading solution to workplace violence in healthcare and can lead to serious consequences for patients [5, 15, 29]. Currently, no systematic reviews have been conducted to measure the effectiveness of nonpharmacological interventions to prevent patient-perpetrated violence against healthcare professionals within hospital settings. Key objectives of this review include identifying interventions effective to prevent violence and evaluating the extent of evidence to support specific preventive approaches to violence. We considered any nonpharmacological intervention as those which included but were not limited to education and training, human resourcing interventions such as staffing, security interventions, environmental modification, policies and procedures, and behaviour contracts.

1.1. Aim. The aim of this systematic review is to analyse nonpharmacological interventions for the prevention and management of violence towards healthcare workers by patients and visitors.

1.2. Methods

1.2.1. Design. Recommendations from the Preferred Reporting Items for Systematic Review and Meta-Analysis Protocols (PRISMA-P) 2015 statements have been used to develop the methods for undertaking this systematic review [30]. The systematic review protocol has been registered in the International Prospective Register of Systematic Reviews (PROSPERO) CRD42017065700.

1.2.2. Inclusion and Exclusion Criteria. Any interventional study that focused on preventing violence in a population of adult hospital patients or visitors of 18 years of age and older was eligible for inclusion (see Table 1). Interventions included were those designed with the stated objective of preventing or reducing the incidence of violence/aggression perpetrated by patients or visitors in the hospital. Studies were not restricted based on design; however, studies were required to have a comparison group of some kind. Outcomes were focused on the effectiveness of the intervention on deescalation, detection of the risk of violence, frequency of violence, injury, and the use of restraint/seclusion. This review only focused on reported acts of violence or aggression committed by patients or visitors within the hospital setting.

1.2.3. Search Strategy. Scopus, PubMed, Cumulative Index to Nursing and Allied Health Literature (CINAHL), PsycINFO, and the Cochrane Library were searched. The reference list of included articles was also read to search for additional potential studies for review. The search strategy is

TABLE 1: Inclusion and exclusion criteria.

Inclusion criteria
Interventional studies on preventing violence against health professionals in hospital patients
Adult human patients (≥18 years)
Published peer-reviewed articles
Exclusion criteria
Publication type
Narrative reviews
Editorials
Government reports
Books or book chapters
Commentaries
Consensus statements
Unpublished manuscripts
Clinical guidelines
Lectures and presentations
Study population
Animals
Children
Pregnant women
Forensic patients
Forensic psychiatric patients
Diagnosed psychiatric illness/patients
Study setting
Nonhospital settings

described in Table 2. All imported data from the search strategies were stored in EndNote with duplicates removed. Initially, 5,558 citations were retrieved, and of these, 1,883 were removed via EndNote as duplications. The remaining 3,675 were then screened for eligibility independently by two authors (NM, NR). A total of 160 full-text articles were retrieved for detailed scrutiny to further assess eligibility. Twelve articles met all inclusion criteria and were selected for review. Table 3 provides a summary of those full-text studies reviewed for inclusion and those excluded, and Figure 1 provides an outline of the screening process.

1.2.4. Data Extraction. Included studies were categorized into groups based on key interventions. Additional information extracted included the type and size of the study, participant groups, outcomes, and the risk of bias score calculated. Data were independently extracted and checked for concordance between reviewers (NR, NM) using a data extraction tool with a minimum of 95% concordance for extraction accuracy to ensure the completion of data.

1.2.5. Quality Assessment. In systematic reviews, especially those involving health services research, the appraisal of methodological quality and quality of reporting is crucial. Traditionally, separate tools have been used for quantitative and qualitative research, owing to the distinct nature of these methodologies which poses challenges in the cohesion of evidence synthesis. The Quality Assessment for Diverse Studies (QuADS) tool addresses this gap by providing a standardized, empirically grounded tool suitable for a variety of study designs, including mixed-methods research

[36]. The QuADS tool was used as it demonstrates strong reliability and ease of use for application to multi- or mixed-methods health services research reviews [36]. The quality assessment was performed independently by two reviewers (NM and NR) who followed the six-step procedure outlined in the QuADS criteria with a kappa value of 0.91 indicating excellent agreement with criterion-based quality assessment performed for each paper against the 13 different QuADS criteria independently (see Table 4). Any discrepancies were resolved through collaborative discussion.

1.2.6. Data Synthesis. There was marked methodological heterogeneity in the studies, and as a result, narrative synthesis was chosen as the most appropriate method to analyse and explain findings. Narrative synthesis involved a modified version of the framework developed to investigate findings and to explore relationships within and between the data [37]. This process involved tabulating study data under headings that included participants, intervention, comparisons, outcomes, and themes. Tabulation allowed for consideration of themes related to key interventions, the development of textual descriptions, and the exploration of relationships within and between studies for an overall assessment of the strength of evidence [37].

2. Results

Of the twelve articles included in this review, eleven reported a change in the incidence of violence postintervention. Various design methods were utilised including before and after study design [8, 27]; randomised controlled trial [15]; quasiexperimental studies [29, 31, 34]; literature review and intervention establishment [11]; qualitative quality improvement observational study [10]; investigative study [32]; a risk assessment checklist and preventative protocol [34]; cross-sectional surveys [33, 35], and chart review and assessment [9].

The 12 interventions included education and training programs (7): [8, 10, 29, 31, 34, 35, 38]; action plans (2): [11, 15]; detection instrument (1): [27]; risk reporting tool (1): [9], and legislation (1): [33]. Specific settings such as emergency departments [10, 27, 33–35] and obstetrics and gynaecology units [29] were identified along with those studies which targeted multiple units and the entirety of the hospital [15].

Study populations included healthcare employees: nurses [8, 9, 31, 34]; doctors and medical students [10, 35]; human resource representatives, security personnel and administration staff [11, 35]; general/unspecified healthcare workers [9, 15, 29, 33, 38]; and patients [27]. Studies were conducted in Australia (1), France (1), Iran (3), Pakistan (1), and the United States (6).

Regardless of the variations between intervention types, population groups, and design methods, each study reported on the incidence of physical and/or verbal violence either as a combined or singular phenomenon. Five outcomes of interest were reported across the twelve studies for inclusion as follows: "Frequency of Violence," "Capability to De-escalate," "Screening for Risk of Violence," "Injury," and "Need for Restraint/Seclusion."

TABLE 2: Preliminary search strategy for systematic review.

Database	Search strategy
Scopus 2903 retrieved	(KEY (violence) OR KEY (aggression)) AND (TITLE-ABS (intervention) OR TITLE-ABS (managing) OR TITLE-ABS (prevent*) OR TITLE-ABS (management) OR TITLE-ABS (de AND escalation) OR TITLE-ABS (reducing)) AND (TITLE-ABS (hospital) OR TITLE-ABS (ward) OR TITLE-ABS (unit)) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "ip")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (DOCTYPE, "ar") OR LIMIT-TO (DOCTYPE, "re") OR LIMIT-TO (DOCTYPE, "ip")) AND (LIMIT-TO (EXACTKEYWORD, "Human")) AND (EXCLUDE (SUBJAREA, "BIOC") OR EXCLUDE (SUBJAREA, "DENT"))
PubMed 132 retrieved	(((("violence"[MeSH Major Topic]) AND "aggression" [MeSH Major Topic])) AND (((((((((("treating" [Title/Abstract]) OR "intervention" [Title/Abstract]) OR "interventions" [Title/Abstract]) OR "managing" [Title/Abstract]) OR "prevention" [Title/Abstract]) OR "preventing" [Title/Abstract]) OR "management" [Title/Abstract]) OR "de-escalation" [Title/Abstract]) OR "reducing" [Title/Abstract])) AND ((((("hospital"[Title/Abstract]) OR "clinic" [Title/Abstract]) OR "ward" [Title/Abstract]) OR "unit"[Title/Abstract]) OR "department"[Title/Abstract])
CINAHL 966 retrieved	S1-AB violence or AB aggression (results = 17640) S2-AB treating or AB intervention or AB managing or AB preventing or AB prevention or AB management or AB de-escalation or AB reducing (results = 424521) S3-AB hospital or AB clinic or AB ward or AB unit or AB department (results = 286193) S4-S1 AND S2 AND S3. Limiters-English language; age groups: all adult; language: English (results = 514)
PsycINFO 1512 retrieved	S1-AB violence OR AB aggression (results = 100210) S2-AB treating OR AB intervention OR AB managing OR AB management OR AB prevention OR AB preventing OR AB de-escalation OR AB reducing (results = 613675) S3-AB hospital OR AB clinic OR AB ward OR AB unit OR AB department (results = 263109) S4-S1 AND S2 AND S3. Narrow by language: English. Narrow by subject age: adulthood (18 years and older) (results = 1285)
Cochrane 45 retrieved	(("Violence") (word variations have been searched))

2.1. Interventions for Decreasing the Frequency of Violence. Overall, ten of the twelve studies noted a decrease in the frequency of violence postintervention whilst two reported no statistically significant difference [11, 29]. Of the ten, one also noted a decrease in the incidence of patient-to-patient violence and the use of seclusion/restraints but no change in the rate of patient-to-staff violence [32]. Reductions in the incidence of violence ranged from 23% to 91.6% [10, 27], respectively. Characteristics of interventions to diminish violence included education programs, action plan development for violence prevention, deescalation and nonviolent crisis intervention training, violence reporting instruments, system efficacy examination, virtual training and questionnaires, risk assessment checklist, and a preventative protocol.

2.2. Interventions for Improving Staff Capability to Deescalate. Three studies reported the use of deescalation techniques to reduce violence, actual, or potential [8, 11, 29]. Current deescalation techniques focus on the adaptation of healthcare providers' behaviours to better respond to, prevent, and reduce violence including the use of self-defence training, verbal deescalation strategies, training programs, and the implementation of the Confidence in Coping with Patient Aggression Instrument (CCPAI). Characteristics of interventions utilised in these studies included two training programs and one education program. Of these studies, two reported results to be statistically nonsignificant, mixed, and inconclusive [11, 29]. The final study noted the use of verbal deescalation strategies significantly increased ($p = 0.011$), resulting in diminished frequency and recurrence of violence by 45% [8].

2.3. Interventions for Screening for Risk of Violence. Three studies utilised screening assessment tools to aid in the identification and perception of potentially violent patients [8, 9, 34]. One of these studies reported an overall reasonable effectiveness in identifying those most at risk of committing violence with moderate sensitivity (71%) and high specificity (94%) [9]. The second study noted decreased frequency and recurrence of violent incidents [8], whilst the third noted a reduction in the perceived risk of violence from 46 to 35% [34]. Characteristics of interventions screening for the risk of violence included the Alert Assessment Form protocol, and the use of specific characteristic criteria to recognise those patients most at risk [8, 9, 34].

TABLE 3: Table of included studies, $n = 12$.

Author (country)	Aim	Study design	Participants	Intervention	Findings
Adams et al. [8] (Australia)	To assess the effectiveness of clinical education in identifying patients at high risk of violence and reducing the frequency of such incidents	Before and after study design	Registered nurses (41 pre, 45 post), enrolled nurses (15 pre, 17 post), and assistants in nursing (3 pre, 5 post). A total of 65 pre and 73 post	An education program addressed four key areas (assessment, planning, implementation (crisis), postincident). Case studies and inpatient scenarios provided context, immediacy, and relevance, and 77% of the staff completed the program	Posteducation, knowledge increased significantly ($p = 0.001$, CI 0.256–0.542), the use of verbal deescalation increased significantly ($p = 0.011$, 1df) and the frequency and recurrence of incidents decreased. All perpetrators met criteria indicating a high risk for violence
Arnetz et al. [15] (United States)	To evaluate the effects of a randomised controlled intervention on the incidence of patient-to-worker (type II) violence-related injury in hospitals	Randomised controlled trial	15000 employees	41 units across 7 hospitals were randomised into intervention ($n = 21$) and control ($n = 20$) groups. Intervention units received unit-level violence data to facilitate development of an action plan for violence prevention; no data were presented to control units	Six months postintervention, incident rate ratios of violent events were significantly lower on intervention units compared with controls (incident rate ratio (IRR) 0.48, 95% confidence interval (CI) 0.29 to 0.80). At 24 months, the risk for violence-related injury was lower on intervention units, compared with controls (IRR 0.37, 95% CI 0.17 to 0.83)
Baig et al. [29] (Pakistan)	To assess the effectiveness of training in prevention, deescalation and management of verbal and physical violence in healthcare settings by equipping healthcare providers with essential skills	A quasiexperimental study using mixed method concurrent embedded design	154 healthcare providers working in emergency, gynaecology, and obstetrics departments	4-hour deescalation training	The overall self-perceived mean score of confidence in coping with patient aggression instrument "(CCPAI)" scale was significantly higher in intervention group (mean = 27.49, SD = 3.53) as compared to control group (mean = 23.92, SD = 4.52) ($p < 0.001$). No statistically significant difference was observed between intervention and control groups with regard to the frequency of violence faced by HCPs posttraining and major perpetrators of violence

TABLE 3: Continued.

Author (country)	Aim	Study design	Participants	Intervention	Findings
Drummond et al. [27] (United States)	To describe one general hospital's success in reducing violent behaviour amongst repetitively disruptive patients	Comparison study	48 patients	An instrument was designed by the medical centre's multidisciplinary behavioural emergency committee (BEC) so employees could report incidents involving an act or threat of violence that disrupted patient care	The number of incidents declined by 91.6%, and visits to the medical centre for any reason decreased by 42.2%. The ratio of violent incidents to visits after the program was begun was less than one-sixth the rate before the program In conclusion, the results are mixed and statistically inconclusive. From the care providers' perspective, any reduction in violence is significant. The data regarding the training interventions indicate that there was an empirical, albeit not statistically significant, change in Code Gray reports. Training may have reduced the violence in the eldercare unit by nearly half
Ford [11] (United States)	To determine if one hour of deescalation and self-defence training can reduce violence and improve the work environment for patient care providers; thereby allowing improved patient care quality	Literature review and intervention evaluation	Representatives from two nursing units, human resources, risk management, security, and administration*	Research was initiated by developing an intervention utilising violence theory and constructs	There was a negative correlation between violence and NCI training in the previous 90–150 days; regression determined a 23% decrease in code purples, pursuant to training
Gillam [10] (United States)	To evaluate the nonviolent crisis intervention training investment	Qualitative quality improvement observational study	75,246 emergency department visits with 111 ED code purple events from November 2012 to October 2013	Nonviolent crisis intervention (NCI) training was initiated to reduce the incidence of violence in an acute care hospital ED with more than 75000 annual visitors	

TABLE 3: Continued.

Author (country)	Aim	Study design	Participants	Intervention	Findings
Jouybari et al. [31] (Iran)	To determine the effect of anger management training on controlling the perceived violence and aggression of nurses in emergency departments	The quasiexperimental study, pretest-posttest study design, and two groups	112 nurses in emergency departments of educational healthcare centres of Gorgan, Iran, in 2017	Nurses were randomly divided into test and control groups. In the test group, training in anger management skills was carried out in person, followed by 2-month virtual training, including short messages related to the skill of anger management delivered via telegram. No specific measure was obtained in the control group. The subjects filled out an anger management skill questionnaire before and after the intervention	The comparison of exposure level to verbal violence in the control group was low at the beginning of the study, which had a significant increase at the end of the investigation ($p = 0.001$). There was a significant difference between the level of exposure to physical violence in the test group before and after the intervention ($p = 0.007$), whereas no change was observed in the control group ($p = 0.91$). Only in the test group, there was a reduction in the level of exposure to sexual anger, and the difference was statistically significant ($p = 0.006$)
Kling et al. [9] (United States)	To examine the use and effectiveness of the alert assessment form	Chart review and assessment	117 violent patients' charts were reviewed and compared to 161 nonviolent patient charts	The alert assessment form is part of the alert system, used by one large acute care hospital to identify patients with a propensity for violence	The overall use of the alert assessment form for violent and nonviolent patients was 75.7% and 35.4%, respectively. The assessment form was found to have moderate sensitivity (71%) and high specificity (94%). It is reasonably effective in identifying potentially violent or aggressive patients when it is used according to protocol
McDade [32] (United States)	To examine the efficacy of an aggression management training in managing aggression and violent behaviour at East Mississippi State Hospital (EMSH), an inpatient behavioural health program	Investigative study	3616 presentations. Hospital staff	The efficacy of the Mandt system was examined through 4 key variables: patient-to-patient incidents, patient-to-staff incidents, seclusion episodes and restraint episodes. Over a 6-year period, incidents of aggression were identified by extracting archival data from incident reports. Archival data were examined 3 years prior to the implementation of the Mandt system and 3 years after the implementation of the training	The researcher found that the rate of patient-to-patient incidents decreased as well as the rate of seclusions and restraint episodes following the implementation of the Mandt system training. The rate of the patient-to-staff incidents did not decrease. Effective training on the management of aggression is essential in decreasing aggressive and violent behaviour

Table 3: Continued.

Author (country)	Aim	Study design	Participants	Intervention	Findings
Peek-Asa et al. [33] (United States)	Compares surveys of emergency nurses before and after the implementation of the AB508	Cross-sectional survey	17 California emergency departments	The California Emergency Nurses Association (ENA) Government affairs committee conducted a survey of California emergency departments in 1990 with a follow-up survey in 2000	Most hospitals reported fewer violent episodes after the implementation of AB508. However, 32% of hospitals reported that 5 or more verbal threats occurred monthly, and 5% reported that 5 or more violent injuries occurred monthly. Overall, hospitals reported improvements in security programs. The most notable increase was in employee training, which rose from 34% to 95.6% of reporting hospitals. However, almost a quarter of hospitals reported not having general violence prevention policies
Sharifi et al. [34] (Iran)	To evaluate the effects of an education program, risk assessment checklist, and preventative protocol on violence against emergency department nurses	Quasiexperimental intervention before and after the study	37 nurses in the emergency department of Tohid Hospital	A workshop in which emergency department nurses were taught a method of using a risk assessment checklist and preventative protocol. The intervention lasted six weeks	The mean score of violence before the intervention was 8.4, and after the intervention, it was 2.7, which was statistically a significant difference ($p < 0.0001$). In addition, there were significant differences in the mean frequency of verbal abuse ($p < 0.0001$), assessment of workplace security ($p = 0.006$), fear of injury ($p < 0.02$) and type of reaction to violence ($p < 0.01$) before and after the intervention amongst the nurses

TABLE 3: Continued.

Author (country)	Aim	Study design	Participants	Intervention	Findings
Touzet et al. [35] (France)	To assess the impact of a comprehensive prevention programme aimed at preventing incivility and verbal violence against healthcare professionals working in the ophthalmology ED of a university hospital	Single-centre, prospective interrupted time-series study	Seven nurses, six ward aides, two orthoptic students, seven residents in ophthalmology, and four senior ophthalmologists	3 periods; a three-month preinterventional period, a three-month training period and a twelve month implementation period of the prevention programme	There were a total of 22 107 admissions, including 272 (1.4%) with at least one act of violence reported by the healthcare workers. Almost all acts of violence were incivility or verbal harassment. The rate of violence significantly decreased from the preintervention to the intervention period (24.8, 95% CI 20.0 to 29.5, to 9.5, 95% CI 8.0 to 10.9, acts per 1000 admissions, $p < 0.001$). An immediate 53% decrease in the violence rate (incidence rate ratio = 0.47, 95% CI 0.27 to 0.82, $p = 0.0121$) was observed in the first month of the intervention period, after the implementation of the triage algorithm

* no n = provided.
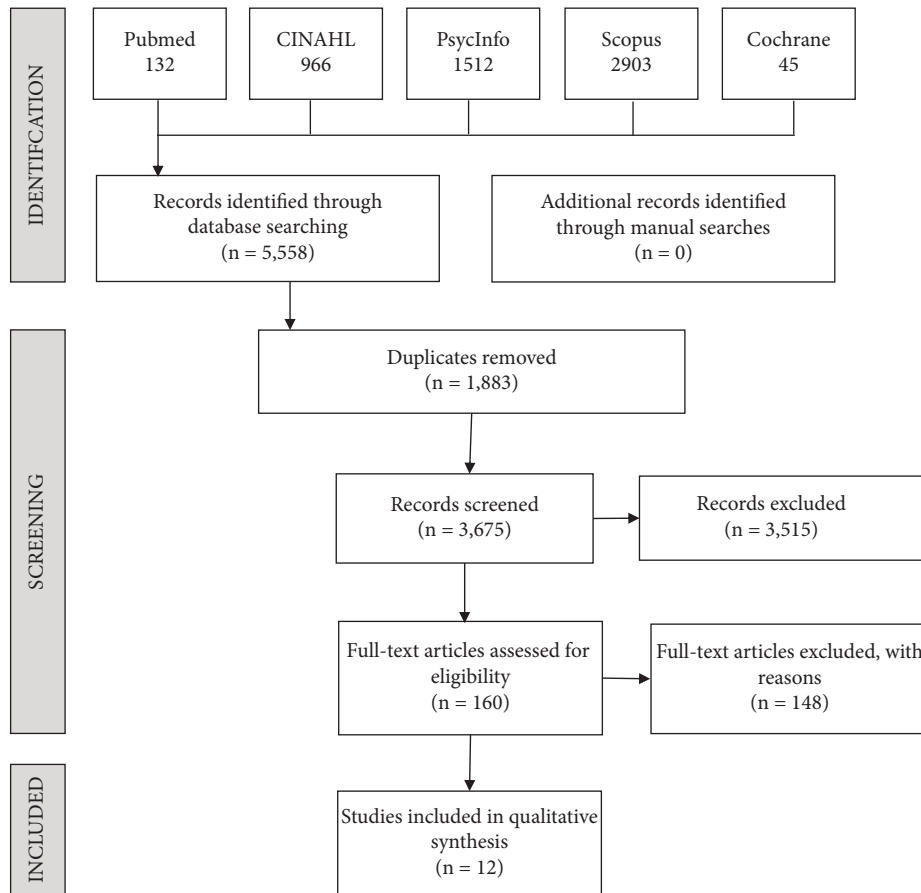
FIGURE 1: PRISMA flowchart.

2.4. Interventions to Reduce Violence-Related Injury. Two studies reported a decrease in the frequency of injury as a direct result of violence. One noted the rate of incidents decreased by 91.6% with staff visits to the medical centre reducing by 42.2% [27]. The second study had minimal impact on the occurrence of self-defence-related injuries in participants with pre- and postintervention rates of 37.5% and 35.7% [35]. These study interventions were characterised by the creation of an instrument allowing employees to better report threats and acts of violence which directly impeded on patient care.

2.5. Interventions to Reduce the Need for Restraint/Seclusion. Only one study highlighted a reduction in the use of seclusions and restraints [32]. The characteristics of the intervention diminished the need for restraining and secluding patients by examining the efficacy of the Mandt System.

3. Discussion

Importantly, following a systematic review of interventions for preventing violence in hospitalised patients, we identified ten of the twelve included studies reported a decrease in the frequency of violence following the introduction of an intervention. However, with the current incidence of violence of concern in the literature, we note this review identified only 12 studies of predominantly low quality. Nonetheless, the studies reported on a diverse range of effective interventions for improving health professionals' capabilities to deescalate violence in hospitals; screening for risk of violence; reducing the frequency of violence; preventing or reducing injuries from violence; and lowering the need for restraint/seclusion.

Deescalation techniques predominantly adopt a "prevention is better than a cure" approach to violence management. Education-based training strategies are commonly utilised and readily adopted into practice by clinical staff [38]. These interventions report an enhanced knowledge of self-defence, break-away techniques, and confidence in aggression management tactics [39–41]. Regardless of their successes, these studies were of low quality with reporting methods being inconsistent. In noting this, it only reiterates that despite the best efforts to teach, train, and educate healthcare workers, current deescalation techniques are inadequately established.

Screening for potentially violent patients aids in the facilitation of early intervention, prevention, and management [13]. Questionnaires, observational checklists, and risk identification screening tools are frequently used to assist in the recognition of high-risk patients [42–44]. Such interventions have commendable success rates; however, they continue to fail when used as a stand-alone measure, and a general lack of consensus remains regarding follow-up

TABLE 4: Quality Assessment for Diverse Studies (QuADS).

Study	Theoretical or conceptual underpinning to the research	Statement of research aims	A clear description of the research setting and target population	The study design is appropriate to address the stated research aim/s	Appropriate sampling to address the research aim/s	Rationale for choice of data collection tool/s	The format and content of the data collection tool are appropriate to address the stated research aim/s	Description of the data collection procedure	Recruitment data provided	Justification for the analytic method selected	The method of analysis was appropriate to answer the research aim/s	Evidence that the research stakeholders have been considered in the research design or conduct	Strengths and limitations critically discussed
	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score	Score
Adams et al. [8]	0	3	3	2	3	2	2	2	2	2	3	0	1
Arnetz et al. [15]	0	3	3	3	3	2	2	2	2	2	3	0	1
Baig et al. [29]	0	3	3	2	3	2	2	2	2	2	3	0	1
Drummond et al. [27]	0	3	3	2	3	0	3	2	2	2	3	0	0
Ford [11]	0	3	3	2	3	1	2	2	2	2	3	0	1
Gillam [10]	0	3	3	2	3	1	2	2	2	2	3	0	1
Jouybari et al. [31]	0	3	3	2	3	2	2	3	2	2	3	0	1
Kling et al. [9]	0	3	3	2	3	2	2	2	2	2	3	0	1
McDade [32]	0	3	3	2	3	2	2	2	2	2	3	0	1
Peek-Asa et al. [33]	0	3	3	2	3	2	3	2	2	2	3	0	1
Sharifi et al. [34]	0	3	3	2	3	2	2	3	2	2	3	0	1
Touzet et al. [35]	0	3	3	2	3	2	2	3	2	2	3	0	1

0 = not at all, 1 = very slightly, 2 = moderately, 3 = complete.

instructions [42]. Therefore, it can be concluded that without the formulation of supplemental instructions, screening tools alone will prove insufficient.

Multiple interventions have been formulated to assist in the decrease of patient-perpetrated aggression. Much of the literature highlights that targeted, clinically applicable, and effective solutions are needed to assist in the identification, prevention, and reduction of workplace violence [45, 46]. Despite this, current methods remain substandard irrespective of their optimistic impact [47]. Until such a time that workplace-associated violence is adequately addressed, it can be rationalised that patients will continue to burden the healthcare sector with acts of aggression.

When evaluating the net benefit of establishing interventions for workplace violence management and prevention against leaving practice unchanged, the answer is obvious. The financial strain it places on the hospital sector is immense [48]. Likewise, psychological, physical, emotional, and social repercussions to staff leave them under significant pressure and unable to fulfil their role-required responsibilities [49, 50]. Immediate action through the establishment of quality interventions is fundamental to bringing positive change to the healthcare sector. By doing so, staff injury rates have the potential to decrease, proving beneficial to the workforce.

The use of seclusion and restraint of patients, physical or chemical, remains highly controversial and problematic [51]. Although it can be argued that these measures can improve patient and staff safety [52], many have serious negative repercussions and create ethical challenges in the delivery of care. Increased stress and agitation, loss of independence, restricted movement, haemodynamic instabilities, and deprivation of dignity have all been reported as adverse outcomes following restraints and seclusion [53].

Many studies have proposed the use of education-based interventions to reduce the need for such "invasive" measures. Seclusion and restraint (chemical and/or physical) of patients remain, both legally and ethically [51]. Whilst the direct and indirect use of these measures can be somewhat justified by maintaining safety [52], they can pose serious negative consequences. Increased agitation and stress, loss of independence and ability to move, the development and exacerbation of pressure area injuries, haemodynamic instability, and deprivation of dignity are all reported adverse outcomes from the use of restraint and seclusion [53]. It has, therefore, been proposed that through education and awareness, the use of such measures can be reduced whilst maintaining a safe environment for all [53]. In doing so, the perceived deprivation of basic human rights is lowered, and it becomes less distressing for patients, their families, and staff and facilitates a more positive environment for all.

Across all studies, we found that studies were of low quality and that no consistent outcome measures and reporting or definitions of violence were used. Studies of various designs and interventions suggest that further work is needed in designing high-quality studies to robustly evaluate interventions that aim to prevent violence in hospitals. Further research is, therefore, needed to develop high-quality interventions using recognised methodologies and test-developed interventions using rigorous designs.

This review is the first of its kind in collating and synthesising the available evidence on the important topic of violence prevention. Conclusively, the deterrence of patient-perpetrated violence benefits the entirety of the healthcare system. Unnecessary expenses are reduced, workforce retention improves, the safety of staff, patients, and visitors is maintained, and the overall functionality of the hospital is enhanced. Despite some promising interventions presented in the literature, the quality of the reporting of such remains inconsistent as per our quality assessment. Moreover, the literature is scant in the context of frequent violence in healthcare settings. Multiple evidence gaps were noted which require urgent investigation to ensure the formulation of evidence-based policies and the implementation of effective interventions into practice.

4. Implications for Nursing Management

This systematic review highlights the need for nurse managers to prioritize the development and implementation of evidence-based strategies to mitigate violence in healthcare settings. Nursing leaders are encouraged to actively engage in the development and enforcement of robust violence prevention protocols, focusing on a multifaceted approach that includes education-based interventions, effective deescalation techniques, and rigorous screening tools for potential violence. Emphasis should be placed on continuous training and support for clinical staff, fostering a culture of safety and preparedness against patient-perpetrated aggression. Furthermore, nursing management must advocate for high-quality research to refine existing interventions and explore novel strategies. By doing so, not only can the incidence of violence be reduced but also the physical and psychological well-being of healthcare professionals can be safeguarded, ultimately enhancing patient care and overall hospital functionality. The role of nursing management is pivotal in bridging the gap between current practices and the ideal state of violence-free healthcare environments, ensuring the safety and dignity of both staff and patients alike.

Data Availability

All data including protocols are included within the article.

Additional Points

This study is registered with PROSPERO.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Acknowledgments

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Research Article

Relationship between Spiritual Care Competence, Perceived Professional Benefit, and Retention Intention among Intern Nursing Students: A Correlational Study

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Aims. We aimed to investigate nursing students' spiritual care competence, perceived professional benefit, and retention intention and to analyze the relationship among these variables. *Background*. Nurse shortages are a global issue, and intern nursing students' willingness to remain in the nursing profession is important. Spiritual care can reduce patients' depression and improve their quality of life. Implementing spiritual care can help individuals have satisfying experiences. Perceived professional benefit is a positive emotional experience that is important in retention intention. However, the relationship among spiritual care competence, perceived professional benefit, and retention intention remains unclear. *Methods*. In this cross-sectional and correlational study, convenience sampling was used to recruit 266 intern nursing students in 10 hospitals throughout China. An online questionnaire was used to assess their sociodemographic characteristics, spiritual care competence, perceived professional benefit, and retention intention. Statistical analyses included the t-test, analysis of variance, Pearson's correlation analysis, and bootstrap analysis. *Results*. Intern nursing students' mean scores were 103.35 ± 19.00 for spiritual care competence, 72.88 ± 10.40 for perceived professional benefit, and 19.58 ± 3.37 for retention intention. Spiritual care competence was positively correlated with perceived professional benefit ($r = 0.545$; $p < 0.01$) and retention intention ($r = 0.149$; $p < 0.05$). Perceived professional benefit was also positively correlated with retention intention ($r = 0.320$; $p < 0.01$). Bootstrap analysis showed that perceived professional benefit completely mediates the relationship between spiritual care competence and retention intention. *Conclusions*. We found that nursing interns had a moderate level of retention intention, and perceived professional benefit was the mediating variable between spiritual care competence and retention intention. *Implications*. Our study results suggest that nursing administrators and educators should improve nursing interns' spiritual care competence and perceived professional benefit to enhance their willingness to remain in the nursing profession and alleviate nurse shortages.

1. Background

As the global population ages and the burden of disease increases, the worldwide demand for healthcare continues to grow. The World Health Organization reported that the global demand for nurses is expected to exceed 9 million by 2030 [1]. However, the current global nursing staff gap is estimated to exceed 4.6 million [2], making nursing staff shortages a critical global public health issue [3]. The shortage of nursing staff not only affects the overall quality of services in the healthcare system but also increases patient mortality, infection rates, medication errors, and hospital stays [4, 5]. Nursing students are the reserve force as the future nursing population. Pre-graduation clinical placements can facilitate the transition

from student to nurse roles and have a considerable impact on nursing student retention [6, 7]. Therefore, the intention of clinical internship nursing students to remain in the nursing profession is of great importance in relieving the shortage of nurses [8].

The willingness of nursing students to remain in the nursing profession after clinical placement needs to be improved. Zadeh et al. [9] surveyed midwifery students and found that those who entered clinical practice had significantly lower intentions to stay in the midwifery profession than those prior to clinical practice. A study by Chuan [10] showed that nursing students' intention to remain in the profession at the end of their internship was at an intermediate level, with the highest scores for the entry "I would leave nursing if I had other job opportunities." In addition, since the outbreak of the coronavirus disease 2019 (COVID-19) pandemic, intern nursing students have been on the front lines with other healthcare providers, where they have encountered additional stressors [6]. The mental health of nursing interns has therefore been affected, and their willingness to leave the nursing profession has increased [6, 11], which may further exacerbate the nursing brain drain. As a result, there is a great need for nursing administrators and educators to find strategies and develop programs to improve the willingness of nurse interns to stay in the nursing profession and expand the nursing talent pool in China and around the world.

Herzberg's two-factor theory [12] suggests that motivational factors such as job performance, enjoyment gained from work, feelings of accomplishment at work, and expectations for future development are factors that influence an individual's work motivation and play a major role over time. Studies have also shown that satisfactory clinical practice experiences and feelings play an important role in a student deciding to continue in the nursing profession [7, 13, 14]. In recent years, as an integral part of holistic care, spiritual care has been recognized as a key element of healthcare guidelines (such as national palliative care guidelines) [15–17]. Spiritual care is defined as care that identifies and responds to the human spirit when faced with life-changing events (e.g., birth, trauma, ill health, and loss or grief) and may include the need for meaning; the need for self-worth; expressing oneself; faith-related support including the need for rituals, prayers, or sacraments; or simply the need for a sensitive audience [18]. Spiritual care not only effectively improves patients' quality of life but also helps caregivers have satisfactory job experiences. A meta-analysis showed that spiritual care reduced patients' anxiety and depression and improved their quality of life [19]. Moreover, successfully implementing spiritual care with patients can help nurses feel that they do not have an ordinary job but rather a spiritual calling and even a "divine blessing," which will allow nurses to gain job satisfaction and maintain a positive attitude toward their work [20]. A previous study [21] also showed that nurses' spiritual care competence (SCC) had a positive correlation with perceived professional benefit; when SCC was stronger, nurses had more positive feelings and reported more satisfactory experiences. Nurses are the primary providers of spiritual care

[22]. In 1998, the American Association of College of Nursing proposed that SCC should be cultivated among nursing students [23]. A crucial stage in the development of nursing students' competence is the clinical practicum [24], and it is unclear whether SCC contributes to intern nursing students remaining in nursing profession.

Perceived professional benefit is based on positive psychology, which refers to the emotional state when individuals feel satisfied and positive in perceiving rewards and benefits brought about by their occupation and when individuals agree that their occupation can promote their overall growth [25]. Perceived professional benefit is important for nursing staff to experience positive emotions at work and enhance their willingness to continue in their profession [26]. Studies have shown that nurses' perceived professional benefit can enhance psychological capital and resilience, reduce burnout, improve professional identity, and increase job satisfaction [27, 28]. Several studies have found that nurses' perceived professional benefit can directly influence retention intention and strengthen the willingness of continuing in nursing work [29, 30]. Nursing interns are in an important period of professional adjustment and transition, and their professional perceptions have a significant impact on future career choices and professional development [31, 32]. Currently, little research has been conducted that examines the relationship between intern nursing students' perceived professional benefit and their willingness to stay in the nursing profession.

Retention intention is defined as an individual's conscious willingness to stay in a profession [33]. Nurses' retention intention is a significant predictor of nurse retention and is key to stabilizing nursing teams [34]. In this study, retention intention was defined as the willingness of nurse interns to stay in a nursing position and work in nursing after their internship. As a special group, intern nursing students are undergoing a change in roles from students to nurses, and the willingness of intern nursing students to stay is very important as to whether they choose nursing positions in the future. However, the current situation, influencing factors, and occurrence mechanisms of intern nursing students' retention are still unclear.

Thus far, most related studies have focused on the nurse population and found that retention intentions are associated with a variety of significant factors [35], such as perceived professional benefit [29, 30]. Many studies have explored the factors that influence nurses' perceived professional benefit [36]. However, few studies have considered the impact or role of SCC. On the one hand, when patients' spiritual suffering worsens as a result of illness and the demand for spiritual care increases [37], the extent of spiritual care provided to patients has a direct impact on clinical care quality, patient satisfaction, and job satisfaction [38, 39]. On the other hand, work competence as a positive personality trait is one of the bases of positive psychology [40], and SCC can be regarded as a source of pleasant emotions and experiences. Therefore, based on Herzberg's two-factor theory [12], we hypothesized that SCC can positively influence retention intention. Based on the theory

of positive psychology [40] and previous studies [29, 30], we also hypothesized that SCC can positively influence perceived professional benefit and that perceived professional benefit mediates the relationship between SCC and retention intention.

Nursing interns represent an essential reserve for nursing professionals [41]. Surprisingly, few empirical studies have investigated the relationship between SCC, perceived professional benefit, and retention intention among nursing interns, especially in China, where there is a serious shortage of total nursing human resources [42]. Consequently, in this study, we aimed to explore the relationship between SCC, perceived professional benefit, and retention intention among nursing interns. Our findings can help nursing administrators and educators implement effective interventions to improve intern nursing students' retention, increase future nursing staff, alleviate the shortage of nurses, and enhance the quality of clinical care.

Based on the previous literature, the objectives of this study were (1) to investigate the current situation of SCC, perceived professional benefit, and retention intention among intern nursing students; (2) to analyze the correlation among these three variables; and (3) to explore the mediating role of perceived professional benefit between SCC and retention intention.

2. Methods

2.1. Study Design and Participants. In this cross-sectional and correlational study, convenience sampling was used to recruit 266 intern nursing students from 10 general hospitals in China in July 2020: three hospitals in Jiangsu Province located in the eastern region, five hospitals in Henan Province located in the central region, and two hospitals in Xinjiang Province located in the western region. The inclusion criteria were (1) full-time nursing majors, (2) who had completed their final clinical internship, and (3) who volunteered to participate in the study. Exclusion criteria were (1) nursing students whose internship was interrupted and (2) those with serious mental disorders or organic diseases.

The sample size in this study was obtained using the rough estimation approach [43], in which the sample size is 10 times the number of independent variables. With 16 independent variables in this study, the sample size was calculated to be 176 instances, assuming that 10% of questionnaires would be invalid.

2.2. Measurements. Our self-rated online questionnaire comprised a section on sociodemographic characteristics, the Chinese version of the Spiritual Care Competence Scale (C-SCCS), a brief nurses' perceived professional benefit questionnaire (NPPBQ), and a questionnaire for nurse intention to remain employed. Participants' sociodemographic data included age, sex, education, place of birth, whether they were an only child, frequency of spiritual care training, religious, self-evaluation of work, and self-assessment of health status.

Intern nursing students' SCC was measured using C-SCCS, which was translated by Hu et al. [22] from the Spiritual Care Competence Scale [44]. C-SCCS contains 27 items and three dimensions: spiritual care assessment, implementation, specialization, and quality improvement (twelve items); individual and group support (nine items); and attitude and communication regarding patients' spirituality (six items) [22]. This instrument was scored on a five-point Likert scale; the total score for SCC ranged from 27 to 135, with a higher score indicating greater SCC [22]. Scores of 27–56 were classified as the mild-level group, 57–106 as the moderate-level group, and 107–135 as the high-level group. Cronbach's alpha coefficient of C-SCCS was 0.982 in this study.

Intern nursing students' perceived professional benefit was assessed using NPPBQ, which was developed by Hu et al. [45]. This questionnaire consisted of 17 items in five dimensions: positive career perception (three items), good patient-nurse relationship (four items), family and friend identification (three items), sense of belonging to a team (three items), and self-growth (four items) [45]. This instrument was scored on a five-point Likert scale; the total score for perceived professional benefit ranged from 17 to 85, with a higher score indicating a greater perceived professional benefit [45]. Scores of 17–36 were classified as the mild-level group, 37–66 as the moderate-level group, and 67–85 as the high-level group. In this study, Cronbach's alpha coefficient of NPPBQ was 0.980.

Nursing interns' retention intention was assessed using the questionnaire for nurse intention to remain employed, developed by Hong and Lin [46]. The questionnaire consisted of six items. This instrument was scored on a five-point Likert scale; the total score for retention intention ranged from 6 to 30, with a higher score indicating greater nurses' retention intention [46]. Scores of 6–13 were classified as the mild-level group, 14–23 as the moderate-level group, and 24–30 as the high-level group. In this study, Cronbach's alpha coefficient of the scale was 0.702.

2.3. Data Collection. We first contacted hospital administrators to obtain their permission and support. Subsequently, with the help of nursing administrators, a link to our electronic questionnaire (created using the Wenjuanxing electronic data collection platform) was distributed to the WeChat group of the student interns that they managed (in China, nursing administrators typically manage student interns by establishing a special WeChat group). Following this, nursing interns who met the inclusion criteria received the questionnaire electronically for completion. The first page of the electronic questionnaire was the informed consent form. Before proceeding to the completion page, participants were asked to read the informed consent form, which included the purpose of the study, time required to complete the survey (10–20 minutes), and inclusion and exclusion criteria, and then to click on "Acknowledgement of Participation in the Study" before proceeding to the official questionnaire completion page. All participants were assured that their participation in the study was strictly voluntary and anonymous. Finally, the data were stored and managed on the

Wenjuanxing platform before being collected and processed by the researcher using a personal account and password that met security requirements.

2.4. Ethical Considerations. The present study was approved by the Institutional Review Board of the School of Nursing, Jilin University (access number: 2017092701). Before inclusion, all participants were provided with information about the research and research purposes. The participants were asked to complete the online questionnaires independently and anonymously, so their identifying information was not collected and their privacy was strictly protected. The tools used in this study were authorized by their original authors.

2.5. Data Statistics. Data were analyzed using IBM SPSS 26.0 (IBM Corp., Armonk, NY, USA). Quantile-quantile plots were used to examine the normal distribution of intern nursing students' SCC, perceived professional benefit, and retention intention. Descriptive analysis was performed for all data; the results were reported as the percentage, mean, and standard deviation. An independent samples t-test and analysis of variance were used to compare demographic differences in intern nursing students' retention intention. Pearson correlation coefficients were used to express the correlation between SCC, perceived professional benefit, and retention intention. Model 4 of Hayes' PROCESS macro in IBM SPSS 26.0 was used to perform bootstrapping to test the mediating role of perceived professional benefit in the relationship between SCC and retention intention. The test level (two-sided) was $\alpha = 0.05$.

3. Results

3.1. Demographics. Of the 270 intern nursing students recruited to participate in this study, 266 finally completed the survey (for a 98.51% response rate). In this study, the average age of the 266 participants was 20.73 ± 1.09 years. The educational level of all participants was an associate degree. Most participants were female (88.7%). Among the participants, 89.1% were not only children (i.e., had siblings), 75.9% were born in rural areas, 56.4% did not attend spiritual care training, 94.4% had no religious beliefs, 59.8% rated their work self-assessment as good, and 45.5% had better self-health assessment (Table 1).

3.2. The Differences of Retention Intention Based on Study Variables. A t-test and analysis of variance showed significant differences in intern nursing students' retention intention in terms of sex, frequency of spiritual care training, and self-assessment of health status (all $p < 0.05$) (Table 1).

3.3. The Level of SCC, Perceived Professional Benefit, and Retention Intention. The levels of the total mean scores of SCC, perceived professional benefit, and retention intention were divided according to Kelley's [47] finding that divisions between the upper and lower 27% of data are most commonly used in project analysis, as well as according to

clinical reality. The total mean score of intern nurses' SCC was 103.35 ± 19.00, which was a moderate level. The mean scores of the assessment, implementation, specialization, and quality improvement of spiritual care; individual and group support; and attitude and communication regarding patients' spirituality were 46.68 ± 8.74, 33.27 ± 7.54, and 23.40 ± 4.59, respectively. Of the dimension item mean scores, attitude and communication regarding patients' spirituality had the highest score (3.90 ± 0.77), followed by assessment, implementation, specialization, and quality improvement of spiritual care (3.89 ± 0.73), and then by individual and group support (3.70 ± 0.84).

The total mean score of perceived professional benefit was 72.88 ± 10.40, which was a moderate to high level. The mean scores of the positive occupational perception; good nurse-patient relationship; recognition from families, relatives, and friends; sense of belonging to a team; and self-growth were 12.49 ± 2.27, 17.41 ± 2.61, 12.75 ± 1.96, 12.87 ± 1.96, and 17.37 ± 2.49, respectively. Of the dimension item mean scores, a good nurse-patient relationship had the highest score (4.35 ± 0.65), followed by self-growth (4.34 ± 0.62), sense of belonging to a team (4.29 ± 0.65), recognition from families, relatives, and friends (4.25 ± 0.65), and positive occupational perception (4.16 ± 0.76).

The total mean score of retention intention was 19.58 ± 3.37, which was a moderate level (Table 2).

3.4. Relationship between SCC with Perceived Professional Benefit and Retention Intention. The total mean score of SCC was positively correlated with the total mean score of perceived professional benefit $(r = 0.545; p < 0.01)$ and with the total mean score of retention intention $(r = 0.149; p < 0.05)$. The total mean score of perceived professional benefit was significantly positively correlated with the total mean score of retention intention $(r = 0.320; p < 0.01)$ (Table 3).

3.5. Mediating Effect of Perceived Professional Benefit between SCC and Retention Intention. The study assessed the mediating role of perceived professional benefit on the relationship between SCC and retention intention. Control variables were sex, place of birth, whether they were an only child, frequency of spiritual care training, religious, self-evaluation of work, and self-assessment of health status. The results revealed a significant indirect effect of the impact of SCC on retention intention through perceived professional benefit $(b = 0.028)$, with a 95% confidence interval (CI) of $(0.014, 0.046)$, which did not contain 0. Furthermore, the direct effect of SCC on retention intention was found to be insignificant $(b = -0.006)$, with a 95% CI of $(-0.030, 0.019)$, which did contain 0. Hence, perceived professional benefit completely mediated the relationship between SCC and retention intention. Mediation analysis summary is presented in Table 4 and Figure 1.

4. Discussion

This study revealed the level of SCC, perceived professional benefit, and retention intention among nursing interns. We found that perceived professional benefit mediated the

Table 1: Comparison of retention intention among intern nursing students with different sociodemographic characteristics ($n = 266$).

Sociodemographic characteristics	Number (%)	Retention intention (mean ± SD)	t/F	p
Sex			2.009	0.046
Male	30 (11.3)	20.73 ± 3.63		
Female	236 (88.7)	19.43 ± 3.32		
Only child			0.427	0.670
Yes	29 (10.9)	19.83 ± 2.98		
No	237 (89.1)	19.54 ± 3.42		
Place of origin			0.803	0.449
Urban	55 (20.7)	19.49 ± 3.84		
Rural	202 (75.9)	19.66 ± 3.28		
Urban-rural	9 (3.4)	18.22 ± 1.92		
Frequency of spiritual care training			2.528	0.041
No	150 (56.4)	19.49 ± 3.26		
Rarely	48 (18.0)	20.13 ± 3.43		
Sometimes	50 (18.8)	18.68 ± 3.05		
Often	14 (5.3)	21.21 ± 3.64		
Always	4 (1.5)	21.75 ± 6.65		
Religious			0.286	0.775
No	251 (94.4)	19.59 ± 3.37		
Yes	15 (5.6)	19.33 ± 3.52		
Work self-evaluation			1.181	0.309
Excellent	59 (22.2)	20.10 ± 3.48		
Good	159 (59.8)	19.33 ± 3.15		
Qualified	48 (18.0)	19.73 ± 3.90		
Self-assessment of health status			3.200	0.014
Very bad	6 (2.3)	16.67 ± 5.65		
Not good	7 (2.6)	17.29 ± 3.86		
Better	121 (45.5)	19.53 ± 3.09		
Good	57 (21.4)	19.23 ± 2.69		
Very good	75 (28.2)	20.36 ± 3.80		

SD, standard deviation.

Table 2: Descriptive analyses of spiritual care competence, perceived professional benefit, and retention intention ($n = 266$).

Variables	Min	Max	Mean ± SD (item mean score)
Spiritual care competence			
Assessment, implementation, specialization, and quality improvement of spiritual care	12.00	60.00	46.68 ± 8.74 (3.89 ± 0.73)
Individual and group support	9.00	45.00	33.27 ± 7.54 (3.70 ± 0.84)
Attitude and communication regarding patients' spirituality	6.00	30.00	23.40 ± 4.59 (3.90 ± 0.77)
Total score	27.00	135.00	103.35 ± 19.00 (3.83 ± 0.70)
Perceived professional benefit			
Positive occupational perception	3.00	15.00	12.49 ± 2.27 (4.16 ± 0.76)
Good nurse-patient relationship	4.00	20.00	17.41 ± 2.61 (4.35 ± 0.65)
Recognition from families, relatives, and friends	3.00	15.00	12.75 ± 1.96 (4.25 ± 0.65)
Sense of belonging to a team	3.00	15.00	12.87 ± 1.96 (4.29 ± 0.65)
Self-growth	4.00	20.00	17.37 ± 2.49 (4.34 ± 0.62)
Total score	17.00	85.00	72.88 ± 10.40 (4.29 ± 0.61)
Retention intention			
Total score	6.00	30.00	19.58 ± 3.37 (3.26 ± 0.56)

Min, minimum; Max, maximum; SD, standard deviation.

relationship between SCC and retention intention. To the best of our knowledge, this was the first study to examine the relationship between these three factors. The results of this study not only provide a better understanding of retention intention among nursing interns but also provide a basis for further research.

First, we examined the status of intern nursing students' SCC, perceived professional benefit, and retention intention based on our findings. In this study, the mean total score for SCC was at a moderate level, which was similar to the findings of a Turkish study [48]. The SCC of intern nursing students in this study was higher than the

TABLE 3: Correlation analyses between spiritual care competence, perceived professional benefit, and retention intention ($n = 266$).

Variables	Spiritual care competence	Perceived professional benefit	Retention intention
Spiritual care competence	1		
Perceived professional benefit	0.545**	1	
Retention intention	0.149*	0.320**	1

*$p < 0.05$; **$p < 0.01$.

TABLE 4: Mediating effect of perceived professional benefit between spiritual care competence and retention intention ($n = 266$).

Effects	B	Bootstrap SE	Bootstrap 95% CI
Total effect	0.023	0.011	0.001–0.045
Direct effect	−0.006	0.012	−0.030–0.019
Indirect effect	0.028	0.008	0.014–0.046

SE, standard error; CI, confidence interval.
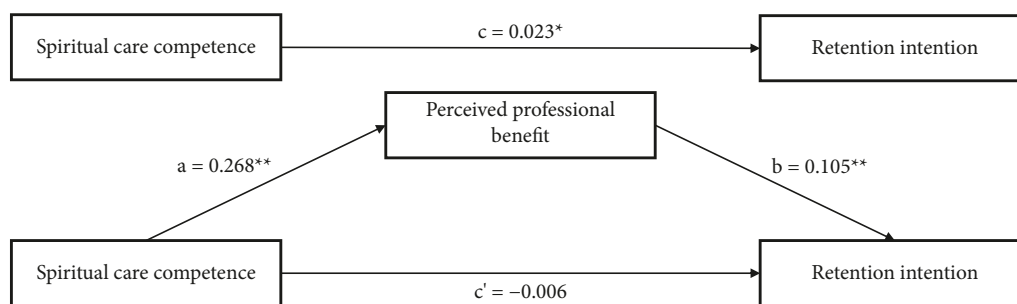
FIGURE 1: Mediating effect of perceived professional benefit in the relationship between spiritual care competence and retention intention. *$p < 0.05$; **$p < 0.001$.

pre-COVID-19 SCC of Chinese trainee nursing students [49] and Iranian nursing interns [50] and lower than that among Iranian nursing students during the same COVID-19 pandemic period [51]. Possible reasons for this include the following: (1) The threat faced and the particular life-saving process involved during the pandemic facilitated the relationship between nursing staff and patients, patients had greater spiritual care needs, and nursing staff perceived patients' spiritual needs more easily [21]. Past literature [49] used a censored version of the Chinese version of the scale, and different authors have different interpretations and expressions of the Chinese version of the SCC scale. (2) Education and religion have been found to be influencing factors of SCC [52]. Participants in the prior study [51] had undergraduate (bachelor's) degrees, and religious beliefs in Iranian society were fruitful in developing students' spiritual care skills [51]. However, all participants in our study had associate degrees, and only a few (5.6%) reported having religious beliefs. Individual and group support dimensions had the lowest mean scores, probably due to the lack of a uniform spiritual care process in China, lack of multidisciplinary cooperation, work overload, and cultural differences, as well as the fact that many hospitals do not provide spiritual care for patients. In addition, little spirituality training is provided to nursing interns, who have fewer opportunities for clinical education and practice and less knowledge of specific approaches to individual and team support.

This study found that the mean total score of perceived professional benefit among intern nursing students was at a moderate to high level, which was similar to the results of Chinese nursing interns [31, 53]. This may be caused by intern nursing students having accumulated nursing knowledge and experience through clinical practice, enabling them to provide some level of healthcare support for their relatives and friends. Good communication with patients and patients' respect for and reliance on them lead to a good nurse-patient relationship. Cooperation with doctors and other nurses in their work makes nurse interns feel a sense of belonging to a team. Clinical internships translate theoretical knowledge into practical and improve the level of practical operations, promoting interns' growth and thereby enhancing their sense of professional benefit. Because there is little research on perceived professional benefit among nursing interns in countries other than China, we could not make comparisons with other countries. The lowest score was obtained for the dimension of positive career perception. On the one hand, nursing students are prone to negative emotions owing to experiences during the internship, the comments and behaviors of teachers, lack of social respect for nursing staff, and hard work during the night shift [54], leading to poor career perception. On the other hand, during the COVID-19 pandemic, intern nursing students may have experienced fear, dread, and anger in the clinical setting with the risk of exposure to the coronavirus, lack of personal protective equipment, and the possibility of spreading infection to their families [6, 55].

This study found that the mean total score of retention intention among intern nursing students was at a moderate level. Retention intention in the nursing internship was higher in this study than in Chinese nursing interns before the COVID-19 pandemic [10]. This may be because the nursing profession has received greater attention from the state during the pandemic, its social status has improved somewhat, and the professional identity of nursing students has increased [56], leading to their increased willingness to remain in their jobs. Our findings were lower than those in a study from Spain, which reported that a higher percentage of intern nursing students were willing to stay on in the hospital (88.9%) [8]. The reason for this is that China has a significant shortage of total nursing human resources [42]. Because interns and registered nurses care for patients in hospitals together, interns have a greater workload and experience more pressure, which may lead to burnout and reduce their willingness to stay in the profession. Furthermore, in the eyes of the public in China, the social prestige of nurses is much lower than that of doctors [57]. Nursing interns feel this gap and inequality, which affects their willingness to remain in nursing work.

Second, we examined the relationship between nursing interns' SCC, perceived professional benefit, and retention intention based on our findings. We found that nursing interns' SCC is positively correlated with perceived professional benefit, indicating that the higher the ability to provide spiritual care, the greater the perception of professional benefits. This is similar to the findings of a recent study [21]. A qualitative study also found that nurses' professional skills and the value they show in the work process can greatly increase their sense of professional benefit [58]. Spiritual care can reduce patients' anxiety and depression and improve their quality of life [19, 22]. The greater the ability of nursing interns to provide spiritual care, the better they can provide spiritual care to patients in clinical practice, which leads to a sense of self-worth, job accomplishment, and a greater sense of professional benefit. In this study, we found a positive correlation between nursing interns' SCC and retention intention in the workplace, indicating that the higher the SCC, the greater the retention intention. The results were similar to those of past studies [59, 60]. Greater spiritual competencies among nursing interns are associated with a better ability to identify, assess, and meet patients' spiritual needs in the clinical setting; to collaborate with other disciplines and be part of a work team; and to communicate with patients in a spiritual way. This can enrich the nursing student's practice experience, enhance their feelings about practice experiences, and increase satisfaction with practice. Studies have shown that the more satisfied nursing students are with their clinical training, the more willing they are to stay working in the hospital [61]. The results of this study showed a positive correlation between perceived professional benefit and retention intention among nurse interns, indicating that the higher the perceived professional benefit, the higher the retention intention, which is consistent with the literature [29, 30]. This may be because perceived professional benefits can regulate negative emotions, reduce job burnout, help to improve the sense of career identity, and further enhance the willingness to stay in their posts [45].

Finally, a key point is that we found that perceived professional benefit completely mediated the relationship between SCC and retention intention and SCC influenced retention intention through perceived professional benefit. Compared with a previous study that found a positive correlation between care competence and retention intention [59], this study narrowed the scope of care competence to SCC and further found a relationship between SCC and retention intention. Spiritual care is an important component of holistic care and is central to everyday care [15]. As one of the professional nursing skills [62], the stronger SCC, the higher the overall quality of nursing care among intern nursing students and the more likely they are to receive compliments from patients and recognition from their supervisors. This can promote nursing students' satisfaction and positive feelings during clinical practice and enhance their sense of professional benefit. Perceived professional benefit is an intrinsic motivating factor for career development and positive emotional experiences, and the degree of perceived professional benefit can play a key role in nurses' judgments regarding trade-offs and retention, which is an important influencing factor in retention intention [29].

It is suggested that nursing administrators and educators should pay greater attention to the cultivation of intern nursing students' SCC and perceived professional benefit and take measures to enhance SCC in both institutions and hospitals to improve intern nursing students' perceived professional benefit, thereby increasing their retention intentions and reducing brain drain among nurses. Chiang et al. [63] suggested that spiritual education courses should be considered a regular part of the nursing curriculum. For the content of spiritual care education and training programs, Jones et al., in a systematic review, identified key components, including the body of knowledge in spiritual care; self-awareness and use of self; communication and interpersonal relationship in spiritual care; assessment and implementation of spiritual care; and quality assurance in spiritual care [64]. At the same time, education needs to address the weaknesses in SCC. The intern nurses in this study had poor individual and team support, which is similar to the results of an Iranian study [50]; targeted training to strengthen the multidisciplinary team component of spiritual care is recommended so that nursing students can understand how different departments collaborate in referrals. In addition, educators and administrators should explore indigenous Chinese models of spiritual care. For example, by incorporating the cultural characteristics of Confucianism's "benevolence" and Buddhism's "Buddha," "compassion," and "goodness," traditional Chinese thought and culture can be incorporated into spiritual care to form a spiritual care service model that is highly adaptable and suitable for clinical practice to enhance SCC among intern nursing students [49]. Nursing managers and educators should pay greater attention to the professional emotional experience of nursing interns and take measures to enhance their perceived professional benefit, including positive

career perceptions, good nurse-patient relationships, family and friend recognition, a sense of belonging to a team, and their own growth [45]. Based on this, it is necessary to strengthen training on career cognition and career planning; actively promote positive nursing experiences to guide intern nurses in developing positive career identity and perception, strengthen training in professional and communication skills, create a collaborative and enthusiastic participatory clinical practice environment and build a collaborative clinical practice model [65] to improve intern nurses' sense of belonging, and provide opportunities for exchange and learning outside the hospital. In addition, our study indicated that the differences in scores for nursing interns' retention intention according to sex and self-assessment of their health status were statistically significant. In our study results, male intern nursing students' retention intention was higher than that of female students, which is inconsistent with the results of previous studies [10, 29]. This may be because during the COVID-19 pandemic, female intern nurses had more negative emotions than male intern nurses [66]. Poor mental health had a significant impact on nurse interns, exacerbating their intention to leave the profession [11]. Nursing managers and educators should attach greater importance to the physical and mental health of nursing interns and provide timely guidance on how to deal with negative emotions and stress [67], especially among female nursing interns.

4.1. Limitations. The present study has several limitations. First, while we considered sample representativeness by selecting participants from hospitals in different regions of China, convenience sampling was used in this study, with the data collected in only 10 hospitals in China and the educational level of all participants in our study not including an undergraduate or postgraduate degree, which limits the generalizability of the results. In the future, stratified random sampling should be considered for sample selection. Second, this was a cross-sectional study, and causal relationships between variables could not be determined. In subsequent studies, longitudinal data should be collected to determine the causal relationships between these variables. Finally, the variables in this study were gathered using self-reported methods, which may lead to bias. Future studies should consider adding objective indicators.

5. Conclusions

This study showed that retention intention and SCC among Chinese intern nursing students are at a moderate level and perceived professional benefit is at a moderately high level. Our key findings were that SCC and perceived professional benefit have a significant positive correlation with retention intention and that SCC has an impact on retention intention through the mediation of perceived professional benefit. Our results may provide new ideas for hospital and school administrators to develop interventions aimed at improving intern nursing students' retention. In the future, hospital and school administrators can develop more specific and

feasible spiritual programs to increase SCC and improve perceived professional benefit, enhancing intern nursing students' willingness to remain in the nursing profession.

5.1. Implications for Nursing Management. In light of increased global aging and nursing staff shortages, it is particularly important to understand the retention intention of nursing interns. The results of our study indicate that SCC influences retention intention among nursing interns through the mediation of perceived professional benefit. Our results can provide a new perspective so as to take measures to improve retention intention among nursing interns and reduce nursing brain drain. It is suggested that nursing managers and educators should develop training programs to improve nursing interns' SCC, improve the quality of clinical spiritual care, and contribute to the positive emotions and experiences of nursing interns. It is important to provide education on career awareness and career planning, as well as professional and communication skills training, in addition to developing a collaborative and participatory clinical practice environment and creating more opportunities for learning and communication to enhance perceived professional benefit among nursing interns.

Data Availability

The data that support the findings of this study are available from the corresponding authors upon reasonable request.

Disclosure

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Yanli Hu, Limei Zhang, Jue Wu, and Yu Feng conducted literature searches, determined the research theme, designed the research, and revised the manuscript. Jing Liu, Weinan Lu, Ting Fang, Yiying Zhang, Yanjia Li, and Xiaoying Zeng collected data. Jing Liu and Weinan Lu analyzed the data. Jing Liu, Weinan Lu, and Dan Li wrote the manuscript and translated the article. All the authors have approved the final version for submission. Jing Liu, Weinan Lu, and Dan Li contributed equally to this work.

Acknowledgments

Supplementary Materials

The STROBE statement for this study is available in the supplementary file. (*Supplementary Materials*)

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Research Article

The Relationship between Social Support, Empathy, Self-Efficacy, and Humanistic Practice Ability among Clinical Nurses in China: A Structural Equation Model

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Aim. This study aims to identify the factors that influence humanistic practice ability, validate the relationship among social support, empathy, self-efficacy, and humanistic practice, and provide reference basis for developing intervention measures. *Background*. Cultivating humanistic practice ability in clinical nurses is essential for improving the quality of nursing care. *Methods*. From February to March 2022, a cross-sectional survey was conducted in top three hospitals in central China. The study used a self-designed questionnaire to ascertain the general characteristics of the participants. The Nurses' Humanistic Practice Ability Scale, Jefferson Empathy Scale, Perceived Social Support Scale, and General Self-Efficacy Scale were used. Data were analyzed using Spearman's correlation and a structural equation model through statistical product and service solutions (SPSS) and analysis of moment structure (AMOS). *Results*. A total of 650 clinical nurses were included in this study. The average age was 32.35 ± 8.35 years. The Nurses' Humanistic Practice ability Scales score was 107.49 ± 19.32. Nurses' humanistic practice ability showed a positive correlation with social support ($r = 0.455$), self-efficacy ($r = 0.369$), and empathy ($r = 0.375$) (all $p < 0.001$). Empathy totally mediated the relationship between social support and humanistic practice ability. In addition, self-efficacy and empathy served as sequential mediators in the association. *Conclusion*. Social support can influence the humanistic practice ability through self-efficacy. In addition, the higher the level of social support, the higher the level of self-efficacy, which further promotes the improvement of their empathy and eventually leads to stronger humanistic practice ability. Therefore, the corresponding measures to promote the humanistic practice ability of nurses can be formulated from the abovementioned three aspects. *Implications for Nursing Management*. We recommend that hospital administrators provide nurses with more comprehensive social support and develop intervention strategies to enhance nurses' self-efficacy and empathy, which help to improve the nurse's humanistic practice ability.

1. Introduction

Nursing is a profession that focuses on caring for the "whole person." The human being is a complete being, not a conglomeration of separate anatomical parts [1]. Patients not only need to be the recipients of first-class diagnostic and therapeutic techniques but also need spiritual and psychological comfort, therapeutic involvement, and comprehensive services. Building a harmonious nurse-patient relationship requires the combining of humanism, science, and technology in clinical work [2]. The Healthy China 2030 plan states that medical education reform should focus on medical humanities education and foster humanism in medical students to improve public health care in China. However, compared with the rapid pace of economic development, the progress of medical humanistic education and practice has been relatively slow [3]. Working in a resource-constrained environment, nurses currently place more emphasis on nursing skills than on humanistic care. Some nurses focus only on the treatment of diseases and neglect to interact with patients [4], which is not conducive to the development of good nurse-patient relationships and the improvement of patient health [5].

Developing humanistic practice ability in nurses could resolve this issue. Nurses' humanistic practice ability refers to the clinical nurse's ability to combine humanistic knowledge, skills, spirituality, and use of technology to serve patients. It highlights the behavioral part of nursing and is the outward expression of quality [6]. Nurses with a strong humanistic practice can engage in effective clinical practice, provide high-quality humanistic care to patients, demonstrate respect for patients and a love of life [7], and promote patients' physical and psychological recovery [8]. Humanistic practice also has a positive impact on nurses' daily work activities and personal and cultural values [9]. Recent studies have shown that the humanistic practice ability of clinical nursing staff and nursing students in China should be improved [10, 11]. The studies have found that the ability to practice in a humanistic way can be developed quickly through short-term training [6] and that there is an urgent need to identify the potential factors influencing humanistic practice and promote our understanding of humanistic practice, which can provide a theoretical basis on which nurses can develop multifaceted training programs.

Perceived social support refers to an individual's subjective feeling and evaluation of the degree to which he or she is supported by the outside world [12]. The degree of concern of family members and colleagues for nurses is significantly correlated with their level of humanistic practice ability; nurses who receive care and love are able to generate more care and love, which in turn promotes humanistic practice with patients [13]. Social support may affect nurses' humanistic practice ability.

Hypothesis 1. Perceived social support is significantly associated with humanistic practice ability.

Empathy is the ability to put oneself in another's shoes [14]. It mainly includes perspective taking, compassionate care, and standing in the patient's shoes. The first factor, perspective taking, is the predominant factor and refers to the cognitive aspects of empathy. The second factor, compassionate care, is characterized by a combination of cognitive and affective aspects of empathy and is also considered an essential factor in professional relationships with patients. The third factor, standing in the patient's shoes, is a concept that is inversed to emotional detachment [15]. In the healthcare context, this means the ability of professionals to put themselves in the shoes of patients and families—to understand their emotions, moods, and psychological conditions and to develop effective nursing interventions that lead to a healthy emotional experience for patients [16]. Empathy is the most valuable virtue in patient-centered care and is a key factor in patient adherence, satisfaction, and outcomes, as well as appropriate care behaviors [17]. One cross-sectional study showed that empathy is closely related to the humanistic caring ability of midwifery students and that empathy may influence the humanistic caring ability of nursing students through the direct and indirect effects of emotional intelligence [10]. Research has shown a positive correlation between empathy and social support, indicating that nurses with more social support have a higher level of empathy [18]. Another research also confirms that social support is considered a protective agent for preventing psychological problems in healthcare providers, helping to improve their empathy. The improvement of empathy can improve the quality of life of nurses and enhance their level of care for patients [19]. Therefore, empathy has been suggested as a powerful predictor of humanistic practice ability.

Hypothesis 2. Empathy is significantly associated with humanistic practice ability.

Hypothesis 3. Perceived social support indirectly influences humanistic practice ability through empathy.

Self-efficacy is defined as an individual's capability to carry out the necessary actions that yield specific outcomes, serving as a crucial link between knowledge and behavior [20]. Previous research indicates that nursing students who receive strong social support are likely to demonstrate enhanced self-efficacy [21]. In addition, self-efficacy has been shown to be related to empathy, suggesting that strategies aimed at bolstering self-efficacy could also enhance empathic abilities [22]. Further studies reveal that self-efficacy plays a significant moderating role between organizational atmosphere and the capability for humanistic practice [23]. Individuals with high levels of self-efficacy are often characterized by a sense of resilience and pride in their abilities. They are motivated to overcome challenges, thereby influencing their behavior—especially in the demanding settings of healthcare environments [24, 25]. Based on the evidence, the role of self-efficacy in humanistic practice ability should be identified.

Hypothesis 4. Self-efficacy is significantly associated with empathy.

Hypothesis 5. Self-efficacy is significantly associated with humanistic practice ability.

Hypothesis 6. Perceived social support indirectly influences humanistic practice ability through self-efficacy.

This study will identify factors that influence humanistic practice ability to provide evidence that can be used to further improve nurses' humanistic practice ability and will validate the correlation between clinical nurses' humanistic practice ability and levels of social support, empathy, and self-efficacy. Finally, our study may encourage management to apply interventions to promote humanistic practice for nurses. The hypothesized theoretical model is shown in Figure 1.

2. Methods

2.1. Setting and Participants. This study involved conducting a cross-sectional survey of nurses in three tertiary hospitals in Changsha. The aim was to identify predictors of clinical nurses' humanistic practice ability, including social support, empathy, and self-efficacy.
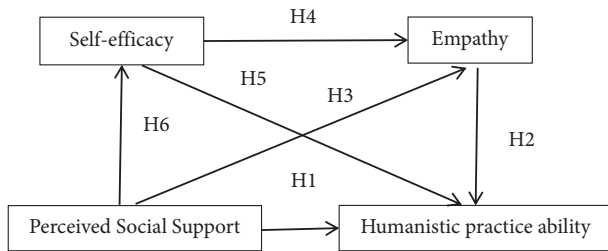
Figure 1: Hypothetical model for factors influencing humanistic practice ability in clinical nurses. H1, hypothesis 1; H2, hypothesis 2; H3, hypothesis 3; H4, hypothesis 4; H5, hypothesis 5; H6, hypothesis 6.

2.1.1. Inclusion and Exclusion Criteria. Registered nurses, working in our hospital for at least 1 year, who agreed to participate in the study were included. Exclusion criteria were as follows: advanced practice nurses, intern nurses, and nonclinical nursing positions.

2.1.2. Sample Size Calculation. The questionnaire included three dimensions of comprehension of social support, three dimensions of an empathy scale, and five dimensions of a nurse humanistic practice ability scale and general self-efficacy scale. There were 10 general information factors and a total of 22 statistical analysis variables. The sample size was determined by 10 participants per variable [26]. Based on the sample content estimation formula (max (number of dimensions) ∗ 10) ∗ (100% + 20%), at least 264 participants were needed.

2.2. Measures

2.2.1. Participants' General Characteristics. We have designed a questionnaire, which included questions gender, nationality, marital status, age, religion, professional position, total working years, amount of training received, understanding of concepts related to "humanistic care," and the objective evaluation of their own humanistic knowledge and quality.

2.2.2. Nurses' Humanistic Practice Ability Scale. The scale was developed by Yan et al. to measure the humanistic practice ability of nursing staff in China [6]. The scale contains the following 26 items across five dimensions: humanistic care practice ability (10 items), self-management ability (3 items), interpersonal communication ability (6 items), ethics and legal practice ability (3 items), and psychological adjustment ability (4 items). Each response was converted to a numerical score ranging from 1 to 5, with 1 indicating strongly disagree and 5 indicating strongly agree. Total scores ranged from 26 to 130, with higher scores indicating stronger humanistic practice ability. The tool's reliability had a Cronbach's α of 0.979 in the work of Wang et al. [27]. The reliability of our study had a Cronbach's α of 0.984.

2.2.3. Jefferson Empathy Scale. This scale, which measures the level of empathic ability of individuals, was developed

by Dr. Mohammadreza Hojat et al. [28] and adapted for the Chinese context by Chinese scholars An et al. [29] in 2008. The scale contains the following three dimensions: perspective taking (10 items), compassionate care care (7 items), and walking in patient's shoes (3 items)—a total of 20 items, 10 of which are reverse scored on a 7-point Likert scale, with higher scores associated with greater empathy. The Cronbach's α and half coefficients are 0.750 and 0.771, respectively, and the retest reliability is 0.659, which has good reliability in the Chinese population [29]. Cronbach's α is 0.896 in the present study.

2.2.4. Perceived Social Support Scale. The scale—a self-assessment scale to measure the individual's perceived level of social support—was developed by Zimet et al. [30] and revised by our scholar Jiang in 2001 [31]. The scale consists of 10 items, with three dimensions—family support (4 entries), friend support (4 entries), and other support (4 entries). All items were rated on a 7-point Likert-type scale, ranging from 1 (strongly disagree) to 7 (strongly agree). The total score range is 12–84. The higher the score, the more social support the individual receives, with 12–36 representing low support, 37–60 intermediate support, and 61–84 a higher level of support. Cronbach's α was 0.956 in the present study.

2.2.5. General Self-Efficacy Scale. In this study, the Chinese version of the general self-efficacy scale revised by Wang et al. was used [32] . The scale was derived from the general self-efficacy scale (GSES) developed by German psychologist Schwarzer, which has good reliability. The scale of "disagree," "not sure," "agree somewhat," and "agree strongly" was used, with scores ranging from 1 to 4 and a total score of 10 to 40. Higher scores indicate higher general self-efficacy of nurses. Cronbach's α was 0.934 in the present study.

2.3. Data Collection. The convenience sampling method was used to select nurses from three tertiary grade A hospitals in Hunan Province as the research object. Data collection was facilitated through an online survey link between February and March 2022. The survey was entered into the Questionnaire Star platform that was developed by Changsha Ranxing Information Technology Co., Ltd, which required an answer for every question to avoid missing data. We organized a presurvey for 10 nurses. We communicated with the hospital nursing department and then explained the purpose and significance of the study to the head nurse. We published recruitment information in the work group, flagged informed consent on the first page of the questionnaire, and highlighted consent before entering the questionnaire to ensure that each participant knew the purpose and content of the study. A total of 665 data were collected online, and during our analysis, we found that 15 of them were duplicate submissions. After deleting duplicates, the effective data were 650 and the questionnaire efficiency was 97.74%. We collected 198, 210, and 242 questionnaires from three hospitals, respectively.

2.4. Ethical Considerations. This study was approved by the Hospital Medical Ethics Review Board. All participants participated voluntarily and could withdraw from the study at any time. The survey did not disclose any personal information.

2.5. Data Analysis. SPSS version 25.0 (SPSS Inc.) and AMOS version 24.0 (IBM Corp.) were used for statistical analysis. The count data were described by frequency and percentage, and the measurement data were described by the mean-±standard deviation. Spearman correlation analysis was performed to analyze the relationship among social support, empathy, self-efficacy, and humanistic practice ability. A structural equation model was employed to identify both direct and indirect relationships in the model. Standardized and unstandardized path coefficients, variances, R-squared values, standard error, and p values were reported. Variables with nonsignificant coefficients were removed from the model. Estimates without zero in the 95% confidence interval (CI) indicated that the mediation effects were significant. The measurement model was examined through reliability (Cronbach's α and composite reliability), convergent validity, and discriminant validity. The structural model fit was evaluated according to the following standards: $\chi^2/DF \leq 5.00$, comparative fit index (CFI) ≥ 0.90, incremental fit index (IFI) ≥ 0.90, and standardized root mean square residual (SRMR) ≤ 0.08 [33]. In this study, $\alpha = 0.05$, whereas tests were two tailed.

3. Results

3.1. Scores of the Humanistic Practice Ability. The average total score of nurses' humanistic practice ability was 107.49 ± 19.32, which was at the upper middle level. The scores for each dimension are shown in Table 1.

3.2. General Characteristics. Table 2 shows the general characteristics of the surveyed nurses. A total of 650 clinical nurses were included in this study. The average age was 32.35 ± 8.35 years, 98.3% were female and 1.7% were male, and the average years of nursing experience were 11.02 ± 8.33. 42.9% of the nurses reported that they had never received training related to humanistic practice, 21.1% of nurses reported that they did not understand the concept of humanistic nursing, and 82% of nurses indicated that they lacked humanistic knowledge and qualities.

3.3. Measurement Model. The humanistic practice ability of nurses is positively correlated with their understanding of perceived social support ($r = 0.455$), self-efficacy ($r = 0.369$), and empathy ($r = 0.375$) (all $p < 0.01$). Table 3 shows the correlation between the study variables and the significant correlation between all variables, indicating the legitimacy of establishing a path between them. We used Cronbach's α and composite reliability (CR) to test the reliability of the model. All results were greater than 0.7, indicating satisfactory reliability [34]. To test convergent validity, we

calculated the average variance extracted (AVE) from each structure to meet the requirement of at least 0.5 in all structures [35].

3.4. Structural Model. The standardized path coefficients from social support to perceived humanistic practice ability and self-efficacy to humanistic practice ability are not significant (Table 4). Therefore, we excluded these two paths and reconstructed the mediation model for analysis. The modified model shows an acceptable fit as follows: $\chi^2/df = 3.784 < 5$, RMSEA = 0.065, CFI = 0.982, TLI = 0.976, and GFI = 0.953. The path map and coefficients are shown in Figure 2. Empathy plays a complete mediating role between perceived social support and humanistic practice ability, with a mediating effect value of 0.402. Perceived social support indirectly affects humanistic practice ability through self-efficacy and the complete chain mediating effect of empathy, with mediation effect values of 0.081 (Table 5).

4. Discussion

The awareness and ability to provide humanistic care among medical staff are crucial factors affecting patients' psychological states, treatment effectiveness, and overall rehabilitation. Moreover, humanistic care plays a vital role in enhancing the quality of medical services, increasing patient satisfaction, fostering harmonious nurse-patient relationships, and elevating the professional awareness of medical staff [11]. This study found that empathy fully mediated the relationship between perceived social support and humanistic practice ability. In addition, perceived social support can influence the humanistic practice ability through the chain-mediating effect of self-efficacy and empathy. These findings enhance our understanding of the mechanisms connecting these variables and shed light on the factors influencing humanistic practice from both external support and individual perspectives.

In this study, the mean score for nurses' humanistic practice ability was 107.29 (SD = 19.30). This is consistent with the research conducted by Zhang et al. [36]. It may be related to the fact that 57.1% of the nurses in this study have received humanistic nursing related training. Training is effective in promoting humanistic care practices [11, 27]. Among the various dimensions of humanistic practice in this study, interpersonal communication ability was the highest, indicating that clinical nurses have strong communication skills with patients. It is possible that 69.4% of the nurses in this study have worked for more than 5 years, and there are more opportunities for communication among nurses, patients, and medical staff in the long-term clinical nursing work process. The accumulation of professional knowledge and work experience has laid the foundation for improving communication skills. The formation process of humanistic practice ability is a process of long-term accumulation and dynamic learning, which cannot be mastered quickly in a short time. The transformation of ability from quantitative change to qualitative change requires continuous learning and personal perception. Therefore, we need

TABLE 1: Total score of the nurses' humanistic practice and all dimensions ($N = 650$).

Variables	Minimum	Maximum	Score (mean ± SD)	Average score (mean ± SD)
Humanistic care practical ability	10	50	40.84 ± 7.70	4.08 ± 0.77
Interpersonal communication ability	6	30	25.66 ± 4.72	4.28 ± 0.79
Ethics and legal practical ability	3	15	12.58 ± 2.44	4.19 ± 0.81
Psychology adjustment ability	4	20	16.38 ± 3.13	4.10 ± 0.78
Self-management ability	3	15	12.04 ± 2.38	4.01 ± 0.79
Humanistic practice ability	26	130	107.49 ± 19.32	4.13 ± 0.74

TABLE 2: Participants' characteristics ($N = 650$).

Characteristics	Categories	N	(%)
Gender	Male	11	1.7
	Female	639	98.3
Nationality	China's main nationality	614	94.5
	Minority nationality	36	5.5
Marital status	Single	192	29.5
	Married	443	68.2
	Divorced	15	2.3
Age (years)	≤25	131	20.2
	26–30	193	29.6
	31–35	156	24.0
	36–40	79	12.2
	≥40	91	14.0
Religion	Yes	31	4.8
	No	619	95.2
Professional position	Nurse	133	20.5
	Primary nurse	239	36.7
	Nurse-in-charge	231	35.5
	Cochief superintendent nurse	44	6.8
	Chief superintendent nurse	3	0.5
Total working years	<5	199	30.6
	5–15	293	45.1
	16–25	104	16.0
	>25	54	8.3
Amount of training received	Not accepted	279	42.9
	<1 time/year	98	15.1
	1 time/year	117	18.0
	2-3 times/year	91	14.0
	>3 times/year	65	10.0
Understanding of concepts related to "humanistic care"	Very well understood	111	17.1
	General understanding	402	61.8
	Unclear	59	9.1
	Some understanding	65	10.0
	No understanding at all	13	2.0
The objective evaluation of their own humanistic knowledge and quality	Very deficient	38	5.8
	Comparatively lacking	495	76.2
	Not lacking	117	18.0

TABLE 3: Descriptive statistics and correlations among study variables.

Variables	Mean (SD)	Standardized factor loading	Cronbach's α	CR	AVE	1	2	3
(1) Perceived social support	67.56 (11.51)	0.726–0.921	0.956	0.966	0.704			
(2) Self-efficacy	26.78 (6.25)	0.555–0.882	0.934	0.933	0.585	0.478**		
(3) Empathy	113.01 (16.84)	0.509–0.886	0.896	0.961	0.555	0.382**	0.106**	
(4) Humanistic practice ability	107.50 (19.32)	0.528–0.941	0.984	0.988	0.762	0.455**	0.369**	0.375**

AVE, average variance extracted; CR, composite reliability; SD, standard deviation. ** $p < 0.01$.

TABLE 4: Model path coefficient.

Endogenous variables	Predicting variables	R^2	B	B′	SEs	t	p value	Lower	Upper
Self-efficacy	Perceived social support	0.247	0.826	0.497	0.061	13.467	***	0.434	0.554
Empathy	Perceived social support	0.591	1.058	0.629	0.080	13.274	***	0.420	0.799
	Self-efficacy		0.232	0.229	0.045	5.169	***	0.122	0.346
Humanistic practice ability	Perceived social support	0.482	−0.175	−0.096	0.344	−0.509	0.610	−1.585	0.210
	Self-efficacy		0.025	0.023	0.086	0.292	0.770	−0.533	0.152
	Empathy		0.810	0.751	0.317	2.558	0.011	0.355	2.605

*** $p < 0.001$.
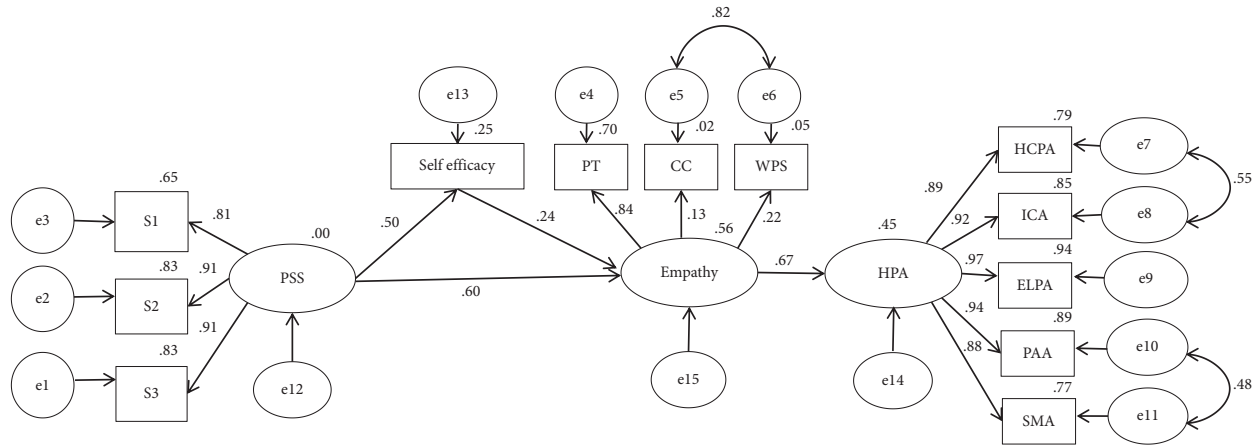
FIGURE 2: The final model of humanistic practice ability and associated factors (with standardized regression coefficients) (all $p < 0.05$). PSS, perceived social support; S1, family support; S2, friend support; S3, other support. PT, perspective taking; CC, compassionate care; WPS, walking in patient's shoes; HPA, humanistic practice ability; HCPA, humanistic care practice ability; ICA, interpersonal communication ability; ELPA, ethics and legal practice ability; PAA, psychological adjustment ability; SMA, self-management ability.

TABLE 5: Results of mediation effect analysis.

Mediation effects	Estimated effects	SE	Bootstrapping 95% CI		p value
			Lower	Upper	
Perceived social support ⟶ empathy ⟶ humanistic practice ability	0.402	0.048	0.306	0.492	0.001
Perceived social support ⟶ self-efficacy ⟶ empathy ⟶ humanistic practice ability	0.081	0.018	0.048	0.120	0.001

to focus on strengthening the regular training of young and junior nurses to further enhance their humanistic practice ability [36].

The lowest score in the self-management dimension in this study may be related to the high intensity and pressure of clinical nursing work, leading to insufficient emotional management and self-planning among nurses [27]. Nursing managers can improve nurses' resilience through group intervention [37] and reduce nurses' perception of work stress [38] and depression [39] through network-based stress management plans (such as cognitive behavioral techniques), helping nurses master emotional regulation skills and avoid emotional work. At the same time, clinical nurses can receive career planning training. Reasonable self-career planning can help strengthen nurses' awareness of self-directed learning, improve their professional skills, and increase their sense of identification and satisfaction with their work.

The findings of this study reveal that empathy acts as a complete mediator between social support and humanistic practice. This suggests that a supportive work environment fosters empathy among nurses, which, in turn, enhances their capacity for humanistic practice. Notably, higher levels of empathetic competence correlate with stronger humanistic practice abilities. These results are corroborated by a cross-sectional study conducted by Wang et al. [10]. According to Watson's theory of human caring, empathy is identified as one of its ten core components [40]. Within the framework of medical humanism, two essential domains—emotional and cognitive—are emphasized.

Empathy enables us to understand the intentions of others, predict their behavior, and experience emotions triggered by the emotions of others. It can be divided into two parts as follows: the cognitive and affective components [41, 42]. The cognitive part helps us to identify others'

emotions at the cognitive level. The emotional part is our ability to feel emotions similar to those of others [43]. Empathy plays a core role in social interaction [44]; people with high empathy ability may more actively understand the care and support of others and will be more deeply involved in the internal state of others, and sympathy for strangers can even produce alternative perception of social support and establish feelings to connect with social network [45].

People with strong empathy are sensitive to the care and support from the outside world. Instead, people with low empathy may not care about the support and care others give them. This may further influence their attitudes towards others. People with high empathy are more likely to perceive support and then show a higher tendency for prosocial behavior [46]. When a person can perceive the existence of social support, he/she will feel a sense of belonging, thus increasing the ability to identify self-worth, have a better understanding of professional responsibilities and obligations, and have the courage and patience to alleviate the pain caused by disease, thus improving their humanistic care ability [47].

Thus, the cultivation of empathy is instrumental in advancing humanistic practice. Existing literature suggests that empathy can be taught and acquired [48]. Various methodologies can be employed by administrators to improve nurses' empathic abilities and, consequently, their competence in humanistic practice. These may include measures to enhance psychological well-being [49], role-playing exercises that facilitate a deeper understanding of patients' perspectives [50], the integration of arts and humanities into the medical curriculum [51], and the use of virtual reality as a pedagogical tool to stimulate visual and emotional learning [52].

Another approach reveals that self-efficacy and empathy have a significant chain-mediating effect between social support and humanistic practice. Nurses with high self-efficacy are more confident and willing to employ empathy in their work, thus facilitating stronger nurse-patient relationships. Improving self-efficacy can serve as a strategy for cultivating empathy [22].

High self-efficacy enables nurses to patiently analyze and accurately perceive problems, particularly in the face of difficulties or setbacks. This confidence influences their level of motivation, which in turn affects their behavior [53]. Moreover, nurses with high self-efficacy believe they possess the skills necessary for effective symptom management, thus influencing the quality of care [54]. Increased self-efficacy encourages nurses to engage more actively in their work, ultimately enhancing patient care and nurse-patient relationships [23]. Research has indicated that self-efficacy mediates the organizational climate in nursing settings and affects humanistic practice ability [23]. In addition, being cared for and loved enhances the caregiver's capacity for care and love, reinforcing their concern for patients [13]. External support from family members and colleagues contributes positively to nurses' personal development, enabling them to better grasp the essence of care giving [55]. Humanistic practice abilities are not innate but are developed over time through experience and perception. As

such, managers should provide external support to improve nurses' self-efficacy, cultivate their empathy, and consequently enhance their humanistic professional skills.

In summary, interventions aimed at improving social support, empathy, and self-efficacy may be beneficial for enhancing the humanistic practice capabilities of nurses.

5. Limitations and Recommendations

This study is a cross-sectional study, measured and analyzed at a particular time and in a particular place, which may introduce reaction bias and affect the accuracy of causality. In future research, the sample size could be expanded and the causality between variables could be inferred by using a multicenter, longitudinal research method.

6. Conclusion

Empathy completely regulates the relationship between perceived social support and human practice ability; moreover, perceived social support can influence human practice ability through the interlocking mediation effects of self-efficacy and empathy. Interventions should focus on improving social support, self-efficacy, and empathy, thus directly or indirectly influencing nurses' humanistic practice abilities.

7. Implications for Nursing Management

The results of this study have practical significance in that they could help clinical nurses improve their humanistic practice ability and promote clinical humanistic nursing more broadly. The results emphasized that strategies to improve nurses' humanistic practice ability should focus on improving nurses' empathy, social support, and self-efficacy. Nursing managers could hire professionals to conduct systematic and continuous humanistic training for clinical nurses to improve empathy and self-efficacy. On the other hand, we also should build a harmonious nursing atmosphere to provide nurses with good social support.

Data Availability

The data used to support the findings of this study are available on request from the corresponding authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Huan Liu and Lin Zhang contributed equally to this work.

Acknowledgments

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Review Article

The Relationship between Transformational Leadership and Staff Nurse Retention in Hospital Settings: A Systematic Review

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Aim. This systematic review aimed to synthesise the relationship between transformational leadership style and staff nurse retention in hospital settings. *Background*. It is known that globally there is a shortage of nurses. Thus, nurse retention and organisational commitment have never been more critical. Nurse managers are responsible for staff retention. Therefore, nurse managers could reduce staff turnover by adopting the "right leadership style." *Methods*. Systematic review, following the guidance of PRISMA. Databases CINAHL, MEDLINE, PubMed, PsychInfo, Cochrane Central Register, and Embase were searched between 27th December 2021 and 22nd June 2023 to find relevant publications. Relevant studies were hand searched in January 2022 and June 2023 to source further potential evidence. A total of twelve articles were retrieved. *Results*. Twelve studies were included in this review, including six cross-sectional studies, two correlational studies, two cross-sectional correlational studies, and two surveys. In relation to retention, the primary outcome, data from eleven of the twelve studies reported statistical significance favouring transformational leadership improving staff retention. One study reported a statistically nonsignificant improvement in retention. *Conclusion*. There is evidence to suggest that transformational leadership may have a positive and significant relationship with staff nurse retention, job satisfaction, and quality of care. *Implications for Nursing Management*. Nurse managers should attend leadership and management training programs. This will allow them to understand and practice transformational leadership which may have a positive connection with staff nurse retention.

1. Introduction and Background

The World Health Organisation [1] has reported that the shortage of healthcare workers is a global concern, particularly nurses and midwives, representing more than 50% of the current shortage of health workers. Staff turnover rates differ significantly in high-income countries, with the highest rate of 44.3% reported in New Zealand, 26.8% in the USA, 23% in Israel, 19.9% in Canada, and 15.1% in Australia [2]. Moreover, in Ireland, the HSE [3] highlighted that the staff nurse turnover rate was 7.7% in 2021, above the national average of 6.4% [4], highlighting the increased struggle for

staff retention. The explanation for this is unclear, thus, warranting the need for further research to determine the reason for this. It is estimated that the global nursing shortage will reach 1.05 million by the end of 2022, keeping with a nurse turnover rate of 18.69% [5]. Numerous studies imply that 4% to 54% of nurses globally intend to quit nursing [6], highlighting concern over inadequate staff and adverse patient outcomes [7]. A growing body of evidence suggests that nurse manager leadership influences nurse retention [8, 9].

Employees are vital commodities of an organisation; thus, this becomes the main area of focus where leadership should lead in ways that improve staff retention [10]. In recent years, leadership has become an important concept in nursing; therefore, leadership styles are required to reduce waste, cost, confusion, and error [11]. It is well documented that leadership styles used by nurse managers play an essential role in nurses' commitment to their workplace [12]. In addition, although job satisfaction can be increased by extrinsic means such as a pay rise, nurse managers can improve job satisfaction by adopting the right leadership style [13]. It is suggested that almost one-third of the level of job satisfaction of nursing staff can be increased by managers just manipulating their leadership behaviours [13]. Thus, nurse managers could cost-effectively retain their staff by displaying the "right leadership style" [13]. Newstrom [14] describes leadership styles as how individuals provide direction, implement plans, and motivate staff. It is proposed that managers who adopt the transformational leadership (TL) style transform their followers' ideas about what is important, inspiring them to see opportunities and challenges in a positive light [15].

Transformational leadership has been compartmentalised into four main components: idealised influence, inspirational motivation, intellectual stimulation, and individualised consideration [16]. Idealised influence occurs when leaders bring about trust and respect by acting as role models to their followers [17]. Second, inspirational motivation occurs when nurse managers enable their staff to achieve the organisation's mission and personal goals [18]. Third, intellectual stimulation occurs when nurse managers encourage their staff to develop new ideas and keep learning through courses or evidence-based materials [18]. Finally, individualised consideration occurs when nurse managers encourage individual staff members by helping them and supporting and providing positive feedback [18]. Therefore, a transformational leader is a leader who can promote the interest of staff and facilitate the commitment of staff to the mission of the organisation [19]. It is clear that the leadership practices of nurse managers can positively or negatively affect outcomes for organisations, staff, and patients [20].

Increased staff turnover in a hospital may result in increased overtime, fatigue, stress, and poor job satisfaction among remaining nurses [21]. Furthermore, it upsets continuity of care, resulting in reduced quality of care and safety, potentially increasing the risk of medication errors, falls, and healthcare-associated infections [21]. Thus, increased staff turnover is of great concern for nurse managers. Moreover, increased staff turnover may also negatively affect hospital budgets [22]. Using the original Nursing Turnover Cost Calculation Methodology, yearly costs associated with nurse turnover were approximately $48,790 in Australia, $20,561 in the US, $26,652 in Canada, and $23,711 in New Zealand [23, 24]. These costs highlight the importance of nurse retention; hence, it is vital to explore the relationship of TL style on staff nurse retention in hospital settings. Effective leadership is considered an essential part of staff nurse retention [25]. Thus, conducting this systematic review is vital to synthesise the link between TL and staff nurse retention in hospital settings to reduce staff turnover. Therefore, this systematic review aims to synthesise the body of knowledge on the relationship between TL and staff nurse retention in hospital settings.

2. Methods

A systematic review was undertaken using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) checklist (Figure 1). The review question was formulated using the PICO mnemonic. The population being considered was staff nurses working in hospital settings, the intervention was transformational leadership which was compared with other leadership styles. The primary outcome was staff retention, and the secondary outcomes were job satisfaction and quality of care. Thus, the research question was "What is the relationship between transformational leadership style and staff nurse retention in hospital settings? This question was formulated as it was an area of interest to the authors."

Table 1 details the inclusion and exclusion criteria.

2.1. Search Strategy. A systematic search was conducted to ensure all available evidence to answer the question was included. The searches were conducted from December 2021 to June 2023. The following databases were searched: CINAHL, MEDLINE, PubMed, PsychInfo, Cochrane Central Register, and Embase. Keywords and phrases included were as follows: transformational AND leadership OR management AND style OR method OR approach AND nurse OR caregiver OR healthcare professional OR healthcare worker AND retention OR turnover OR commitment OR intent to stay OR organisational commitment OR affective commitment OR reduced predicted turnover OR turnover intention OR anticipated turnover OR intention to leave AND hospital OR acute care setting OR acute care facility. The English language limitation was applied. The reference list of identified studies was hand-searched for suitable studies and citations.

2.2. Data Extraction and Data Analysis. One review author independently extracted data from eligible studies using a data extraction sheet and table; this was validated by five authors (see Table 2 for data extraction). The data extraction table included authors, year, country, study setting, study design, population and sample size, results, primary outcome, and secondary outcomes (Table 2). Meta-analysis was
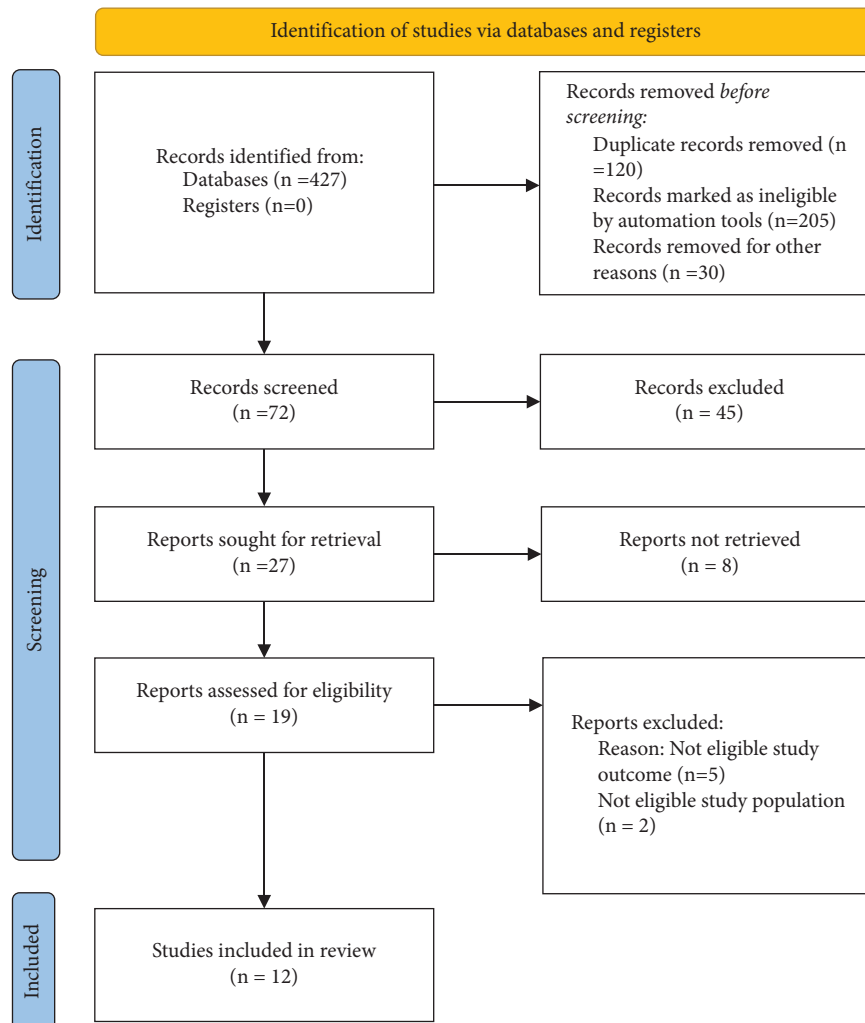
Figure 1: PRISMA flow diagram.

not feasible due to the heterogeneity of the studies included. Therefore, a narrative description of the studies was undertaken.

2.3. Quality Appraisal. The quality of the selected studies was appraised by six independent reviewers, who assessed the internal and external validity and determined the bias affecting the methodological quality. Furthermore, the Critical Appraisal Checklist (EBL) devised by Glynn [34] was also used to appraise the included studies. Accordingly, the studies were appraised under the following headings: population, data collection, study design, and results. Applying this tool, the study quality in each category is invalid with a final score of <75. Therefore, the studies that produced results of "Yes" ≥75% or, "No + Unclear" ≤25% were considered good quality. The score from each section was calculated at the end to indicate the study's validity.

3. Results

The initial search yielded 427 articles. The six authors worked in pairs for the filtration process and after removing duplicates, 307 remained. Upon removal of ineligible studies, 72 were screened, of which 45 were excluded. Of the remaining 27, 8 studies were not retrieved. Following this, 19 full-text articles were rigorously screened for eligibility. 7 were excluded for valid reasons. 5 articles had a noneligible study outcome, and 2 had a noneligible study population. This resulted in 12 studies meeting the inclusion criteria for this systematic review (Figure 1).

3.1. Description of Included Studies. Twelve studies met the inclusion criteria for this systematic review. The research was conducted in hospital settings across many different countries, namely, Saudi Arabia [12, 30], Canada [26],

TABLE 1: Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Quantitative research	Qualitative and literature review
Participants who were registered nurses	Nurses who were not registered
Transformational leadership	Studies not including transformational leadership
Measuring retention, turnover, commitment, intent to stay, organisational commitment, affective commitment, reduced predicted turnover, turnover intention, and anticipated turnover	Studies not including retention, turnover, commitment, intent to stay, organisational commitment, affective commitment, reduced predicted turnover, turnover intention, and anticipated turnover
Working in hospital settings	Settings outside the hospital setting
English language	Non-English language
Post-year 2011	Pre-year 2011

TABLE 2: Data extraction.

Authors and year	Country	Study setting	Study design	Population and sample size	Primary outcome	Secondary outcome
Abualrub and Alghamdi [12]	Saudi Arabia	Western region of Saudi Arabia: 6 public hospitals	Correlational design	308 registered nurses. 56% female, 44% male	TL was not linked with nurse retention. $P \leq 0.14$	TL had a positive effect on job satisfaction. $P \leq 0.001$
Lavoie-Tremblay et al. [26]	Canada	Quebec hospitals	Cross-sectional	541 registered nurses. 88.2% female, 11.8% male	Positive relationship between TL and nurse retention. $P \leq 0.05$	TL lead to a high quality of care. $P \leq 0.0001$
Asamani et al. [13]	Ghana	Eastern region of Ghana: 5 hospitals	Cross-sectional	273 registered nurses. 78% female, 21.3% male	Positive relationship between TL and nurse retention. $P \leq 0.001$	TL was positively correlated to job satisfaction
Kodama et al. [27]	Japan	Kanto: 4 midsized acute care hospitals	Cross-sectional	396 registered nurses. 93.9% female, 6.1% male	Positive relationship between TL and nurse retention. OR = 2.23	
Abualrub and Nasrallah [28]	Jordan	6 hospitals-a mix of public, private and university-affiliated	Correlational design	285 registered nurses. 56.1% female, 43.9% male	Positive relationship between TL and nurse retention. $P < 0.001$	
Wang et al. [29]	China	Shanghai: 4 general hospitals	Cross-sectional	535 registered nurses, 98.3% female, 1.7% male	Positive relationship between TL and nurse retention. $P \leq 0.001$	
Al-Yami et al. [30]	Saudi Arabia	Riyadh: 2 biggest hospitals	Survey design	219 registered nurses and nurse managers. 55 nurse managers and 164 staff nurses. 89% female, 11% male	Positive relationship between TL and nurse retention. $P \leq 0.001$	
Pishgooie et al. [31]	Iran	10 government hospitals	Correlational cross-sectional	1,617 registered nurses. 72.2% female, 27.8% male	Positive relationship between TL and nurse retention. $P \leq 0.001$	
Labrague et al. [32]	Philippines	Central Philippines: 15 hospitals	Cross-sectional	770 registered nurses. 58.6% female, 41.4% male	Positive relationship between TL and nurse retention. $P \leq 0.05$	TL positive influence on job satisfaction. $P \leq 0.001$
Magbity et al. [2]	Ghana	5 hospitals	Cross-sectional	250 registered nurses	Positive relationship between TL and nurse retention. $r = -0.377$	
Suliman et al. [33]	Jordan	North Jordan: 3 public sector hospitals, 1 university-affiliated hospital	Cross-sectional, correlational design	250 registered nurses. 59% female, 41% male	Positive relationship between TL and nurse retention. $P \leq 0.001$	
Yücel [10]	Turkey	2 private hospitals in Ankara and Istanbul	Survey design	478 participants. 58.3% female, 41.7% male	Positive relationship between TL and staff nurse retention. $P < 0.001$	

TABLE 3: Data collection instruments.

Authors	Leadership measurement	Reliability	Retention measurement	Reliability
Abualrub and Alghamdi [12]	Multifactor Leadership Questionnaire (MLQ)	Cronbach's alpha was 0.87	McCain's Intent to Stay Scale	Cronbach's alpha was 0.80
Lavoie-Tremblay et al. [26]	Global Transformational Leadership (GTL) Scale	Cronbach's alpha was 0.94	O'Driscoll and Beehr Scale	Cronbach's alpha was 0.91
Asamani et al. [13]	Path-Goal Leadership Questionnaire	Cronbach's alpha was 0.701	Intention to Stay Scale	Cronbach's alpha was 0.695
Kodama et al. [27]	MLQ	Cronbach's alpha was 0.87	Affective Commitment Scale	Cronbach's alpha was 0.77
Abualrub and Nasrallah [28]	Leadership Practice Inventory	Cronbach's alpha was 0.97	McCain's Intent to Stay Scale	Cronbach's alpha was 0.88
Wang et al. [29]	Transformational Leadership Scale	Cronbach's alpha was 0.90	Intent to Stay Scale	Cronbach's alpha was 0.79
Al-Yami et al. [30]	MLQ	Cronbach's alpha was >0.60	Organisational Commitment Questionnaire	Cronbach's alpha was 0.77
Pishgooie et al. [31]	MLQ	Cronbach's alpha was 0.90	Anticipated Turnover Scale (ATS)	Cronbach's alpha was 0.73
Labrague et al. [32]	GTL scale	Cronbach's alpha was 0.91	O'Driscoll and Beehr Scale	Cronbach's alpha was 0.92
Magbity et al. [2]	MLQ	Not reported	Turnover Intention Scale	Not reported
Suliman et al. [33]	MLQ	Not reported	ATS	Not reported
Yücel [10]	MLQ	Cronbach's alpha was 0.89	Six-item turnover intention scale	Cronbach's alpha was 0.84

TABLE 4: Primary outcome.

Authors	Staff retention	Pearson correlation value	P value	OR	95% confidence interval (CI)
Abualrub and Alghamdi [12]	TL was not linked with nurse retention	R = 0.08	P ≤ 0.14		
Lavoie-Tremblay et al. [26]	TL style reduced intention to quit	R = −0.39	P ≤ 0.05		
Asamani et al. [13]	Positive relationship between TL and nurse retention	R = 0.221	P ≤ 0.001		
Kodama et al. [27]	Positive relationship between TL and nurse retention			2.23	(1.31–3.80)
Abualrub and Nasrallah [28]	TL style was associated with higher levels of retention	R = 0.391	P ≤ 0.001		
Wang et al. [29]	Positive relationship between TL and nurse retention	R = 0.375	P ≤ 0.001		(0.269–0.478)
Al-Yami et al. [30]	Positive relationship between TL and nurse retention	R = 0.374	P ≤ 0.001		
Pishgooie et al. [31]	TL style reduced intention to quit	R = −0.22	P ≤ 0.001		
Labrague et al. [32]	TL style reduced intent to leave	R = −0.08	P ≤ 00.05		
Magbity et al. [2]	TL style reduced turnover intention	R = −0.377			
Suliman et al. [33]	TL style reduced intention to leave		P ≤ 0.001		
Yücel [10]	TL style reduced turnover intention		P ≤ 0.001		

TABLE 5: Job satisfaction.

Authors	Job satisfaction (JS)	Correlation value	P value
Abualrub and Alghamdi [12]	Positive link between TL style and JS	$R = 0.45$	$P \leq 0.001$
Asamani et al. [13]	Positive link between TL style and JS	$R = 0.462$	$P \leq 0.001$
Labrague et al. [32]	Positive link between TL style and JS	$R = 0.37$	$P \leq 0.001$

Ghana [2, 13], Japan [27, 33], Jordan [28], China [29], Iran [31], Philippines [32], and Turkey [10]. The mean sample size in the twelve studies was 535 participants, ranging from 219 to 1,617 participants. Participants in one of the twelve studies were a mix of registered nurses and nurse managers. The study's characteristics are presented in the data extraction table (Table 2).

3.1.1. Data Collection Instruments. Table 3 represents the details of various data collection instruments used in the included studies. All the data collection methods were deemed reliable and valid as Cronbach's alpha scores were all greater than 0.50 [35]. Two of the twelve studies did not detail Cronbach's alpha score; however, both studies reported that their instruments were reliable.

3.1.2. Primary Outcome. The primary outcome, staff retention, was measured in all twelve studies. Overall, eleven of the twelve studies demonstrated that there was a positive relationship between TL style and staff nurse retention in hospital settings. The results are illustrated in Table 4. Lavoie-Tremblay et al. [26] revealed that TL style negatively and significantly predicted the intention to quit ($r = -0.39$, $P \leq 0.05$). Asamani et al. [13] found that there was a weak but significant positive correlation between TL style and staff nurses' intention to stay ($r = 0.221$, $P \leq 0.001$). Kodama et al. [27] reported that TL style was significantly and positively related to affective commitment (OR = 2.23, 95% CI: [1.31–3.80]). Abualrub and Nasrallah [28] discovered that increased staff retention was associated with TL style ($r = 0.391$, $P \leq 0.001$). Wang et al. [29] reported that TL style was positively correlated with nurse retention ($P \leq 0.001$, 95% CI: [0.269–0.478]). Al-Yami et al. [30] revealed that TL style and organisational commitment were positively related ($r = 0.364$, $P \leq 0.01$). Pishgooie et al. [31] found that there was a positive correlation between TL style and anticipated turnover ($r = -0.22$, $P \leq 0.001$). Labrague et al. [32] discovered that TL style correlated significantly with organisational turnover intention ($r = -0.08$, $P \leq 0.05$). Magbity et al. [2] reported a significant correlation between TL style and nurses' turnover intention ($r = -0.377$). Suliman et al. [33] found that TL style had a significant effect on nurse turnover ($P \leq 0.001$). Yücel [10] discovered that TL style significantly negatively predicted turnover intention ($P \leq 0.001$). These results indicate that TL style has a statistically significant positive connection with staff nurse retention in hospital settings. Abualrub and Alghamdi [12] was the only study to report that the relationship between TL style and staff retention was statistically insignificant ($P \leq 0.14$), indicating that there was no relationship between TL style and staff nurses' retention at work.

3.1.3. Secondary Outcomes. Three studies found a positive connection between TL style and job satisfaction. The results are illustrated in Table 5, while one study found that TL style resulted in high quality of care.

A multiple linear regression analysis was used to determine if the demographic characteristics (model 1) and the nurse managers' leadership styles (model 2) significantly accounted for the levels of job satisfaction. The results in the three articles revealed that TL style was linked to nurses' job satisfaction. Abualrub and Alghamdi [12] reported a positive significant moderate correlation between TL style and nurses' job satisfaction ($r = 0.45$, $P \leq 0.001$). Asamani et al. [13] found that TL style of nurse managers was positively correlated with staff nurses' levels of job satisfaction ($r = 0.462$, $P \leq 0.001$). Labrague et al. [32] also discovered that TL style correlated significantly with job satisfaction ($r = 0.37$, $P \leq 0.001$). These results suggest that TL style has a statistically significant positive link to staff nurses' job satisfaction.

Lavoie-Tremblay et al. [26] investigated the link between nurse manager leadership styles and quality of care. Quality of care was measured on a 4-item scale [36]. This scale was deemed reliable as it had a Cronbach's alpha score of 0.84. Lavoie-Tremblay et al. [26] discovered that TL style had a positive and significant connection with quality of care ($P \leq 0.001$).

3.2. Quality Appraisal. The results from the quality appraisal are presented in Table 6. All studies were deemed valid, except for Magbity et al. [2] who showed issues with the choice of population and the results section. In [2], the inclusion and exclusion criteria were not clearly outlined, and it was unclear whether informed consent was obtained from the participants. It was also unclear whether there was external validity. Suggestions for further research were not provided, and subset analysis was a major focus.

4. Discussion

The primary aim of this systematic review was to examine the relationship between TL style and staff nurse retention in hospital settings. The secondary outcomes were presented as job satisfaction and quality of care. The results of eleven of the twelve studies indicate that TL style positively affects staff nurse retention [2, 10, 13, 26–33]. Moreover, three of the twelve studies suggest that TL style has a positive and significant link with job satisfaction [12, 13, 32]. One study discovered that TL style also has a positive and significant connection to quality of care [26].

The study conducted by Abualrub and Alghamdi [12] indicated that the relationship between TL style and staff nurse retention was statistically insignificant. The results

TABLE 6: Critical appraisal checklist (EBL) results.

Study	Section A: population	Section B: data collection	Section C: study design	Section D: results	Overall validity
Abualrub and Alghamdi [12]	83% valid	67% valid	100% valid	67% valid	78% valid
Lavoie-Tremblay et al. [26]	100% valid	67% valid	100% valid	67% valid	83% valid
Asamani et al. [13]	83% valid	83% valid	100% valid	50% valid	78% valid
Kodama et al. [27]	83% valid	67% valid	100% valid	67% valid	78% valid
Abualrub and Nasrallah [28]	83% valid	83% valid	100% valid	67% valid	83% valid
Wang et al. [29]	83% valid	67% valid	80% valid	83% valid	78% valid
Al-Yami et al. [30]	83% valid	83% valid	80% valid	67% valid	78% valid
Pishgooie et al. [31]	83% valid	83% valid	100% valid	100% valid	91% valid
Labrague et al. [32]	83% valid	83% valid	80% valid	67% valid	78% valid
Magbity et al. [2]	50% valid	83% valid	80% valid	50% valid	65% not valid
Suliman et al. [33]	83% valid	83% valid	80% valid	83% valid	83% valid
Yücel [10]	83% valid	57% valid	80% valid	67% valid	74% valid

from this study may suggest that TL style has a minimal link to nurse retention. However, this study was the most outdated, which may explain why this was the only study with this outcome. Upon review, Asamani et al. [13] implied that there was a weak but significant connection between TL style and staff nurse retention ($r = 0.221$, $P < 0.001$) as this study found a stronger correlation between participative leadership and staff nurse retention ($r = 0.243$, $P < 0.001$).

Overall, the results from this systematic review indicate that TL style has a positive relationship with staff nurse retention. In support of this, multiple past studies have suggested that nurses are seeking challenges in their work [37]; they want to be encouraged, respected, and recognised (Lavoie-Tremblay et al., 2010) and require feedback on their performance [38, 39]. Moreover, Hutchinson et al. [40] implied that a supportive work environment might be vital in retaining nurses. Likewise, a high level of collaboration in nursing units was linked with retention [41]. These elements, which concern the needs of nurses, can be facilitated through TL practices [26] and thus result in staff retention. When considering mixed results such as this, it would be appropriate to question the specific elements of TL style that may or may not significantly link to staff retention. Furthermore, it may be relevant to compare different leadership styles and their relationship with staff retention to determine which style is best related to staff nurse retention; thus, this requires further research.

Concerning the secondary outcome of this systematic review, the three studies that measured job satisfaction [12, 13, 32] highlighted that TL style has a significant positive connection with job satisfaction. Both Abualrub and Alghamdi [12] and Asamani et al. [13] reported that levels of job satisfaction among nurses were generally moderate. Thus, it may be implied that nurses across different countries are generally not satisfied with their jobs, a situation that can potentially reduce productivity and worsen the current shortage of nurses [13]. However, as previously mentioned, TL had a positive correlation with job satisfaction. This suggests that the adoption of TL style by nurse managers may result in an increase in the level of nursing staff and job satisfaction [12, 13, 32].

Besides the results of the present systematic review, Cummings et al. [42] also conducted a systematic review and found that TL style had a strong connection with job satisfaction, productivity, and retention. Thus, participatory management practices and a nurse-friendly work environment, which can be accomplished with a nurse manager who adopts a TL style, can be related to staff retention and job satisfaction [21, 43]. The potential positive significance of nurse retention, considering that improved job satisfaction could reduce turnover, must be recognised as another area for further research.

Interestingly, Lavoie-Tremblay et al. [26] reported that TL style has a significant positive link to quality of care. This was the only study that measured quality of care and found that TL style resulted in high quality of care, another secondary outcome. Excluding the results from this systematic review, previous systematic reviews discovered that TL style was associated with increased patient satisfaction, reduced adverse events, lower patient mortality, and fewer hospital-acquired infections [44, 45].

4.1. Limitations. This systematic review was limited by the research available for inclusion. Most of the included studies were cross-sectional and correlational by design, which contributed to the weakness of being unable to determine casual relationships compared with a cohort study [46]. In addition, two studies used the survey method for collecting data which has its own set of disadvantages. It is suggested that one typical issue with employing surveys to gather data is that of missing data [47]. Although there are statistical techniques available to handle missing data, these techniques do not always result in complete accuracy [10]. Furthermore, eight out of the twelve studies utilised convenience sampling [2, 12, 13, 27–29, 32, 33], which is nonrandom and may limit the generalisability of the results. Nonetheless, eleven of the twelve included studies scored highly (>75%) on quality appraisal. Further research should utilise an RCT design to assess the leadership practices of nurse managers (Lavoie-Tremblay et al., 2015). Another limitation of this review is that eleven of the twelve studies included were all pre-

COVID-19 [2, 12, 13, 26–33]. Although this was a limitation, both pre-COVID-19 studies and the post-COVID-19 study had similar findings. Furthermore, another limitation to this SR may be that the literature on the original aim was expanded based on the findings; thus, they may be considered an extrapolation from the original aim. Finally, included studies were limited to English, as there was no funding for translation services.

5. Conclusion

This review aimed to examine the relationship between TL style and staff nurse retention in hospital settings. The results of this study highlighted the importance of TL style in enhancing staff nurse retention, job satisfaction, and quality of care. Agreeable with the literature, this SR provides support to previous studies connecting TL style to encouraging results in nurses, especially staff nurse retention. Nonetheless, the results are not entirely definitive, as there is a scarcity of primary research related to this issue, highlighting the need for further research in this vital area.

6. Implications for Nursing Management

This review has several implications for nursing management. Nurse directors should promote the TL leadership behaviours of nurse managers through leadership training programmes to enhance staff retention. Educational leadership programmes can positively and significantly impact nurse managers' leadership and professional behaviours [48]. Furthermore, in partnership with nurse educators, the regulatory bodies of the nursing profession should develop competencies for nurse managers based on TL and include these competencies in nursing education programmes [28]. The recruitment policies of nurses for leadership roles should be based on these competencies [28].

In addition, it is suggested that magnet hospitals have improved staff retention [49]; this may be because TL style is one component of the magnet model [50]. Thus, magnet hospitals utilise the TL style and have greater staff nurse retention than nonmagnet hospitals [49]. This is important when considering the results from this review as leadership programmes would better educate nurse managers concerning TL style, which can be linked with staff nurse retention, job satisfaction, and quality of care.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Research Article

Relationships between Alternative Nurse Staffing Level Measurements and Nurses' Perceptions of Nurse Staffing Level Adequacy, Fatigue, and Care Quality

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Aims. This study examined the influence of nurse staffing level, measured using various methods, on nurses' perceived adequacy of nurse staffing level, fatigue, and nursing care quality. *Background.* Although previous studies have recommended various methods of measuring nurse staffing level, there is a lack of research that compares different measurement methods or considers nurses' perceptions of staffing level on a daily basis. *Methods.* We conducted a cross-sectional study using work sampling and the questionnaire method in a general hospital in South Korea from July 18 to August 14, 2022. Results based on responses from 90 nurses and scores of 5,536 inpatients derived from the Korean Patient Classification System were included in the analysis. *Results.* The average nurse-to-patient ratio a day was 1 : 3.20, and the registered nursing hours per patient day was 2.35. Perceived insufficient nurse staffing and fatigue were higher on weekdays than on weekends ($p < 0.001$). All variables measuring the nurse staffing level affected the nurses' perceived inadequacy of nurse staffing level, fatigue, and nursing care quality, compared to other variables related to nurse staffing level, such as work intensity and demanding nursing hours per nurse (R^2: 0.19–0.31), the nurse-to-patient ratio had the lowest explanatory power in explaining the nurses' perceptions (R^2: 0.14–0.18). *Conclusions.* Nurse staffing level measurement should consider the acuity of inpatients and nursing care time. Further research is needed to utilize nurses' perceptions of the appropriate nurse staffing level. *Implications for Nursing Management.* Efforts are required to maintain an appropriate nurse staffing level through continuous monitoring of nurses' perceptions and acuity of inpatients to preserve nurses' alertness during work and improve nursing care quality.

1. Introduction

Previous studies have examined the relationship between adequate nurse staffing and patient outcomes such as inpatient mortality, fall incidences, hospitalization days, and incidences of pneumonia in patients after surgery [1–3]. Although adequate nurse staffing level is an important factor for patient safety, the number of practicing nurses per 1,000 persons in the South Korean population was found to be lower than the average rates reported in other member countries of the Organisation for Economic Co-operation and Development (OECD) [4]. Moreover, the declined inpatients' length of stay and increased average acuity of

patients have made the care burden heavier and increased the demand for nursing staff [5]. The workload of registered nurses and nurse staffing level differs between weekdays and weekends in South Korea [6].

As nurse staffing is a factor that can strongly influence the quality of care [7], scholars have developed methods of measuring this variable and attempted to identify the characteristics of optimal nurse staffing [8, 9]. As nurse staffing measurement systems, previous studies have mainly used nurse-to-patient ratios, the acuity/dependency method, nursing hours per patient day (NHPPD) or registered nursing hours per patient day (RN HPPD), and nurse-perceived staffing adequacy [10–12]. The nurse-to-patient

ratio is a relatively simple and quick calculation method that tends to allocate nursing resources without regard for patient need or complexity [13]. A policy in South Korea limits the nurse-to-patient ratio to 2.5 or less, and 12 outpatients are counted as one inpatient [14].

Moreover, the acuity/dependency method relies on patients being classified based on acuity and dependency, according to which nursing requirements are then determined [15]. The Safer Nursing Care Tool is the most widely used method; acuity refers to patients' increased risk of clinical deterioration and complexity, whereas patient dependency means the level of need to support their physical activities, such as eating, drinking, and personal hygiene [16]. Patient dependency values can be used to estimate the work intensity of nurses; an example is the Oulu Patient Classification (OPC), developed in Finland [17, 18]. NHPPD or RN HPPD refers to the total number of productive hours worked by nursing staff or registered nurses per patient day on a designated inpatient unit during a specific calendar month. It has been widely used because of its relative simplicity and has shown high inter-rater reliability for measuring adequate nurse staffing level; for example, NHPPD showed high predictive validity for patient falls [9, 19, 20]. Finally, nurses' perceptions of nurse staffing adequacy have also been used, and a prior study has revealed it to be a strong predictor of unit-acquired pressure ulcers [8].

However, despite the importance of adequate nurse staffing levels and the development of various measurement systems, no evidence supports the choice of any particular tool [13], because nurse staffing levels have constantly moving targets and the unceasing fluctuation in patient volume creates unpredictable nursing workloads [21, 22]. Therefore, in order to generate evidence to choose an appropriate nurse staffing level measurement tool, it is necessary to compare various measurement systems and examine the relationship between nurse staffing level and nurses' perceptions of nurse staffing level adequacy and fatigue on a daily basis. An effective tool can help facilitate effective nursing manager responses to relocate nursing personnel for appropriate nurse staffing level.

The current study examined the differences in the effects of nurse staffing measurement systems on nurses' perceptions of nurse staffing level, fatigue, and nursing care quality. Inadequate nurse staffing levels and increased acuity levels of patients associated with nursing workload [23] have led to an increase in fatigue [24]; moreover, fatigued nurses are more harmful to patient safety [25]. Nurse staffing level was also negatively associated with perceived nursing care quality [26].

Focused on nurse staffing levels, the current study aimed to report its influence on nurses' perceptions of inadequate nurse staffing levels and compared its effects, measured using various methods, on nurses' perceptions. Although examining nurses' perceptions of nurse staffing adequacy is one among the nurse staffing measurement methods, it is used as a dependent variable influenced by other staffing measurement variables, such as nurse-to-patient ratio and RN HPPD because it is based on nurses' perceptions.

This study aimed to determine which measurement tool best captures workload and represents nurses' perceptions. The objectives of the study were (1) to examine nurse staffing level using nurse-to-patient ratios, work intensity, and RN HPPD, according to the patient classification and number of patients in the patient groups; (2) to investigate the relationships between nurse staffing level using various measurement methods and the nurses' perceptions of nurse staffing adequacy, fatigue at the end of the shift, and quality of nursing care; and (3) to explore the factors influencing nurses' perceptions, with a focus on nurse staffing level assessed using various measurement methods.

2. Materials and Methods

2.1. Design and Participants. A cross-sectional study was conducted, and data were collected between July 18 and August 14, 2022 (four weeks). This study was conducted using the convenience sampling method in a general hospital in South Korea, and the researcher informed the nursing department about the purpose and methods of the study. The hospital comprised 14 general wards, and the study participants included registered nurses working in six wards; however, those in four comprehensive care units, one infection control ward, one hospice ward, one psychiatric ward, and one children's ward were excluded because of the heterogeneity of patient composition and nursing activities. Because the 6 selected wards were mixed-type wards with internal medicine and surgery, the patients were similar across the wards; therefore, classification by ward was not necessary. Data were analyzed based on the number of days worked to report the effects of nurse staffing level on nurses' perceptions of a work day, and data of 168 days (28 days of work across six wards) were analyzed. The sample size was determined using the G^* Power 3.1.9.4 program. For multiple regression analysis, assuming the effect size = 0.15 with a significance level of 0.05 at a power of 0.80 and four predictors, the minimum required sample size was 108. Only the nursing activities of and survey completed by registered nurses were included in the analysis because the work performed by most of the nurse assistants was unit-related such as running errands, securing supplies, restocking, and environmental cleaning, and their work status was flexible, such as an assistant nurse covering more than a ward or not working at night. The study focused on registered nurses' staffing level and perceptions.

2.2. Data Collection

2.2.1. Distributions of Nursing Personnel and Inpatients. The number of registered nurses on duty, total unique inpatients, and turnover of patients including admission, discharge, and transfer-in and transfer-out per day in six wards, which was used to measure the nurse staffing level each day, was collected for four weeks. Moreover, the daily Korean Patient Classification System-General Ward (KPCS-GW) score of every inpatient was measured by night shift nurses for the day; this was confirmed and reported to the researcher by head nurses. In Korea, the Korean Patient

Classification System-1 has been used to measure the nursing care demands of inpatients in general wards, and a revised, short-form version (KPCS-GW) has been developed [27, 28]. Furthermore, the reliability and validity have been confirmed [28]. Each week, the head nurse of each ward reported the daily results to the researcher by e-mail.

2.2.2. RN HPPD by Patient Classification.

A work sampling method was used to identify registered nurses' nursing activities, report RN HPPD, and identify required nursing time according to patient classification. Work sampling surveys were conducted for four days (two weekdays and two weekends) during the study period for each of the six wards where nurses performed typical three-shift work: day, evening, and night. Eight trained observers, who were senior nursing students, carried out the observations in shifts and every 10 min. They recorded their observations and the activities of each registered nurse in the ward on a data collection sheet.

2.2.3. Nurses' Perceptions of Nurse Staffing Level Adequacy, Fatigue, and Nursing Care Quality.

At the beginning of the study, registered nurses in six wards were informed about the purpose and methods of the study, and a survey to report registered nurses' perceptions was conducted for four weeks. The questionnaires for the registered nurses, except the head nurses, were placed in each ward, and they were asked to fill out the questionnaires anonymously and drop them into enclosed questionnaire collection boxes placed in the ward after every shift for four weeks. The researcher picked up the completed questionnaires placed in the questionnaire collection boxes every week.

2.3. Measurements

2.3.1. Patient Classification by Nursing Care Needs.

Patient classifications by nursing needs were measured using the KPCS-GW, which comprises 34 items on the required nursing activities, such as vital sign checks and blood sugar test; the higher the KPCS-GW score, the higher the nursing care needs [28]. Patient groups could be classified from 1 to 4, according to the total scores of the KPCS-GW: scores of 1–10 for group 1, 11–20 for group 2, 21–30 for group 3, and 31 or more for group 4. As many patients belonged to groups 1 and 2 in the general hospital where the study was conducted, patients with scores of 1–5, 6–10, 11–15, 16–20, and over 20 were classified into groups 1, 2, 3, 4, and 5, respectively, in the analysis.

2.3.2. Work Sampling.

Nursing care activities were observed and reported based on the "nursing activities work sampling instrument" [29]; the authors had obtained permission to use this tool. In the present study, nursing activities were categorized as follows: 12 types in direct care work, five types in indirect care work, six types in unit-related work, and personal time. Personal time was excluded to measure the nursing hours.

2.3.3. Registered Nurse Survey.

The perception of adequate nurse staffing was measured using an ad hoc questionnaire comprising three items. The first item was "how adequate do you think the nurse staffing level is in the ward today to provide quality nursing care?" The responses ranged from −10 (denoting an excess, that is, too many nursing staff compared to the workload) to +10 (denoting shortage, that is, the workload was too much); 0 represented optimal workload. The higher the score, the higher the perception of insufficient nurse staffing. The second item, to measure fatigue at the end of the shift, employed a visual analogue scale for fatigue [30], ranging from 0 (not at all tired) to 10 (extremely tired). The last item—perceived nursing care quality—was measured using one item: "How do you perceive the quality of care in the ward today?" The responses were based on a 4-point Likert scale ranging from 1 (extremely poor) to 4 (excellent). Although using a single item can cause some validity and reliability concerns, global single-item indicators have been reported to provide valid and reliable measures [21, 31]. The response rate of the questionnaire was 76.8%.

2.4. Data Analysis

2.4.1. Distribution of Nursing Personnel, Patients, and Nurses' Perceptions.

Data on the average tenure of nurses in a day, number of inpatients in a ward, KPCS-GW scores of inpatients, number of patient turnover per day, and perceptions of nurses in the four weeks were analyzed through descriptive analysis. The differences between weekdays and weekends were analyzed through an independent t-test. $p < 0.05$ was considered statistically significant.

2.4.2. Nursing Hours by Nursing Activities and RN HPPD According to Patient Classification.

The number of nursing hours based on the nursing activities for four days was calculated by multiplying the number of observations for each activity performed by registered nurses by 10, because the observation was recorded every 10 min. In the case of direct nursing care, the ID number of patients receiving nursing care was recorded by the observers so that the researchers could later merge the KPCS-GW score. However, it was impossible to measure the indirect nursing care time per patient. Indirect nursing care time was allocated in proportion to the direct nursing hours because indirect care work, such as charting and handover, increases based on direct care. Accordingly, unit-related work was allocated equally for each patient [32]. RN HPPD were calculated by summing the direct care time, indirect care time, and unit-related work time, and descriptive analysis was used to report nursing hours per patient day according to the patient classification.

2.4.3. Nurse Staffing Level-Related Variables.

The nurse-to-patient ratio was measured by dividing the total number of inpatients by the number of nurses who had worked on a particular day. Daily work intensity per registered nurse was also reported. First, the mean value of each KPCS-GW score was calculated based on each patient group's total

score, and the weighting coefficients of groups 2–5 were calculated by dividing the mean KPCS-GW scores of each patient group by the mean value of group 1. Next, the weighting coefficients were multiplied by the number of patients in each group, constituting the total sum of the nursing care intensity value. Finally, the total nursing care intensity value of the day was divided by the number of nurses who worked on that day. This method relates to the work intensity measurement system using the OPC [17, 18].

The total demanded nursing hours in a day were also calculated by the sum of the multiplied value of the number of patients in each group and the RN HPPD of the group; these hours were divided by the number of nurses who had worked on that day to measure demanded nursing hours per nurse for the day. Descriptive analysis was used to examine the nurse staffing level, and an independent t-test was used to examine the differences between weekdays and weekends. $p < 0.05$ was considered statistically significant.

2.4.4. Associations between Nurse Staffing Level and Nurses' Perceptions. Pearson's correlation was used to examine the relationship between nurse staffing level-related variables and nurses' perceptions. Multiple regression analysis was used to examine the effects of nurse staffing level, measured using various methods, on nurses' perceptions. $p < 0.05$ was considered statistically significant. We used the variance inflation factor (VIF) for collinearity diagnostics in the study, and VIF values ranged from 1.42 to 1.47, indicating that severe collinearity did not occur between the independent variables [33]. The data were analyzed using SPSS 26.0 (IBM, SPSS Inc., Chicago, IL, USA).

2.5. Ethical Considerations. Before data collection commenced, the research proposal was approved by the Institutional Review Board of the corresponding author's institution (IRB no. KWNUIRB-2022-06-002-001). The researchers obtained consent from the nurses after informing them of the study purposes and methods and the reward for participation (a digital coffee coupon of approximately 70 dollars) and whether or not a nurse provided consent was not disclosed to the nursing manager. All nurses in the wards in which the study was conducted agreed to participate in the survey and received the reward after their participation.

3. Results

3.1. Distributions of Nursing Personnel, Patients, and Nurses' Perceptions. Table 1 shows the statistical distributions of nursing personnel, patients, and nurses' perceptions for four weeks. Ninety registered nurses in six wards participated in the study, and the nurses completed 1,730 shifts in four weeks. The average tenure of nurses in a day was equivalent to 3.76 (±0.85) years, and the difference between weekdays and weekends was not significant. The average number of inpatients per day in a ward was 32.95 (±8.40): 34.83 (±7.85) on a weekday and 28.27 (±7.95) on a weekend. Approximately 48.16% of inpatients had a KPCS-GW score of 10 or less, and the average KPCS-GW score was 11.56 (±7.33). The number of patient turnover per

day was 11.90 (±5.83), and the difference between weekdays and weekends was significant ($p < 0.001$).

Nurses' perceived inadequacy of nurse staffing level was significantly higher ($p < 0.001$) on weekdays (3.43 ± 2.70) than on weekends (1.72 ± 2.36). Fatigue levels were also higher on weekdays (7.40 ± 1.33) than on weekends (6.12 ± 1.30). Perceived nursing care quality was higher on weekends than on weekdays, and the difference was significant ($p < 0.001$).

3.2. Nursing Hours by Nursing Activities and RN HPPD According to Patient Classification. Table 2 shows the nursing hours for four days based on patient classification according to nursing care needs. Nurses' working hours comprised 631.83 h (31.16%) of direct care work, 1,164.00 h (57.41%) of indirect care work, and 231.67 h (11.43%) of unit-related work. Among the tasks performed in direct care nursing hours, medication/IV administration (268.50 h, 42.50%) took the most time to execute, followed by assessment (152.33 h, 24.11%). The proportions of nursing hours for direct care during the procedures and transportation of group 5 patients (those with high nursing care needs) were 11.83 h (14.58%) and 4.00 h (4.93%), respectively, while those taken for group 1 were 4.67 h (5.03%) and 0 h (0.00%), respectively. For indirect care nursing time, data entry/retrieval through notes/computer took the most time (830.00 h, 71.31%), and it is the most common activity among all nursing activities.

The average RN HPPD was 2.35 (±1.89) h and comprised 0.73 (±0.68) h of direct care work, 1.35 (±1.21) h of indirect care work, and 0.27 (±0.08) h of unit-related work. Group 5 showed the highest RN HPPD of 3.22 (±2.65), whereas group 1 showed the lowest RN HPPD of 1.81 (±1.20). The higher the KPCS-1 score of a group, the higher the direct nursing time and RN HPPD.

3.3. Nurse Staffing Level Measured Using Various Methods. Table 3 shows the number of patients per registered nurse, work intensity, and demanded nursing hours for four weeks in six wards (168 days). The average nurse-to-patient ratio in a day was 1 : 3.20 (±0.76), and the difference between weekdays and weekends was not significant ($p = 0.128$). The average work intensity was 11.07 (±5.33), and the difference between weekdays and weekends was also not significant ($p = 0.573$).

The average demanded nursing hours for a day per nurse were 7.63 (±2.21), and the difference between weekdays and weekends was not significant ($p = 0.160$). However, the proportion that demanded over 8 h was higher on the weekdays (46.67%) than it was on the weekends (29.17%), and the difference was significant ($p = 0.038$).

3.4. Correlations of Perceived Insufficient Nurse Staffing Level, Fatigue, and Nursing Care Quality with Nurse Staffing Level-Related Variables. Table 4 shows the correlations of nurses' perceptions with nurse staffing levels using various measurement methods. The nurse staffing level-related variables, nurse-to-patient ratio, work intensity, and demanded

TABLE 1: Distributions of nursing personnel, patients, and nurses' perceptions for four weeks ($M \pm SD$).

Variables	Total (overall)	Weekday ($n = 120$ days)	Weekend ($n = 48$ days)	t (p)
Nursing personnel ($n = 90$)				
Average tenure of RNs in a day (year)	3.76 ± 0.85	3.78 ± 0.84	3.72 ± 0.89	0.43 (0.667)
Distributions of patients based on unit level ($n = 5,536$)				
Number of inpatients per day in a ward	32.95 ± 8.40	34.83 ± 7.85	28.27 ± 7.95	4.87 (<0.001**)
Group 1 (KPCS-GW score 1–5)	7.23 ± 7.02	7.24 ± 7.08	7.19 ± 6.96	0.05 (0.964)
Group 2 (KPCS-GW score 6–10)	8.64 ± 6.39	9.03 ± 6.59	7.69 ± 5.78	1.23 (0.221)
Group 3 (KPCS-GW score 11–15)	8.40 ± 4.81	9.34 ± 5.00	6.04 ± 3.29	4.22 (<0.001**)
Group 4 (KPCS-GW score 16–20)	4.65 ± 4.72	5.16 ± 4.69	3.40 ± 4.59	2.21 (0.028*)
Group 5 (KPCS-GW score ≥21)	4.03 ± 4.98	4.06 ± 4.87	3.96 ± 5.29	0.12 (0.907)
Average scores of the KPCS-GW (weighting coefficient)	11.56 ± 7.33	11.62 ± 7.14	11.40 ± 7.89	0.97 (0.334)
Group 1 (KPCS-GW score 1–5)	3.34 ± 1.32 (1)	3.36 ± 1.32 (1)	3.29 ± 1.30 (1)	0.92 (0.359)
Group 2 (KPCS-GW score 6–10)	7.80 ± 1.40 (2.34)	7.80 ± 1.41 (2.32)	7.83 ± 1.39 (2.38)	−0.39 (0.693)
Group 3 (KPCS-GW score 11–15)	12.78 ± 1.42 (3.82)	12.77 ± 1.43 (3.80)	12.80 ± 1.40 (3.90)	−0.32 (0.749)
Group 4 (KPCS-GW score 16–20)	17.61 ± 1.34 (5.27)	17.54 ± 1.33 (5.22)	17.88 ± 1.34 (5.44)	−2.92 (0.004**)
Group 5 (KPCS-GW score ≥21)	24.86 ± 7.21 (7.44)	24.65 ± 7.13 (7.33)	25.39 ± 7.39 (7.73)	−1.20 (0.231)
Number of patient turnover per day	11.90 ± 5.83	14.28 ± 4.81	5.85 ± 3.27	11.03 (<0.001**)
Admission/discharge	9.94 ± 5.59	11.98 ± 5.01	4.85 ± 3.27	9.09 (<0.001**)
Transfer in/out	1.89 ± 1.95	2.30 ± 2.10	0.88 ± 0.89	4.53 (<0.001**)
Perceptions of registered nurses				
Perceived insufficient nurse staffing ($-10 \leq +10$)	2.95 ± 2.72	3.43 ± 2.70	1.72 ± 2.36	3.80 (<0.001**)
Fatigue at the end of shift ($0 \leq +10$)	7.04 ± 1.44	7.40 ± 1.33	6.12 ± 1.30	5.66 (<0.001**)
Perceived nursing care quality ($1 \leq 4$)	2.12 ± 0.51	2.02 ± 0.43	2.38 ± 0.60	−4.28 (<0.001**)

M, mean; SD, standard deviation; p, level of statistical significance. *Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

nursing hours were correlated positively with perceived insufficient nurse staffing level and fatigue and negatively with perceived nursing care quality. Perceived insufficient nurse staffing level was correlated positively with fatigue ($r = 0.64$, $p < 0.001$) and negatively with perceived nursing care quality ($r = -0.49$, $p < 0.001$). Moreover, fatigue and perceived nursing care quality were negatively correlated ($r = -0.55$, $p < 0.001$).

3.5. Effects of Nurse Staffing Level on Perceived Insufficient Nurse Staffing Level, Fatigue, and Nursing Care Quality. Using multiple linear regression analysis, Table 5 shows the effects of nurse staffing level, measured using various methods, on nurses' perceptions. Whether on the weekend or not, the average tenure as a nurse among nurses who worked on a particular day and the number of turnover patients were included in the model as control variables because they were factors related to the nurse's workload or staffing level [6, 8, 34]. Moreover, nurse-to-patient ratio, work intensity per nurse, and demanded nursing hours of the day were included in different regression models to compare their effects on nurses' perceptions.

Nurses' perceptions of insufficient nurse staffing level and fatigue were lower on weekends than weekdays, and their perception of nursing care quality was higher on

weekends than weekdays. Moreover, the average tenure as a nurse had a positive effect on fatigue and a negative effect on perceived nursing care quality. The nurse-to-patient ratio, work intensity, and demanded nursing hours were factors that positively affected perceived insufficient nurse staffing levels and negatively affected perceived nursing care quality. Moreover, the adjusted R^2 was the highest in the model that included demand for nursing hours. Conversely, although nurses staffing level also had a positive effect on fatigue, the adjusted R^2 was the highest in the model that included work intensity, in the regression model that identified the effects on fatigue (adjusted $R^2 = 0.31$). The general linear model results for fatigue, $R^2 = 0.31$, indicated that the variables in the model explained 31% of the variance of fatigue. The models that included the nurse-to-patient ratio showed the lowest adjusted R^2 compared to those that included other nurse staffing-related variables, work intensity, and demanded nursing hours.

4. Discussion

The current study, conducted in a general hospital in South Korea, aimed to examine the effects of nurse staffing level measured using various methods on nurses' perceptions of nurse staffing level, fatigue, and nursing care quality. The

TABLE 2: Nursing hours by nursing activities and RN HPPD according to patient classification for four days (hours, %).

Variable	Overall*	Group 1** (KPCS score 1–5)	Group 2** (KPCS score 6–10)	Group 3** (KPCS score 11–15)	Group 4** (KPCS score 16–20)	Group 5** (KPCS score ≥21)
Total number of inpatients for four observed ***days (h, %)	840	164 (19.52)	257 (30.60)	216 (25.71)	117 (13.93)	86 (10.24)
Total nursing care hours for four observed days						
Direct care (h, %)	631.83 (31.16)	92.83 (100.00)	156.83 (100.00)	188.33 (100.00)	105.00 (100.00)	81.17 (100.00)
Admission	26.67 (4.22)	2.00 (2.15)	6.17 (3.93)	12.50 (6.64)	4.17 (3.97)	1.83 (2.26)
Assessment	152.33 (24.11)	23.00 (24.78)	40.00 (25.50)	46.83 (24.87)	27.17 (25.87)	15.33 (18.89)
Hygiene	3.33 (0.53)	0.50 (0.54)	0.33 (0.21)	1.33 (0.71)	1.00 (0.95)	0.17 (0.21)
Patient mobility	1.00 (0.16)	0.33 (0.36)	0.17 (0.11)	0.33 (0.18)	0.00 (0.00)	0.17 (0.21)
Medication/IV administration	268.50 (42.50)	43.33 (46.68)	72.33 (46.12)	69.67 (36.99)	42.50 (40.48)	33.00 (40.66)
Procedures	60.67 (9.60)	4.67 (5.03)	9.00 (5.74)	22.83 (12.12)	12.33 (11.75)	11.83 (14.58)
Specimen collection/testing	20.50 (3.24)	2.33 (2.51)	5.33 (3.40)	5.67 (3.01)	3.33 (3.17)	3.83 (4.72)
Nutrition	1.50 (0.24)	0.00 (0.00)	0.17 (0.11)	0.67 (0.35)	0.17 (0.16)	0.50 (0.62)
Elimination	9.17 (1.45)	1.33 (1.44)	2.67 (1.70)	2.17 (1.15)	1.67 (1.59)	1.33 (1.64)
Transporting patient	11.67 (1.85)	0.00 (0.00)	2.17 (1.38)	3.83 (2.04)	1.67 (1.59)	4.00 (4.93)
Assisting with procedures	10.17 (1.61)	4.33 (4.67)	1.00 (0.64)	1.17 (0.62)	1.33 (1.27)	2.33 (2.87)
Patient/family interaction	66.33 (10.50)	11.00 (11.85)	17.50 (11.16)	21.33 (11.33)	9.67 (9.21)	6.83 (8.42)
Indirect care	1164.00 (57.41)					
Verbal report/handover	200.67 (17.23)					
Communication/information	103.83 (8.92)					
Room/equipment setup/cleaning	7.00 (0.60)					
Progress notes/computer: data entry/retrieval	830.00 (71.31)					
Coordination of care: rounds, team meetings	22.50 (1.93)					
Unit-related work	231.67 (11.43)					
Teaching/inservice	7.83 (0.39)					
Supplies, check, and restock	95.17 (4.69)					
Errands	46.00 (2.27)					
Meeting and administration	4.17 (0.21)					
Clerical	45.83 (2.26)					
Environmental cleaning	32.67 (1.61)					
Nursing hours per patient day (M ± SD)	2.35 ± 1.89	1.81 ± 1.20	2.01 ± 1.36	2.63 ± 2.10	2.83 ± 2.30	3.22 ± 2.65
Direct care	0.73 ± 0.68	0.55 ± 0.45	0.61 ± 0.49	0.84 ± 0.78	0.90 ± 0.80	1.01 ± 0.91
Indirect care	1.35 ± 1.21	1.00 ± 0.76	1.15 ± 0.87	1.51 ± 1.31	1.65 ± 1.48	1.95 ± 1.74
Unit-related work	0.27 ± 0.08	0.26 ± 0.09	0.26 ± 0.09	0.28 ± 0.08	0.28 ± 0.07	0.26 ± 0.06

Blank indicates not applicable. M, mean; SD, standard deviation. *% of column based on overall nursing activities. **% of column based on direct nursing care. ***% of row.

TABLE 3: Nurse staffing level-related variables measured using various methods.

Category	Nurse-to-patient ratio	Work intensity			Demanded nursing hours		
	Number of patients per nurse per day (M±SD)	Number of nurses worked per day (a, M±SD)	Sum of work intensity (b, M±SD)	Work intensity per nurse (a/b, M±SD)	Demanded nursing hours per day (c, M±SD)	Demanded nursing hours per day per nurse (c/a, M±SD)	Number of days demanding over 8 nursing hours (n, %)
Overall (n = 168 days)	3.20 ± 0.76 (1.44–5.22)	10.30 ± 0.99 (8.00–13.00)	114.00 ± 55.18 (32.43–259.14)	11.07 ± 5.33 (3.60–26.88)	78.69 ± 24.01 (27.58–139.03)	7.63 ± 2.21 (3.06–13.70)	70 (41.67)
Weekday (n = 120 days)	3.25 ± 0.72 (1.64–5.00)	10.71 ± 0.81 (8.00–13.00)	120.35 ± 53.25 (50.69–259.14)	11.21 ± 4.83 (4.88–24.47)	83.48 ± 22.71 (38.70–139.03)	7.78 ± 2.03 (3.83–13.60)	56 (46.67)
Weekend (n = 48 days)	3.06 ± 0.84 (1.44–5.22)	9.25 ± 0.53 (8.00–11.00)	98.12 ± 57.24 (32.43–241.89)	10.70 ± 6.45 (3.60–26.88)	66.71 ± 23.18 (27.58–123.32)	7.25 ± 2.59 (3.06–13.70)	14 (29.17)
t or χ^2 (p)	1.53 (0.128)	11.48 (<0.001**)	2.39 (0.002**)	0.56 (0.573)	4.30 (<0.001**)	1.41 (0.160)	4.32 (0.038*)

M, mean; SD, standard deviation; χ^2, chi square; p, level of statistical significance. * $p < 0.05$ (2-tailed). ** $p < 0.01$ (2-tailed).

TABLE 4: Correlations of perceived nurse staffing level, fatigue, and nursing care quality with nurse staffing level-related variables (r, p).

Variables	Number of patients per nurse	Work intensity per nurse	Demanded nursing hours per nurse	Perceived insufficient nurse staffing level	Fatigue	Perceived nursing care quality
Number of patients per nurse	1					
Work intensity per nurse	0.61 (<0.001**)	1				
Demanded nursing hours per nurse	0.88 (<0.001**)	0.91 (<0.001**)	1			
Perceived insufficient nurse staffing level	0.27 (<0.001**)	0.35 (<0.001**)	0.35 (<0.001**)	1		
Fatigue	0.16 (0.035*)	0.38 (<0.001**)	0.32 (<0.001**)	0.64 (<0.001**)	1	
Perceived nursing care quality	−0.25 (0.001*)	−0.33 (<0.001**)	−0.34 (<0.001**)	−0.49 (<0.001**)	−0.55 (<0.001**)	1

r, Spearman's correlation; p, level of statistical significance. *Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

TABLE 5: Effects of nurse staffing level on perceived insufficient nurse staffing level, fatigue, and nursing care quality.

Variables	Perceived insufficient nurse staffing level			Fatigue			Perceived nursing care quality		
	Model 1 (β, p)	Model 2 (β, p)	Model 3 (β, p)	Model 1 (β, p)	Model 2 (β, p)	Model 3 (β, p)	Model 1 (β, p)	Model 2 (β, p)	Model 3 (β, p)
Weekend (vs. weekday)	−0.34 (<0.001**)	−0.29 (0.002**)	−0.30 (0.002**)	−0.40 (<0.001**)	−0.32 (<0.001**)	−0.35 (<0.001**)	0.31 (0.001**)	0.26 (0.006***)	0.26 (0.005**)
Average tenure as a nurse of nurses worked in a day	0.10 (0.178)	0.08 (0.270)	0.11 (0.137)	0.16 (0.033*)	0.17 (0.012*)	0.18 (0.008***)	−0.22 (0.003**)	−0.19 (0.006**)	−0.23 (0.001**)
Number of turnover patients per day	−0.14 (0.136)	−0.04 (0.689)	−0.08 (0.377)	−0.04 (0.684)	0.09 (0.297)	0.02 (0.797)	0.05 (0.592)	−0.06 (0.547)	−0.01 (0.886)
Number of patients per nurse	0.26 (0.001**)			0.16 (0.028*)			−0.27 (<0.001**)		
Work intensity per nurse		0.34 (<0.001**)			0.41 (<0.001**)			−0.35 (<0.001**)	
Demanded nursing hours per nurse			0.34 (<0.001**)			0.33 (<0.001**)			−0.36 (<0.001**)
F (p value)	7.79 (<0.001)	10.45 (<0.001)	10.47 (<0.001)	10.26 (<0.001)	19.95 (<0.001)	15.59 (<0.001)	9.83 (<0.001)	12.81 (<0.001)	13.39 (<0.001)
Adj. R^2	0.14	0.19	0.19	0.18	0.31	0.26	0.18	0.22	0.23

β, standardized regression coefficient value; p, level of statistical significance; F, regression coefficients; R^2, coefficient of determination. *Correlation is significant at the 0.05 level (2-tailed). **Correlation is significant at the 0.01 level (2-tailed).

mean score of the KPCS-GW was 11.56, and the nurse-to-patient ratio was 3.20, violating the South Korean law, which mandates 2.5 or less [35]. In a previous study conducted in South Korea, the average daily inpatients per RN in general hospitals were 2.9 [35], this nurse staffing level was slightly higher than the result of the present study.

Our study shows that more than half of the nursing activities (57.41%) were classified as indirect care work, approximately one-third (31.16%) were classified as direct care work, and 11.43% were classified as unit-related work. The results showed a lower direct care proportion (36.5%) and a higher indirect care proportion (44.9%) than a previous study conducted in the USA [36]. As nurses working in high-staffing units had significantly lower mean scores of missed care than those in low-staffing units [37], further research is needed to examine whether a low proportion of direct care leads to missed nursing care. The average of RN HPPD in the current study was 2.35, which was slightly lower than the 2.82 reported in a previous study conducted in a tertiary hospital in South Korea [32]. This may be attributed to the lower acuity of inpatients in general hospitals compared to those in tertiary hospitals. Moreover, the higher the KPCS-GW score in a group, the higher the RN HPPD, indicating that the KPCS-GW instrument reflected the actual patients' nursing care needs.

The average number of nursing care hours demanded in a day is 7.63. However, in 41.67% of the days, over eight nursing hours had been demanded, even though the fixed working hours for three-shift work were 8 h. In a previous study conducted in South Korea, the average overtime hours for nurses per shift was 1.14 h [38]. Overtime is related to a heavy workload that cannot be completed in the normal working time, and having demanded nursing hours that exceeded 8 h was related to perceived insufficient nurse staffing level, fatigue, and perceived nursing care quality in the current study.

All nurse staffing level-related variables were correlated with nurses' perceptions and affected nurses' perceptions. This means that the perception of nurses can be used to evaluate and determine the adequate nurse staffing level. In previous studies, perceived adequacy of staffing was measured using other tools to obtain accurate estimates of nurse staffing levels that reflected various factors influencing nursing workload other than patient acuity, such as cooperation, leadership, and teamwork [39, 40]. However, there has been inadequate effort to examine the actual perceived adequacy of nurse staffing for measuring optimal nurse staffing level with multiple items and to confirm psychometric properties such as reliability and criterion validity [40]. Some nurses may have considered that an optimal nurse staffing level would help them to complete tasks in a typical working time, whereas some nurses may have considered that it would help provide emotional support and education to patients. The instrument would have to present an objective criterion for an "optimal" nurse staffing level.

Even though the number of total turnover for patients and nurse staffing level-related variables were controlled, nurses' perceptions of inadequate nurse staffing level, fatigue, and perceived nursing care quality were higher on weekdays than on weekends in every regression model. In a previous study [41], nurses perceived a lower workload on weekends and holidays than on weekdays because admissions and elective surgeries are rarely scheduled on weekends/holidays except for emergency cases. Nursing managers should consider that other different factors between weekdays and weekends affect the demand of nurse staffing and allocate adequate nurse staffing.

The regression model including the nurse-to-patient ratio showed the lowest explained variability compared to other nurse staffing level-related variables. California mandated minimum nurse-to-patient ratios in hospitals because this is a very simple calculating and monitoring method; however, it is far less sensitive to the complexity of the patient mix and tends to minimize professional judgment in day-to-day staffing [13]. Therefore, measuring the nurse staffing level through a patient acuity measurement system such as the KPCS-GW or demanding nursing care time based on HPPD would be more appropriate. However, because HPPD cannot reflect the quality of care and patient factors such as age and anxiety, appropriate adjustments in the measure's application are necessary to capture variations in the characteristics of nurses, patients, and hospitals [20]. A staffing measurement system taking into account the possible factors related to nursing workload, such as the number of work interruptions and the type of working schedule, should be developed [42].

The current study has multiple strengths; it measures the actual RN HPPD at the individual patient level, compares different ways of measuring nurse staffing level, and measures nurses' perceptions on a daily basis rather than using the average of specific periods. Nevertheless, this study has certain limitations. First, the study lacks generalizability as it was conducted in a single hospital, and the preceptee's nursing work was not included in the analysis. Second, the unit-level factors that could affect the nurses' perceptions were not included in the regression model. Third, missing data related to nurses' sociodemographic information could have affected our results regarding nurses' perceptions. Finally, variables that are not considered in this study, such as the head nurse's leadership and the individual competency of each nurse, may have influenced the nurses' perceptions.

5. Conclusion

Nurse staffing level-related variables are factors that affect nurses' perceptions regarding the adequacy of nurse staffing level, fatigue at the end of shifts, and nursing care quality. Work intensity and RN HPPD were more reliable measurement methods than the nurse-to-patient ratio, and measuring the adequacy of nurse staffing level should reflect the acuity of inpatients and the nurses' workload. It is necessary to develop measurement instruments that ensure higher reliability and validity, considering factors influencing nurses' workload other than patient acuity, and efforts should be made to improve nurse staffing levels in clinical practice to minimize fatigue, which can lead to ill health and diminished nursing care quality.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

The Relationships of Leaders' Narcissistic Admiration and Rivalry with Nurses' Organizational Citizenship Behavior towards Leaders: A Cross-Sectional Survey

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Aim. The aim of this study is to investigate the unique contributions of two distinct dimensions of leaders' narcissism—admiration and rivalry—to nurses' organizational citizenship behavior towards the leader and the mediating role of nurses' challenge appraisal and hindrance appraisal based on the transactional stress theory. *Background.* Leaders' narcissism is widespread in hospitals, so whether nurses will show organizational citizenship behavior to narcissistic leaders is related to the harmony and stability of the team. Thus, clarifying the positive or negative relationship between leaders' narcissism and nurses' organizational citizenship behavior towards leaders has become a priority. *Methods.* A cross-sectional survey was conducted at two-time points with 280 Chinese nurses. We used the structural equation model to analyze our data. *Results.* We found that leaders' narcissistic admiration was positively correlated with nurses' organizational citizenship behavior towards the leader; however, leaders' narcissistic rivalry was negatively correlated with nurses' organizational citizenship behavior towards the leader. Furthermore, mediation analyses revealed that leaders' narcissistic admiration had a significant indirect effect on nurses' organizational citizenship behavior towards leaders via challenge appraisal, and leaders' narcissistic rivalry had a significant indirect effect on nurses' organizational citizenship behavior towards leaders via hindrance appraisal. *Conclusion.* By introducing two dimensions of narcissistic admiration and rivalry, we resolve previous contradictory findings about the relationship between leader narcissism and organizational citizenship behavior towards the leader. *Implications for Nursing Management.* Nursing managers need to understand that there are both positive and negative relationships between leaders' narcissism and nurses' organizational citizenship behavior towards the leader, and we can promote the positive effects of leaders' narcissistic admiration and curb the negative consequences of leaders' narcissistic rivalry by taking some specific steps, such as promoting the loving cooperative atmosphere and punishing disruptive behaviors.

1. Introduction

Narcissism can be characterized by an inflated self-view, a strong sense of psychological superiority and entitlement, and a low level of empathy [1, 2]. In hospitals, narcissism is quite prevalent [3], especially for leaders [4]. Therefore, it is inevitable that nurses have interpersonal interactions with narcissistic leaders. Because narcissistic leaders are self-centered, they expect nurses to perform more extra-role behaviors [5], in particular organizational citizenship behavior toward leaders (OCBL), to meet their own unique needs. Only by understanding the consequences of narcissistic leaders in the process of interpersonal interaction (e.g., nurses' OCBL), can the organization give play to the positive effects of narcissistic leaders and restrain its negative consequences, so as to improve the harmonious atmosphere and cohesion of the team.

However, we found by reviewing previous studies that the relationship between leader narcissism and OCBL seems

to have contradictory findings. On the one hand, narcissistic leaders focus on themselves, neglect the interests and feelings of others, and lack empathy, leading to a decrease in OCBL. For example, some scholars confirmed that leader narcissism negatively affects OCBL by increasing hindrance stress [6] and decreasing perceived insider status [7]. On the other hand, some attributes of narcissistic leaders, such as self-confidence, boldness of vision, and a strong desire for leadership and success, produced productive or positive outcomes [8]. Some scholars found that narcissistic leaders are positively related to change-oriented OCB and questioned the idea that leader narcissism is always negatively associated with OCBL [9].

The reason for these contradictory findings can be traced back to the fact that prior research studies conducted on narcissism as a global construct with two facets of narcissism have been neglected [10, 11]. Therefore, we draw on the narcissistic admiration and rivalry concept [12] in which the NARC proposes that narcissism contains two related dimensions: an agentic dimension called narcissistic admiration and an antagonistic dimension called narcissistic rivalry ([13], p. 59). Narcissistic admiration involves anticipation and an approach to opportunities for admiration, through assertive self-promotion [12, 14]. Those positive strategies elicit challenge stress assessments from nurses, which in turn leads to positive interpersonal outcomes (e.g., increased OCBL). Conversely, narcissistic rivalry involves striving for supremacy and devaluation of others, through antagonistic self-protection [12, 14]. Those negative strategies elicit hindrance stress assessments from nurses, which in turn leads to negative interpersonal outcomes (e.g., decrease OCBL). Thus, the present study will explain the inconsistencies between narcissistic leaders and nurses' OCBL using the NARC framework.

The paper is organized as follows. In Section 2, the hypotheses are developed. Section 3 includes samples, procedures, and measurement scales. In Section 4 to Section 6, the results are displayed and subsequently discussed in terms of main findings, contributions, and limitations. Finally, the implications for nursing management are provided in Section 7.

2. Theory and Hypotheses

2.1. Leader Narcissism and Nurses' OCBL. NARC is a bidimensional (i.e., admiration and rivalry) process model of narcissism describing motivational and behavioral dynamics alongside social interaction outcomes [12]. Narcissistic admiration might lead to favorable social outcomes, and the narcissistic rivalry is presumed to go along with exhibiting devaluing behavior toward others and negative social outcomes [12]. Thus, we predicted that leaders' narcissistic admiration positively impacted nurses' OCBL; however, leaders' narcissistic rivalry negatively impacted nurses' OCBL.

Specifically, leaders' narcissistic admiration would be adopting assertive self-promotion strategies, which can be summarized with slogans such as "show the world how great you are!" or "let others admire you!" ([13], p. 59). They strove for uniqueness, actualized grandiose fantasies, and exhibit

a charming (expressive, self-assured, and dominant) behavior [12]. In this case, nurses perceive their leader as confident, competent, and charismatic, and these positive characteristics are in line with the leadership prototype expected by nurses, which deepens nurses' favorable impression of their leader and further promotes nurses to implement OCB towards their leaders [15]. However, leaders' narcissistic rivalry adopts antagonistic self-protection strategies, which can be summarized with the imperative "do not let others tear you down!" ([13], p. 60). They strove for supremacy, devaluate others, and exhibit an aggressive (annoyed, hostile, and socially insensitive) behavior [12]. In this case, nurses perceive their leaders as cold-blooded, hostile, or unsympathetic, and these negative characteristics are inconsistent with the leadership prototype expected by nurses, which deepens nurses' antipathy toward the leader and further decreases nurses' desire to implement OCB towards their leader.

> H1a: leaders' narcissistic admiration positively impacted nurses' OCB towards leaders
>
> H1b: leaders' narcissistic rivalry negatively impacted nurses' OCB towards leaders

2.2. The Mediating Role of Nurses' Challenge and Hindrance Appraisal. To further explore the specific process of leaders' narcissistic admiration and rivalry with nurses' OCBL, this paper constructed a theoretical model of challenge and hindrance appraisal as mediating variables based on the transactional stress theory [16]. The transactional stress theory argues that environmental conditions (termed stressors) are not the direct cause of a stress reaction, but rather it is the people's appraisal of a challenge or hindrance that proceeds the response [17]. LePine et al. [18] pointed out that challenge stressors likely elicit challenge appraisals and hindrance stressors likely elicit hindrance appraisal, and the two appraisals differentially impact individual behaviors. Thus, we predicted that leaders' narcissistic admiration (challenge stressor) positively impacts nurses' OCBL via challenge appraisal and leaders' narcissistic rivalry (hindrance stressor) negatively impacts nurses' OCBL via hindrance appraisal.

Specifically, challenge stressors refer to job demands or environmental situations that require effort but have the potential to create opportunities for performance and support goal pursuits [19, 20]. According to this definition, leaders' narcissistic admiration can be considered a challenging stressor. This is because narcissistic admiration leaders treat their nurses better, strive to maintain interpersonal relationships with nurses, and even take the initiative to help nurses [21]. In this kind of an environmental situation, leaders' knowledge, skills, and abilities can help them achieve personal gain, growth, development, and well-being [18], which generates challenge appraisal. Furthermore, challenge appraisal may induce nurses' positive emotions and intrinsic motivation, so they engage in positive behaviors, and especially when they are influenced by leaders, they are more willing to engage in OCBL. Parker et al. [22] put forward a point that challenge appraisal

positively impacts intrinsic motivation and prosocial behavior.

> H2a: challenge appraisal played a mediating role between leaders' narcissistic admiration and nurses' OCB towards leaders

Hindrance stressors refer to job demands or environmental situations that involve excessive or undesirable constraints that interfere with or hinder an individual's ability to achieve valued goals ([19], p. 67). Leaders' narcissistic rivalry can be considered a hindrance stressor because leaders high in narcissistic rivalry are focused on their advantages but lack empathy and concern for nurses, and they build success at the expense of nurses [12, 23]. In this kind of an environmental situation, leaders' narcissistic rivalry threatened nurses' well-being by hindering the attainment of goals and personal development, and nurses generated hindrance appraisals. In addition, hindrance appraisal may induce nurses' negative emotions and they may choose to deal with work in negative ways, including reducing work effort and helping others (i.e., OCBL) [18, 22].

> H2b: hindrance appraisal played a mediating role between leaders' narcissistic rivalry and nurses' OCB towards leaders

The specific conceptual framework is shown in Figure 1.

3. Method

3.1. Samples and Procedures.
We recruited 350 full-time Chinese nurses to complete the two-stage questionnaires via https://www.credamo.com/, a reliable Chinese data collection platform similar to the Qualtrics online sample. Other studies have used this platform to collect data (i.e., [24, 25]). Only nurses who have stable full-time jobs involving frequent face-to-face communication with their leaders can participate in the follow-up survey as participants. In this study, we adopted the following ways to ensure ethical issues. First of all, nurses were invited to participate in the survey through voluntary registration, and they had the right to quit at any stage of the survey. Second, the survey ensured the privacy of the participants, and all procedures performed involving human participants followed the ethical standards of the institutional and/or national research committee. Finally, at the end of the survey, we informed the participants of our research purpose and context, which was to eliminate the adverse effects caused by participation in the survey.

In the first stage, we collected the demographic variables (age, educational background, and tenure in the organization) of all nurses, and nurses were asked to rate their leaders' narcissistic admiration and rivalry. In the second stage, we asked nurses to provide ratings for challenge appraisal, hindrance appraisal, and OCBL. We eliminated the following three types of invalid questionnaires. First, the questionnaire which was incomplete and more than half of the items in a single scale were not answered. Second, the questionnaires in which the participants failed the attention
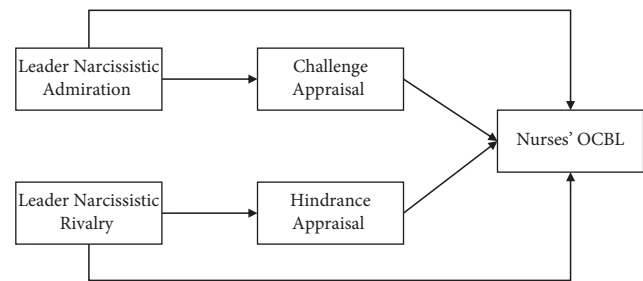
Figure 1: Conceptual framework.

check. Third, the unmatched questionnaire, that is, where the first stage and the second stage cannot be matched. Finally, we obtained 280 complete and usable questionnaires with a response rate of 80%. As suggested by the reviewer, a post hoc analysis was conducted using Gpower3.1 to determine if the sample size was appropriate. The results showed power = 0.99, which is greater than the standard of 0.80, indicating that the sample size was appropriate. The specific demographic variables are shown in Table 1.

3.2. Measure.
As the original scales of our study were developed in English, we followed Brislin's (1986) translation and back-translation procedure to ensure the accuracy of translating English items into Chinese. Responses were collected using a seven-point Likert scale ranging from 1 for "strongly disagree" to 7 for "strongly agree." All scales are unidimensional and have no reverse items.

3.2.1. NARC.
We measured NARC by using the eighteen-item scale developed by Back et al. [12]. Nine items assessed narcissistic admiration and nine assessed narcissistic rivalry. According to Fehn and Schütz's [23] conclusion, we adopted the nurse-rated leaders' narcissistic admiration and rivalry. Sample items included the following: "my leader wants his/her rivals to fail (rivalry)" and "my leader shows others how special he/she is (admiration)." Cronbach's $\alpha = 0.87$ (0.80) for rivalry, and Cronbach's $\alpha = 0.89$ (0.84) for admiration in our study (original study).

3.2.2. Challenge and Hindrance Appraisal.
We used two three-item scales developed by LePine et al. [18] for challenge and hindrance appraisal. Sample items included the following: "in general, I feel that my job promotes my personal accomplishment (challenge appraisal)" and "in general, I feel that my job hinders my personal accomplishments (hindrance appraisal)." Cronbach's $\alpha = 0.75$ (0.83) for challenge appraisal, and Cronbach's $\alpha = 0.79$ (0.70) for hindrance appraisal in our study (original study).

3.2.3. OCBL.
We measured OCBL by using the six-item scale developed by Dalal et al. [26]. Sample items included the following: "I went out of my way to be nice to my leader" and "I tried to help my leader." Cronbach's $\alpha = 0.84$ (0.83) for OCBL in our study (original study).

TABLE 1: Demographic characteristics ($n = 280$).

Characteristics	Frequency	%
Age (years)		
20–29	118	42.1
30–39	141	50.4
40–49	14	5.0
50–59	7	2.5
Educational background		
High school and below	8	2.9
Associate degree	33	11.8
Bachelor's degree	197	70.4
Master's degree and higher	42	15.0
Tenure (years)		
1–5	114	40.7
6–10	122	43.6
11–15	28	10.0
>15	16	5.7

3.2.4. Control Variables. Nurse's age, educational background, and organizational tenure were included as control variables in the analyses since they could be related to OCB in prior studies (see, e.g., [27–29]).

4. Results

4.1. Confirmatory Factor Analysis. We conducted a series of confirmatory factor analyses to assess the discriminant validity of the variables in our model. Due to many measurement items of some variables (i.e., narcissistic admiration and rivalry), considering that there are many parameters to be estimated in the model, the standard errors may be increased. According to Little et al.'s [30] recommendation, narcissistic admiration and rivalry are randomly packaged into three parcels. The fit statistics of a model that included the focal variables (i.e., leaders' narcissistic admiration, leaders' narcissistic rivalry, challenge appraisal, hindrance appraisal, and OCBL) were acceptable: χ^2 (125) = 219.35, RMSEA = 0.05, CFI = 0.95, TLI = 0.94, and SRMR = 0.05. Alternative model specifications resulted in a deteriorated fit statistics. For example, a model combining both the independent variables (narcissistic admiration and rivalry) resulted in a worse-fitting model: χ^2 (129) = 442.55, RMSEA = 0.09, CFI = 0.84, TLI = 0.81, and SRMR = 0.10, as did a model combining both the mediators (challenge appraisal and hindrance appraisal): χ^2 (129) = 377.69, RMSEA = 0.08, CFI = 0.87, TLI = 0.85, and SRMR = 0.07.

4.2. Common Method Bias Test. Since all variables in this study were evaluated with nurses, a test for the possible common method bias was required. First, the results of Harman's one-factor analysis indicated that the cumulative variance interpretation rate of the first precipitation factor was 25.14%, which was less than half of the total explanation (62.18%), and did not exceed the recommendation criterion of 40% [31], provisionally indicating that the sample did not have a serious problem of common method bias. Second, by adding a common method factor into the five-factor model, the results show that the six-factor model could not be fitted

by the Mplus8.3 software, again indicating that the sample does not have a serious common method bias problem and can proceed to the next step of data analysis.

4.3. Descriptive Statistics. Table 2 provides the means, standard deviations, alphas, and correlations for the study variables. As shown in Table 2, leaders' narcissistic admiration was positively related to challenge stressors ($r = 0.40$ and $p < 0.01$) and OCBL ($r = 0.30$ and $p < 0.01$). Leaders' narcissistic rivalry was positively related to hindrance stressors ($r = 0.26$ and $p < 0.01$) and negatively related to OCBL ($r = -0.33$ and $p < 0.01$). In addition, challenge appraisal was positively related to OCBL ($r = 0.52$ and $p < 0.01$); however, hindrance appraisal was negatively related to OCBL ($r = -0.39$ and $p < 0.01$). These results preliminarily supported our hypothesis.

4.4. Hypotheses Testing. We tested the proposed model using structural equation modeling (SEM) with Mplus8.3. Following Anderson and Gerbing [32], we compared a sequence of nested models to identify the best model for testing the proposed hypotheses.

We first tested the direct effect of leaders' narcissistic admiration and rivalry on OCBL in the absence of mediating variables. We found that leaders' narcissistic admiration had a significant positive impact on OCBL ($b = 0.30$, SE = 0.08, and $p < 0.01$) and leaders' narcissistic rivalry had a significant negative impact on OBCL ($b = -0.43$, SE = 0.09, and $p < 0.01$), after controlling for nurse age, educational background, and tenure. Hypotheses 1a and 1b were supported. We thus proceeded to investigate whether the relationship was mediated by challenge appraisal and hindrance appraisal.

To determine the optimum structural model fit, fully mediated and partially mediated models were examined. We used the partial mediation model (M0) as the baseline model. In the baseline model, we estimated all relationships between the current variables. In M1 (full mediation model), we removed the direct path from leaders' narcissistic admiration and rivalry to OCBL. Control variables were included in all structural models. Table 3 shows the results of confirmatory factor analyses (CFAs) of the nested models. The results in Table 3 show that both M0 (χ^2 (178) = 316.62, CFI = 0.93, TLI = 0.91, and RMSEA = 0.05) and M1 (χ^2 (180) = 323.44, CFI = 0.93, TLI = 0.91, and RMSEA = 0.05) fit the data well. Both the fixed indices and the chi-square test ($p < 0.05$) indicated significant differences between M1 and M0; thus, M0 (partial mediation model) was selected.

We tested this indirect effect of M0 using the procedure developed by Edwards and Lambert [33]. Thus, we calculated the indirect effect of leaders' narcissistic admiration and rivalry on OCBL mediated through challenge appraisal and hindrance appraisal and developed CI with 5,000 resamples. The SEM results are shown in Figure 2. Here, the indirect effect of leaders' narcissistic admiration on OCBL through challenge appraisal was significant (indirect effect = 0.15, 95% CI: 0.094 and 0.213), supporting Hypothesis 2a. Moreover, the indirect effect of leaders'

TABLE 2: Descriptive statistics, correlations, and reliabilities.

Variables	M	SD	1	2	3	4	5	6	7
1. Age	31.09	6.40							
2. Education	2.98	0.62	−0.09						
3. Tenure	7.29	5.43	0.86**	−0.16**					
4. Leaders' narcissistic admiration	5.00	0.95	0.04	0.02	0.05				
5. Leaders' narcissistic rivalry	2.75	0.98	−0.09	−0.04	−0.05	−0.13*			
6. Challenge appraisal	5.94	0.46	0.01	0.02	0.01	0.40**	−0.25**		
7. Hindrance appraisal	2.35	0.63	−0.06	0.08	−0.02	−0.17**	0.26**	−0.39**	
8. OCBL	5.48	0.67	0.04	0.05	0.03	0.30**	−0.33**	0.52**	−0.39**

$^* p < 0.05$; $^{**} p < 0.01$.

TABLE 3: Model comparison results.

Model	χ^2	df	χ^2/df	CFI	TLI	RMSEA	$\Delta\chi^2$	Δdf	AIC
M0	316.62	178	1.78	0.93	0.91	0.05	—	—	15206.23
M1	323.44	180	1.80	0.93	0.91	0.05	2	6.82*	15209.05

narcissistic rivalry on OCBL through hindrance appraisal was significant (indirect effect = −0.05, 95% CI: −0.119 and −0.011), supporting Hypothesis 2b.

5. General Discussion

We have learned about the important role of nurses' OCBL in enhancing and improving the relationship between leaders and nurses, and that leaders' narcissism is one of the important antecedents of nurses' OCBL. Despite the strong interest of theoretical scholars and management practitioners in leaders' narcissism, the existing literature has largely taken a single view of this trait and presented inconsistent findings on its interpersonal impact. In contrast, our study adopts a two-dimensional view of narcissism and outlines how leaders' narcissism positively and negatively impacts nurses' OCBL. Using a multistage questionnaire study of 280 nurses from China, we found that leaders' narcissistic admiration was positively associated with nurses' OCBL, whereas leaders' narcissistic rivalry was negatively associated with nurses' OCBL. In addition, challenge appraisal substantially mediated the relationship between leaders' narcissistic admiration and nurses' OCBL, and hindrance appraisal substantially mediated the relationship between leaders' narcissistic rivalry and nurses' OCBL. This result has great significance.

First, many scholars have explored the relationship between narcissistic leaders and OCBL but have drawn inconsistent conclusions. As demonstrated by our decision to explore leader narcissism and its many implications on nurses' OCBL based on the two-dimensional view of narcissism, we urge scholars to use the method that extensively analyze narcissism [34]. Our study based on Back et al. [12] proposed that narcissism is a two-dimensional concept with both positive and negative traits, divided narcissism into two dimensions of narcissistic admiration and rivalry, and explored the relationship between narcissistic leaders and OCBL. Our results acknowledge and emphasize the need of elaborating narcissists' subtle and fundamental inner conscious patterns in order to better comprehend their range of interpersonal and behavioral tendencies toward other individuals in the workplace [35].

Second, our research adds to the body of knowledge on leadership, notably on leaders' narcissism and the relationship between leaders and nurses. The mechanisms connecting leaders' narcissism and nurses' OCBL are specifically revealed by our study. Furthermore, we contend that this study puts the spotlight on unique and previously unrecognized pathways connected to narcissism in the workplace. For example, previous narcissism-related research has focused on intimate and acquaintance-based relationship networks [14, 36, 37]. These intimate relationships are distinct from work relationships, which are often more distant. Based on the transactional stress theory, our study found that challenge appraisal substantially mediates the relationship between leaders' narcissistic admiration and nurses' OCBL, and hindrance appraisal substantially mediates the relationship between leaders' narcissistic rivalry and nurses' OCBL. In conclusion, we believe that by revealing the unique mechanisms between leaders' narcissism and nurses' OCBL, we have made a contribution to how leaders' narcissism affects interpersonal consequences and advanced the study of narcissism in the field of leadership.

Finally, we have also contributed to the study of the antecedents of OCBL in the field of nursing management. In hospitals, a good or bad relationship between leaders and nurses can affect the working atmosphere of the team or organization and even the functioning of the hospital. Therefore, it is especially important to understand the positive or negative antecedents of nurses' OCBL. On the other side of the leader-nurse interaction, leaders' traits may have a strong impact on nurses' OCBL. Therefore, this study specifically examined the relationship between leaders' narcissistic traits and nurses' OCBL and found that the positive trait of leaders' narcissistic admiration promotes nurses' OCBL, whereas the negative trait of leaders' narcissistic rivalry inhibits nurses' OCBL. In conclusion, our study provides two very important antecedents of OCBL in the field of nursing management.
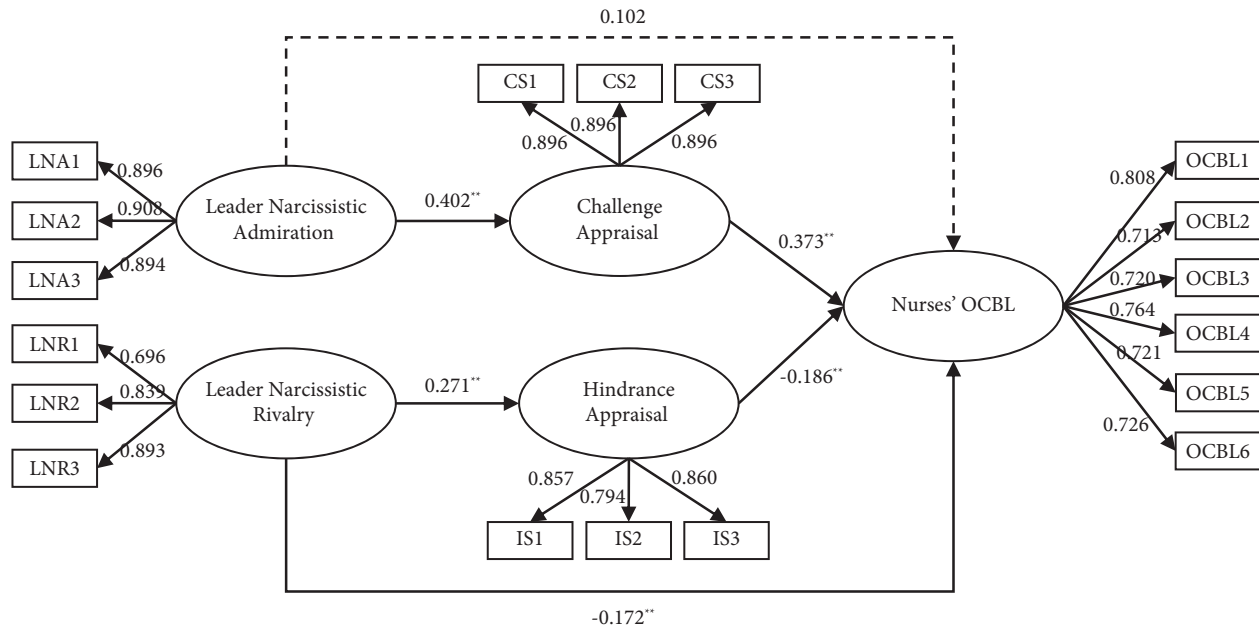
Figure 2: The results of SEM.

6. Limitations

There are some limitations to consider when evaluating our findings. First, as the data were self-reported, there may be concerns about the common method bias [31]. Although our study confirms that there is no serious common method bias problem, we recommend that future studies use experimental or multistage and multisource longitudinal research designs to enhance the causality of our research conclusions.

Second, according to the conclusion of Fehn and Schütz [23], we use other-rated (nurses) but not self-rated leaders' narcissistic admiration and rivalry. However, we suggest that future studies can continue to compare the impact of self-rated and nurse-rated leaders' narcissistic admiration and rivalry on OCBL and observe whether there is a difference, which is still an interesting topic.

7. Implications for Nursing Management

Our study concluded that leaders' narcissistic admiration can increase nurses' OCBL via increasing their challenge appraisal, and leaders' narcissistic rivalry can decrease nurses' OCBL via increasing their hindrance appraisal. In order to improve the quality of leader-member interaction, hospitals should maximize the positive effects of leaders' narcissistic admiration and avoid the negative effects of leaders' narcissistic rivalry.

(1) *For Hospitals.* Hospitals can suppress the expression of the negative effects of narcissistic leaders by implementing both "soft culture" and "hard policy." Specifically, the hospital should actively promote the organizational culture of cooperation and punish the sabotage and create a working atmosphere of mutual help, solidarity, and love, so as to strengthen the positive relationship between the leaders' narcissistic admiration and nurses' OCBL and weaken the

negative relationship between the leaders' narcissistic rivalry and nurses' OCBL.

(2) *For Leaders.* Leaders should lead by example, actively play the positive role of leaders' narcissistic admiration, and try to avoid the negative consequences of leaders' narcissistic rivalry. Specifically, leaders should feel free to display their own charismatic (an external form of narcissistic admiration) and positive narcissistic traits when they want to during their regular interactions with nurses but should refrain from doing so when they want to disparage others. This can help build a more positive leader-nurse relationship.

(3) *For Nurses.* Nurses think that their leader is narcissistic, and there are specific impression management strategies which they can use to deal with it. For instance, nurses may need to emphasize their similar work experiences and backgrounds while speaking with leaders who are narcissistic admiration. Nevertheless, nurses may need to display a little more humility and avoid some behaviors (e.g., self-promotion) while speaking with leaders who are narcissistic rivalry because these leaders may view these behaviors as threatening.

Data Availability

The data that support the findings of this study are available from the corresponding author upon request.

Consent

Informed consent was obtained from all participants in our study.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Reliability and Validity of the Japanese Version of the Implementation Leadership Scale for Nurse Managers and Staff Nurses: A Cross-Sectional Study

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Background. Strategic leadership is key to implementing evidence-based practice (EBP). Evaluating the readiness and processes necessary to implement EBP using the Japanese version of the implementation leadership scale (ILS) may be useful to systematically promote the implementation of EBP in Japan. This study aimed to evaluate the reliability and validity of the Japanese version of the ILS for nurse managers and staff nurses. *Methods.* Data were collected in a cross-sectional study. The original ILS was translated into Japanese and back-translated into English. Clinical nurses reviewed it and confirmed its face validity. We distributed a web questionnaire to 119 nurse managers and 2,858 staff nurses working at three university hospitals in Japan's metropolitan areas. Construct validity was assessed for nursing managers and staff nurses, respectively, using confirmatory factor analysis. Known-group validity for nurse managers was assessed by verifying differences in ILS scores by educational background and experience of learning EBP and working on EBP. We evaluated reliability using Cronbach's alpha and test-retest reliability. *Results.* The response rates for nurse managers and staff nurses were 56.3% and 16.9%, respectively. Data from 67 nursing managers and 484 staff nurses were analyzed, excluding duplicate responses. Confirmatory factor analyses of both samples supported the four-factor structure of ILS. The ILS total score of nurse managers with experience learning EBP or experience working on EBP was statistically significantly higher than that of those with no experience, and known-group validity was supported. Across both samples, internal consistency reliability was strong (Cronbach's alpha: 0.91–0.97) and test-retest reliability was moderate. *Conclusion.* This study illustrated the reliability and validity of Japanese versions of the ILS for both nurse managers and staff nurses. This study enabled international comparisons of the leadership required for EBP implementation and may support the development of intervention programs and strategies to promote EBP's implementation in different countries. *Trial Registration.* UMIN Clinical Trials Registry (UMIN-CTR). This trail is registered with UMIN000045782.

1. Introduction

Evidence-based practice (EBP) is the integration of the best available research evidence with clinical expertise and individual patient values and circumstances [1]. Successful implementation of EBP is expected to result in more effective healthcare service delivery, reduced costs, and increased clinician and patient satisfaction [2–4]. Hence, EBP implementation is widely accepted worldwide as a priority to promote quality clinical practice and optimal patient outcomes [5, 6].

Previous studies have indicated that EBP is not consistently used by nurses in clinical settings [7, 8]. EBP implementation at the unit level has various obstacles, such as fewer opportunities to learn about EBP implementation [9] and nursing managers' passive attitude toward EBP implementation [10]. EBP is challenging for staff nurses to implement on their own. Nurse managers play an important role in all processes of EBP implementation because they can influence the organizational climate of the workplace, the degree of cooperation among team members, and the attitudes of staff nurses toward EBP [11–14]. Therefore, EBP implementation in the unit requires not only the effort of individual staff nurses but also a proactive approach by nurse managers. Nurse manager leadership is an important factor in successful EBP implementation [15, 16].

Evidence suggests a relationship between EBP implementation and managerial leadership. Supervisors' transformational leadership and transactional leadership are associated with followers' positive attitudes toward the adoption of EBP [17, 18]. Nurse manager leadership in EBP implementation is defined as a multidimensional process that influences staff, their environment, and the organizational infrastructure to facilitate the integration of evidence into clinical practice [19]. Nurse managers are required to strategically create an EBP implementation environment and take action to promote the implementation and sustainability of EBP. Strategic leadership involves anticipating organizational change, making strategic decisions, and managing the change process [19, 20]. A meta-analysis conducted by Hong et al. [13] confirmed that strategic leadership is advantageous for specific organizational change initiatives. Hence, the strategic leadership of nurse managers can be useful for EBP implementation.

Based on theory and previous research on EBP implementation, leadership, and organizational membership, Aarons et al. [11] developed the implementation leadership scale (ILS), a psychometric scale that assesses the strategic leadership demonstrated by leaders in EBP implementation. The scale consists of 12 items and four subscales, and its brevity makes it appropriate for busy healthcare settings. The ILS has both leader and staff versions, which is useful in that it allows evaluation from multiple perspectives. The ILS, which was originally in English, has been translated into Chinese, Greek, and Norwegian, and its reliability and validity have been confirmed [3, 21, 22]. Previous studies reported that the ILS was associated with the multifactor leadership questionnaire (MLQ) [11, 21] and the implementation climate scale [23] as measures of convergent validity and less associated with the evidence-based practice attitude scale (EBPAS) [21, 23] and organizational climate measure [3, 11] as measures of discriminant validity. Moreover, the ILS has been used to develop intervention programs [24] and as an evaluative tool for educational intervention research [25]. As mentioned above, the ILS has been shown to be associated with multiple psychological measures and has been used in intervention research, but its psychometric properties (i.e., which individual characteristics are associated with the ILS scores) have not been adequately tested [3, 26].

The Japanese version of the ILS will allow the exploration of relevant factors, the development and evaluation of educational intervention programs, and international comparisons. As in many other countries, the implementation of EBP in Japan is of growing interest to ensure the best possible care delivery by integrating research evidence and clinical practice. However, EBP implementation and research in Japan are ongoing and developing slowly [27]. The Japanese version of the ILS is expected to promote research on EBP implementation in Japan's healthcare settings. This study aimed to evaluate the translated ILS factor structure and psychometric properties of nurse managers and staff nurses in a Japanese nursing context.

2. Materials and Methods

2.1. Study Design.
This was a cross-sectional study for the psychometric testing of the Japanese version of the ILS. The original ILS has two versions: one for leaders to measure their leadership, and one for staff to measure the leadership of the head of their unit.

2.2. The Japanese Version of ILS.
The original ILS was translated into Japanese by a professional English translator who was not a nursing expert, and the translation was reviewed and confirmed by the authors. Face validity was also assessed by 20 clinical nurses. Subsequently, the ILS was back-translated into English by the authors, and permission was obtained from the original authors.

The validity of the ILS in the Japanese population was assessed in terms of content validity, construct validity, and criterion-related validity (known-group validity). Reliability was assessed using internal consistency and the test-retest method.

2.3. Participants and Sample Size.
The participants were nurses working at three university hospitals in the Greater Tokyo area of Japan. Using convenience sampling, we selected hospitals where ILS scores were expected to vary among subjects. The inclusion criterion for participants was nurse managers and staff nurses working at the target facility, and the exclusion criterion was the head of the nursing department.

In setting the sample size, several issues were considered. First, the ILS is available in two types: one for staff and one for leaders; therefore, a minimum of 100 cases were required for each analysis [28]. Second, the response rate in previous

studies on Japanese nurse managers was approximately 50% [29, 30]. Third, the selection of units and staff may raise issues of subject selection bias and ethical considerations. Finally, the results from only one facility may have biased responses. We estimated approximately 50 nursing managers per hospital and a 50 percent response rate. We planned to recruit participants from four hospitals to reach the needed sample size of nurse managers, but we refrained from recruiting one of them due to the COVID-19 pandemic.

For the survey of staff nurses, we were concerned about the arbitrary selection of staff and the possibility of discouraging voluntary participation. Therefore, we targeted all staff nurses in approximately 150 departments at the three facilities to which the targeted nursing managers belonged and estimated a maximum of 3,000 survey forms.

2.4. Data Collection. The study was conducted from October 2021 to February 2022. We requested for their cooperation in the study and obtained consent from the head of the nursing department at each facility. An online survey tool was used, and leaflets with QR codes were distributed to 119 nurse managers and 2,858 staff nurses in the three facilities. The remainder of the study was sent to nurse managers in January 2022. For test-retest reliability, participants were asked to answer the survey again at least two weeks after the completion of the initial survey.

2.5. Instruments

2.5.1. Demographics. Participants were asked about their gender, age, academic background, years of experience as clinical nurses, and years of experience working in the unit.

2.5.2. The Implementation Leadership Scale (ILS). This scale measures unit-level leaders' leadership in implementing EBPs and consists of 12 items and four subscales (proactive leadership, knowledgeable leadership, supportive leadership, and perseverant leadership). This scale has two versions, one for leaders and one for staff. The leader version is a self-assessment, whereas the staff version is an evaluation of the leader's leadership by others. In the original ILS, because the target of each version is evaluated differently, the items are written with "I" in the leader's version and the name of the leader to be evaluated in the staff version. Respondents rated the items on a 5-point Likert scale ranging from 0 (not at all) to 4 (very great extent). The scale scores were calculated as the mean of each subscale and all items.

2.5.3. Experiences in Learning EBP and Working on EBP Implementation. The participants were asked about their experiences in learning EBP and working on EBP implementation, respectively, with "No," "Yes," and "Unsure" as possible answers.

2.6. Statistical Analysis. We tested the construct validity, known-group validity, internal consistency, and test-retest reliability of the ILS using the following statistical methods:

Construct validity was tested using confirmatory factor analysis (CFA) and the following model fit indexes: comparative fit index (CFI), Tucker-Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). CFI and TLI values greater than 0.90, RMSEA values less than 0.10, and SRMR values less than 0.09 indicate an acceptable fit of the model [31, 32]. This study assumed four-factor structure as the original study [11]. Furthermore, since staff nurses working in the same unit have the same leader, the CFA was conducted considering a multilevel nested data structure for staff nurses.

We tested for known-group validity using the nurse managers' ILS scores. Nurse leaders' graduate-level education, years of leadership experience, and completion of leadership courses are important factors that positively influence their leadership for EBP implementation [33]. Previous research has suggested that nurses with a master's degree or higher had higher knowledge and skills of EBP and more positive attitudes about EBP implementation than nurses with diploma and baccalaureate degrees [9, 34, 35]. Based on these findings, we hypothesized that nurse managers with postgraduate degrees would have higher ILS scores than those with other educational levels. The nurse managers' educational backgrounds were divided into three groups: (a) high school/vocational school/junior college, (b) university, and (c) graduate school. The Kruskal–Wallis test with a post hoc Bonferroni–Dunn test was used to examine our hypothesis. Furthermore, nurse managers who learned EBP reported enhanced leadership in EBP implementation [36]. Mentoring by nurses with adequate EBP experience facilitates EBP implementation [10, 37]. These results imply adequate EBP learning and working by unit leaders, which probably strengthens their leadership for the implementation of EBP. Therefore, we hypothesized that nurse managers with experiences in learning and working on EBP would have higher ILS scores than those without such experiences. The Mann–Whitney U test was used to verify the prediction that nurses with experiences in learning and working on EBP implementation would score higher than those without such experiences.

Internal consistency was assessed using Cronbach's alpha for each subscale. The intraclass correlation coefficient (ICC): ICC (1) and average within-group correlation (a_{wg}) were calculated as indexes of agreement to determine whether staff nurses' scores were a unit-level component. The ICC (1) was interpreted based on 0.12 proposed by James [38], although there is no clear criterion, with higher values indicating higher group-level agreeableness. Values of a_{wg} greater than 0.60 represent acceptable agreement [39].

In the test-retest method, $ICC_{(2,1)}$ was calculated for each subscale of the ILS. Values of ICC 0.5– 0.75 was moderate while ICC< 0.5 was poor [40]. Weighted kappa coefficients were calculated for agreement for each item. The agreement levels were suggested as follows: 0–0.2 (poor), 0.2–0.4 (fair), 0.4–0.6 (moderate), 0.6–0.8 (substantial), and 0.8–1.0 (almost perfect) [41, 42]. The analyses were conducted using IBM SPSS ver. 28.0 and Mplus ver. 8.0. ICC (1), and a_{wg} were calculated using the "multilevel" package [43] in the statistical software R ver 4.2.0. The significance level was set at 5%.

2.7. Ethical Consideration. This study was approved by the Institutional Ethics Review Board of the Chiba University Graduate School of Nursing. Participants accessed the explanatory document via the web page individually from the study participation leaflet. After reading it, consent was obtained at the beginning of the study. Participants were given 500 JPY in electronic money as an incentive after responding to the first survey.

3. Results

3.1. Content Validity. In the Japanese version of the ILS for staff, for the sake of generality, the name of the leader of an item was set as the "leader of the department." The content of all items in the Japanese version of the ILS was confirmed through discussions among researchers, and consensus was reached, which was judged to ensure content validity.

3.2. Questionnaire Participants and Demographic Data. The flow diagram of the study participants is given in Figure 1. In total, 67 nurse manager and 484 staff data were analyzed (response rate; nurse manager: 56.3%, staff: 16.9%), and the response rate for each hospital ranged from 16.8 to 21.5%. Of these, 53 nurse managers and 265 staff nurses responded to the retest survey. The participant demographics are shown in Table 1. More than 90% of the participants were female. 97% of nurse managers were over 40 years old, and 77.5% of staff nurses were under 40 years old.

3.3. Internal Consistency and Group-Agreement Indexes. Table 2 shows the ILS items and means, SD, reliabilities, and aggregation statistics. Cronbach's α ranged from 0.91 to 0.97 for nurse managers and from 0.94 to 0.97 for staff nurses. For staff nurses, the within-group agreement index a_{wg} ranged from 0.47 to 0.56, all items below the criteria of 0.60. ICCs ranged from 0.16 to 0.22, which are generally acceptable values.

3.4. Construct Validity. CFA validated the original model, consisting of 12 items and four factors. The nurse manager data showed CFI = 0.981, TLI = 0.975, RMSEA = 0.081, and SRMR = 0.038, indicating an acceptable model fit (Figure 2). First-order factor loadings ranged from 0.81 to 0.99, and second-order factor loadings ranged from 0.77 to 0.93. The staff nurse data showed CFI = 0.981, TLI = 0.973, RMSEA = 0.057, and SRMR = 0.027, indicating an acceptable model fit (Figure 3). First-order factor loadings ranged from 0.86 to 0.97, second-order factor loadings ranged from 0.80 to 0.94. The Japanese version of the ILS supports the original factor structure for both leaders and staff.

3.5. Known-Group Validity. The ILS total scores of nurse managers were compared in three groups by education level: (a) high school/vocational school/junior college, (b) university, and (*c*) graduate school. Mean (SD: standard deviation) scores for a, b, and c were 1.25 (0.72), 1.54 (0.80),

and 2.05 (0.78), respectively ($H = 9.557$, $p = 0.008$), with $a < c$ ($p = 0.006$) for multiple comparisons.

The ILS total scores of nurse managers were also compared based on their experience learning EBP and working on EBP implementation. Those with experience learning EBP scored 1.89 (0.84) and those with no experience scored 1.03 (0.57) ($U = -3.452$, $p < 0.001$). Those with experience working on EBP scored 2.04 (0.85) and those with no experience scored 1.00 (0.48) ($U = -4.229$, $p < 0.001$).

3.6. Test-Retest Reliability. The $ICC_{(2,1)}$ values of the nurse managers for the subscales were as follows: proactive leadership, 0.58; knowledgeable leadership, 0.79; supportive leadership, 0.71; perseverant leadership, 0.67; and total scale, 0.80. For the staff nurses, the $ICC_{(2,1)}$ values for the subscales were as follows: proactive leadership, 0.64; knowledgeable leadership, 0.72; supportive leadership, 0.72; perseverant leadership, 0.74; and total scale, 0.78. All the ICC values were moderate according to the criterion.

The nurse managers' weighted kappa coefficient values for each item in the subscales were within the following ranges: proactive leadership, 0.22–0.47; knowledgeable leadership, 0.56–0.60; supportive leadership, 0.47–0.50; and perseverant leadership, 0.38–0.56. For the staff nurses, the weighted kappa coefficient values ranged as follows: proactive leadership, 0.41–0.43; knowledgeable leadership, 0.50–0.55; supportive leadership, 0.48–0.57; and perseverant leadership, 0.52–0.57 (Table 3). The weighted Kappa coefficient values were fair in two items and moderate in the rest of the items, according to the criterion.

4. Discussion

4.1. Validity of the Japanese Version of the ILS. This study translated the ILS into Japanese and confirmed the validity and reliability of the nurse manager and staff nurse versions. CFA, assuming a four-factor model [11], showed a moderate to good fit with the Japanese version of the ILS, suggesting its construct validity. Previous validation studies of translated ILS have supported the original four-factor model [3, 21, 22], and this factor structure was consistent across studies in different contexts.

Testing the known-group validity of the nurse managers' version of the scale showed a statistically significant group difference between (a) high school/vocational school/junior college and (c) graduate school. Nurse managers whose last education was (b) college showed no statistically significant group differences compared with the other groups, but the mean of the scale was confirmed to increase according to educational background. Previous studies have reported that factors associated with an individual's EBP implementation included EBP training, university position, higher education, professionalism, and belief in EBP [8], and our results mostly support this. These results confirm the known-group validity of the scale for nurse managers. However, this study did not examine the staff's known-group validity. The relationship with the nurse manager and experience of working together
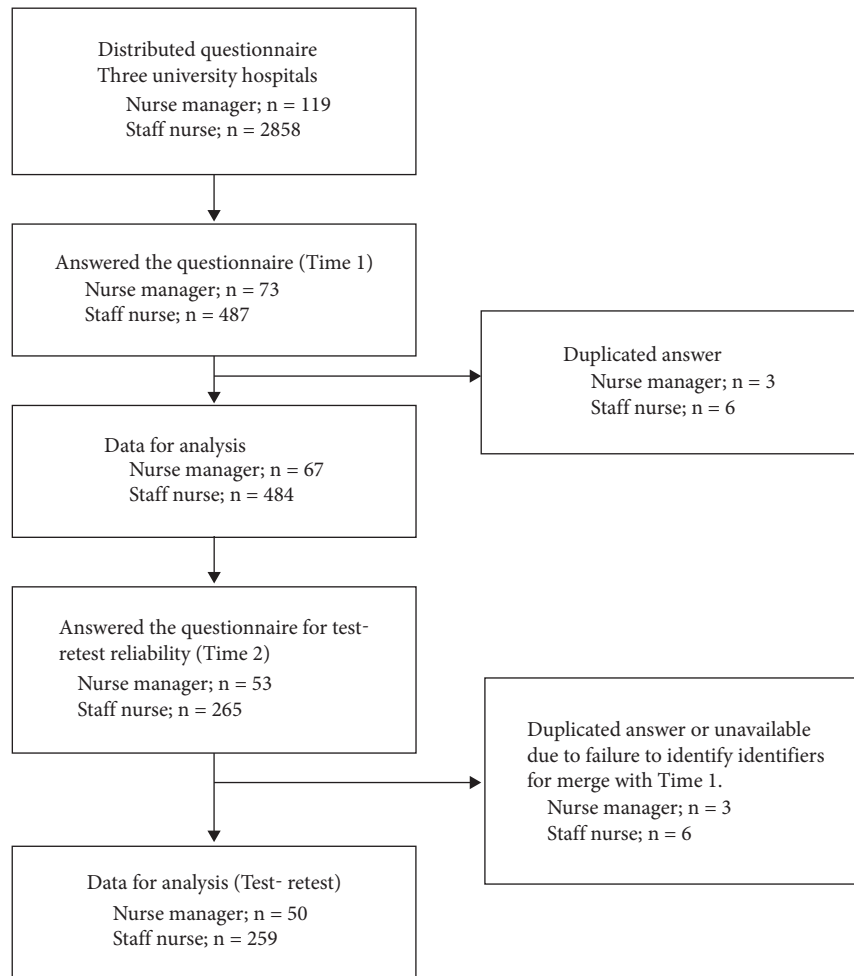
FIGURE 1: Participants flow.

TABLE 1: Demographic data.

	Nurse manager, $n = 67$		Staff, $n = 484$	
	n	(%)	n	(%)
Gender				
Female	65	97.0	445	91.9
Male	1	1.5	26	5.4
Unknown	1	1.5	13	2.7
Age group				
Below 25	0	0.0	121	25.0
26–30	0	0.0	121	25.0
31–40	2	3.0	133	27.5
41–50	28	41.8	79	16.3
Above 51	37	55.2	30	6.2
Academic background				
Bachelor's degree	25	37.3	352	72.7
Master's degree	15	22.4	39	8.1
Doctoral degree	0	0.0	3	0.6
No degree※	27	40.3	90	18.6
Years of experience as clinical nurses				
Below 1	0	0.0	56	11.6
2 or 3	0	0.0	82	16.9
4–10	0	0.0	161	33.3
Above 11	67	100.0	185	38.2

TABLE 1: Continued.

	Nurse manager, $n = 67$		Staff, $n = 484$	
	n	(%)	n	(%)
Years of experience working in the unit				
Below 1	5	7.5	76	15.7
2 or 3	16	23.9	118	24.4
4–10	23	34.3	178	36.8
Above 11	23	34.3	112	23.1
Learning experience of EBP				
No	18	26.9	176	36.4
Yes	35	52.2	118	24.4
Unsure	14	20.9	190	39.3
Experience of working on EBP				
No	24	35.8	182	37.6
Yes	28	41.8	110	22.7
Unsure	15	22.4	192	39.7

Notes: ※It includes high school, vocational school, and junior college.

TABLE 2: Implementation leadership scale, subscale, and item statistics.

	Nurse manager, $n = 67$			Staff, $n = 484$				
	Mean	SD	α	Mean	SD	ICC(1)	a_{wg}	α
1. Proactive leadership	1.33	1.04	0.91	1.57	1.06	0.21	0.54	0.94
(1) Developed a plan to facilitate EBP implementation	1.15	0.96		1.48	1.06		0.51	
(2) Removed obstacles to implementation of EBP	0.91	0.95		1.29	1.08		0.52	
(3) Established clear standards for implementation of EBP	1.13	0.90		1.45	1.01		0.54	
2. Knowledgeable leadership	1.54	0.91	0.97	1.93	1.12	0.19	0.50	0.97
(4) Is knowledgeable about EBP	1.49	0.94		1.85	1.13		0.53	
(5) Is able to answer staff questions about EBP	1.42	0.94		1.86	1.12		0.47	
(6) Knows what he/she is talking about when it comes to EBP	1.48	0.91		1.88	1.09		0.47	
3. Supportive leadership	2.15	0.94	0.96	2.00	1.15	0.22	0.56	0.96
(7) Recognizes and appreciates employee efforts	1.93	0.96		1.87	1.17		0.49	
(8) Supports employee efforts to learn more about EBP	1.99	0.96		1.88	1.16		0.56	
(9) Supports employee efforts to use EBP	2.02	0.91		1.92	1.11		0.56	
4. Perseverant leadership	1.58	0.94	0.97	1.79	1.13	0.16	0.52	0.97
(10) Perseveres through the ups and downs of implementing	1.54	0.96		1.78	1.11		0.51	
(11) Carries on through the challenges of implementing EBP	1.43	1.00		1.82	1.12		0.51	
(12) Reacts to critical issues regarding implementation of EBP	1.52	0.94		1.80	1.08		0.51	
Implementation leadership scale total	1.54	0.81	0.96	1.76	0.98	0.22		0.97

Note. Range [0–4]; SD: standard deviation.
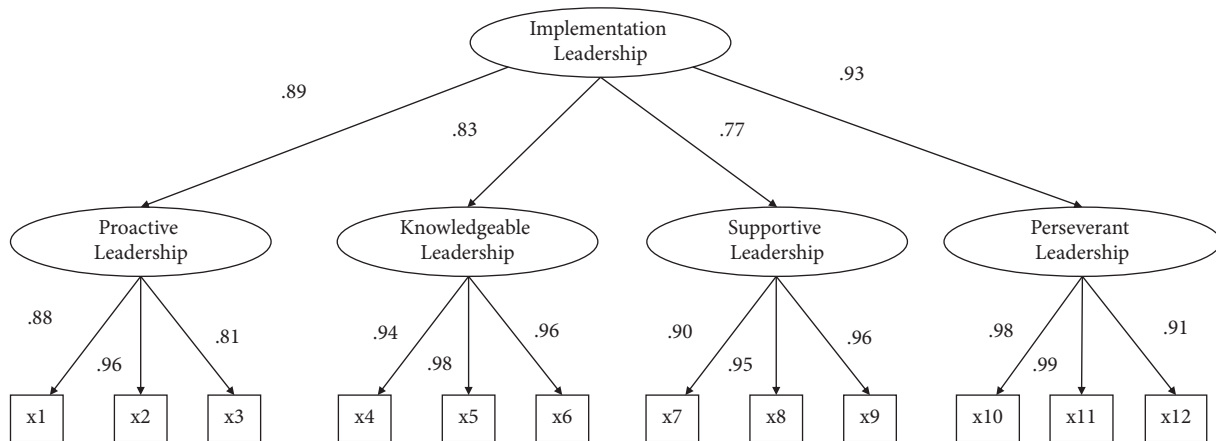
$X^2 (50) = 71.710$ p<0.05
CFI= 0.981
TLI=0.975
RMSEA=0.081
SRMR=0.038

FIGURE 2: Second-order confirmatory factor analysis for the ILS of the nurse managers.
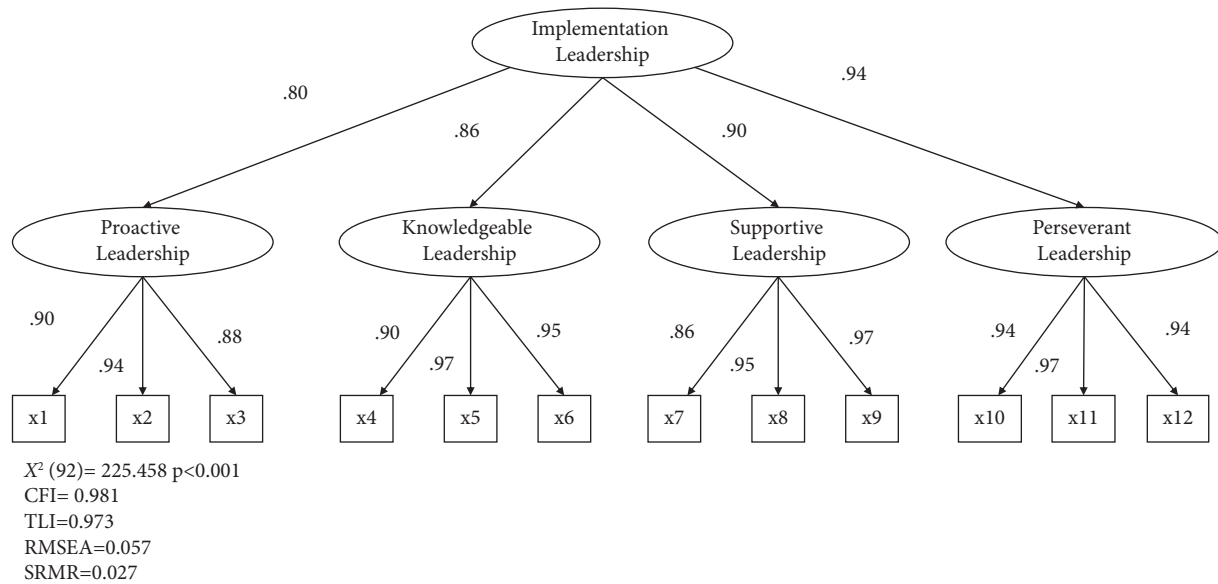
FIGURE 3: Second-order confirmatory factor analysis for the ILS of the staff nurses.

TABLE 3: Test-retest reliability.

	Nurse manager, $n = 50$		Staff, $n = 259$	
	Weighted kappa coefficient	$ICC_{(2,1)}$	Weighted kappa coefficient	$ICC_{(2,1)}$
Proactive leadership		0.58		0.64
(1) Developed a plan to facilitate EBP implementation	0.43		0.41	
(2) Removed obstacles to implementation of EBP	0.47		0.43	
(3) Established clear standards for implementation of EBP	0.22		0.44	
Knowledgeable leadership		0.79		0.72
(4) Is knowledgeable about EBP	0.56		0.55	
(5) Is able to answer staff questions about EBP	0.60		0.54	
(6) Knows what he/she is talking about when it comes to EBP	0.59		0.50	
Supportive leadership		0.71		0.72
(7) Recognizes and appreciates employee efforts	0.47		0.48	
(8) Supports employee efforts to learn more about EBP	0.50		0.57	
(9) Supports employee efforts to use EBP	0.50		0.56	
Perseverant leadership		0.67		0.74
(10) Perseveres through the ups and downs of implementing	0.47		0.52	
(11) Carries on through the challenges of implementing EBP	0.44		0.57	
(12) Reacts to critical issues regarding implementation of EBP	0.38		0.56	
Implementation leadership scale total		0.80		0.78

may be relevant, and further validation is needed in the future.

This study reveals differences in ILS scores according to nurse managers' attributes. This knowledge can assist in evaluating the implementation of leadership and developing intervention programs for EBP implementation.

4.2. Reliability of the Japanese Version of the ILS. Cronbach's α, indicating internal consistency, was greater than 0.9 for each subscale for both nurse managers and staff nurses. The Kappa coefficient, which indicates temporal stability, shows an overall moderate agreement was confirmed. In addition, the ICC of the ILS showed moderate values, confirming temporal stability. With these results, the validity and reliability of the Japanese version of the ILS were confirmed for both nurse managers and staff nurses. Whereas a few items in the nurse manager version showed particularly low temporal stability. These items might have influenced responses at each point in terms of the interpretation of adjectives such as "clear department standard" and "critical issues" in the wording. Therefore, several items need to be examined more closely to improve validity and reliability.

4.3. Linking Evidence to Action. The Japanese version of ILS allows us to understand the relationship between nurse managers' strategic leadership and EBP implementation in

units, as well as to make international comparisons of leadership for EBP implementation. Moreover, ILS was found to be compatible with the Ottawa Model of Implementation Leadership, a theoretical model of implementation leadership [24], thus providing a foundation for intervention research. In future studies, the ILS can be used as an evaluation instrument for educational interventions targeting nurse managers in EBP implementation and compound interventions in facilities.

4.4. Limitation. The participants were nurses from three university hospitals in a metropolitan area of Japan, which may have biased the population. In addition, university hospitals may have more nurses with experience learning or working with EBP than other hospitals because of their role as educational and research institutions. Therefore, this sample may not necessarily be representative of all clinical nurses in Japan, and additional validation using other samples is needed. Furthermore, this study did not examine associations between the ILS and other scales with similar concepts; further validation of the relationships between other indicators related to leadership is needed in the Japanese context.

5. Conclusion

This study developed Japanese versions of the ILS for nurse managers and staff nurses. Our findings suggest that it is a valid and reliable measurement of leadership in EBP implementation. The findings of this study may contribute to increasing the reliability of assessing EBP implementation in Japan since the ILS is considered an effective tool for measuring leadership when implementing EBP.

Data Availability

The datasets generated and/or analyzed during the current study are not publicly available due to the risk of identifying participants, but extracts are available from the corresponding author on reasonable request.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Acknowledgments

Supplementary Materials

Supplementary Table S1: Framework for strengthening the reporting of observational studies in epidemiology (STROBE) statement. (*Supplementary Materials*)

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Research Article

Reliability and Validity of the Indonesian Version of the McCloskey/Mueller Satisfaction Scale

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Aim. To examine the reliability and validity of the Indonesian translation of the McCloskey/Mueller Satisfaction Scale. *Background.* The McCloskey/Mueller Satisfaction Scale is an instrument to measure nurses' feelings about their job. Although the instrument has existed for a long time, there has been a lack of studies using this questionnaire in Indonesia due to the limitation of instrument validation in the Indonesian version. Therefore, it is necessary to investigate the validation and reliability of the instrument. *Methods.* The instrument was validated with a cross-sectional study of 350 nurses. For purposes of transcultural adaptation and psychometric validation, a forward-back translation strategy was used in conjunction with an expert panel and a cross-sectional study. The validity of the construct was verified using confirmatory factor analysis, and the overall fit of the model was measured using the calculated fit indices. The standard deviation of the extracted variance was used to evaluate the convergence validity. Composite reliability and Cronbach's alpha coefficients were used to investigate the internal consistency of the study. *Results.* According to the results of the reverse translation, the Indonesian and original instruments are statistically indistinguishable. As a result of the confirmatory factor analysis, it was determined that the Indonesian version of the McCloskey/Mueller Satisfaction Scale adhered closely to the original structure of the English version. The convergence validity of the construct (0.44–0.74), reliability (Cronbach $\alpha = 0.69$–0.93), and internal consistency (0.49–0.79) were rated highly. *Conclusions.* Good homogeneity and construct validity have been shown for the Indonesian translation of the McCloskey/Mueller Satisfaction Scale in the context of healthcare practice and research. *Implications for Nursing Management.* Nursing policymakers in Indonesia can use the instrument to inform the development of practice policies aimed at improving job satisfaction among nurses in the country.

1. Introduction

Nurse satisfaction is an important factor in nursing quality and turnover intentions [1, 2]. Despite being studied for a long time, the importance of individuals' feelings for their job is increasing. There are several nurse job satisfaction instruments based on motivational theories [3], which include the Job Satisfaction Survey by Spector [4], and the Job Descriptive Index (JDI) and the Job in General Scale (JIG) by Smith [5]. Others use human need theory [6], including Index Work Satisfaction (IWS) by Stamps [7] and the National Database of Nursing Quality Indicators (NDNQI)–adapted IWS by Taunton [8]. The McCloskey/Mueller Satisfaction Scale (MMSS) was developed based on the combined human need theory and motivational theory [3]. Thus, MMSS would give different perspectives compared to the job satisfaction instruments commonly used for nurses.

1.1. Background. The McCloskey/Mueller Satisfaction Scale (MMSS) is a comprehensive survey instrument developed for registered nurses working in hospitals [9]. For the first time, the instrument was developed with 36 distinct items. Mueller then reviewed the instrument to make it valid, reliable, and easy to use. Three items were excluded, and two items did not connect with any other dimensions, so that was the reason MMSS has now become 31 items [9].

Conceptually, MMSS was constructed by eight dimensions, including satisfaction with external awards (3 items), satisfaction with service schedules (6 items), satisfaction with the balance between family and work (3 items), satisfaction with relationships with coworkers (2 items), satisfaction with the opportunity to interact in the work environment (4 items), satisfaction with the opportunity to develop professionally (4 items), satisfaction with public recognition (4 items), and satisfaction with responsibility (5 items) [9]. It is related that when McCloskey-Mueller developed this instrument, they divided hospital rewards into three categories that included safety, social, and psychological. Satisfaction with maternity leave support, childcare facilities, direct supervisor support, relationships with peers, and opportunities to mingle with coworkers were all seen to be part of the social dimension of job satisfaction. Work responsibilities, educational possibilities, positive feedback, and a sense of agency in one's work were all factors in the minds of employees when it came to their jobs [9].

The former study reviewed factors related to nurse job satisfaction measured by MMSS [2]. The instrument has been widely used in many settings, including tertiary hospital, acute care hospital, mental health hospital, community, nursing homes, home healthcare, and urban and rural areas. Although it was designed for nurses, other studies have also applied it to evaluate the satisfaction of other professionals, such as case managers, midwives, and physicians. Another finding from Al-Qahtani et al. [2] showed that work environment, emotional state, social support, career ladder, and accountability had a significant impact on nurse satisfaction.

In a previous study [10], five experts in nursing administration calculated the content validity index for the Indonesian version of MMSS (I-MMSS), and CVI ranged from 0.92 to 1. Pearson's correlation with a correlation greater than 0.4 established the validity of the criterion. In addition, convergent validity was used with an average variance extracted (AVE) greater than 0.54. The total scale's Cronbach's alpha coefficient was 0.86, and the composite reliability was 0.89. However, the previous study did not measure this instrument comprehensively, and specifically, the translation process was not discussed, nor were construct validity and composite reliability results presented. This study has measured the construct validity and reliability of MMSS based on its psychometric properties.

A previous psychometric study from the USA revealed that MMSS was valid with 25 items out of 31 items. Cronbach's alpha was higher than in the original study, which ranged from 0.71 to 0.87 [11]. However, some studies did not suit 25 items, specifically the Middle East countries. Therefore, psychometric properties are critically needed in order to check instrument construct validity and reliability.

MMSS has been used in several settings and countries. Although it was developed in the United States, several other countries, including Arabic, Persian, China, Turkey, and Indonesia, have translated and validated it [12–16]. This scale aims to know the quality of nursing care from the perspective of the nurse. All translations of the scale must maintain the same level of precision as the original [17]. Therefore, accurate translation and cultural adaptation are necessary before it can be used effectively. The validity and reliability of the construct in the Indonesian version still needed to be established, even though it had been validated in other languages. This study aimed to examine the reliability and validity of the Indonesian version of the MMSS (I-MMSS).

2. Methods

2.1. Design. A cross-sectional observational prospective study was used to achieve cultural adaptation of the Indonesian version of the MMSS. This study was conducted in two phases to translate and test the construct validity and reliability of the Indonesian versions of the MMSS.

2.1.1. Phase I: Cultural Adaptation and Translation of the Questionnaire. The first stage consisted of the following subphases, all of which were concerned with localizing the MMSS instrument into Indonesian [18]: (1) forward translation and compare translation between instructors, (2) back translation and compare translation between instructors, (3) compare original and translation, (4) pilot testing. Forward translator was done by a professional language translator and a professor in nursing. Then, backward translator was done by two nurses' experts from the hospital.

2.1.2. Phase II: Questionnaire Test. The phase was validated through a retrospective cross-sectional observational study.

2.2. Participants. Three hundred-fifty Indonesian nurses were surveyed for this study. The information was collected from August to September 2022 from a random sample of inpatient nurses (IPD). The following standards were used to select participants: (1) have worked in an IPD unit for at least one year, and (2) have a bachelor's degree or diploma in nursing from an accredited university. Professionals who were not currently employed were not included in the analysis.

Selecting a sufficient sample size is a crucial decision. Regrettably, no agreed-upon criteria for validation studies exist in the existing literature [19]. The majority of them are approximations that range from three to 20 items per variable [20]. There are a total of 31 items on the MMSS scale, so the 350 participants fall within the established norms. Moreover, the research employed a convenience sampling technique to select nurses from seventeen hospitals. The questionnaires were disseminated and retrieved until the desired number of participants was achieved.

2.3. Data Collection Instruments. I-MMSS has 31 items with eight dimensions, including satisfaction with external awards (3 items), satisfaction with service schedules (6 items), satisfaction with the balance between family and work (3 items), satisfaction with relationships with co-workers (2 items), satisfaction with the opportunity to interact in the work environment (4 items), satisfaction with the opportunity to develop professionally (4 items), satisfaction with public recognition (4 items), and satisfaction with responsibility (5 items). The scoring and interpretation of the score is a five-point Likert scale. The score ranged from 1 = strongly disagree to 5 = strongly agree.

According to the prevailing agreement among professionals, the I-MMSS score is evaluated using a numerical continuum that spans from 1 to 5, encompassing five discrete gradations. The class interval formula $\bar{x} = (\bar{x}\ max - \bar{x}\ mix)/k$ has been utilized to categorize the mean score into five levels. Furthermore, in order to avoid the incidence of intersecting intervals, a margin of 0.01 was introduced to every subsequent lower boundary, as indicated in citation [18]. The mean scores of the I-MMSS have been classified into five levels of interpretation. The aforementioned tiers are categorized as follows: the study revealed that the level of satisfaction among nurses was generally low, with a range of scores falling between 1.00 and 2.60 for poor and very poor levels of satisfaction. A fair level of satisfaction was observed within the range of 2.61 to 3.40, while a good level of satisfaction was noted between 3.41 and 4.20. The highest level of satisfaction, falling within the range of 4.21 to 5.00, was classified as very good.

2.4. Ethical Considerations. The research project adhered to the principles delineated in the Declaration of Helsinki, which served as the guiding document for the study. The Ethics Committee of the National Research and Innovation Agency of the Republic of Indonesia (BRIN) granted approval to the research protocol (Ref. No: 176/KE.01/SK/8/2022), and written authorization was also obtained from the hospital's managing director. Prior to affixing their signature to the document, every participant submitted a written informed consent form and furnished details pertaining to their personal information and participation in the research. The study's participants provided voluntary consent to participate in the investigation, without any form of coercion or inducement. The participants were granted unrestricted autonomy to engage in sketching activities at any juncture during the data collection process.

2.5. Data Collection Procedure. Upon receiving the official permission letter from the hospital director, we proceeded to establish communication with either the nursing director or the chief nursing officer. The ward coordinator or the unit coordinator ensured that the research was comprehensively elucidated to all individuals present. The questionnaires were distributed to the nurses by the coordinator of the respective ward or unit. After the research team member provided a comprehensive explanation of the study to all participants, they were instructed to complete a questionnaire promptly. The completed questionnaires were collected by the participants

and placed in a secure container situated at the nursing station of their designated units. The aforementioned container was exclusively available to the individuals responsible for overseeing the administration of the research investigation.

2.6. Statistical Analysis. Using LISREL 8.72, this study conducted a confirmatory factor analysis (CFA) to assess the validity of the construct. Factor analysis is the go-to statistical method for examining test dimensions and subscales via score data. Experimenters can choose between an exploratory and a confirmatory factorial design. The MMSS is a theory-based test, so it makes sense to use a confirmatory analysis to see if it follows the same format as the original data collection instrument. Each of the following three steps must be completed:

The goodness-of-fit index (GFI) > 0.90, the comparative fit index (CFI) > 0.90, the standardized root mean square residual (SRMR) 0.08, and the root mean square error of approximation (RMSEA) 0.07 were used to assess the congruence of the measurement model with the research data. Items' factor loadings above 0.3 and a significant T-value greater than 1.96 constitute the cutoff [21].

Consistent with the recommendation of Hair et al., convergent validity was evaluated using the average variance extracted (AVE) statistic. When the variance extracted values are high, it means that the indicators are good surrogates for the latent variable. To meet recommendations, a construct's average variance extracted value must be greater than 0.5 [21]. If AVE is less than 0.5, but the composite reliability is higher than 0.6, the convergent validity of the construct is still adequate [22].

Both composite reliability and Cronbach's alpha were used to evaluate the reliability of the survey. All composite construction reliabilities were greater than the critical value of 0.7, indicating high reliability [21]. Most often, this will be a coefficient like Cronbach's alpha. Correlations between items and overall were also reported as means. When the former is between 0.3 and 0.7, it is considered normal, while the latter is fine once it rises above 0.3 [23].

3. Results

3.1. Translation. The translation procedure was gone through four phases. First, one member of the research team met with the original researcher, who translated the instrument, to determine whether or not the measure was culturally relevant, and this study used this meeting to assess the instrument's conceptual equivalence. Second, the translator, fluent in English and Indonesian and well-versed in the culture to which the MMSS administered, worked to translate the items from the English version of the MMSS into Indonesian and back into English. Third, the translated version was reviewed for relevance and conceptual ambiguities by a panel of experts consisting of three nurses with doctoral degrees and extensive clinical experience and one official translator. Forth, a preliminary version of the instrument was tested with native speakers of the target language. Once the questionnaire was translated into

Indonesian, it underwent a series of pilot tests ($n = 30$) among a representative sample of nurses from the intended sample. This was done to ensure that the questionnaire's instructions, items, and response format were all easily understood. A dichotomous scale was used to have each participant rate the items and directions (clear or unclear). Since the pilot test revealed that there were no questions that needed clarification, the final version of the questionnaire did not require modifications.

3.2. Construct Validity. The initial model only had a significant result for χ^2 (0.00) and CFI (0.95), and others were insignificant. After following the modification indices of error covariance on each observed variable, the criteria can be achieved, including χ^2 (0.00), $\chi^2/\mathrm{d}f$ (2.21), CFI (1.00), GFI (0.97), AGFI (0.96), RMSEA (0.06), and SRMSR (0.06) (Table 1). The findings indicated that the I-MMSS exhibited construct validity, as evidenced by significant results of eight dimensions and 31 items.

The CFA revealed that the three subscales established in each dimension of the original MMSS were statistically significant in the Indonesian version. The loading of standardized factors of each dimension ranged from 0.75 to 0.97 at a statistically significant level of 0.05. Factor loadings for each item ranged from 0.62 to 0.86 for extrinsic, from 0.64 to 0.78 for scheduling, from 0.59 to 0.72 for family and work balance, from 0.68 to 0.88 for coworker, from 0.80 to 0.89 for interaction, from 0.72 to 0.76 for praise/recognition, from 0.78 to 0.83 for professional opportunities, and from 0.80 to 0.92 for control/responsibility. The details of unstandardized factor loading, standard error, standardized factor loadings, $R2$ and error are shown in Supplementary Appendix (available here). Figure 1 reports the obtained standardized factor loading. Another important issue of the CFA is to check the fit of the factorial model.

3.3. Composite Reliability and Average Variance Extracted. The composite reliability of I- MMSS for each of its latent variables ranged from 0.70 to 0.93, with higher values indicating more robust reliability (Table 2). Composite reliability was highest for the control/responsibility dimension ($\rho c = 0.93$), then for the interaction dimension ($\rho c = 0.92$), and finally for the professional opportunity dimension of professional opportunities ($\rho c = 0.89$). Overall, Cronbach's alpha indicated a level of trustworthiness within the data of 0.96. Cronbach's alpha for the full five-factor scale was between 0.69 and 0.93. Table 2 displays the item-to-total correlation, which varied from 0.49 to 0.79.

The average variance extracted using I-MMSS for each latent variable varied between 0.44 and 0.66 (Table 2). A moderate amount of the variance of the latent variable's variance ($\rho v = 0.44$) can be explained by the dimensions of family-work balance. Others were explained at a high level.

4. Discussion

The CFA found that in the I-MMSS questionnaire, all eight of the subscales established in the original version's

Table 1: Goodness-of-fit statistics of the Indonesian version of the McCloskey/Mueller Satisfaction Scale (I-MMSS) measurement model ($N = 350$).

Relative fit index	Initial model	Modified model
χ^2	0.00	0.00
$\chi^2/\mathrm{d}f$	5.98	2.21
CFI	0.95	1.00
GFI	0.68	0.97
AGFI	0.63	0.96
RMSEA	0.11	0.06
SRMSR	0.12	0.06

dimensions were significant. Several goodness-of-fit indices can be used, depending on the characteristics of the sample and the study, but different viewpoints and thresholds are presented in the literature [24]. There is currently no "winning" fit index that can be accepted by everyone. The study followed Hair et al. [21] which considered χ^2, $\chi^2/\mathrm{d}f$, CFI, GFI, AGFI, SRMR, and RMSEA.

Factor loading showed the variance explained by the variable on that factor. In the factor analysis approach, 0.3 or higher factor loading represents that the factor extracts moderate variance from that variable [25]. The latent dimension variable constructed well I-MMSS (from 0.75 to 0.97). The highest factor loading of the dimensions was praise/recognition at 0.97 ($R^2 = 0.94$), which was followed by professional opportunities at 0.93 ($R^2 = 0.87$) and family and work balance at 0.89 ($R^2 = 0.79$).

The majority of items had a factor loading higher than 0.6. The highest factor loading was item 31 ($b = 0.92$) "participation in decision making," followed by item 30 "control of the workplace environment" and then item 19 "interaction with others in healthcare" with a factor loading of 0.89 on each item. Those showing items 31 and 30 were dominantly influenced to construct dimension control/responsibility, as well as item 19 was the highest item to construct interaction. The study supported the previous psychometric study in Canada that found that control/responsibility and interaction had a significant result [26]. Additionally, former studies found that nurses feel satisfied when they have appropriate control of and responsibility for their job [27, 28].

Meanwhile, item 12 "childcare facilities on workplace" was the lowest factor loading of 0.59, which was followed by item three "benefit if resigned" and item six "clinical ladder" at 0.62 and 0.64, respectively. Those elements were the lowest to influence the dimensions to construct, and the results were above the minimum 0.3 [21]. These findings could be considered as the nurse feeling unsatisfied related to them. Most of the hospitals in Indonesia, public and private, could not provide childcare facilities. The minimum benefit for resigning is because the person will lose their insurance. In addition, the clinical ladder in some countries might not work well. A redundant role or act impacts implementation in the hospital [29].

The composite reliability and Cronbach's Alpha reliability were almost the same. It showed that I-MMSS has a strong internal consistency [30]. The highest internal
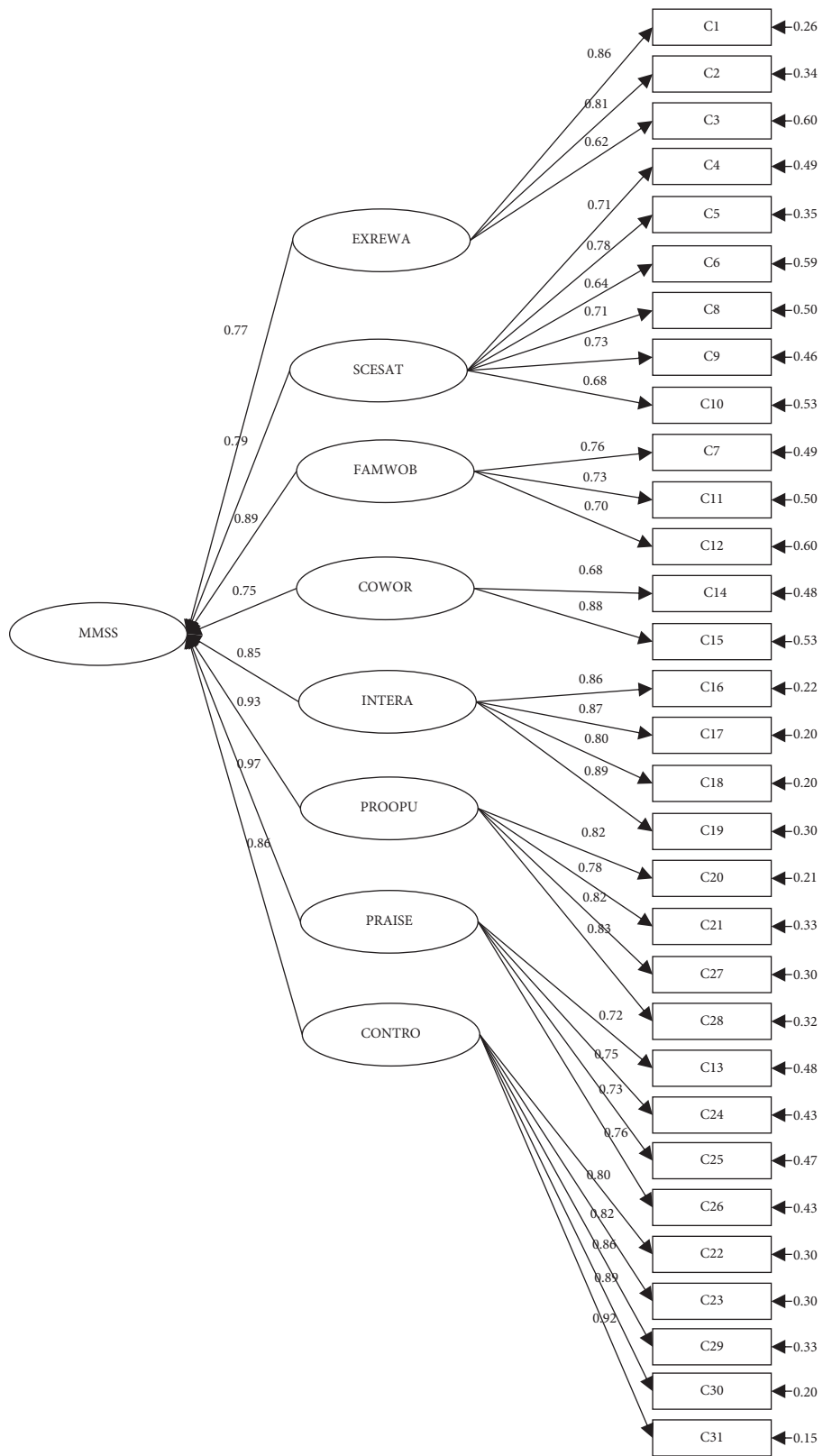
Figure 1: Modified measurement model.

TABLE 2: Summary of composite reliability, extracted average variance, and internal consistency.

Latent variables	Item	Composite reliability of latent variables	Average variance extracted	Cronbach's α	Item to total correlation
Extrinsic	3	0.81	0.59	0.77	0.58–0.62
Scheduling	6	0.85	0.51	0.85	0.44–0.77
Family and work balance	3	0.70	0.44	0.69	0.45–0.57
Coworker	2	0.76	0.62	0.75	0.6
Interaction	4	0.92	0.73	0.93	0.77–0.88
Praise/recognition	4	0.83	0.55	0.84	0.57–0.68
Professional opportunities	4	0.89	0.66	0.89	0.71–0.81
Control/Responsibility	5	0.93	0.74	0.93	0.74–0.88
Overall	31			0.96	0.49–0.79

consistency was control/responsibility ($\rho c = 0.93$) and was followed by the dimension of interaction and the professional opportunities at $\rho c = 0.92$ and $\rho c = 0.92$, respectively. However, the dimension of family and work balance was the lowest internal consistency ($\rho c = 0.70$), which was followed by the coworker ($\rho c = 0.76$) and extrinsic ($\rho c = 0.81$).

The convergent validity showed that all constructs had $\rho v > 0.5$, except family and work balance ($\rho v = 0.44$). However, based on Fornell and Larcker [22], if the composite reliability >0.6, it was not an issue for the convergent validity.

4.1. Implications for Nursing Management. This finding has potential implications for clinical practice policy. MMSS could accurately measure the nurse's feelings about their job in their workplace, which would be beneficial for the nurse manager or the nursing organization to check the nurse's condition. The dimension of MMSS provides nurse feelings about salary, working hours, childcare facilities, relation with nursing peers, social contact in workplace, opportunities to step up the career ladder, manager or leader recognition, and voice of decision making. The nurse manager and the chief nursing officer can check it regularly to maintain nurse performance. In addition, the dimensions of MMSS can be a framework for nurse organizations to promote nurse satisfaction in hospitals. The fresh graduate nurse or experienced nurse would consider moving or applying to the new workplace according to the MMSS framework. This tool can become an initial assessment of hospital policy if nurses underperform which would help the nurse problem in the unit.

4.2. Limitations and Future Directions. This study is the first study to investigate MMSS translation and psychometric properties in Indonesia. This finding could be as a reference for psychometric properties, specifically construct validity and reliability, as well as convergent validity. However, there are some limitations. To begin, other forms of construct validity testing, such as concurrent and discriminant validity, were not included in this investigation. Second, the study could not perform the test-retest reliability. Further studies must measure the concurrent and discriminant validity, as well as the test-retest reliability with the different settings and a larger sample size.

5. Conclusions

According to the results of the research, the Indonesian version of the MMSS demonstrates satisfactory levels of construct validity, convergent validity, and internal consistency. I-MMSS can be used to evaluate the perceptions of IPD nurses in terms of how they feel about salary, scheduling, family and work balance, coworker, interaction, praise/recognition, professional opportunities, and control/responsibility in the Indonesian hospital. These perceptions can be evaluated in terms of how nurses feel about professional opportunities, control, and responsibility.

Data Availability

Datasets are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Acknowledgments

Supplementary Materials

The supplementary appendix showed unstandardized (b) and standardized (B) factor loadings, standard error (SE), *t*-value, *R* square, and error of each item. Additionally, the COSMIN checklist was used to guide the report of this study. (*Supplementary Materials*)

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Research Article

Resilience Capability and Capacity in Unexpected Crises: Experiences and Lessons Learned in a Healthcare Organisation during the COVID-19 Pandemic

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Aim. The current article aims to gain insight into (a) what characterises organisational resilience during an unexpected crisis such as COVID-19 and (b) how organisations respond to developments in their environments. *Background.* In times of societal crises, such as the COVID-19 pandemic, the resilience of the healthcare organisation is tested. *Method.* This research is based on a case study in a university hospital and a county hospital in Sweden using surveys with both structured and open answers. *Results.* The result shows ambiguity and "polarised" experiences, emphasising flexibility vs. structure, clear hierarchical information vs. spaces for peer learning through dialogue, and focus on acute care vs. determination to continue with core operations. *Conclusion.* The article concludes that the pandemic resulted in paradoxes, tensions, and new experiences in organisational processes and interactions. These create opportunities for learning not only during crises but also for improving nursing management in both acute and planned care. Three relations are important in building organisational resilience in crises: resilience capability, resilience capacity, and sustainable resilience practices. *Implications for Nursing Management.* Organisational resilience under extraordinary circumstances, such as a pandemic, as well as enhancing the previous literature on nursing management that offer a more individually oriented perspective.

1. Introduction

In times of societal crises, such as the COVID-19 pandemic, the resilience of the healthcare organisation is tested for the unpredictable. Organisational resilience can support the resilience of work at the organisational level, through preparedness for crises and extraordinary events, improvising with existing resources to develop solutions for unexpected situations and problems [1, 2]. Resilience can be defined as the positive adaptation to significant adversity [3]. It can serve to mitigate negative outcomes such as burnout and anxiety during a pandemic as well as improve patients'

care [4]. Labrague and Santos [5] define personal resilience as a person's capacity to recover from a stressful event or to cope with or manage heavy workload and stress during a crisis or disaster event. For nursing management, resilience is a pivotal issue to nursing administrators and managers both with regards to recruiting and retaining nurses, i.e., to both competence supply and staff retention [6, 7] and to avoid burnout and work-related negative health effects [8].

Resilience must be supported by leadership strategies within the healthcare sector that contribute to creating supportive work environments [9]. Organisational support is defined as structural support, efficient communication, provision of a safe work environment, trainings related to COVID-19, and monitoring of healthcare workers' (HCWs) health and well-being. But resilience at the individual level has a limited effect, unless the work of strengthening resilience also permeates the team and organisational levels [10]. Rangachari and Woods [1] emphasise the importance of seeing organisational resilience as a system developed by the organisation and managers to learn from the work of individual employees, with a focus on proactivity, adaptation, and recovery.

Furthermore, Duchek [11] highlights a capability-based conceptualisation of organisational resilience in response to a crisis as three stages. The proactive stage occurs before an unexpected event and is defined as anticipation through observation, identification, and preparation to have resources available. The concurrent action stage occurs during the unexpected event through accepting, developing, and implementing solutions to support and use the social resources efficiently. The reactive action stage occurs after an unexpected event through reflection, learning, and change in which power and responsibility structures become central. In this study, the framework on organisational resilience that combines a processual approach and a focus on resilience capabilities, suggested by Duchek, will be used.

The mental well-being of nurses during COVID-19 has been stated to constitute a key component in the securing and rebuilding of the healthcare workforce following the pandemic [12]. Several studies have focused on how nurse leaders can support nurse staff and encourage a supportive work environment that mitigates stress and experiences of insecurity and anxiety at work [9, 13, 14]. Other studies have highlighted the role of nurse managers in creating such environments and how the responsibility it entails can lead to stress and burnout [15, 16]. Against this background, these studies stress the importance of research focusing nurse managers' well-being and resilience.

The importance of implementing resilience-promoting measures on an organisational level to manage a crisis is highlighted [10]. Such measures include balancing structures, such as a learning organisation. When organisational support is in place, it also promotes resilience by allowing hierarchies to be bypassed, micromanagement to be eliminated, and innovative approaches to focus on core patient-related activities [17]. The ability to predict the impact of severe crises as well as restore safe conditions increases by learning from previous crises and by adapting the organisation to new circumstances [18]. The importance of

organisational conditions to support resilience is highlighted by Sihvola et al. [19], who emphasise a relational leadership style, supportive and safe work environment, and adequate communication to support nurses' resilience.

The following aspects have been highlighted as pivotal components for a supportive work environment that supports mental well-being: empathy in leadership and communication with staff [20–23], provision of appropriate resources [24], gaining access to sufficient information [25, 26], and functioning communication and empowerment of staff to take action [27]. Healthcare workers in a Swedish study, working with COVID-19-infected patients, reported factors such as worries about being infected, having to change workplace, and lack of protective equipment affecting their work capacity negatively [28]. Furthermore, another study using the same data set showed that psychiatric nurses were the most affected among HCWs in psychiatric clinics although psychiatric services did not directly care for patients with severe COVID-19 infection [29].

Most studies on resilience among first-line healthcare environments during COVID-19 apply an individual perspective, focusing on individual traits and leadership styles [12, 30, 31]. Scholars, however, have begun to challenge the focus on resilience as an individual ability and responsibility, arguing for a view of it as a joint responsibility of the individual and the organisation [16].

Accordingly, more detailed knowledge is needed on organisational resilience within the area of nursing management [6, 32]. The aim of this study is to increase the understanding of complex resilience capabilities by studying processes and actions during an unexpected pandemic crisis. With a focus on how organisations respond to and manage developments in their environments in the face of a crisis, the study aims to provide insight into effective nursing management of resilience in practice.

Research question: What are the characteristics of the experiences, structures, and processes that promote organisational resilience among employees and managers?

2. Methods

2.1. Setting. The study was conducted at two hospitals in Sweden, a university hospital and a county hospital in Västra Götaland region. All hospital administrations in the region were invited to participate, of which one university hospital and one county hospital responded positively to the opportunity. During the pandemic, the hospitals provided frontline care to COVID-19 patients. The university hospital with around 17,000 employees is one of the largest in Sweden, focusing on innovation and clinical research, with a broad cooperation with academia, industry, and patients. They have leading expertise in around 25 specialist areas, including cardiovascular care, reconstructive surgery, children's care, vaccinations, immunology, rheumatology, and catheter interventions, thus caring for patients from all over the country. The county hospital with a couple of thousand employees provides care for inhabitants equivalent to a small city. The hospital offers high quality care in all specialties, has extensive experience in working with process-oriented

improvements in healthcare, and also has a research department with a university hospital setting.

This qualitative study is a part of a larger research project, with the aim of investigating the work environment and health of employees at a university hospital and a county hospital during a pandemic in a region in the western part of Sweden. The study included a total of 7740 respondents who were willing to participate in the research project. Detailed information on the questionnaire, and inclusion and exclusion criteria can be found in the article by Jonsdottir et al. [28]. It is based on 4097 (53%) respondents' free-text answers from managers and employees who completed the questionnaire and chose to comment on the included open-ended questions. The web-based questionnaire was administered in collaboration with the hospitals' Human Resources departments and distributed to all hospital employees (20314) eligible for study participation. The questionnaire invitation was sent by email in the first week of September 2020, with a link to an anonymous survey, and was followed up by a reminder email. Individuals could respond within 35 days [28]. The questionnaire included a total of 22 questions with subquestions and including three open-ended questions. The questionnaire took 10–15 minutes to complete. The questionnaire included questions pertaining to positive and negative experiences during the spring of 2020 when the COVID-19 pandemic was at its peak. Managers were asked questions about what organisational conditions had been important to them in their work as a manager in the spring of 2020 (e.g., clarity in decisions and procedures, division of responsibilities, resources, support, participation, and scope for action) and what organisational conditions they found were lacking in their work as a manager during the same period. The sample distributed by gender, age, and professional role is depicted in Table 1.

The data constitute experience-based knowledge. A central part of the study is to identify processes and factors, which are crucial for organisational resilience and for organisational conditions necessary for organisational learning that can function as a balancing structure. By mapping processes and factors that affect resilience, it is possible to create new knowledge that can be translated into clinical work to ensure adequate crisis preparedness in healthcare organisations and enable improved ways of working with acute care and planned care under regular circumstances.

The study was approved by the Swedish Ethical Review Authority (ref. 2020-04771), and participants provided informed consent. The study was conducted in compliance with the Helsinki Declaration.

2.2. Analysis of Free-Text Responses in the Survey. In the analysis, we draw on the Duchek [11] framework on organisational resilience and show how processes and practices relate to how the studied organisation responded to developments in its environment when facing a crisis. Figure 1 summarises the central stages and processes suggested by Duchek [11] (p. 224).

The analysis was an iterative process of interpretation and sense making that began with initial statements in the free-text responses. The first reading and the initial categorisation of statements in the free-text responses were marked using patterns and links in their descriptive content. The next step was done based on the chosen theoretical framework in search of themes to categorise organisational resilience and how the organisation responded to developments in their environments in the face of a crisis. Finally, an iterative analysis was performed of the data encoded in these categories, with examples and illustrative quotes of organisational resilience that combine a processual approach and a focus on resilience capabilities suggested by Duchek (see Figure 1).

3. Results

The findings revealed four important processual practices constructing organisational resilience capability during the crisis at a university hospital and a county hospital caring for COVID-19 patients: (1) problem-solving orientation; (2) cooperation, peer support, and trust; (3) organisational learning and knowledge acquisition; and (4) information and communication. Questionnaire statements from each theme are presented in Table 2 and in the subsequent thematic presentation of our results.

An analysis of the four processual practices from the conceptual framework suggested by Duchek [11] shows that the three different temporal stages merge, while the prioritised focus in the conceptualising of *organisational resilience capability* is on concurrent action and the ongoing dynamic between the four processual practices. Furthermore, the other two stages (the proactive stage and the reactive stage) become more important to conceptualise *organisational resilience capacity* building practices, i.e., what practices are of importance for preparing, reflecting, learning, and changing before and after a crisis.

The result shows a pattern of ambiguity and "polarised" experiences at the operational level, emphasising the importance of flexibility vs. structure, clear hierarchical information vs. spaces for peer learning through dialogue, focus on acute care vs. a determination to continue with core operations.

3.1. Problem-Solving Orientation. A recurring theme in the survey responses was how the crisis brought a problem-solving orientation to the forefront, while a focus on policies and organisational charts was pushed aside. Decisions were made on the floor, mostly concerning the core work of care, i.e., patient-related matters. Time was no longer exceedingly spent on administration, HR, finance, and reports. Instead, patient work took the centre stage. This supported the organisation.

In many statements, an action-oriented approach was articulated to speed up processes, favouring a slower and less efficient decision-making process where issues are discussed broadly and anchored within the organisation.

Table 1: Descriptive data of the participants in the qualitative study.

	Samples (N)	Percentages (%)
Participants		
Total	4097	100
Distribution by gender		
Female	3377	82
Male	678	17
Prefer not to say/missing	42	1
Distribution by age		
≤29	416	10
30–39	889	22
40–49	1016	25
50–59	1151	28
≥60	606	15
Missing	19	<1
Professional role		
Registered nurses (including specialist)	1337	33
Physicians (including specialists)	421	10
Assistant nurses (enrolled nurses, child care)	734	18
Healthcare professionals, other physiotherapist, occupational therapist, speech and language therapist, dietician, and biomedical analyst	447	11
Administrative staff, human resources	448	11
Manager	385	9
Other	259	6
Missing	66	2
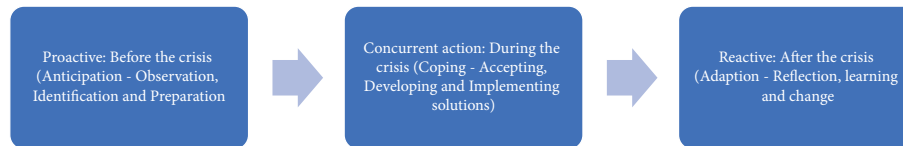
Figure 1: A capability-based conceptualisation of organisational resilience [11].

The strength of focusing on a common goal and getting things done in an otherwise slow organisation (administrator, e.g., economist, HR specialist, communicator, and IT administrator).

Collaboration transcending organisational and disciplinary boundaries was set against conventional organising, abiding by set boundaries and organisational schemes.

To stop looking at organisational units and look at the whole, and that we all help each other, has been fantastic (First-line manager).

Furthermore, a focus on core activities, such as prioritising caring for patients instead of meetings and other less pressing issues, can be seen as an outcome of the action orientation. This prioritisation contributed to the resilience of the organisation by ensuring that the patients were referred to the right service.

The right patients came to specialist care. Primary care patients were properly managed in primary care. More time for patient work, less time for appointments. It felt very good. Unfortunately, we are now seeing a return to more meeting time and less understanding from clinic management to focus on patients (Specialist doctor).

Many comments testified to an increased focus on core activities and that pressing matters were prioritised over presumably less important issues.

When the pandemic hit, hospital leaders, managers, and administrators/care developers suddenly agreed that it is healthcare we should be producing, instead of gossipy printed materials, exciting patient-oriented projects, improvement boards, X-matrices, and other drivel. Suddenly, the focus was on taking care of as many patients as possible and the money was rolling in (Specialist doctor).

3.2. Cooperation, Peer Support, and Trust. Also prominent in the survey responses was the perception that collaboration between clinicians had increased during COVID-19. Many respondents expressed that during the crisis, the organisation had become more collective, deviating from the individual focus that under more general conditions seemed to

TABLE 2: Depicting data-derived themes and questionnaire statements.

Themes	Questionnaire statements
Problem-solving orientation	"You had the opportunity to practice the core of your basic profession as the administrative bits were limited." "Positive: quick decisions and execution. Clarity towards the organisation and requirement for action where results were followed up in the near future." "I felt that I became clearer as a manager. . .easier to be clear when we don't have the luxury of taking into account all the personal nuances of the staff." "Unusually clear objectives for the business. Irrelevant work was pushed aside." "People stopped complaining about the usual, everyone focused on resolving/ making the best of the situation." "We worked on what was important, other things were scaled back; lessons for the future!"
Cooperation, peer support, and trust	"There has been a great willingness to collaborate across clinics and within clinics." "Cohesion in the clinic increased." "There was a very good sense of community among all staff and it felt like everyone was 'pitching in' and doing their best." "Good collegial cohesion and cooperation."
Organisational learning and knowledge acquisition	"What I see as generally positive is increased knowledge and an improved approach to patients with respiratory symptoms." "Increased insight, increased competence, increased understanding" "Developed in my professional role and knowledge" "Learned a tremendous amount about IVA work in a short time. Grew in my role."
Information flow and overflow	"Unclear information, different rules, and procedures in different activities." "Often mixed guidelines, protective equipment removed for healthcare workers because "it wasn't needed"-very strange that it then came to be needed anyway." "Negative: the flow of information which was at times unreasonably large, unsynchronised, and rushed as to what applied and for how long." "Lack of reliable information." "Unclear and changing guidelines."

dominate. In the observed case, decent work, organisational conditions, and organisational resilience were facilitated by a sense of community, collaboration, and collective efforts. The interrelatedness between the organisational levels was mainly depicted as enacted between organisational units and horizontal rather than vertical.

Positive That the Cooperation between the Different Units Has Been So Good (Specialist Doctor)

Managers viewed the increased cooperation between colleagues and professional groups within and between units as a positive aspect of the crisis. Both nurses and physicians expressed that working during the crisis has increased community and cohesion among staff.

The positive thing has been the sense of community with colleagues and that everyone did their best. You felt you were making a big contribution (Assistant nurse).

The sense of community was further emphasised as important for those employees who were moved between units, depending on needs and labour shortages.

You felt very welcome at your "new" workplace, and everyone was very grateful for your help. It was easy to feel like "one of the bunch," and everyone understood that you didn't know everything from the start (Specialist doctor).

Some managers stated that cooperation both improved and deteriorated and that it was difficult as a manager to support employees.

Cooperation improved at some levels and deteriorated at others. Difficult to support staff in the way that I am used to (First-line manager).

This was stated repeatedly:

The support from colleagues was positive. What was negative was the absence of support and guidance from senior managers (Specialist doctor).

However, the most prominent pattern among the managers' responses was their emphasis on the importance of the positive collaborative culture and a sense of community among healthcare professionals focusing on the needs of patients that emerged during the crisis.

It has been positive, with a sense of community and a hospital spirit (First-line manager).

The interrelatedness mainly concerned the staff on the same hierarchical level, internally between the staff in the units and across units.

3.3. Organisational Learning and Knowledge Acquisition.
Another common theme was that the crisis had brought about an increased focus on learning and gaining new insight, which according to the respondents had led to a knowledge boost within the organisation. Several managers emphasised that the staff's knowledge had increased significantly during the crisis.

Everyone wants to help, and the staff want to learn new things to provide the best care for patients (First-line manager).

Nurses and doctors emphasised the learning that occurred during the crisis and the importance of having access to specialist skills.

The positive thing has been the help we have received and the fact that colleagues from other units have come to the infection department. It was important that specialist expertise was available and that there was good cooperation with the Intensive Care Unit (ICU) and that the staff at the ICU were available. We have increased our skills in the department, and it has been a steep learning curve (Assistant nurse, ICU).

Some managers also highlighted the complexity of managing the crisis while simultaneously working on learning and knowledge enhancement related to all the new and rapidly changing knowledge about the virus. The focus was not on training new and inexperienced staff but on keeping up with the state of knowledge pertaining to the virus.

It is been hard to work extra and supervise new staff in the department on how to work according to hygiene procedures (Assistant nurse).

The action-oriented discourse present in the material was linked to collegiality and peer learning and associated with efficient problem solving and flexibility.

Our employees have increased their knowledge and have a lot of flexibility (First-line manager).

Positive and negative experiences were reported regarding the enforced flexibility, where staff had to be moved around. Some described having had to perform different tasks than what they were used to, which had been instructive. However, for some nurses, this meant a working environment characterised by considerable uncertainty while caring for the patients.

No training in what I was expected to do. Also had to work in a completely new workplace with completely new tasks, with no training (Specialist nurse).

Organisational resilience was strengthened by the commitment of staff to continually learn and expand their knowledge and to do their utmost to be flexible and adapt to the rapidly changing needs of the organisation.

3.4. Information and Communication. A fourth theme in the survey comments concerned access to accurate information. While previous themes largely focused on factors that facilitated resilience, information access and distribution frequently seemed to present barriers to decent work, sustainability, and organisational resilience. Overflow and unclear and ever-changing, contradictory information posed problems. Both insufficient information and information overload were described.

The information about COVID-19 was poorly available –too much and confusing./.../An infinite number of emails (Specialist doctor).

Respondents commented on the communication of information, specifically on how the distribution of information complicated the access to accurate and updated data and also created uncertainty regarding the information given. Several respondents depicted the distribution of information as inadequate. Having to distinguish between outdated and new information was mentioned as a problem.

There was too much unsorted information. When new findings come out, then send out only what is new, not what is new mixed with previous information, as it becomes hopeless to... (Specialist doctor).

The frequency of new information, often contradicting the previous instructions, was raised and linked to the ability to make informed decisions.

A lot of the information circulating at work became contradictory because there was so much new information coming in all the time (caregiver, paediatric nurse, healthcare assistant, etc.).

The reliability of information was also questioned when the right procedure one day could be deemed wrong the next day.

It has been difficult to keep up with certain routines as they could change several times; how to do certain things could be completely wrong in the next work shift (Assistant nurse).

A lot of the information abovementioned referred to hygiene practices and protective equipment; hence, it had bearing on the frontline workers' sense of safety and confidence in their ability to perform their tasks correctly.

Confusing when guidelines changed back and forth and when protective equipment changed (First-line manager).

4. Discussion

This study offers a more detailed understanding of the anticipation and learning processes experienced by HCWs during the COVID-19 pandemic [11]. In relation to individually focused scholarship on resilience within nursing management, this article contributes to studies on resilience by focusing on organisational processes and how resilience relates to practise within a specific healthcare organisation. Organisational practices can support and facilitate both individual and organisational resilience by creating favourable work conditions and environments. All the four empirical themes found — problem-solving orientation, cooperation, peer support, and trust, organisational learning and knowledge acquisition, and information and communication — have bearing on organisational resilience. Focusing on the concurrent action, mainly the development and implementation of coping strategies, *resilience capability* is central in managing an ongoing dynamic between different processual practices.

The need for swift action was underlined by the first theme of adopting a *problem-solving orientation.* This theme illustrated the ability to prioritise between tasks, focusing on core activities as being central to resilience capability in a crisis. The respondents' statements revealed that the crisis enabled the organisation to adopt a problem-solving and action-oriented mindset, through which the most pressing matters (care of patients) were prioritised over routines (anchoring work) and democratic decision-making processes. The action-oriented discourse present in the empirical material entailed the rewarding of "doers" and short decision-making processes over administrative work and staff polling. This theme mirrors previous studies linking the prioritisation of patient-related core activities to healthcare organisations' resilience in crisis [17].

The second theme — *cooperation, peer support, and trust* — demonstrated how the crisis brought about cooperation across professional and organisational boundaries, which, in turn, contributed to a better overview for those involved. A sense of community within and across professional and organisational boundaries is described as having facilitated operations and ensured flexibility. Uniting behind a common cause and striving towards a shared goal promoted resilience and constituted a counterforce in the face of exhaustion and mental breakdown of HCWs. A recurring comment was the common desire among staff to help solve problems and together make the best of the situation. Our findings support the previous studies emphasising a supportive culture and social setting to promote resilience and reduce stress and anxiety at work [9, 13–15].

The third theme — *organisational learning and knowledge acquisition* — shows how resilience capability is related to the degree to which an organisation, during a crisis, is receptive to and engages in learning. Gaining knowledge quickly is essential in a crisis where information is constantly being added and updated and the state of knowledge is

continuously increasing. When the crisis concerns a new condition, as during COVID-19, it is important that the organisation can absorb and incorporate new knowledge into its operations. The fourth theme illustrates how all themes are interrelated and overlapping. Knowledge acquisition is closely linked to the first theme's emphasis on access to information. Relationships and communication across professional and organisational boundaries, highlighted through the third theme, act as facilitators for knowledge acquisition to take place. This theme ties in with the previous research that has highlighted the ability to assimilate new knowledge and adapt to new circumstances as prerequisites for creating security and predictability in a crisis situation [18].

Finally, the fourth theme, *information and communication*, alludes to the importance for resilience capability of having access to sufficient and accurate, timely information. Rapid decision-making depends on a reliable flow of information, as decisions are made based on all information available at a given time. As rapid decision-making and action constitute prerequisites for operating in a crisis, clarity and timeliness in managing and disseminating information are pivotal for effective operations. Contradictory information and information that recipients could not trust were barriers to the development of resilience. This theme supports and follows up on previous findings demonstrating the importance of employee communication [20–23] and access to information and necessary resources [24–26] to resilience and perceived mandate to take action [27].

In this study, the focus on core activities, i.e., patient care, is brought forward as a facilitator for organisational resilience. This focus implies attention to frontline workers dealing with patients. Resilience becomes dependent on the organisation's ability to perceive and treat frontline staff as critical to successful operations.

The barriers to resilience in this study reflect the results of previous studies that identify adequate information and functioning communication as vital components of a supportive work environment [19, 25, 26].

The study illustrates the interplay between individual and organisational resilience for the ability to manage a crisis [10, 33]. The case articulates how the interrelatedness of individual efforts plays a central role in achieving a resilient organisation. In line with Labrague and Santos [5], this study highlights social support as social networks among colleagues at work as pivotal for an organisation's resilience. Organisational support, however, was not as noticeable. Specifically, noted issues that hindered resilience were poorly communicated information and limited support from management. Issues pertaining to communication and dissemination of information support the previous findings that emphasise functioning communications and clear directives for decent work conditions [28].

In this crisis, collegiality and peer learning appear to have presented an organisational response to the uncertain conditions. This is by no means a given response. An alternative response could have been to rely on routines, protocols, and regulations. The described crisis organisation prioritised core activities while casting aside less urgent and relevant matters.

This could be said to constitute a desirable approach also under more regular circumstances. One could argue that certain elements of organising during a crisis should not be confined to crisis management. The view of organising during a crisis can be compared to the shifting perception among organisational scholars of organising during change. The perception of change as a deviating occurrence has given way to a perception of change as the norm.

5. Conclusion

The study concludes that COVID-19 resulted in paradoxes, tensions, and new experiences in organisational processes and interactions in healthcare organisations. These create an opportunity for lessons learned, not only in times of crises but also for enabling improved ways of working in accomplishing both acute care and planned care. Furthermore, the conclusions of this study are threefold. First, *resilience capability* is characterised by managing an ongoing dynamic between four types of processual practices: (1) problem-solving orientation; (2) cooperation, peer support, and trust; (3) organisational learning and knowledge acquisition; and (4) information and communication. Second, *resilience capacity* includes three stages of processual practices. Third, *sustainable resilience practices* within nursing management involve a focus on the interaction between the individual, team, and organisational level.

6. Limitations and Implications for Nursing Management

By its focus and approach, the article addresses issues of organisational resilience under extraordinary circumstances such as a pandemic and complements the previous literature on nursing management that offer a more individually oriented perspective. A limitation of the study is that the qualitative data are limited to questionnaire statements in response to open-ended questions. The addition of interviews would mean richer material and provide a context useful for interpreting the statements.

Although the conclusion of this case study is transferable to other similar healthcare organisations, further studies in similar contexts would be of interest. More thorough studies of organisational resilience and organisational process practices, including the observations of their relations, could provide a more detailed understanding of the significance of enhancing nursing management during unexpected crises.

The findings of our study illustrate the importance of the collective and the social context for organisational resilience. In line with previous scholars (e.g., [15]), we, therefore, argue that focus should be on the collective responsibility for building a resilient culture rather than on individual leadership. Among our findings' practical implications for nursing management is the call for formal training to achieve resilience among staff [16, 34].

Data Availability

Access to data is restricted. However, data are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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Research Article

Safety Behavior and Transition Shock among Newly Graduated Nurses: The Mediating Role of Feedback-Seeking Behavior

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Aim. To determine the relationship between transition shock and safety behavior among newly graduated nurses (NGNs) and explore the mediating role of feedback-seeking behavior. *Background*. The safety behavior of NGNs plays a vital role in improving patient safety in clinical situations. The direct effect of the transition shock experienced by these nurses on safety behavior remains limited, and little is known about the mediating effect of feedback-seeking behavior. *Methods*. A descriptive correlational research design was conducted with a cross-sectional sample of nurses in China using an online survey. A convenience sample of 575 nurses from 17 hospitals completed the questionnaires. Correlation analysis and structural equation modeling were used to examine the hypotheses. *Results*. The sampled NGNs' safety behavior score was 55.35 ± 5.46. Their transition shock was negatively associated with safety behavior ($\beta = -0.225$, $p < 0.001$). In contrast, feedback-seeking behavior was positively related to safety behavior ($\beta = 0.502$, $p < 0.001$). The feedback-seeking behavior partially mediated the relationship between transition shock and safety behavior, and the mediating effect was 58.29%. *Conclusions*. The results emphasized that the relationship between NGNs' transition shock and safety behavior is mediated by feedback-seeking behavior. *Implications for Nursing Management*. Interventions focusing on transition shock relief could help improve NGNs' safety behavior. This study highlights the importance of encouraging feedback-seeking behavior to improve patient safety outcomes, especially for junior nurses. It can therefore be assumed that the nursing managers' training of NGNs in special skills, such as feedback-seeking, may be conducive to their positive coping and contribute to forming safety behaviors.

1. Introduction

Patient safety is a fundamental priority of global healthcare systems. However, delivery of safe care remains one of the greatest challenges in clinical practice [1].

Nursing-related adverse medical events accounted for approximately 40% of these incidents [2]. Therefore, practicing appropriate safety behavior is vital for nurses in ensuring that patients' safety goals are realized. Safety behavior refers to a series of actions conducted by nurses in their work to protect patients from harm or promote patient safety [3]. There remain obstacles to nurses' implementation of appropriate safety behavior such as poorly staffed hospitals, lack of appropriate nurse engagement, ineffective leadership, and burnout that can negatively impact nurses' safety behavior [4, 5]. Most studies to date have focused on the nursing population as a whole, and there has been less research conducted on specific groups [6, 7]. However, the

times of new staff inductions accounted for more preventable errors than at other times of the year [2, 8].

Newly graduated nurses (NGNs) are defined as those with between 0 and 24 months of work/clinical experience according to the Royal College of Nursing (RCN) [9] or those within three years of graduation [10]. NGNs comprise an increasing proportion of nursing staff today, which may be a response to both concerns about critical shortages [11] and nurses' high turnover intentions [12]. The ability of NGNs to positively influence patient outcomes may be hampered by their unskilled techniques and limited clinical experience [13]. Furthermore, NGNs often show different intentions regarding the promotion of medication safety and attitudes towards medication management, which may be attributed to differences in education currently provided at the undergraduate level [14]. It is imperative that NGNs are equipped with the clinical competence and experience necessary to prevent poor patient outcomes. For nursing managers, understanding the influencing mechanism of NGNs' safety behavior is essential. This is also the basis to explore new paths to improve their safety behavior and promote the intervention development aimed at reducing the incidence of adverse events.

NGN transition has been at the forefront of nursing research in recent years, as the competence of NGNs has been questioned, along with the observed latent relationship between NGNs and a high rate of adverse patient events. According to Duchscher's transition shock model, transition shock emerges when nurses move from the known role of students to the less familiar role of professional nurses [15]. For NGNs, the transition to practice is a highly turbulent time that brings continued challenges. During this time, they are vulnerable newcomers who require understanding and support from their more experienced colleagues [16]. The sudden responsibility imposed on NGNs as registered nurses can make them feel overwhelmed, stressed, and diminished in confidence [17, 18]. To address some of these difficulties experienced, the transition shock model proposes that enhancing NGN's transition to practice through targeted education can help to improve patient safety [19].

Feedback-seeking behavior is defined as the conscious devotion of effort towards determining the correctness and adequacy of one's behavior to attain valued goals [20]. Employees could become proactive by seeking feedback in the socialization process, adopting norms, and manifesting appropriate behavior accepted in the organization [21]. Research on transition shock mainly focused on employees, medical students, and interns [21–23]. However, the evidence of new nurses' feedback-seeking behavior is limited. Thus, it is necessary to explore the feedback-seeking behavior of new nurses, which may provide a new perspective for nursing management.

In recent studies, nurses' transition shock has been negatively linked to feedback-seeking behavior [22]. Previous studies have reported that feedback has a synergistic influence on safety-related behavior changes and can be used as a cogent tool in safety incentive systems [23]. Feedback was also suggested as an important factor

in supporting positive transition for NGNs [24]. A qualitative study reported that seeking feedback could help NGNs obtain positive experiences and facilitate a successful transition [16]. Prior studies focused less on new nurses. For the mediating effect of feedback-seeking behavior on the relationship between transition shock and patient safety, research remains scarce. According to the COM-B (Capability, Opportunity, Motivation, Behavior) framework developed by Michie [25], to perform a specific behavior, individuals must be physically and psychologically capable (C) of possessing adequate skills and knowledge, have opportunities (O) that enable or prompt the behavior, and also have reflective or automatic motivation (M) . In this study, we hypothesized that except for motivation (M), transition shock (C) and feedback-seeking (O) would both play important roles in the endorsement of safety behavior (B). Hence, we hypothesized that (1) NGNs' transition shock is negatively related to safety behavior; (2) feedback-seeking behavior is positively linked to safety behavior; and (3) feedback-seeking behavior serves to mediate the association between transition shock and safety behavior.

2. Methods

2.1. Design. A multicenter cross-sectional research study was conducted.

2.2. Sample. The NGNs that participated in the study were selected by convenience sampling on October 10, 2022. The inclusion criteria were as follows: (a) being a full-time registered nurse, (b) holding either a permanent or contracted role, (c) being formally employed in either a private or public clinical unit, (d) having no more than three years of work experience, and (e) being willing to participate. Nurses who were absent from work because of illness or personal leave were excluded.

The minimum sample size was calculated using the PASS program (version 11.0), which indicated that a sample size of 154 achieved 90% power to detect an R-Squared value of 0.10, which was attributed to five independent variables using an F-test with a significance level (alpha) of 0.05 [26]. Considering the nonresponses of the target sample and missing data, the calculated sample size was 200. However, it was difficult to estimate the total number of NGNs who received the survey link, as the link was disseminated by administrators working in the nursing departments of each hospital. The final sample size was 600. A total of 575 valid questionnaires were used for data analysis, with an effective response rate of 95.83%.

2.3. Procedure. The online survey was conducted using Wenjuanxing (http://www.wjx.cn), the largest domestic online survey platform in China. The researchers compiled a standardized set of instructions, including information on the purpose and significance of the study. Electronic questionnaires with formatted instructions were sent using WeChat groups to participants who met the inclusion

criteria. All survey items were answered before submission to ensure the effectiveness of the data collection. A total of 600 NGNs in 17 hospitals participated in this study.

2.4. Instruments

2.4.1. General Demographic Questionnaire. The participants' demographic data were collected using a general demographic questionnaire, which included gender, age, ethnicity, employment type, educational level, marital status, prior working experience, whether they were parents, whether their parents were medical workers, the average number of night shifts worked per month, whether they were independent on duty, and their level of participation in systematic patient safety training.

2.4.2. Nurse Safety Behavior Questionnaire. The Nurse Safety Behavior Questionnaire (NSBQ) was used to calculate the NGNs' safety behavior level. Shih designed the questionnaire [3] and Rong translated it into Chinese [27]. This questionnaire has been widely used to investigate nurses' work performance in relation to avoiding patient harm and improving patient safety. The NSBQ consists of 12 items in total, and a 5-point Likert scale is used to calculate the total score. Responses for this study were measured on a scale ranging from 1 (never) to 5 (always). Higher scores indicated better nurses' performance regarding patient safety behavior. The revised Chinese version of the NSBQ questionnaire has shown good reliability and validity, with a Cronbach's α of 0.931 in newly recruited nurses [27]. In this study, Cronbach's α was 0.894.

2.4.3. Feedback-Seeking Behavior Scale. The Feedback-Seeking Behavior Scale (FSBS) was developed by Callister et al. [28]. The FSBS is an 11-item scale divided into four dimensions of feedback-seeking behavior: leader inquiry (two items), leader observation (two items), colleague observation (three items), and colleague inquiry (four items). For this study, the items were evaluated on a 7-point scale ranging from 1 (completely inconsistent) to 7 (completely consistent), with higher scores indicating better feedback-seeking behavior. The FSBS was previously translated into Chinese and used for a survey on the feedback-seeking behavior of employees in Chinese enterprises, and its Cronbach's α was 0.890 [29]. Cronbach's α of the scale in this study was 0.961, and was respectively, 0.940, 0.896, 0.954, and 0.940 for each dimension.

2.4.4. Transition Shock of Newly Graduated Nurses Scale. Xue developed the Transition Shock of Newly Graduated Nurses Scale (TSNGNS) based on Duchscher's transition shock theory [30]. This scale consists of 27 items and is scored on a 5-point Likert scale (ranging from 1 = totally disagree to 5 = totally agree). This scale is grouped into four subscales: physical (six items), emotional (eight items), knowledge and skills (five items), and sociocultural and developmental (eight items). Higher scores indicate

a stronger transition shock. Content validity was tested, and the item content validity indices all exceeded 0.86. The reported Cronbach's α coefficients varied from 0.86 to 0.94 [30]. Cronbach's α of the scale was 0.974, and was respectively, 0.929, 0.931, 0.910, and 0.947 for each dimension in the present study.

2.5. Statistical Analysis. Data were analyzed using IBM SPSS Statistics (version 26) and IBM SPSS AMOS (version 26). Categorical data, such as demographic data, were presented as frequencies and percentages. Continuous variables with normal distribution were expressed as mean ± standard deviations (M ± SD). An independent sample t-test and one-way ANOVA were used to compare the differences in safety behavior, transition shock, and feedback-seeking behavior according to each of the recorded demographic characteristics. Post hoc comparisons were performed for statistically significant associations using the Bonferroni test. Pearson's correlation analysis was used to determine the correlationsamong the three major variables. Regression analysis were conducted to estimate the direct effect of transition shock on nurses' safety behavior. Structural equation modeling with the advantage of dealing with relationships between multiple variables and distinguishing indirect effects from direct effects was chosen to examine the indirect effect of feedback-seeking behavior among NGNs.

2.6. Ethical Considerations. The Ethics Review Committee of the Affiliated Hospital of Qingdao University approved this study (Approval No. QDFYWZLL27973). After receiving approval from each of the hospitals involved in this study, online questionnaires were sent to the study participants along with informed consent forms. Their agreement to participate was asserted by choosing the "I agree" option ahead of filling in the questionnaires, which ensured that all respondents fully agreed to participate in this survey. Participants were assured that the questionnaires were collected anonymously, and that all individual information was strictly confidential. All methods were performed in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) statement.

3. Results

3.1. Characteristics of Participants. Table 1 summarizes respondents' recorded characteristics. A total of 575 nurses, 461 females (80.2%) and 114 males (19.8%), participated in this study. The mean age of the participants was 23.94 ± 2.00 years. Participants were predominantly unmarried (89.0%) and had no children (95.5%). A total of 272 (47.3%) of the nurses surveyed had a bachelor's degree, 75% had worked for <2 years, and most (81.2%) were independent on duty. The proportion of temporary nurses was eight times more than that of permanent employment nurses (88.9% vs. 11.1%). Most respondents (80.5%) had participated in systematic patient safety training.

TABLE 1: Participants' demographics and differences in study variables ($N = 575$).

Characteristics	Category	No. (%)	Safety behavior			Transition shock			Feedback-seeking behavior		
			M ± SD	t/F	p	M ± SD	t/F	p	M ± SD	t/F	p
Gender	Female	461 (80.2)	55.20 ± 5.37	-1.38[a]	0.168	59.32 ± 19.21	-0.89[a]	0.373	62.52 ± 12.56	-0.67[a]	0.506
	Male	114 (19.8)	55.98 ± 5.80			61.21 ± 24.05			63.40 ± 12.82		
Ethnicity	Han	549 (95.5)	55.36 ± 5.48	0.15[a]	0.879	59.32 ± 20.30	-2.01[a]	0.045*	62.76 ± 12.70	0.58[a]	0.565
	Other	26 (4.5)	55.19 ± 5.18			67.46 ± 18.00			61.30 ± 10.48		
Only child	Yes	161 (28.0)	55.43 ± 5.34	-0.23[a]	0.819	59.21 ± 21.35	0.35[a]	0.723	63.80 ± 12.33	-1.31[a]	0.191
	No	414 (72.0)	55.32 ± 5.51			59.88 ± 19.83			62.27 ± 12.70		
Employment types	Temporary	511 (88.9)	55.58 ± 5.41	2.90[a]	0.004**	58.81 ± 20.10	-2.97[a]	0.003**	62.97 ± 12.65	1.48[a]	0.139
	Permanent	64 (11.1)	53.50 ± 5.56			66.72 ± 20.29			60.50 ± 12.10		
Educational level	Junior college	284 (49.4)	56.22 ± 4.48	11.21[b]	<0.001**	57.18 ± 21.32	4.41[b]	0.013*	64.69 ± 12.21	7.13[b]	0.001**
	Bachelor	272 (47.3)	54.73 ± 6.03			62.04 ± 19.07			60.75 ± 12.73		
	Master or above	19 (3.3)	51.21 ± 7.18			63.55 ± 16.05			60.84 ± 12.67		
Marital status	Married	63 (11.0)	55.94 ± 4.35	-0.90[a]	0.368	62.02 ± 21.30	-0.97[a]	0.334	64.51 ± 10.66	-1.21[a]	0.228
	Unmarried	512 (89.0)	55.28 ± 5.58			59.41 ± 20.12			62.48 ± 12.81		
Have child	None	549 (95.5)	55.28 ± 5.54	-2.23[a]	0.029*	59.38 ± 20.02	-1.73[a]	0.084	62.47 ± 12.68	-2.52[a]	0.017*
	Have	26 (4.5)	56.85 ± 3.27			66.41 ± 24.16			67.54 ± 9.86		
Working experience (months)	≤6	48 (8.3)	54.60 ± 6.18	2.77[b]	0.041*	61.90 ± 22.24	1.57[b]	0.195	62.75 ± 11.72	0.96[b]	0.409
	7–12	200 (34.8)	55.38 ± 5.49			57.17 ± 19.35			62.78 ± 12.64		
	13–24	183 (31.8)	56.38 ± 4.37			59.90 ± 22.23			64.01 ± 12.86		
	25–36	144 (25.0)	54.77 ± 5.87			61.32 ± 18.95			61.67 ± 12.58		
Parents are medical workers	Yes	19 (3.3)	57.32 ± 4.22	-1.60[a]	0.111	49.71 ± 20.34	2.19[a]	0.029*	66.74 ± 13.12	-1.42[a]	0.156
	No	556 (96.7)	55.28 ± 5.49			60.03 ± 20.18			62.56 ± 12.57		
Night shifts (per month)	0	102 (17.7)	55.45 ± 5.78	3.41[b]	0.017*	54.82 ± 12.45	3.41[b]	0.017*	63.56 ± 12.18	3.93[b]	0.009**
	1–2	46 (8.0)	55.28 ± 5.00			63.04 ± 20.84			62.74 ± 12.02		
	3–4	150 (26.1)	56.47 ± 4.54			58.48 ± 22.36			65.24 ± 11.56		
	≥5	277 (48.2)	54.72 ± 5.78			61.59 ± 19.31			61.00 ± 13.18		
Independent on duty	Yes	467 (81.2)	55.39 ± 5.14	0.33[a]	0.741	60.18 ± 20.37	1.21[a]	0.226	62.71 ± 12.65	0.04[a]	0.970
	No	108 (18.8)	55.19 ± 6.68			57.56 ± 19.68			62.66 ± 2.45		
Systematic safety training	Yes	463 (80.5)	56.25 ± 4.41	6.30[a]	<0.001**	58.55 ± 20.76	-3.10[a]	0.002**	64.39 ± 11.55	5.98[a]	<0.001**
	No	112 (19.5)	51.63 ± 7.46			64.43 ± 17.32			55.70 ± 14.31		

On an 8-hour basis, the 12 h night shift refers to 1.5 night shifts. *$p < 0.05$; **$p < 0.01$. [a] t-test for the independent group; [b] one-way ANOVA.

3.2. Score of NGNs' Safety Behavior, Transition Shock, and Feedback-Seeking Behavior. Table 2 shows the descriptive statistics of the variables and the normality test results. The normality test results for the latent variable factors were verified using skewness and kurtosis. According to the standard proposed by Klein [31], the data recorded meet the criteria for an approximate normal distribution. The absolute values of the skewness coefficient and kurtosis coefficient were three and within eight, respectively.

The mean score of NGNs' safety behavior was 55.35 ± 5.46. The mean score of the transition shock scale was 3.01 ± 1.01, with the physical aspect scoring highest and social culture and development lowest. For the feedback-seeking behavior, the average score was 62.70 ± 12.60. The order of the four dimensions according to their score from high to low was as follows: colleague observation, leader observation, colleague inquiry, and leader inquiry.

3.3. Comparison of NGNs' Safety Behavior, Transition Shock, and Feedback-Seeking Behavior with Different Demographic Characteristics. The results of the *t*-test and ANOVA showed that employment type, educational level, whether the respondents have child or not, hospital working experience, average number of night shifts per month, and participation in systematic patient safety training significantly impacted NGNs' safety behavior. In the post hoc comparison, junior NGNs showed the highest level of safety behavior compared to bachelors (mean difference: 1.490; $p = 0.003$; Cohen's effect $d = 0.28$) and master's degree or above (mean difference: 5.011; $p < 0.001$; Cohen's effect $d = 0.84$). NGNs who worked for 25–36 months showed lower safety behavior compared to those who worked for 13–24 months (mean difference: 1.605; $p = 0.043$; Cohen's effect $d = 0.31$). Those who had 5 night shifts per month showed lower safety behavior compared to those with 3-4 night shifts per month (mean difference: 1.755; $p = 0.009$; Cohen's effect $d = 0.34$).

Employment type, educational level, average number of night shifts per month, and participation in systematic patient safety training significantly influenced the transition shock experienced by NGNs ($p < 0.05$). NGNs with a bachelor's degree showed higher transition shock compared to juniors (mean difference: 4.862; $p = 0.014$; Cohen's effect $d = 0.24$). Those with ≥ 5 night shifts per month showed higher transition shock compared to their counterparts without night shift (mean difference: 6.764; $p = 0.023$; Cohen's effect $d = 0.42$).

Furthermore, educational level, parental status, average number of night shifts per month, and participation in systematic patient safety training also had a meaningful impact on NGNs' feedback-seeking behavior. NGNs with bachelor's degree showed higher feedback-seeking behavior compared to juniors (mean difference: 3.933; $p = 0.001$; Cohen's effect $d = 0.32$). Those who worked ≥5 night shifts per month showed lower feedback-seeking behavior compared to those with 3-4 night shifts per month (mean difference: 4.240; $p = 0.005$; Cohen's effect $d = 0.34$). The details are presented in Table 1.

3.4. Correlations between Variables. The correlations between the latent variables were analyzed using Pearson's correlation coefficient analysis (Table 2). The transition shock experienced by NGNs was negatively and significantly related to their feedback-seeking behavior ($r = -0.195$, $p < 0.01$) and safety behavior ($r = -0.223$, $p < 0.01$). Additionally, NGNs' feedback-seeking behavior had a positive relationship with their safety behavior ($r = 0.502$, $p < 0.01$).

3.5. Results of the Structural Equation Model. First, a confirmatory factor analysis was conducted to identify how well the observed variables represented the latent variables in this study. The standardization factors of all constructs were shown to be higher than the recommended value of 0.7 [31] and the *t* value was at least 1.96, indicating that the construct validity of the scales was supported. The Average Variance Extracted (AVE) values were >0.5, and construct reliability CR values were >0.7, which indicated that the measurement tool had good convergent validity [32] (Table 3).

The fitness analysis of the theoretical model showed that it proved a satisfactory fit (CMIN/DF(χ^2/df) = 2.275 < 3, GFI = 0.982 > 0.9, AGFI = 0.961 > 0.9, RSMSEA = 0.047 < 0.05, IFI = 0.993 > 0.9, NNFI = 0.942 > 0.9, CFI = 0.993 > 0.9).

The standardization path coefficient and *t* values of the structural equation model were verified to determine whether there were direct or indirect relationships between the variables (Table 4). Figure 1 shows the pathways between the variables in the nurses' safety behavior model. The NGNs' transition shock was negatively associated with feedback-seeking behavior ($\beta = -0.170$, $p < 0.001$). Their feedback-seeking behavior was positively associated with safety behavior ($\beta = 0.447$, $p < 0.001$). Meanwhile, the NGNs' transition shock had a direct effect on the nurse safety behavior model ($\beta = -0.140$, $p < 0.001$). In the bootstrapping test, the 2,000 bootstrapping resamples revealed that the 95% CI recorded for the indirect effect of transition shock on safety behavior through feedback-seeking behavior did not include zero (-0.808/-0.274), indicating that the indirect effect was significant. Therefore, these findings indicate that NGNs' feedback-seeking behavior acted as a mediator in the relationship between their transition shock and safety behaviors.

4. Discussion

This study investigated the influence of transition shock on NGNs' safety behavior and determined the mediating role of feedback-seeking behavior between safety behavior and transition shock.

The NGNs who participated in this study exhibited a level of safety behavior consistent with previous research conducted in this field [33]. As shown in the results, the average score of NGNs' safety behavior was 55.35 ± 5.46, which was also similar to that of 454 newly recruited nurses in Shandong Province with <2 years of work experience (56.56 ± 5.19) [33]. The reasons may be the high similarity of participants; both studies involved NGNs who had worked

Table 2: Scores of safety behavior, transition shock, and feedback-seeking behavior and correlations ($N = 575$).

Latent variable	Observed variable	M ± SD	Min/max	Feedback-seeking behavior	Safety behavior
Safety behavior		55.35 ± 5.46	11.00/77.00		1
Transition shock		3.01 ± 1.01	1.00/5.00	−0.195**	−0.223**
	Physical	3.39 ± 1.13	1.00/5.00		
	Emotional	3.02 ± 1.07	1.00/5.00		
	Knowledge and skills	2.99 ± 1.09	1.00/5.00		
	Sociocultural and developmental	2.64 ± 1.14	1.00/5.00		
Feedback-seeking behavior		62.70 ± 12.60	11.00/77.00	1	0.502**
	Leader observation	5.86 ± 1.10	1.00/7.00		
	Leader inquiry	5.28 ± 1.64	1.00/7.00		
	Colleague observation	5.94 ± 1.07	1.00/7.00		
	Colleague inquiry	5.65 ± 1.31	1.00/7.00		

** $p < 0.001$.

Table 3: Confirmatory factor analysis of the measurement model.

Latent variable	Observed variable	B	β	SE	t value	AVE	CR
NGNs' transition shock						0.76	0.93
⟶	Physical	1.00	0.78				
	Emotional	1.11	0.91	0.04	27.73**		
	Knowledge and skills	1.13	0.91	0.05	23.76**		
	Sociocultural and developmental	1.16	0.90	0.05	23.41**		
Feedback-seeking behavior						0.76	0.93
⟶	Leader observation	1.00	0.93				
	Leader inquiry	1.22	0.76	0.05	22.59**		
	Colleague observation	0.90	0.86	0.03	27.36**		
	Colleague inquiry	1.19	0.93	0.04	27.50**		

** $p < 0.001$.

for less than two or three years. NGNs' work experience was significantly related to their safety behavior, which concurred with that of Chu et al. [34]. The longer the employment duration, the better the safety behavior recorded ($t = 3.560$, $p = 0.015$) [34]. Adverse events may occur because of the incompetency of individual healthcare professionals with limited experience in ensuring patient safety, inadequate skills, or knowledge, or because of untargeted training programs, resulting in poor safety behavior [34–36]. Compared with senior nurses with rich experience and long working time, the safety behavior of NGNs needs to be improved. An implication of this finding is the possibility that attending the systematic patient safety behavior training may improve NGNs' professional competence and reduce the incidence of adverse events.

The transition to practice is a key learning period that sets new nurses on the path to becoming expert practitioners [10]. During this process, NGNs face immense physical and psychological shock owing to their unfamiliarity with clinical work [37]. The one-way ANOVA results showed that the average number of night shifts per month was one of the main factors that influenced the transition shock levels of NGNs. This finding is consistent with the results obtained by Zhang et al. [38]. Night-shift work is related to sleep deprivation and physical and psychological burnout, which could in turn aggravate the transition impact [38, 39]. Night-shift work is also associated with an increased prevalence of mood disorders [40]. Furthermore, labile emotions were

constantly expressed by NGNs during the initial transition stage [15] and were found to be closely related to nurses' transition shock [39, 41]. This raises the possibility that delaying of the start to night shift or reducing its frequency may allow NGNs to adapt to the new working environment and reduce the degree of physical and psychological burnout. Meanwhile, nursing managers need to pay attention to NGNs' emotional status and recommend necessary psychological counseling to reduce the accumulation of their negative emotions. Of a possible mean value of five, our results also showed that newly graduated nurses experienced moderate transition shock (3.01 ± 1.01). The higher the NGNs' educational level, the higher the transition shock. Analysis showed that the higher the nurses' educational levels, the higher their individual requirements and the stronger their sense of achievement. The mismatch between the expectations of professional practice and the reality experienced leads to a lack of confidence in the ability to work independently and the inability to continuously deal with many tasks simultaneously [37–39]. This indicates that nursing management needs to focus on NGNs with higher educational levels , and pay attention to theirself-regulating and environmental support. Participating in systematic patient safety training was another important factor that influenced not only NGNs' level of transition shock but also affected their feedback-seeking and safety behavior in this study. Having less work experience may cause a lack of safety consciousness among NGNs [42]. Thus, safety training and

TABLE 4: Path analysis between variables of the study model.

Path	β	SE	t value	p	95% CI
Transition shock to feedback-seeking behavior	−0.170	0.051	−3.868	<0.001	−0.305/−0.098
Feedback-seeking behavior to safety behavior	0.477	0.205	12.37	<0.001	1.935/3.332
Direct effect of transition shock on safety behavior	−0.140	0.236	−3.693	<0.001	−1.437/−0.238
Indirect effect of transition shock on safety behavior	−0.502			<0.001	−0.808/−0.274
Total effect	−1.373			<0.001	−0.808/−0.275

efforts to increase professional knowledge may be undertaken to improve NGNs' comprehensive abilities.

The transition shock experienced by NGNs directly and negatively affected feedback-seeking behavior [22, 43]. A reasonable explanation may be that junior nurses (nurses with <5 years of clinical nursing experience) have worked for longer than NGNs, meaning they are more familiar with the work itself, have less stress, and tend to choose positive and active coping styles. Hence, there is a need for nursing managers to encourage new nurses to adopt more feedback-seeking behavior through relevant training and the cultivation of a feedback-exchange culture in hospitals. Previous studies also have confirmed that reducing transition shock enables young nurses to find a better balance in their work life and achieve better physical, psychological, and social health [44, 45], which could in turn enhance their initiative to seek feedback from the workplace. Previous findings from qualitative content analysis have reported the importance of regular feedback conversations in improving NGNs' correct clinical behavior [16]. Therefore, we infer that supportive feedback-seeking cultures may be maintained by enhancing transition facilitation programs for NGNs.

NGNs have previously identified deficiencies in the work environment as a major source of frustration during this transition [46]. Their transition shock was a direct, significant predictor of safety behavior, indicating that NGNs who experienced less reality shock in the transition phase were more competent in avoiding patient harm and improving patient safety. This study's results also support those of Hampton, who argued that the transition shock experienced by NGNs has a significant influence on missed nursing care, adverse events, and perceived quality of care [47]. Novice nurses who were not prepared for the inconsistencies that occur between academic training and professional nursing practices experienced significant internal conflict [48]. This mismatch has long been linked to negative nursing and patient outcomes [49]. To increase NGNs' ability to cope with the shock of transition, medical institutions may be required to accommodate an evolving program of mentorship, utilizing qualified nurse preceptors and experienced nurses.

Previous research has shown that feedback provision can ensure nurses' adherence to patient-safety principles [50]. This finding broadly supports the work of other studies in this area linking NGNs' feedback-seeking with their safety behavior at work. A systematic review summarized that nurses actively seeking regular practical feedback processes, interaction opportunities, and observation of peers and senior colleagues could improve their adherence to patient safety principles [51]. It is therefore likely that encouraging

newcomers' feedback-seeking through special orientation programs, social events, and mentoring could reduce the probability of nursing error events for NGNs and enhance the effectiveness of interventions for safety and care quality. Improving nurses' patient safety behavior is an essential component of quality of care [52]. Nurses' positive safety behavior is strongly associated with a reduction in the key patient outcomes of falls, medication errors, pressure injuries, and healthcare-associated infections [53]. In line with our hypotheses, we found that feedback-seeking behavior acted as a partial mediator in the relationship between NGNs' transition shock and safety behavior. Previous studies focused more on a single variable, such as the impact of transition shock or feedback-seeking on nurses' safety behavior. This study is the first to reveal that reducing NGNs' transition shock and ensuring their smoother integration into the nursing workforce may increase the level of feedback-seeking behavior among nurses, which in turn motivates NGNs to engage in more safety behavior in practice. These provide further support for the hypotheses that pre-job orientation programs, through including knowledge about professional role transition, proposing preceptorship and peer support initiatives, and providing individualized transitional psychological counseling and feedback-seeking skills for NGNs, may benefit their safety behavior. These measures could establish a harmonious workplace culture and climate for NGNs and ultimately decrease the level of emotional, physical, sociocultural, developmental, and intellectual shock they experience.

4.1. Limitations. This study has several limitations. First, it adopted a cross-sectional research design, which could not provide cause-and-effect explanations. Thus, longitudinal studies examining NGNs' transition shock, feedback-seeking behavior, and safety behavior are recommended. Second, data were collected from 17 hospitals in China. This location and sample range may be regarded as too geographically limited for broad generalization. A further study with more focus on improving the generalization of the sample population and locations is therefore suggested. Third, we used convenience sampling and adopted self-reported measurements, which may have increased social desirability bias. Finally, this study investigated only feedback-seeking behavior as a mediator between NGNs' transition shock and safety behavior. Other mediators such as organizational support, safety knowledge and motivation, psychological capital, and perception of patient safety culture should be explored in future studies.
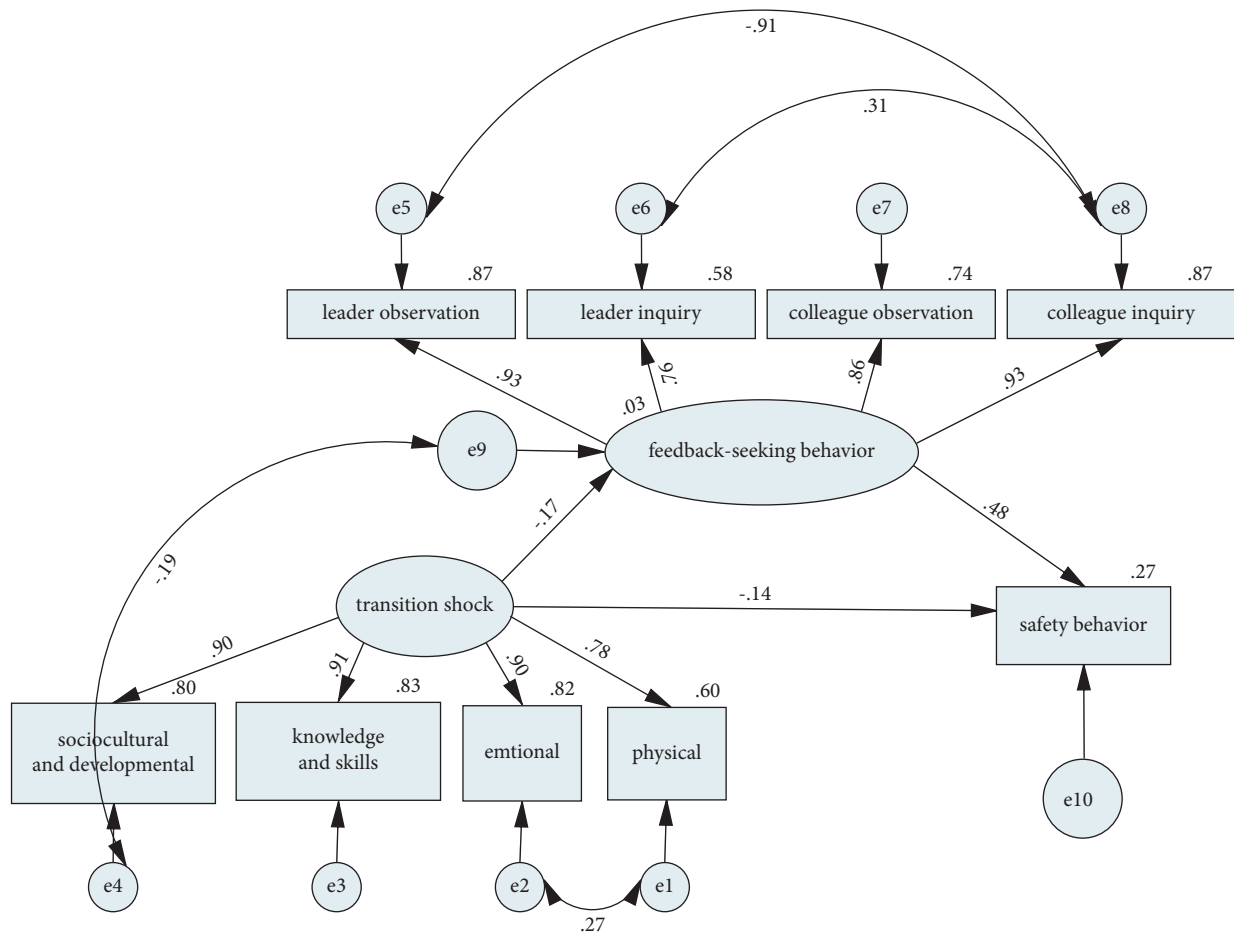
Figure 1: Path diagram of the NGNS' safety behavior model (standardized regression coefficients).

5. Conclusions

This study provides additional support for the hypotheses that NGNs' transition shock is negatively associated with safety behavior, and that feedback-seeking behavior is positively associated with NGNs' safety behavior. Transition shock indirectly affects NGNs' safety behavior through the mediating effect of feedback-seeking behavior. Management of NGNs' transition shock is essential to enhancing NGNs' feedback-seeking behavior, which ultimately promotes their safety behavior in clinical practice.

6. Implications for Nursing Management

Transition shock and feedback-seeking behavior are two vital variables that influence NGNs' safety behavior in practice. Our findings indicate that a successful transition from student to clinical nursing roles would make NGNs feel a less oppressive hierarchy among nursing staff and enhance their willingness to seek constructive feedback, which could in turn improve their overall safety behavior. This provides a new clue for nursing managers to improve the safety behavior of new nurses. For nursing managers, it is also important to take cluster measures to reduce the transition shock of new nurses. Futhermore, the corresponding

measures to improve their feedback-seeking behavior not only help reduce the level of transition shock but also help new nurses to improve safety behavior. Therefore, compared to reducing their transition shock alone, this may significantly improve the safety behavior of new nurses.

Data Availability

The data used to support the findings of this study are available from the corresponding authors upon reasonable request.

Ethical Approval

This study was approved by the Committee on Medical Ethics of the Affiliated Hospital of Qingdao University (No. QDFYWZLL27973).

Disclosure

Yan Zhang and Xilin Yu are co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Yan Zhang, Lili Wei, and Qiaofeng Wei were responsible for study design. Xiaohong Lu, Yalin Tang, Wenbin Jiang, and Qiaofeng Wei were responsible for data collection. Xilin Yu was responsible for data analysis. Yan Zhang, Xilin Yu, and Lili Wei were responsible for manuscript writing and revisions.

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Research Article

A Safety Huddle Intervention in In-Patient Surgical Units: A Mixed-Methods Study

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Open communication about patient safety concerns is necessary to enable a learning environment where lessons can be learned to improve patient safety, but nurses often hesitate to speak up even in situations where their patients may be at risk. One way to create a safe environment for speaking up is through the use of unit-level daily huddles. This study aimed to assess the effects of a 12-week huddle intervention on nine unit, nurse and patient care outcomes and describe nurses' experiences with the intervention. We used a single group, pre- and post-test mixed-methods design, with a dominant quantitative thread, and a final sample of 89 staff nurses. The intervention was conducted in four surgical units in a tertiary teaching hospital in Seoul, Korea. The intervention included two educational workshops for huddle leaders, two workshops for staff nurses, and 12-week huddles with coaching visits. We collected quantitative data on nine outcomes using online surveys before and after the intervention and qualitative data on nurse experiences of the intervention after the intervention. Paired *t*-tests were used for quantitative data analysis, and content analysis was used for qualitative data. We examined four unit-level outcomes (organizational learning, situation monitoring, mutual support, and speaking-up climate), three nurse-level outcomes (promotive and prohibitive voice behaviors and job satisfaction), and two patient care outcomes (patient safety and quality of care). Significant improvements were found in six of the nine outcomes. Findings from the qualitative data confirmed the benefits of the intervention but also identified challenges to huddle participation. Patient safety huddles can contribute to a learning environment by flattening hierarchies and encouraging nurses to speak up regarding safety issues. Leadership is a key in role modelling and creating the foundation for a more collaborative patient safety culture in healthcare organizations, for example, through the use of daily huddles.

1. Introduction

Although efforts have been made to enhance patient safety in healthcare over the last two decades, patients still experience preventable adverse events during hospitalization, and patient harm is the 14th leading cause of disease burden globally [1]. Open communication about patient safety concerns is necessary to enable a learning environment [2] where lessons can be learned to improve patient safety and the quality of care [3]. Among the various healthcare professionals, nurses play an important role in ensuring safe,

quality care for patients. Because of their constant presence at the bedside and direct contact with the patients, nurses are usually the first to notice errors and near misses that can affect patient safety [4]; thus, it is important that they are able to voice their concerns and suggestions related to safe patient care. However, nurses often hesitate to speak up even in situations that could put their patients at risk [5].

It is widely known that speaking up is challenging for those who are at lower levels in the healthcare hierarchy, such as nurses [6]. However, in East Asian cultures, speaking up is difficult even within nursing care teams, as cultural

values such as collectivism, obedience, and respect that are embedded in general society [7] are also reflected in healthcare contexts as seniority- and age-based hierarchies [5, 8]. In addition, the tendency in Korean healthcare environments to assign blame to individuals for errors [9] leads nurses to suppress their voices about patient safety concerns that involve themselves or their team members. Other identified barriers to speaking up include the lack of a safety culture, ineffective teamwork, unsupportive managers and colleagues, and the notion that no change will result from speaking up for better patient safety and quality of care [5, 10–13]. Research has shown that creating an environment where nurses feel safe to voice their concerns and suggestions without fear of punishment, retaliation, or humiliation [5, 14–16] is vital for continuous organizational learning, which will, in turn, contribute to better patient safety and quality of care [16, 17].

One way to overcome the abovementioned barriers and create a psychologically safe environment for speaking up is through the use of a unit-level daily huddle [14]. A huddle is a short, regular meeting that takes no more than 10 minutes at the start of each work day or shift in a clinical setting [18]. Regular huddles provide opportunities for team members to discuss concerns, address issues, and provide and receive feedback. Huddles provide a platform for open communication and information sharing which can flatten hierarchies in clinical settings and empower frontline staff to raise their voices [19, 20]. Huddles also help to build trust and positive work relationships, which can enhance the quality of patient care [14]. Research has shown the benefits of huddles in healthcare settings, including improved teamwork and communication [20, 21], an enhanced patient safety climate [22], and increased job satisfaction of frontline staff [21]. However, most studies have been conducted in Western cultures [23], and interventions developed in one culture do not always translate easily into other contexts [24]. To our best knowledge, no intervention research on the use of huddles has been conducted in Korean healthcare contexts. Thus, we developed, implemented, and evaluated an intervention focused on the use of huddles in surgical units in a Korean hospital.

The aim of this study was to assess the effects of the huddle intervention on nine unit, nurse and patient care outcomes. We investigated four unit-level outcomes (organizational learning, situation monitoring, mutual support, and speaking-up climate), three nurse-level outcomes (promotive and prohibitive voice behaviors, and job satisfaction), and two patient care outcomes (patient safety and quality of care), as well as nurse experiences of the intervention.

2. Materials and Methods

2.1. Study Design, Setting, and Sample. We used a single group, pre- and post-test concurrent mixed-methods design, with a dominant quantitative thread. Qualitative data were used simultaneously in data analysis at Time 2 for enriching our understanding of the quantitative findings [25]. The intervention was conducted in four surgical units (ranging from 48 to 53 beds) in a 1,099-bed, tertiary, nonprofit, teaching hospital in South Korea. Surgical units were selected as they have a higher risk of adverse events than other hospital units due to a high degree of complexity; thus, a huddle intervention might enhance patient safety in these units [26].

The principal investigator (PI) met with the chief nursing officer and two nursing directors to explain the study purpose and proposed methods. The PI then met with the unit managers of surgical wards to explain the study and ask for study participation. Using convenience sampling, four study sites were selected based on the managers' willingness to participate. Subsequently, all 108 staff nurses in the four units were invited by emails and posters in the staff room to participate in the study, and 103 consented to participate. The minimum sample size needed was 34 to reach a sufficient power (80%), effect size (0.5), and alpha (0.05), based on G-Power version 3.1.9.4. Ethical approval for this study was obtained from the Institutional Review Board of the participating university health system (#4-2021-0766). This study was conducted in accordance with the principles of the Declaration of Helsinki. Due to the nature of the online survey, no written informed consent was necessary, but participants were advised that clicking boxes regarding consent to participate on the first page of the questionnaire constituted the consent to participate in the study.

2.2. The Intervention. The PI, who has a graduate certificate in patient safety, developed the training materials using various resources such as the Daily Huddle Component Kit [27], the Patient Safety Essential toolkit: Huddles [18], the Safety Huddles Implementation Guide [28, 29], and the Framework for Safe, Reliable, and Effective care [30]. All materials were reviewed by two content experts.

Two 2-hour face-to-face workshops were provided to the four huddle leaders (i.e., unit managers) on leadership development, safety culture, psychological safety, and communication and teamwork with a focus on huddles as the key strategy. Two 1-hour online workshops on safety culture, psychological safety, and communication and teamwork with a focus on huddles were given to the staff nurses. Following the completion of the workshops, the research team supported the initiation of daily huddles. In each unit, the huddle took place at 7:30 am in nurse workrooms, allowing nurses to discuss concerns and issues related to patient safety in a confidential manner [31]. Each unit used a visual management board (i.e., the huddle board) for a standardized huddle. The huddle leaders were asked to document the starting and finishing time, attendance, issues addressed, concerns discussed, resolution status, and the number of patient safety issues raised during each huddle, using a huddle checklist created by the research team [18, 27, 28, 32]. Weekly coaching visits were made to each unit for the first four weeks, followed by monthly coaching visits until the intervention was completed. A huddle evaluation form developed by the research team was used when providing feedback to the huddle leaders. Also, weekly calls, when possible, were established between the PI and the

huddle leaders. The intervention, including educational workshops for leaders and staff nurses and 12-week huddles, was conducted from October 2021 to February 2022.

2.3. Data Collection Procedures. Data were collected at the baseline (Time 1, before the initial educational workshop was held) and at the follow-up (Time 2, one week after the completion of the intervention) using an online survey. The Time 1 survey included demographic questions and measures of the nine outcomes. The Time 2 questionnaire measured the same nine outcomes but also included open-ended questions asking nurses about their experiences with the intervention.

2.4. Measures. Nine standardized measures were used in this study. Items for overall patient safety and quality of care were each rated on a 4-point response scale ranging from 1 (poor) to 4 (excellent). All other items were rated on a 5-point response scale ranging from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate higher levels of the construct.

Organizational learning (3 items) was assessed using the organizational learning, continuous improvement subscale from the Korean version of the hospital survey on patient safety culture (K-HSOPSC) 2.0, which has demonstrated acceptable reliability and validity in a nursing population [33]. A sample item is "In this unit, changes to improve patient safety are evaluated to see how well they worked." Cronbach's alpha for the scale was 0.70 at Time 1 and 0.71 at Time 2.

Situational monitoring (7 items) and mutual support (7 items) were each measured using two relevant subscales from the Teamwork Perceptions Questionnaire [34], which has shown good psychometric properties [35]. Items included "Staff actively anticipate each other's need" (for situation monitoring) and "Staff assist fellow staff during high workload" (for mutual support). For the present study, the Cronbach's alpha for situational monitoring was 0.86 at both Times 1 and 2, and the alpha for mutual support was 0.81 at Time 1 and 0.85 at Time 2.

Speaking-up climate (5 items) was assessed using the speaking-up climate for patient safety, which has demonstrated good reliability and validity [36]. A sample item is "The culture in my clinical area makes it easy to speak up about a patient safety concern that does not involve me or my patients." For the study sample, Cronbach's alpha was 0.78 at both Times 1 and 2.

Nurses' voice behaviors were measured using Liang et al. [37]'s 10-item, 2-dimensional scale for promotive voice (5 items) and prohibitive voice (5 items), which has demonstrated acceptable reliability and validity [37]. Items include "I proactively develop and make suggestions for issues that may influence the unit" (for promotive voice), and "I speak up honestly with problems that might cause serious loss to the work unit, even when/though dissenting opinions exist" (for prohibitive voice). In the study sample, the Cronbach's alpha for promotive voice was 0.93 at both Times 1 and 2, and the alpha for prohibitive voice was 0.88 at Time 1 and 0.87 at Time 2.

Nurses' job satisfaction (3 items) was measured using the job satisfaction subscale of the Michigan Organizational Assessment Questionnaire [38], which has demonstrated good psychometric properties [39]. A sample item is "All in all, I am satisfied with my job." For the study sample, Cronbach's alpha was 0.85 at both Times 1 and 2.

Patient safety and quality of care were each measured with a single item from the K-HSOPSC [33] that asked nurses to provide an overall rating of each dimension of care in their units. Reliability has been shown for both measures (patient safety, [40]; quality of care, [41]).

Participants' background information (gender, age, educational level, years of nursing experience, hospital tenure, and unit tenure) was also asked at Time 1. At Time 2, we asked nurses to respond to the following open-ended items: (1) Please describe any changes that occurred as a result of the huddles; (2) Please describe any challenges you faced participating in huddles; and (3) Please feel free to provide any other comments about the huddles.

2.5. Data Analysis. All quantitative data analyses were conducted using SPSS version 25. Descriptive statistics were used to describe the characteristics of the participants and key study variables. Within-group differences in study outcomes were examined using paired *t*-tests with an alpha of 0.05. We analyzed the qualitative data using manifest content analysis [42]. Phrases and sentences were used as units of analysis. Two researchers independently reviewed the data and coded the meaning of units, repeatedly comparing their results, and discussed any differences in interpretation until an agreement was reached to assure credibility of the findings. The codes were integrated into subcategories and categories, and exemplar quotations were selected. Findings from the qualitative data were used to better understand the findings that arose from the quantitative data.

3. Results

3.1. Participant Characteristics. A total of 103 staff nurses completed the baseline survey, and 89 completed the follow-up survey. Almost all participants in the final sample were female ($n = 86$, 97%) and had a baccalaureate degree in nursing ($n = 85$, 92%). The mean age was 29.2 years (SD = 7.42) and the average length of nursing experience was 5.4 years (SD = 7.36). The mean hospital and unit tenure was 5.0 (SD = 6.3) and 2.8 years (SD = 2.4), respectively.

3.2. Changes in Outcome Variables. Table 1 summarizes the mean scores on each outcome variable at the baseline (Time 1) and the follow-up (Time 2). After 12 weeks of the huddle intervention, significant improvements were found in six of the nine outcomes: organizational learning, situation monitoring, nurses' promotive and prohibitive voice behaviors, and units' overall patient safety as well as quality of care. The mean scores of mutual support, speaking up climate, and nurses' job satisfaction increased but were not statistically significant.

TABLE 1: Mean scores of variables pre- and postintervention with paired *t*-test (*N* = 89).

Variables	Preintervention *M* (SD)	Postintervention *M* (SD)	Mean difference[a]	*t*	*p*
Unit outcomes					
Organizational learning	3.07 (0.70)	3.45 (0.61)	0.38	5.00	<0.001
Situation monitoring	3.61 (0.54)	3.73 (0.52)	0.12	2.03	0.046
Mutual support	3.60 (0.49)	3.67 (0.52)	0.08	1.31	0.195
Speaking up climate	3.44 (0.52)	3.54 (0.59)	0.09	1.62	0.110
Nurse outcomes					
Promotive behavior	2.55 (0.73)	2.93 (0.81)	0.38	4.60	<0.001
Prohibitive behavior	2.87 (0.72)	3.19 (0.73)	0.32	4.20	<0.001
Job satisfaction	3.15 (0.74)	3.16 (0.81)	0.01	0.16	0.876
Patient care outcomes					
Patient safety rating	2.36 (0.53)	2.60 (0.65)	0.24	3.08	0.003
Quality of care	2.44 (0.46)	2.82 (0.49)	0.38	6.76	<0.001

[a]Mean difference, the difference between post-test and pretest scores (post-test–pretest).

3.3. Findings from the Open-Ended Items. Analysis of the qualitative data yielded 3 categories and 9 subcategories. The findings are discussed below and exemplar quotes are presented in Table 2.

3.3.1. Benefits of Huddles. A majority of the participants reported that huddles promoted growth in their overall situational awareness that they were more likely to identify safety and quality issues requiring immediate or extra attention. In particular, the huddles were seen to help the less-experienced nurses develop a more comprehensive view of unit operations and procedures that can impact patient safety. Participants noted that using the visual huddle board contributed to their situational awareness. Participants also commented that having a designated time every day for communicating with their team members was critical for patient care. Sharing information about high-risk patients on the unit allowed the nurses to pay more attention to those patients, put preventive measures in place, and provide rapid responses (risk management). Nurses mentioned that identifying safety risks and potential solutions reduced patient safety incidents, including fewer patient falls. Finally, the participants reported that huddles enabled them to anticipate each other's needs which resulted in improved teamwork and collegiality. Also, creating the time and space for meaningful team communication strengthened a culture of safety and created an atmosphere that encouraged speaking up. Remarkably, two nurses reported that less experienced or newly graduated nurses felt more empowered to speak up, even with those who had more seniority and authority.

3.3.2. Challenges for Huddle Participation. The most frequently mentioned challenge to huddle participation was the time pressure related to heavy workloads. Although nurses understood the importance and benefits of huddles, creating time to participate could be burdensome at times. A few nurses also mentioned that changes or a deterioration in a patient's condition meant that direct patient care took priority over participation in the huddle.

Additionally, nurses noted the challenges presented by a lack of understanding by patients, caregivers, and other health professionals regarding huddles. One nurse mentioned that other healthcare providers (e.g., physicians) disturbed huddles, and it seemed that they did not understand or appreciate the importance of huddles for improving patient safety (the lack of awareness about huddles).

3.3.3. Recommendations for Future Huddles. Few participants offered recommendations for future huddles. One nurse suggested the use of digital board instead of the analog huddle board. Another noted that there should be a plan for proceeding with the huddle in situations where the unit manager is unable to participate as the huddle leader. There was also a suggestion for an alarm notifying that it was time to join the huddle.

4. Discussion

This study examined the effects of a huddle intervention on various outcomes in surgical units in a Korean hospital. We found statistically significant improvements in six of the nine outcomes, organizational learning, situation monitoring, nurses' promotive and prohibitive voice behaviors, and overall patient safety and quality of care, following the intervention. We also gained further insights from nurses regarding their experiences with the intervention, demonstrating the benefits and challenges of huddles.

Consistent with the previous research [26], our study found that the huddle intervention improved organizational learning. Patient safety requires organizational learning, which is demonstrated by a willingness and ability to learn from feedback [43] and changes in organizational routines that impact risk and safety [44]. In the current study, sharing information between the huddle leader and staff and among team members, and the subsequent modification of patient care processes seem to have contributed to the nurses' perceptions of their ward as a learning unit for improving patient safety and quality.

Table 2: The results of qualitative data analysis ($N = 89$).

Categories (n)	Subcategories (n)	Quotes
	Growth in overall situational awareness (76)	(i) I was able to respond to patients without delay, as we shared important information for patient care, such as patients at high risk for falls, patients with severe delirium, and patients with multiple drainages that we would not have been aware of if they were not my patients. Huddle really helped me to understand what is going on in the unit (P 44)
		(ii) It was good and helpful to share patient safety events and potential safety risks in the unit, which I would not have known normally without huddles (P 42)
		(iii) It was helpful for newly graduate nurses to be able to get an overview of the situation in the unit (P 37)
		(iv) Through the huddle board, I was able to understand what has been going on in the unit and how the unit has been doing as a whole (P 17)
	Risk management (23)	(i) Huddles helped to prevent patient safety incidents by identifying high-risk patients (P 54)
		(ii) We can identify and pay more attention to patient safety issues that frequently occur particularly in our unit (P 39)
		(iii) Huddles helped reduce the number of patients' falls in the unit (P 22)
Benefits of huddles (80)	Improved teamwork and collegiality (17)	(i) It was nice to help other team members when they had high workload and to be able to get help when I needed their helps (P 68)
		(ii) Huddles helped improve teamwork by identifying and supporting team members who had high workloads due to their responsibilities to take care of patients with high acuity (P 24)
		(iii) Because of huddles, an atmosphere that supports speaking up has been created; so, it seems that reporting to colleagues or to those who have more authority has become a habit, and it has been a lot easier to speak up (P 28)
	Strengthened safety culture (7)	(ii) Huddles were the beginning of creating a venue for even less-experienced nurses to express their opinions (P 63)
		(i) Efficient communication was possible because patient safety-related information was shared with all team members in the ward (P 25)
	Facilitated team communication (5)	(ii) It was a great help in knowing and communicating with the up-to-date protocols in a situation where the protocols related to COVID-19 were constantly changing (P 22)
		(iii) Huddles provided us an opportunity to gather together and communicate in a positive way (P 56)
	Heavy workload (53)	(i) When I was too busy due to high workloads, it was difficult to participate huddles (P 11)
		(ii) Under the time pressure, it was a difficult for everyone to get together on time (P 52)
Challenges for huddle participation (58)	Change in patients' condition (11)	(i) I was not able to participate in huddles when my patient's condition deteriorated and thus i had to urgently notify the doctor (P 4)
		(i) It was difficult for everyone to participate due to persistent demands from patients or their families during huddles (P 55)
	Lack of awareness about huddles (7)	(ii) Patients, physicians, and other professionals did not understand much about huddles, so huddles were often interrupted (P 69)
Recommendations for future huddles (7)	Recommendations for future huddles (7)	(i) Digital huddle board would be nicer than the white board (P 62)
		(ii) It seems that a plan should be prepared so that huddles can be operated effectively even when the unit manager is not present (P 68)
		(iii) Setting an alarm for a huddle would be helpful (P 75)

Notably, we found that nurses' speaking up behaviors, an important aspect of patient safety culture [26], improved following the huddle intervention. A standardized huddle generates the necessary structure for openly discussing safety concerns. The huddle creates a common ground among team members that assists in flattening the hierarchies in healthcare teams [45]. In the current study, nurses noted that huddles created an environment that encouraged speaking up and enhanced the culture of safety. Speaking up about safety concerns in a workplace is more difficult for healthcare professionals who are at a lower hierarchical level [6] and work in an environment with poor safety culture [46] and inadequate support from their direct managers [15] and colleagues [5]. A standardized huddle intervention may be a strategy for addressing each of these issues.

Consistent with the previous research [20], we found that huddles enhanced nurses' situational awareness, for example, by discussing the potential risks of a particular medication, which would have facilitated error prevention. Although we did not have the necessary data to quantify the frequency of such events, in the qualitative responses, nurses reported that there were fewer patient safety events such as patient falls. Previous studies [47, 48] have demonstrated significant reductions in patient adverse events such as medication errors and patient falls after huddles in clinical settings. Thus, when possible, future research should investigate the effects of huddles with more objective data such as incident reports.

In the current study, we did not find a significant increase in nurse-perceived mutual support following the intervention. A prior study [26] similarly failed to find improvements in mutual support after 6 months of huddle intervention, but they did find improvements after 12 months. This could imply that mutual support should be viewed as a long-term rather than short-term outcome and suggests the importance of sustaining the huddle intervention. The intervention in our study was limited to 12 weeks for practical reasons, but the huddle has become an integral part of daily routine in the four study sites, and the hospital plans to expand the intervention to other nursing units. Management commitment and support for huddles will be the key for successful intervention implementation and sustainability [14]. In the current study, the intervention was carried out within a single discipline (i.e., nursing staff), but multidisciplinary huddles should be considered due to the reported benefits of interprofessional huddles for improving patient safety and quality of care [23]. The lack of awareness by other healthcare personnel regarding the importance of huddles that was noted as a challenge in this current study may be resolved through multidisciplinary huddles.

4.1. *Limitations.* Several study limitations should be noted. First, due to the limited number of nursing units included in this study, we were unable to account for the effects of nurses clustered within units, which may have affected the study findings. Second, we were unable to include control groups due to complications posed by the COVID-19 situation. Although this poses a threat to the internal validity of the study, a prepost design is a common and practical method in settings where

a randomized design is not feasible [26]. Finally, the intervention was conducted in surgical units in one Korean hospital, and the study findings may not be generalizable to other contexts.

5. Conclusion

This study was the first to examine the effect of huddles among nurses in a Korean healthcare context. Our primary findings indicate that the daily safety huddle may be a useful approach for flatting hierarchies and creating an environment where frontline nurses can speak up freely about patient safety and quality of care issues and concerns. Huddles appear to improve the effectiveness of information sharing and engender a more collaborative culture that contributes to a shared awareness and anticipation of patient safety risks which will, in turn, improve patient safety and quality of care. Due to the study's limitations, there should be further evaluation of the effects of huddles with stronger research designs and broader target populations.

5.1. *Implications for Nursing Management.* Open communication and collegial support for safety concerns are vital for improving patient safety. Although all team members are responsible for creating a psychologically safe environment [49], leadership is the key in role modelling and creating the foundation for a collaborative culture in healthcare organizations. Implementing and sustaining a safety huddle is challenging in complex healthcare settings [20], and strong leadership support from managers at all levels is needed. Unit managers should encourage staff to actively engage in huddles by listening to staff concerns, considering their inputs, and providing respectful feedback, with the shared goal of increasing patient safety.

Data Availability

The participants of this study did not give written consent for their data to be shared publicly, so due to the sensitive nature of the research, supporting data are not available.

Disclosure

The funding body has no involvement in study design, collection, management, analysis and interpretation of data, or the decision to submit for publication.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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Research Article

Self-Care Behavior and Associated Factors of Nursing Students with Dysmenorrhea: A Structural Equation Model

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Objective. To assess the factors influencing the self-care behavior among nursing students with dysmenorrhea. *Background*. The practice of self-care behavior for dysmenorrhea has gradually attracted immense attention from society; however, thus far, only a few studies have been conducted to predict this behavior and analyze the associated factors by creating a structural equation model. *Methods*. A cross-sectional multistage cluster sampling study was conducted among nursing students within six universities in Shaanxi province, China. A model was constructed, and structured questionnaires were adopted to measure model variables, including e-health literacy, negative emotion, self-efficacy, self-care agency, degree of dysmenorrhea, and self-care behavior for dysmenorrhea. Descriptive data analysis was performed using SPSS 23.0 software, and AMOS 23.0 was used to verify and analyze the structural model. *Results*. In total, 1851 valid questionnaires were collected; the effective recovery rate was 93.15%, and the prevalence of dysmenorrhea was 64.51%. e-Health literacy ($B = 0.171$, $P < 0.001$), self-efficacy ($B = 0.416$, $P < 0.001$), self-care agency ($B = 1.177$, $P < 0.001$), and degree of dysmenorrhea ($B = 0.310$, $P < 0.001$) significantly influenced self-care behavior for dysmenorrhea. The total, direct, and indirect effects of e-health literacy and self-efficacy on self-care behavior for dysmenorrhea were 0.158 and 0.492, 0.128 and 0.248, and 0.030 and 0.244, respectively. *Conclusion*. The self-care behavior for dysmenorrhea is affected by several factors and self-efficacy has the greatest effect on it. To promote girls to actively implement self-care behavior for dysmenorrhea, educators should strengthen the training of self-efficacy and self-care agency of the nursing students to alleviate the uncomfortable experience brought by dysmenorrhea and decrease the harm of dysmenorrhea. *Implications for Nursing Management*. Nursing managers should work with constant efforts to explore and optimize the management model for dysmenorrhea, encouraging young women to actively engage in self-care behavior for dysmenorrhea, to alleviate the discomfort experienced by individuals and improve women's overall health.

1. Background

Dysmenorrhea is defined as recurrent spasmodic pain in the lower abdomen during menstruation and is one of the most common causes of pelvic pain and menstrual disorders [1]. According to relevant reports, 56.4%–90% of women have dysmenorrhea [2–4], which is the main cause of their absenteeism from school and work [5, 6]. Dysmenorrhea is clinically divided into primary and secondary dysmenorrhea [7]. From the viewpoint of individual physical and mental development, severe dysmenorrhea can interfere with their

daily activities as well as cause varying degrees of harm to their life and quality of life [8, 9], thus adding to a huge public health burden [10]. Conversely, from the social and economic viewpoint, absenteeism caused by dysmenorrhea [11] causes an annual loss of 140 million working hours in the United States and economic losses of over $4.2 billion in Japan, thus making dysmenorrhea one of the important issues that need to be urgently addressed by researchers globally. The level of self-care agency of patients with dysmenorrhea is closely associated with their dysmenorrhea status [12]. Therefore, one of the most important approaches

for alleviating dysmenorrhea symptoms and reducing the harm of dysmenorrhea is whether individuals can fully take the initiative and be enthusiastic to implement self-care behaviors beneficial for their health.

According to the latest revision of the WHO Guidelines on self-care interventions [13], self-care is defined as the ability of individuals, families, and communities to promote health, prevent disease, maintain health, and cope with illness and disability, with or without the support of health workers. As a new primary healthcare approach [14], self-care has the potential to save health system resources and reduce patient care and follow-up costs [15, 16]; furthermore, it is cost-effective and easy to learn [17]. Self-care has been widely used in postpartum women, those with spinal cord injury, those who underwent cancer surgery, and those with chronic diseases and plays an important role in the clinical outcome and prognosis of patients with chronic diseases [18–25]. Meanwhile, nursing students, as a special group, have been shown that the implementation of self-care behavior can not only help nursing students relieve pressure and make them better transition to nurse status but also help nurses and patients jointly create a safe clinical environment [26]. However, there are few research studies on the combination of nursing students' dysmenorrhea and self-care behavior as the research direction, the existing research studies are mostly single-factor or cross-sectional investigations, and the holistic research based on the scientific nursing theory is relatively lacking. Therefore, in this study, taking Orem's self-care theory as the theoretical framework, a structural equation model was created to conduct a multidimensional investigation and analysis of the self-care behavior of nursing students, discussed the status quo of nursing students self-care behavior for dysmenorrhea and related influencing factors, and provided reference and basis for medical personnel to frame effective intervention measures and guide these nursing students in actively implementing self-care behavior.

1.1. Literature Review. Dysmenorrhea is one of the most common gynecological disorders affecting the quality of life and social activities of women [27]. However, only 20.8% of the students choose to seek medical help for alleviating the discomfort and pain caused by dysmenorrhea; the vast majority of students prefer self-care [28]. The self-care behavior for dysmenorrhea is affected by many factors, among which self-care agency has the greatest impact on it, demonstrating a positive correlation and direct effect [29, 30]. Wong et al. [30] pointed out that previous knowledge regarding menstruation has direct and indirect effects on self-care behaviors for dysmenorrhea and that there is a direct effect between the mother's education level and degree of dysmenorrhea and self-care behaviors for dysmenorrhea. The higher the e-health literacy [31, 32] and the better the individuals' self-efficacy [33, 34], the more willing they are to adopt self-care behaviors that can improve their health status and alleviate their pain. However, thus far, the existing studies on self-care for dysmenorrhea are mostly single factor, and there is a lack of systematic research on the relationship between multiple

variables based on scientific theories and models. Therefore, to help medical staff identify the potential or existing wrong self-care behavior of patients with dysmenorrhea as early as possible and improve self-care agency, it is important to assess the self-care behavior of these patients.

1.2. Structural Equation Model. This study is guided by Orem's self-care theory, which considers that each individual can independently implement self-care behavior [35] and that nursing intervention aims to help individuals improve their self-care agency [36].

Orem's self-care theory comprises self-care, self-care defect, and nursing system theories [37]. The self-care theory can provide the foundation for explaining self-care behavior, assessing the relationship between relevant variables, and predicting the effect of self-care intervention. This theory points out that self-care agency is an important requirement for individuals to implement self-care behavior and that its strength is closely associated with basic condition factors (BCFs). BCFs include age, sex, developmental status, health status, sociocultural context, health reasons (e.g., medical diagnoses and therapeutic interventions), family factors, lifestyle, environmental factors, and availability [38]. All BCFs can affect the level of self-care agency and are used in self-care behavior, that is, BCFs affect self-care behavior through self-care agency [37].

Resource availability and its adequacy are one of the BCFs that have a direct impact on self-care agency [37]. e-Health literacy as a reflection of the ability to acquire and apply network resources demonstrates that [39, 40] the level of e-health literacy of individuals directly affects their ability to care for poor health. The pain intensity during dysmenorrhea is a distress signal released by the body after an individual's health condition is compromised; the pain degree of women with dysmenorrhea is significantly associated with their self-care behavior [30, 41]. Therefore, in the model framework of the present study, from Orem's self-care theory, resource availability and the health status were selected as exogenous variables and self-care agency and self-care behavior as media and outcome variables, respectively.

Furthermore, the path relationship between the factors was established based on the findings from the existing research. Negative emotional experiences can decrease the pain threshold and increase the pain degree of individuals, leading to a vicious cycle of negative emotional responses to dysmenorrhea [42]; nonetheless, negative emotions have a significant negative relationship with self-care agency [43, 44]. Individuals with high self-efficacy are frequently able to actively learn relevant knowledge, take correct and positive nursing measures, improve their self-care agency, and alleviate their pain and discomfort through continuous learning [45]. These individuals also display higher self-care abilities and implement self-care behaviors that are favorable to symptom relief or improvement of their condition [46]. Although Orem's self-care theory does not highlight the association among negative emotion, self-efficacy, and degree of dysmenorrhea, previous studies have confirmed the significant association between the abovementioned variables; therefore,

the path generated by the abovementioned variables was included in the present model. To sum up, the following hypothesis model was proposed after integrating Orem's self-care theory with the findings of previous studies (Figure 1).

1.3. Purpose. This study aimed to create a structural equation model and use it to clarify the influencing factors and the relationship between the variables of the self-care behavior of nursing students with dysmenorrhea in China to provide a theoretical basis and reference for medical staff and educators to better provide dysmenorrhea-related diagnosis and develop treatment strategies and scientific protective behaviors.

2. Methods

2.1. Overview. In this study, a cross-sectional multistage cluster sampling survey was conducted among nursing students from six universities in Shaanxi province, China. The structural equation model was used to assess the relationship between various variables and self-care behaviors for dysmenorrhea.

2.2. Participants and Data Collection. From February 2023 to April 2023, a multistage cluster sampling method was used for recruiting students. First, Shaanxi province in northwest China was chosen as the sampling unit among the seven major geographical regions in China. Second, according to the size and category of the university, six medical colleges were chosen from 15 universities offering undergraduate nursing majors in Shaanxi province and using the convenience sampling method to select eight classes in first- and second-year nursing undergraduate students from each medical college, resulting in a total of 48 classes. Finally, all nursing students from the selected classes who met the inclusion criteria were taken as subjects.

Inclusion criteria were as follows: (1) consistent with the diagnosis of dysmenorrhea [47] and (2) not having a psychiatric illness. Exclusion criteria included communication difficulties, poor compliance, and inability to complete the questionnaire.

According to the calculation method of the sample size of the structural equation, the baseline sample size was 15–20 times the predictive variables [48, 49] and the number of measured variables in this study was 23. By calculating 20 times the measured variables, 460 subjects should have been selected. In this study, it was calculated by the following equation: $(3 + 3 + 4 + 4 + 3 + 6) * 20 = 460$. A total of 1,987 questionnaires were sent to six schools in this study, and 1,851 valid questionnaires were finally recovered after excluding those that did not meet the inclusion criteria. The effective recovery was 93.15%.

2.3. Measurement Tools

2.3.1. e-Health Literacy Scale. The e-Health Literacy Scale [50], which includes eight items and wherein each item adopts the Likert 5-level scoring method, including three dimensions, application ability, evaluation ability, and decision-making ability of online health information and services, was used

Figure 1: Theoretical framework.

as an assessment tool. The Cronbach's α coefficient of the Chinese version of the scale was 0.913 [51], and Cronbach's α was 0.960 in this study.

2.3.2. Depression Anxiety Stress Scale-Simplified Version. A simplified version of the Depression Anxiety Stress Scale [52], which includes depression, anxiety, and stress with a total of 21 items, was used to measure the negative emotions of the study subjects. The Likert 5-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.890 [53] and Cronbach's α was 0.969.

2.3.3. Self-Rated Abilities for the Health Practices Scale. The Self-Rated Abilities for Health Practices Scale compiled by Becker et al. was used to measure self-efficacy [54]. This tool was translated from English into Chinese with a total of 28 items and four dimensions that represented the ability to promote healthy behavior in four aspects, namely, nutrition, exercise, psychological well-being, and health responsibility. The Likert 5-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.950 [55] and Cronbach's α was 0.976.

2.3.4. Self-Care Agency Scale. The Exercise of Self-Care Agency Scale translated into Chinese by Kearney and Fleischer and [56] and Taiwan scholars [57] as a research tool with a total of 43 items and four dimensions, including the health knowledge level, self-concept, self-care responsibility, and self-care skills, was used. The Likert 5-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.890–0.920 [57] and Cronbach's α was 0.931.

2.3.5. Degree of Dysmenorrhea Scale. The Menstrual Distress Questionnaire, developed by Moos [58], which includes two subscales of physical dysmenorrhea symptoms and mental

and psychological symptoms before menstruation, each with three dimensions and a total of 30 items, was used. The subscale of physical dysmenorrhea symptoms in the Menstrual Distress Questionnaire, including pain-related symptoms, autonomic nervous disorder symptoms, and water and sodium retention symptoms, with a total of 14 items, was selected. The Likert 5-level scoring method was used. The higher the score, the more severe the dysmenorrhea. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.937 [59] and Cronbach's α was 0.943.

2.3.6. Adolescent Dysmenorrhea Self-Care Scale. The Adolescent Dysmenorrhea Self-Care Scale developed and compiled by Hsing et al. [60], and translated into Chinese and Cantonese by Wong et al. [61] (Hong Kong, China), is a research tool for measuring self-care behavior of nursing students with dysmenorrhea. The scale includes six dimensions of knowledge acquisition, emotional expression, seeking help, control of external factors, resource utilization, and self-control, with a total of 35 items. The Likert 6-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.940 [61] and Cronbach's α was 0.973.

2.4. Data Analysis. The data collected in this study were directly exported from the questionnaire platform. IBM SPSS Statistics version 23 software and IBM SPSS AMOS version 23 software were used to analyze. The measurement data were represented by $(\overline{x} \pm s)$; the counting data were statistically described by frequency and probability. The structural equation model was composed of two major parts as follows: the measurement model and the structural model. In the measurement model, confirmatory factor analysis (CFA) and the Pearson correlation coefficient were used to test the reliability and validity. In the structural model, the comparative fit index (CFI > 0.90), normed fit index (NFI > 0.90), Tucker–Lewis index (TLI > 0.90), and root mean square error of approximation (RMSEA < 0.06) were analyzed for model fit [62–64]. Bootstrapping analysis was used for the indirect effects, total effects, and statistical significance of the model, and the bootstrap ML method was utilized; the results of this method are more stable [65] and more accurate than other methods in studies with a sample size greater than 200 [66]. The 95% bias-corrected confidence intervals were used and the number of repeated samples was 5000 times. Two-sided P values less than 0.05 were considered significant.

2.5. Ethical Considerations. This study has been approved by the Ethics Committee of the Xi'an Medical University (number: XYYJSLS2022067). The participants voluntarily enrolled in this investigation and provided signed informed consent before the study.

3. Results

3.1. Characteristics. The number of valid questionnaires in this study was 1,871, of which 1207 cases (64.51%) had dysmenorrhea. The average age of the subjects was 19.97 ± 1.27 years

and approximately half of the girls had menarche at the age of 13–14 years (49.3%). Among the nursing students with dysmenorrhea, 186 (15.4%) had very irregular menstrual periods and the average number of menstrual days was 5–7 days in 826 (67.6%). Other general information is shown in Table 1.

3.2. Measurement Model. First, the original measurement model was verified, and the measurement variable with a standard factor load value below 0.7 was deleted [67, 68], that is, the self-control dimension of dysmenorrhea self-care behavior, resulting in a final measurement model comprising six latent variables and twenty-two measured variables.

Second, confirmatory factor analysis was conducted on the final measurement model. The results indicated that all factors had an average variance extracted (AVE) greater than 0.5 and construct reliability (C.R) higher than 0.7 [69, 70], demonstrating good convergent validity of the data in this study (Table 2).

Finally, based on Pearson correlation analysis, the self-care agency for dysmenorrhea was significantly positively correlated with e-health literacy, self-efficacy, self-care agency, and degree of dysmenorrhea ($r = 0.318$, $P < 0.001$; $r = 0.503$, $P < 0.001$; $r = 0.524$, $P < 0.001$; $r = 0.058$, $P < 0.05$) and negatively correlated with negative emotion ($r = -0.098$, $P < 0.01$) (Table 3). The results of the discriminant validity test in the measurement model demonstrated that the correlation coefficients between variables were all lower than the square root of AVE, indicating good discriminant validity of the model (Table 3).

3.3. Structural Equation Model. The theoretical framework (Figure 1) drew a total of nine paths; the hypothetical model is constructed based on the framework, and the result of the model fit showed that RMSEA = 0.062, CFI = 0.961, NFI = 0.953, and TLI = 0.954. According to the results of the software correction index, the model was further modified, the path between self-efficacy and dysmenorrhea in the hypothetical model was removed, and the final model with a total of eight paths was formed and analyzed, as shown in Figure 2. The fit index of the modified model showed the following: RMSEA = 0.058, CFI = 0.967, NFI = 0.959, and TLI = 0.962.

The parameter estimation table of the modified model for the self-care behavior of nursing students with dysmenorrhea is shown in Table 4. This study showed that eight out of nine pathways were statistically significant, whereas the path from self-efficacy to dysmenorrhea showed no statistical significance. Among them, the explanation rate of the degree of self-care behavior explained by self-care agency, degree of dysmenorrhea, e-health literacy, and self-efficacy was 41.7%, that of self-care agency explained by e-health literacy, negative emotions, and self-efficacy was 53.7%, and that of the degree of dysmenorrhea explained by negative emotions was 32.1%.

3.4. Effects. In the present study, self-care agency had the greatest effect on the outcome variable self-care behavior for dysmenorrhea and self-efficacy had the greatest effect on the media variable self-care agency. The direct and overall effects

TABLE 1: General characteristics.

Factors	Groups	No dysmenorrhea	Frequency (%)	$\bar{x} \pm s$	Dysmenorrhea	Frequency (%)	$\bar{x} \pm s$
Age	≤18	77	4.2		65	5.4	
	19–21	1546	83.5	19.97 ± 1.27	992	82.2	20.07 ± 1.29
	≥22	228	12.3		150	12.4	
BMI (kg/m²)	Emaciation (<18.5)	483	26.1		305	25.3	
	Normal (18.5 ≤ BMI < 24)	1171	63.3	20.39 ± 2.83	767	63.5	20.60 ± 3.20
	Overweight (24 ≤ BMI < 28)	169	9.1		98	8.1	
	Obesity (≥28)	28	1.5		37	3.1	
Age of menarche	≤12	643	34.7		431	35.7	
	13–14	913	49.3	13.18 ± 1.36	597	49.5	13.15 ± 1.37
	≥15	295	15.9		179	14.8	
Menstrual cycle	Very regular	715	38.6		434	36.0	
	Relatively regular	867	46.8		587	48.6	
	Very irregular	269	14.5		186	15.4	
Menstrual period	2–4 days	549	29.7		346	28.7	
	5–7 days	1252	67.6		826	68.4	
	>7 days	50	2.7		35	2.9	
Total		1,851			1,207		

TABLE 2: Verification results of confirmatory factor analysis.

Latent variable	Item	Factor load (FL)	Average variance extracted (AVE)	Construct reliability (C.R)
e-Health literacy	X11	0.962	0.864	0.950
	X12	0.872		
	X13	0.884		
Negative emotion	X21	0.926	0.948	0.982
	X22	0.943		
	X23	0.966		
Self-efficacy	X31	0.810	0.830	0.951
	X32	0.917		
	X33	0.907		
	X34	0.867		
Self-care agency	Y11	0.824	0.924	0.980
	Y12	0.802		
	Y13	0.899		
	Y14	0.919		
Degree of dysmenorrhea	Y21	0.832	0.745	0.897
	Y22	0.901		
	Y23	0.735		
Self-care behavior for dysmenorrhea	Y31	0.853	0.694	0.919
	Y32	0.927		
	Y33	0.881		
	Y34	0.865		
	Y35	0.824		

X11: test the application capability of network health information and service; X12: judging ability; X13: decision-making ability; X21: depressed; X22: anxiety; X23: stress; X31: nourishment; X32: movement; X33: psychological comfort; X34: health responsibility; Y11: health knowledge level; Y12: self-concept; Y13: self-care responsibility; Y14: self-care skills; Y21: pain-related symptom; Y22: autonomic nervous disorder; Y23: water and sodium retention; Y31: acquire knowledge; Y32: emotional expression; Y33: ask for help; Y34: control external factors; Y35: resource utilization.

TABLE 3: Average scores of each variable item, discriminant validity, and Pearson correlation coefficient ($n = 1207$; SD, standard deviation).

	Mean (SD)	Range	X1	X2	X3	Y1	Y2	
e-Health literacy (X1)	3.91 [0.79]	1.00–5.00	**0.930**					
Negative emotion (X2)	1.49 [1.31]	0.00–6.00	−0.099**	**0.974**				
Self-efficacy (X3)	2.17 [0.75]	0.04–4.00	0.343***	−0.166***	**0.911**			
Self-care agency (Y1)	2.40 [0.47]	1.12–4.00	0.314***	−0.351***	0.650***	**0.962**		
Degree of dysmenorrhea (Y2)	2.44 [0.76]	1.00–5.00	−0.092**	0.519***	−0.123***	−0.195***	**0.863**	
Self-care behavior for dysmenorrhea (Y3)	3.74 [0.99]	1.09–6.00	0.318***	−0.098**	0.503***	0.524***	0.058*	**0.833**

Diagonal bold numbers are AVE square root values, and numbers below diagonal are Pearson correlation coefficients (*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$). If the AVE square root value is greater than the correlation coefficients of the corresponding variable, it indicates good discriminant validity of the measured variable.

of the eight pathways and the indirect effects of e-health literacy and self-efficacy on self-care behavior for dysmenorrhea were statistically significant (Table 5).

4. Discussion

4.1. Current Situation of the Self-Care Behavior of Nursing Students with Dysmenorrhea. According to the general characteristics of the population included in this study, approximately half of the girls had menarche at the age of 13–14 years (49.3%) and the average number of menstrual days was 5–7 days in 826 (68.4%). The incidence of dysmenorrhea was about 64.51% (1207/1871), which was similar to the findings of a previous study [71], indicating that dysmenorrhea is still a major problem that should be paid more attention to during the healthy development of female body and mind. Most individuals with dysmenorrhea have

menarche at the age of 13-14 years, accounting for 49.5%. It is suggested that schools should form a relationship education mechanism with local primary healthcare departments and parents of students and conduct activities including lectures or exchange forums related to menstruation to establish correct cognition of normal physiological phenomena such as menstruation in individuals and encourage them to take positive and correct self-care behaviors for dysmenorrhea spontaneously, thus helping them alleviate the discomfort caused by dysmenorrhea.

4.2. Fit Degree of the Structural Equation Model for the Self-Care Behavior of Nursing Students with Dysmenorrhea. This study took Orem's self-care theory as the core framework. After the verification and modification of the structural model, the fit degree of the structural equation model for the self-care

FIGURE 2: Structural equation model of self-care behavior of medical students with dysmenorrhea. X11: test the application capability of network health information and service; X12: judging ability; X13: decision-making ability; X21: depressed; X22: anxiety; X23: stress; X31: nourishment; X32: movement; X33: psychological comfort; X34: health responsibility; Y11: health knowledge level; Y12: self-concept; Y13: self-care responsibility; Y14: self-care skills; Y21: pain-related symptom; Y22: autonomic nervous disorder; Y23: water and sodium retention; Y31: acquired knowledge; Y32: emotional expression; Y33: ask for help; Y34: control external factors; Y35: resource utilization. $^*P < 0.05$, $^{**}P < 0.01$.

TABLE 4: Parameter estimates of variables for the modified model.

Paths	B (S.E.)	β	P value	SMC
Self-care agency: self-care behavior for dysmenorrhea	1.177 (0.111)	0.398	<0.001	
Degree of dysmenorrhea: self-care behavior for dysmenorrhea	0.310 (0.044)	0.184	<0.001	0.417
e-health literacy: self-care behavior for dysmenorrhea	0.171 (0.035)	0.128	<0.001	
Self-efficacy: self-care behavior for dysmenorrhea	0.416 (0.061)	0.248	<0.001	
e-health literacy: self-care agency	0.035 (0.011)	0.077	0.001	
Negative emotion: self-care agency	−0.146 (0.014)	−0.248	<0.001	0.537
Self-efficacy: self-care agency	0.348 (0.017)	0.614	<0.001	
Negative emotion: degree of dysmenorrhea	0.585 (0.030)	0.567	<0.001	0.321

S.E.: standard error, β: standardized estimate, SMC: squared multiple correlation.

TABLE 5: Standardized direct, indirect, and total effects.

Dependent variable	Independent variable	Direct effect	Indirect effect	Total effect
Self-care behavior for dysmenorrhea	Self-care agency	0.398**	—	0.398**
	Degree of dysmenorrhea	0.184**	—	0.184**
	e-Health literacy	0.128**	0.030*	0.158**
	Self-efficacy	0.248**	0.244**	0.492**
Self-care agency	e-Health literacy	0.077*	—	0.077*
	Negative emotion	−0.248**	—	−0.248**
	Self-efficacy	0.614**	—	0.614**
Degree of dysmenorrhea	Negative emotion	0.567**	—	0.567**

$^*P < 0.01$, $^{**}P < 0.001$.

behavior of nursing students with dysmenorrhea was at a good level. Self-care agency, degree of dysmenorrhea, e-health literacy, self-efficacy, and other independent variables directly affected the self-care behavior for dysmenorrhea, and the explanation rate of the abovementioned variables was 41.7%. Among them, e-health literacy, self-efficacy, and self-care

behavior for dysmenorrhea had indirect effects. The variables that directly affected self-care agency were e-health literacy, negative emotion, and self-efficacy; the explanation rate of these variables was 53.7%. Furthermore, negative emotion was a factor that directly affected the degree of dysmenorrhea; the explanation rate of this factor was 32.1%.

4.3. Mediating Effect of Various Variables on the Self-Care Behavior of Nursing Students with Dysmenorrhea. Individual e-health literacy can not only directly affect the self-care behavior for dysmenorrhea but also indirectly affect self-care agency. Similarly, self-efficacy not only has a direct effect on the self-care behavior for dysmenorrhea but also indirectly affects the self-care behavior of individuals through self-care agency. This fully demonstrates that the self-care agency plays a critical role in e-health literacy, self-efficacy, and self-care behavior for dysmenorrhea. Therefore, healthcare departments or universities should be fully aware of self-care agency when conducting menses-related education for nursing students and boost self-care agency by improving individual e-health literacy and guiding students to improve self-efficacy to achieve the aim of actively implementing self-care behaviors for dysmenorrhea.

4.4. Limitations. This study has two limitations. First, the sample size is confined to nursing students exclusively from select medical colleges in Shaanxi province, China, which may restrict the generalizability and diversity of the findings. To enhance the universality and persuasiveness of the research results, it is recommended to expand the types and range of samples in future studies. Second, due to the inherent constraints of cross-sectional research regarding time relationships and causality, establishing associations between variables in this study relies on theoretical frameworks and previous literature. Therefore, conducting longitudinal or interventional studies on factors influencing self-care behaviors for dysmenorrhea among nursing students would be advantageous for further exploration of predictive factors impacting such behaviors.

5. Conclusion

Based on Orem's self-care theory and the findings of previous studies, this study created a scientific structural equation model that can explain the factors affecting self-care behavior for dysmenorrhea. The model verified and analyzed the explanation degree of e-health literacy, negative emotion, and self-efficacy on self-care behavior for dysmenorrhea, and the mediating role and effect size of the self-care agency and degree of dysmenorrhea.

6. Implications for Nursing Management

Dysmenorrhea is a significant factor affecting women's health. It is not merely a temporary issue for individuals, schools, or families but also a major concern related to students' academic performance and future fertility. It profoundly impacts their overall well-being, future life, and

work. Implementing proactive and effective self-care behaviors can alleviate the discomfort and enhance their quality of learning and life. Schools and families should offer proper guidance to students with dysmenorrhea, foster the development of correct cognitive attitudes, and establish positive coping strategies. Nursing managers can refine the management model for self-care behaviors associated with dysmenorrhea. With the advancements in the Internet and big data, they can create authoritative and scientific information platforms for students to access and reference, thereby reducing the pressure on students' e-health literacy. In addition, considering individual personality traits and lifestyle habits, tailored self-care recommendations can be provided, thereby reducing menstrual discomfort and furthering women's health.

Data Availability

The data used to support the findings of this study have not been made available because of person privacy and ethical issues.

Ethical Approval

This study was approved by the Institutional Review Board of the Xi'an Medical University Ethics Committee (approval no. XYYJSLS2022067).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Self-Care Behavior and Associated Factors of Nursing Students with Dysmenorrhea: A Structural Equation Model

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Objective. To assess the factors influencing the self-care behavior among nursing students with dysmenorrhea. *Background*. The practice of self-care behavior for dysmenorrhea has gradually attracted immense attention from society; however, thus far, only a few studies have been conducted to predict this behavior and analyze the associated factors by creating a structural equation model. *Methods*. A cross-sectional multistage cluster sampling study was conducted among nursing students within six universities in Shaanxi province, China. A model was constructed, and structured questionnaires were adopted to measure model variables, including e-health literacy, negative emotion, self-efficacy, self-care agency, degree of dysmenorrhea, and self-care behavior for dysmenorrhea. Descriptive data analysis was performed using SPSS 23.0 software, and AMOS 23.0 was used to verify and analyze the structural model. *Results*. In total, 1851 valid questionnaires were collected; the effective recovery rate was 93.15%, and the prevalence of dysmenorrhea was 64.51%. e-Health literacy ($B = 0.171$, $P < 0.001$), self-efficacy ($B = 0.416$, $P < 0.001$), self-care agency ($B = 1.177$, $P < 0.001$), and degree of dysmenorrhea ($B = 0.310$, $P < 0.001$) significantly influenced self-care behavior for dysmenorrhea. The total, direct, and indirect effects of e-health literacy and self-efficacy on self-care behavior for dysmenorrhea were 0.158 and 0.492, 0.128 and 0.248, and 0.030 and 0.244, respectively. *Conclusion*. The self-care behavior for dysmenorrhea is affected by several factors and self-efficacy has the greatest effect on it. To promote girls to actively implement self-care behavior for dysmenorrhea, educators should strengthen the training of self-efficacy and self-care agency of the nursing students to alleviate the uncomfortable experience brought by dysmenorrhea and decrease the harm of dysmenorrhea. *Implications for Nursing Management*. Nursing managers should work with constant efforts to explore and optimize the management model for dysmenorrhea, encouraging young women to actively engage in self-care behavior for dysmenorrhea, to alleviate the discomfort experienced by individuals and improve women's overall health.

1. Background

Dysmenorrhea is defined as recurrent spasmodic pain in the lower abdomen during menstruation and is one of the most common causes of pelvic pain and menstrual disorders [1]. According to relevant reports, 56.4%–90% of women have dysmenorrhea [2–4], which is the main cause of their absenteeism from school and work [5, 6]. Dysmenorrhea is clinically divided into primary and secondary dysmenorrhea [7]. From the viewpoint of individual physical and mental development, severe dysmenorrhea can interfere with their

daily activities as well as cause varying degrees of harm to their life and quality of life [8, 9], thus adding to a huge public health burden [10]. Conversely, from the social and economic viewpoint, absenteeism caused by dysmenorrhea [11] causes an annual loss of 140 million working hours in the United States and economic losses of over $4.2 billion in Japan, thus making dysmenorrhea one of the important issues that need to be urgently addressed by researchers globally. The level of self-care agency of patients with dysmenorrhea is closely associated with their dysmenorrhea status [12]. Therefore, one of the most important approaches

for alleviating dysmenorrhea symptoms and reducing the harm of dysmenorrhea is whether individuals can fully take the initiative and be enthusiastic to implement self-care behaviors beneficial for their health.

According to the latest revision of the WHO Guidelines on self-care interventions [13], self-care is defined as the ability of individuals, families, and communities to promote health, prevent disease, maintain health, and cope with illness and disability, with or without the support of health workers. As a new primary healthcare approach [14], self-care has the potential to save health system resources and reduce patient care and follow-up costs [15, 16]; further-more, it is cost-effective and easy to learn [17]. Self-care has been widely used in postpartum women, those with spinal cord injury, those who underwent cancer surgery, and those with chronic diseases and plays an important role in the clinical outcome and prognosis of patients with chronic diseases [18–25]. Meanwhile, nursing students, as a special group, have been shown that the implementation of self-care behavior can not only help nursing students relieve pressure and make them better transition to nurse status but also help nurses and patients jointly create a safe clinical environment [26]. However, there are few research studies on the com-bination of nursing students' dysmenorrhea and self-care behavior as the research direction, the existing research studies are mostly single-factor or cross-sectional in-vestigations, and the holistic research based on the scientific nursing theory is relatively lacking. Therefore, in this study, taking Orem's self-care theory as the theoretical framework, a structural equation model was created to conduct a mul-tidimensional investigation and analysis of the self-care behavior of nursing students, discussed the status quo of nursing students self-care behavior for dysmenorrhea and related influencing factors, and provided reference and basis for medical personnel to frame effective intervention measures and guide these nursing students in actively implementing self-care behavior.

1.1. Literature Review. Dysmenorrhea is one of the most common gynecological disorders affecting the quality of life and social activities of women [27]. However, only 20.8% of the students choose to seek medical help for alleviating the discomfort and pain caused by dysmenorrhea; the vast ma-jority of students prefer self-care [28]. The self-care behavior for dysmenorrhea is affected by many factors, among which self-care agency has the greatest impact on it, demonstrating a positive correlation and direct effect [29, 30]. Wong et al. [30] pointed out that previous knowledge regarding men-struation has direct and indirect effects on self-care behaviors for dysmenorrhea and that there is a direct effect between the mother's education level and degree of dysmenorrhea and self-care behaviors for dysmenorrhea. The higher the e-health literacy [31, 32] and the better the individuals' self-efficacy [33, 34], the more willing they are to adopt self-care behaviors that can improve their health status and alleviate their pain. However, thus far, the existing studies on self-care for dys-menorrhea are mostly single factor, and there is a lack of systematic research on the relationship between multiple

variables based on scientific theories and models. Therefore, to help medical staff identify the potential or existing wrong self-care behavior of patients with dysmenorrhea as early as possible and improve self-care agency, it is important to assess the self-care behavior of these patients.

1.2. Structural Equation Model. This study is guided by Orem's self-care theory, which considers that each indi-vidual can independently implement self-care behavior [35] and that nursing intervention aims to help individuals improve their self-care agency [36].

Orem's self-care theory comprises self-care, self-care defect, and nursing system theories [37]. The self-care theory can provide the foundation for explaining self-care behavior, assessing the relationship between relevant vari-ables, and predicting the effect of self-care intervention. This theory points out that self-care agency is an important re-quirement for individuals to implement self-care behavior and that its strength is closely associated with basic con-dition factors (BCFs). BCFs include age, sex, developmental status, health status, sociocultural context, health reasons (e.g., medical diagnoses and therapeutic interventions), family factors, lifestyle, environmental factors, and avail-ability [38]. All BCFs can affect the level of self-care agency and are used in self-care behavior, that is, BCFs affect self-care behavior through self-care agency [37].

Resource availability and its adequacy are one of the BCFs that have a direct impact on self-care agency [37]. e-Health literacy as a reflection of the ability to acquire and apply network resources demonstrates that [39, 40] the level of e-health literacy of individuals directly affects their ability to care for poor health. The pain intensity during dysmenorrhea is a distress signal released by the body after an individual's health condition is compromised; the pain degree of women with dysmenorrhea is significantly associated with their self-care behavior [30, 41]. Therefore, in the model framework of the present study, from Orem's self-care theory, resource availability and the health status were selected as exogenous variables and self-care agency and self-care behavior as media and outcome variables, respectively.

Furthermore, the path relationship between the factors was established based on the findings from the existing re-search. Negative emotional experiences can decrease the pain threshold and increase the pain degree of individuals, leading to a vicious cycle of negative emotional responses to dys-menorrhea [42]; nonetheless, negative emotions have a sig-nificant negative relationship with self-care agency [43, 44]. Individuals with high self-efficacy are frequently able to ac-tively learn relevant knowledge, take correct and positive nursing measures, improve their self-care agency, and alleviate their pain and discomfort through continuous learning [45]. These individuals also display higher self-care abilities and implement self-care behaviors that are favorable to symptom relief or improvement of their condition [46]. Although Orem's self-care theory does not highlight the association among negative emotion, self-efficacy, and degree of dys-menorrhea, previous studies have confirmed the significant association between the abovementioned variables; therefore,

the path generated by the abovementioned variables was included in the present model. To sum up, the following hypothesis model was proposed after integrating Orem's self-care theory with the findings of previous studies (Figure 1).

1.3. Purpose. This study aimed to create a structural equation model and use it to clarify the influencing factors and the relationship between the variables of the self-care behavior of nursing students with dysmenorrhea in China to provide a theoretical basis and reference for medical staff and educators to better provide dysmenorrhea-related diagnosis and develop treatment strategies and scientific protective behaviors.

2. Methods

2.1. Overview. In this study, a cross-sectional multistage cluster sampling survey was conducted among nursing students from six universities in Shaanxi province, China. The structural equation model was used to assess the relationship between various variables and self-care behaviors for dysmenorrhea.

2.2. Participants and Data Collection. From February 2023 to April 2023, a multistage cluster sampling method was used for recruiting students. First, Shaanxi province in northwest China was chosen as the sampling unit among the seven major geographical regions in China. Second, according to the size and category of the university, six medical colleges were chosen from 15 universities offering undergraduate nursing majors in Shaanxi province and using the convenience sampling method to select eight classes in first- and second-year nursing undergraduate students from each medical college, resulting in a total of 48 classes. Finally, all nursing students from the selected classes who met the inclusion criteria were taken as subjects.

Inclusion criteria were as follows: (1) consistent with the diagnosis of dysmenorrhea [47] and (2) not having a psychiatric illness. Exclusion criteria included communication difficulties, poor compliance, and inability to complete the questionnaire.

According to the calculation method of the sample size of the structural equation, the baseline sample size was 15–20 times the predictive variables [48, 49] and the number of measured variables in this study was 23. By calculating 20 times the measured variables, 460 subjects should have been selected. In this study, it was calculated by the following equation: $(3 + 3 + 4 + 4 + 3 + 6) * 20 = 460$. A total of 1,987 questionnaires were sent to six schools in this study, and 1,851 valid questionnaires were finally recovered after excluding those that did not meet the inclusion criteria. The effective recovery was 93.15%.

2.3. Measurement Tools

2.3.1. e-Health Literacy Scale. The e-Health Literacy Scale [50], which includes eight items and wherein each item adopts the Likert 5-level scoring method, including three dimensions, application ability, evaluation ability, and decision-making ability of online health information and services, was used

FIGURE 1: Theoretical framework.

as an assessment tool. The Cronbach's α coefficient of the Chinese version of the scale was 0.913 [51], and Cronbach's α was 0.960 in this study.

2.3.2. Depression Anxiety Stress Scale-Simplified Version. A simplified version of the Depression Anxiety Stress Scale [52], which includes depression, anxiety, and stress with a total of 21 items, was used to measure the negative emotions of the study subjects. The Likert 5-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.890 [53] and Cronbach's α was 0.969.

2.3.3. Self-Rated Abilities for the Health Practices Scale. The Self-Rated Abilities for Health Practices Scale compiled by Becker et al. was used to measure self-efficacy [54]. This tool was translated from English into Chinese with a total of 28 items and four dimensions that represented the ability to promote healthy behavior in four aspects, namely, nutrition, exercise, psychological well-being, and health responsibility. The Likert 5-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.950 [55] and Cronbach's α was 0.976.

2.3.4. Self-Care Agency Scale. The Exercise of Self-Care Agency Scale translated into Chinese by Kearney and Fleischer and [56] and Taiwan scholars [57] as a research tool with a total of 43 items and four dimensions, including the health knowledge level, self-concept, self-care responsibility, and self-care skills, was used. The Likert 5-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.890–0.920 [57] and Cronbach's α was 0.931.

2.3.5. Degree of Dysmenorrhea Scale. The Menstrual Distress Questionnaire, developed by Moos [58], which includes two subscales of physical dysmenorrhea symptoms and mental

and psychological symptoms before menstruation, each with three dimensions and a total of 30 items, was used. The subscale of physical dysmenorrhea symptoms in the Menstrual Distress Questionnaire, including pain-related symptoms, autonomic nervous disorder symptoms, and water and sodium retention symptoms, with a total of 14 items, was selected. The Likert 5-level scoring method was used. The higher the score, the more severe the dysmenorrhea. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.937 [59] and Cronbach's α was 0.943.

2.3.6. Adolescent Dysmenorrhea Self-Care Scale. The Adolescent Dysmenorrhea Self-Care Scale developed and compiled by Hsing et al. [60], and translated into Chinese and Cantonese by Wong et al. [61] (Hong Kong, China), is a research tool for measuring self-care behavior of nursing students with dysmenorrhea. The scale includes six dimensions of knowledge acquisition, emotional expression, seeking help, control of external factors, resource utilization, and self-control, with a total of 35 items. The Likert 6-level scoring method was used. In this study, the Cronbach's α coefficient of the Chinese version of the scale was 0.940 [61] and Cronbach's α was 0.973.

2.4. Data Analysis. The data collected in this study were directly exported from the questionnaire platform. IBM SPSS Statistics version 23 software and IBM SPSS AMOS version 23 software were used to analyze. The measurement data were represented by ($\overline{x} \pm s$); the counting data were statistically described by frequency and probability. The structural equation model was composed of two major parts as follows: the measurement model and the structural model. In the measurement model, confirmatory factor analysis (CFA) and the Pearson correlation coefficient were used to test the reliability and validity. In the structural model, the comparative fit index (CFI > 0.90), normed fit index (NFI > 0.90), Tucker–Lewis index (TLI > 0.90), and root mean square error of approximation (RMSEA < 0.06) were analyzed for model fit [62–64]. Bootstrapping analysis was used for the indirect effects, total effects, and statistical significance of the model, and the bootstrap ML method was utilized; the results of this method are more stable [65] and more accurate than other methods in studies with a sample size greater than 200 [66]. The 95% bias-corrected confidence intervals were used and the number of repeated samples was 5000 times. Two-sided P values less than 0.05 were considered significant.

2.5. Ethical Considerations. This study has been approved by the Ethics Committee of the Xi'an Medical University (number: XYYJSLS2022067). The participants voluntarily enrolled in this investigation and provided signed informed consent before the study.

3. Results

3.1. Characteristics. The number of valid questionnaires in this study was 1,871, of which 1207 cases (64.51%) had dysmenorrhea. The average age of the subjects was 19.97 ± 1.27 years

and approximately half of the girls had menarche at the age of 13–14 years (49.3%). Among the nursing students with dysmenorrhea, 186 (15.4%) had very irregular menstrual periods and the average number of menstrual days was 5–7 days in 826 (67.6%). Other general information is shown in Table 1.

3.2. Measurement Model. First, the original measurement model was verified, and the measurement variable with a standard factor load value below 0.7 was deleted [67, 68], that is, the self-control dimension of dysmenorrhea self-care behavior, resulting in a final measurement model comprising six latent variables and twenty-two measured variables.

Second, confirmatory factor analysis was conducted on the final measurement model. The results indicated that all factors had an average variance extracted (AVE) greater than 0.5 and construct reliability (C.R) higher than 0.7 [69, 70], demonstrating good convergent validity of the data in this study (Table 2).

Finally, based on Pearson correlation analysis, the self-care agency for dysmenorrhea was significantly positively correlated with e-health literacy, self-efficacy, self-care agency, and degree of dysmenorrhea ($r = 0.318$, $P < 0.001$; $r = 0.503$, $P < 0.001$; $r = 0.524$, $P < 0.001$; $r = 0.058$, $P < 0.05$) and negatively correlated with negative emotion ($r = -0.098$, $P < 0.01$) (Table 3). The results of the discriminant validity test in the measurement model demonstrated that the correlation coefficients between variables were all lower than the square root of AVE, indicating good discriminant validity of the model (Table 3).

3.3. Structural Equation Model. The theoretical framework (Figure 1) drew a total of nine paths; the hypothetical model is constructed based on the framework, and the result of the model fit showed that RMSEA = 0.062, CFI = 0.961, NFI = 0.953, and TLI = 0.954. According to the results of the software correction index, the model was further modified, the path between self-efficacy and dysmenorrhea in the hypothetical model was removed, and the final model with a total of eight paths was formed and analyzed, as shown in Figure 2. The fit index of the modified model showed the following: RMSEA = 0.058, CFI = 0.967, NFI = 0.959, and TLI = 0.962.

The parameter estimation table of the modified model for the self-care behavior of nursing students with dysmenorrhea is shown in Table 4. This study showed that eight out of nine pathways were statistically significant, whereas the path from self-efficacy to dysmenorrhea showed no statistical significance. Among them, the explanation rate of the degree of self-care behavior explained by self-care agency, degree of dysmenorrhea, e-health literacy, and self-efficacy was 41.7%, that of self-care agency explained by e-health literacy, negative emotions, and self-efficacy was 53.7%, and that of the degree of dysmenorrhea explained by negative emotions was 32.1%.

3.4. Effects. In the present study, self-care agency had the greatest effect on the outcome variable self-care behavior for dysmenorrhea and self-efficacy had the greatest effect on the media variable self-care agency. The direct and overall effects

Table 1: General characteristics.

Factors	Groups	No dysmenorrhea	Frequency (%)	$\overline{x} \pm s$	Dysmenorrhea	Frequency (%)	$\overline{x} \pm s$
Age	≤18	77	4.2	19.97 ± 1.27	65	5.4	20.07 ± 1.29
	19–21	1546	83.5		992	82.2	
	≥22	228	12.3		150	12.4	
BMI (kg/m^2)	Emaciation (<18.5)	483	26.1	20.39 ± 2.83	305	25.3	20.60 ± 3.20
	Normal (18.5 ≤ BMI < 24)	1171	63.3		767	63.5	
	Overweight (24 ≤ BMI < 28)	169	9.1		98	8.1	
	Obesity (≥28)	28	1.5		37	3.1	
Age of menarche	≤12	643	34.7	13.18 ± 1.36	431	35.7	13.15 ± 1.37
	13–14	913	49.3		597	49.5	
	≥15	295	15.9		179	14.8	
Menstrual cycle	Very regular	715	38.6		434	36.0	
	Relatively regular	867	46.8		587	48.6	
	Very irregular	269	14.5		186	15.4	
Menstrual period	2–4 days	549	29.7		346	28.7	
	5–7 days	1252	67.6		826	68.4	
	>7 days	50	2.7		35	2.9	
Total		1,851			1,207		

Table 2: Verification results of confirmatory factor analysis.

Latent variable	Item	Factor load (FL)	Average variance extracted (AVE)	Construct reliability (C.R)
e-Health literacy	X11	0.962	0.864	0.950
	X12	0.872		
	X13	0.884		
Negative emotion	X21	0.926	0.948	0.982
	X22	0.943		
	X23	0.966		
Self-efficacy	X31	0.810	0.830	0.951
	X32	0.917		
	X33	0.907		
	X34	0.867		
Self-care agency	Y11	0.824	0.924	0.980
	Y12	0.802		
	Y13	0.899		
	Y14	0.919		
Degree of dysmenorrhea	Y21	0.832	0.745	0.897
	Y22	0.901		
	Y23	0.735		
Self-care behavior for dysmenorrhea	Y31	0.853	0.694	0.919
	Y32	0.927		
	Y33	0.881		
	Y34	0.865		
	Y35	0.824		

X11: test the application capability of network health information and service; X12: judging ability; X13: decision-making ability; X21: depressed; X22: anxiety; X23: stress; X31: nourishment; X32: movement; X33: psychological comfort; X34: health responsibility; Y11: health knowledge level; Y12: self-concept; Y13: self-care responsibility; Y14: self-care skills; Y21: pain-related symptom; Y22: autonomic nervous disorder; Y23: water and sodium retention; Y31: acquire knowledge; Y32: emotional expression; Y33: ask for help; Y34: control external factors; Y35: resource utilization.

Table 3: Average scores of each variable item, discriminant validity, and Pearson correlation coefficient ($n = 1207$; SD, standard deviation).

	Mean (SD)	Range	X1	X2	X3	Y1	Y2
e-Health literacy (X1)	3.91 [0.79]	1.00–5.00	**0.930**				
Negative emotion (X2)	1.49 [1.31]	0.00–6.00	−0.099**	**0.974**			
Self-efficacy (X3)	2.17 [0.75]	0.04–4.00	0.343***	−0.166***	**0.911**		
Self-care agency (Y1)	2.40 [0.47]	1.12–4.00	0.314***	−0.351***	0.650***	**0.962**	
Degree of dysmenorrhea (Y2)	2.44 [0.76]	1.00–5.00	−0.092**	0.519***	−0.123***	−0.195***	**0.863**
Self-care behavior for dysmenorrhea (Y3)	3.74 [0.99]	1.09–6.00	0.318***	−0.098**	0.503***	0.524***	0.058*	**0.833**

Diagonal bold numbers are AVE square root values, and numbers below diagonal are Pearson correlation coefficients (*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$). If the AVE square root value is greater than the correlation coefficients of the corresponding variable, it indicates good discriminant validity of the measured variable.

of the eight pathways and the indirect effects of e-health literacy and self-efficacy on self-care behavior for dysmenorrhea were statistically significant (Table 5).

4. Discussion

4.1. Current Situation of the Self-Care Behavior of Nursing Students with Dysmenorrhea. According to the general characteristics of the population included in this study, approximately half of the girls had menarche at the age of 13–14 years (49.3%) and the average number of menstrual days was 5–7 days in 826 (68.4%). The incidence of dysmenorrhea was about 64.51% (1207/1871), which was similar to the findings of a previous study [71], indicating that dysmenorrhea is still a major problem that should be paid more attention to during the healthy development of female body and mind. Most individuals with dysmenorrhea have

menarche at the age of 13-14 years, accounting for 49.5%. It is suggested that schools should form a relationship education mechanism with local primary healthcare departments and parents of students and conduct activities including lectures or exchange forums related to menstruation to establish correct cognition of normal physiological phenomena such as menstruation in individuals and encourage them to take positive and correct self-care behaviors for dysmenorrhea spontaneously, thus helping them alleviate the discomfort caused by dysmenorrhea.

4.2. Fit Degree of the Structural Equation Model for the Self-Care Behavior of Nursing Students with Dysmenorrhea. This study took Orem's self-care theory as the core framework. After the verification and modification of the structural model, the fit degree of the structural equation model for the self-care

FIGURE 2: Structural equation model of self-care behavior of medical students with dysmenorrhea. X11: test the application capability of network health information and service; X12: judging ability; X13: decision-making ability; X21: depressed; X22: anxiety; X23: stress; X31: nourishment; X32: movement; X33: psychological comfort; X34: health responsibility; Y11: health knowledge level; Y12: self-concept; Y13: self-care responsibility; Y14: self-care skills; Y21: pain-related symptom; Y22: autonomic nervous disorder; Y23: water and sodium retention; Y31: acquired knowledge; Y32: emotional expression; Y33: ask for help; Y34: control external factors; Y35: resource utilization. $^{*}P < 0.05$, $^{**}P < 0.01$.

TABLE 4: Parameter estimates of variables for the modified model.

Paths	B (S.E.)	β	P value	SMC
Self-care agency: self-care behavior for dysmenorrhea	1.177 (0.111)	0.398	<0.001	
Degree of dysmenorrhea: self-care behavior for dysmenorrhea	0.310 (0.044)	0.184	<0.001	0.417
e-health literacy: self-care behavior for dysmenorrhea	0.171 (0.035)	0.128	<0.001	
Self-efficacy: self-care behavior for dysmenorrhea	0.416 (0.061)	0.248	<0.001	
e-health literacy: self-care agency	0.035 (0.011)	0.077	0.001	
Negative emotion: self-care agency	−0.146 (0.014)	−0.248	<0.001	0.537
Self-efficacy: self-care agency	0.348 (0.017)	0.614	<0.001	
Negative emotion: degree of dysmenorrhea	0.585 (0.030)	0.567	<0.001	0.321

S.E.: standard error, β: standardized estimate, SMC: squared multiple correlation.

TABLE 5: Standardized direct, indirect, and total effects.

Dependent variable	Independent variable	Direct effect	Indirect effect	Total effect
Self-care behavior for dysmenorrhea	Self-care agency	0.398**	—	0.398**
	Degree of dysmenorrhea	0.184**	—	0.184**
	e-Health literacy	0.128**	0.030*	0.158**
	Self-efficacy	0.248**	0.244**	0.492**
Self-care agency	e-Health literacy	0.077*	—	0.077*
	Negative emotion	−0.248**	—	−0.248**
	Self-efficacy	0.614**	—	0.614**
Degree of dysmenorrhea	Negative emotion	0.567**	—	0.567**

$^{*}P < 0.01$, $^{**}P < 0.001$.

behavior of nursing students with dysmenorrhea was at a good level. Self-care agency, degree of dysmenorrhea, e-health literacy, self-efficacy, and other independent variables directly affected the self-care behavior for dysmenorrhea, and the explanation rate of the abovementioned variables was 41.7%. Among them, e-health literacy, self-efficacy, and self-care

behavior for dysmenorrhea had indirect effects. The variables that directly affected self-care agency were e-health literacy, negative emotion, and self-efficacy; the explanation rate of these variables was 53.7%. Furthermore, negative emotion was a factor that directly affected the degree of dysmenorrhea; the explanation rate of this factor was 32.1%.

4.3. Mediating Effect of Various Variables on the Self-Care Behavior of Nursing Students with Dysmenorrhea. Individual e-health literacy can not only directly affect the self-care behavior for dysmenorrhea but also indirectly affect self-care agency. Similarly, self-efficacy not only has a direct effect on the self-care behavior for dysmenorrhea but also indirectly affects the self-care behavior of individuals through self-care agency. This fully demonstrates that the self-care agency plays a critical role in e-health literacy, self-efficacy, and self-care behavior for dysmenorrhea. Therefore, healthcare departments or universities should be fully aware of self-care agency when conducting menses-related education for nursing students and boost self-care agency by improving individual e-health literacy and guiding students to improve self-efficacy to achieve the aim of actively implementing self-care behaviors for dysmenorrhea.

4.4. Limitations. This study has two limitations. First, the sample size is confined to nursing students exclusively from select medical colleges in Shaanxi province, China, which may restrict the generalizability and diversity of the findings. To enhance the universality and persuasiveness of the research results, it is recommended to expand the types and range of samples in future studies. Second, due to the inherent constraints of cross-sectional research regarding time relationships and causality, establishing associations between variables in this study relies on theoretical frameworks and previous literature. Therefore, conducting longitudinal or interventional studies on factors influencing self-care behaviors for dysmenorrhea among nursing students would be advantageous for further exploration of predictive factors impacting such behaviors.

5. Conclusion

Based on Orem's self-care theory and the findings of previous studies, this study created a scientific structural equation model that can explain the factors affecting self-care behavior for dysmenorrhea. The model verified and analyzed the explanation degree of e-health literacy, negative emotion, and self-efficacy on self-care behavior for dysmenorrhea, and the mediating role and effect size of the self-care agency and degree of dysmenorrhea.

6. Implications for Nursing Management

Dysmenorrhea is a significant factor affecting women's health. It is not merely a temporary issue for individuals, schools, or families but also a major concern related to students' academic performance and future fertility. It profoundly impacts their overall well-being, future life, and

work. Implementing proactive and effective self-care behaviors can alleviate the discomfort and enhance their quality of learning and life. Schools and families should offer proper guidance to students with dysmenorrhea, foster the development of correct cognitive attitudes, and establish positive coping strategies. Nursing managers can refine the management model for self-care behaviors associated with dysmenorrhea. With the advancements in the Internet and big data, they can create authoritative and scientific information platforms for students to access and reference, thereby reducing the pressure on students' e-health literacy. In addition, considering individual personality traits and lifestyle habits, tailored self-care recommendations can be provided, thereby reducing menstrual discomfort and furthering women's health.

Data Availability

The data used to support the findings of this study have not been made available because of person privacy and ethical issues.

Ethical Approval

This study was approved by the Institutional Review Board of the Xi'an Medical University Ethics Committee (approval no. XYYJSLS2022067).

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Self-Controlled Perspective: Nurses' Perceived Social Undermining and Knowledge-Sharing Behavior in Public Hospitals

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Nurses work in a high-risk and uncertain environment, which may lead to harmful social interactions resulting in self-regulation impairment. The aim of this study was to examine the effects of perceived social undermining and how and when this perception affects nurses' knowledge-sharing behavior. We developed a conceptual framework of self-regulation impairment in which nurses' perceived social undermining (from supervisors and coworkers) depletes self-control resources, dampening their knowledge-sharing behavior. We hypothesized social adaptability and resource management ability as self-regulating capacities that mitigate the impairment process. Results from a multisource and multiwave in the public hospitals provided support to our hypotheses. This study yielded significant findings with theoretical and practical implications that provide leads for future investigations in the field of healthcare research.

1. Introduction

Seven decades ago, [1] stated that others in an organization (coworkers) "do the most to make our lives sweet or sour." Unsurprisingly, extensive research has been conducted to better understand how environmental factors influence (e.g., perceived social support [2] and perceived social undermining [3]) and contribute to the "sweetness" and "sourness" of our lives. Social undermining is a form of mistreatment categorized as "a perception of others' expressions of negative affect (e.g., anger), negative evaluations, and behaviors that hinder one's goal attainment" [4]. It creates an environment where stressful stimuli cause individuals to experience different strain reactions and has been linked to numerous well-being and health-related outcomes [5]. For instance, employee perceptions of social undermining have been linked to various stress-related outcomes, including poor mental health [6], psychological

distress [7], turnover [8], sleep quality and work engagement [4], and deviant behavior [9]. In addition, Vinokur and Van Ryn [6] revealed that compared with social support, social undermining has an asymmetrically greater impact on employees' well-being and reactions in stressful situations.

Despite the well-established theoretical foundation of social undermining, studies on social undermining mostly emphasized its antecedents (e.g., [10–16]) and consequences (e.g., [4, 6, 8]). A limited number of studies have addressed the within-individual level factors that are competent for extenuating the destructive effects of perceived social undermining (e.g., [5]) on potential detrimental behavioral outcomes, especially in the healthcare service sector such as hospitals. The studies that have been conducted so far suggest that self-efficacy as an individual difference [17], trait resilience [4], social identification [18], and moral identity [19] can buffer the relationships between perceived social undermining and its consequences. To the best of our

knowledge, these studies lack a single, cohesive explanation for within-individual mitigating effects.

Moreover, the detrimental impacts of perceived social undermining such as work engagement [4]; job attitudes, well-being, and deviant behavior [20]; revenge, avoidance, and reconciliation [21]; and engaging in undermining [22] on individuals have been studied. However, employee behavioral outcomes have been paid less attention [17]. Especially individuals' knowledge-sharing behavior is an imperative work outcome that continues to be understudied in social undermining literature. According to scholars, knowledge and its management are important for the competitive advantage, success, and long-term sustainability of organizations [23]. Given that knowledge sharing is one of the most important discretionary behaviors in the modern knowledge-based economy, it is critical to examine the conditions under which employees can or cannot do so [24, 25].

In this study, we incorporated these issues and developed a model that integrates a blended integrative resource regulation perspective (see [26] for more details) with the literature on perceived social undermining [27], knowledge sharing through self-control resource depletion, and within-individual buffering factors, namely, social adaptability and resource management ability. The aim of this study was to identify additional factors that mitigate the negative affective and behavioral reactions of individuals to perceive social undermining. Our research focuses on distinctions that highlight an individual's ability to exert a direct influence on threatening circumstances. Building on the resource regulation perspective, we argue that perceived social undermining (both from supervisors and coworkers) depletes individuals' self-control resources, which leads to dysfunctional behavior (knowledge sharing). Moreover, we further propose that employees with high levels of social adaptability and resource management ability will encounter fewer adverse reactions (i.e., self-control resource depletion) and have improved behavioral outcomes (i.e., knowledge sharing) when faced with social undermining from supervisors and coworkers than less adept employees. Given that social undermining is a perception and that it is possibly unrealistic to eliminate such sensitivities from individuals' cognitions, it is crucial to identify the factors that can mitigate its harmful effects.

This study makes several significant contributions. First, it contributes to the research on interpersonal relationships by demonstrating how social undermining shapes nurses' deviant behavior via self-control resource depletion. Second, by investigating the buffering roles of social adaptability and resource management ability in healthcare nursing departments, it provides a deeper comprehension of the relationship between the perceptions of social undermining and nurses' behavioral outcomes. Finally, from a blended integrative resource regulation perspective, we investigated how destructive behaviors (supervisors and coworkers undermining) affect nurses' willingness to share their knowledge, which has not yet been thoroughly investigated in previous studies on harmful social interactions [26, 28] but was recently recommended in a study on social undermining [4].

2. Theory and Research Framework

Social undermining at work refers to dysfunctional behavior [29] perceived as stressful both cognitively and emotionally [21, 30] and is anticipated to deplete individuals' self-control resources when viewed through the lens of self-regulation (e.g., [19]). As required by societal standards [31], individuals must suppress not only undermining cognitive and behavioral manifestations but also emotional manifestations [32]. Such suppression requires self-control, and exercising self-control uses up an individual's limited supply of resources for self-regulation [33]. In addition, employees' perceptions of undermining are psychologically taxing because they make them consider the causes and effects of maladaptive treatment [34]. As a result, self-regulation, or the capacity to restrain instinctive impulses and reactions, is necessary for appropriate responses to undermine threats [35, 36] and thus promote goal pursuit and context-appropriate behavior [37]. In our study, we propose the theory that the depletion of self-control resources serves as a mechanism to elucidate how social undermining perceptions influence employees' subsequent behaviors. Negatively valenced events consume more self-regulatory resources than positively valenced events, causing dysfunctional social encounters [27, 35, 37]. Previous research has linked social interpersonal problems to outcomes such as decreased prosocial behavior and increased deviance [38]. In fact, individuals often use self-regulatory mechanisms to restrain their urges and carefully consider the situation before acting when they are subjected to unfair treatment [34]. According to scholars (e.g., [35, 37]), this could result in energy depletion, which would then adversely affect individuals' other attitudes and behaviors [39]. Integrating a blended resource regulation perspective [26], we emphasize that when an individual's cognitive and physical resources are depleted, stress can occur, and this resource depletion further leads to stress-driven behavioral reactions and outcomes. Moreover, researchers have revealed that individuals' self-control resources are depleted by factors at work such as justice social comparison perception [40], emotional dissonance [41], family-work conflict [42], daily procedural and interpersonal justice behaviors [43], experienced incivility [44], ethical leader behavior [45], surface acting [46], contingent punishment [47], air pollution [48], and undermining victimization [22].

Concerning our review of the existing studies, we focused on acts of helping, which require self-regulatory resources [43]. When individuals' resources are depleted by social undermining, we expect them to engage in fewer helping behaviors (e.g., knowledge sharing) and more uncivil ones (e.g., increased counterproductive work behavior [48]). Our study used the self-regulation theory to better comprehend how individuals respond to the perceived social undermining of supervisors and coworkers on the basis of their characteristics. In the present study, we acknowledge that subordinates' social adaptability levels can significantly affect how they view their social interactions with supervisors and coworkers within an organization. Our research objective was to comprehend how social adaptability as
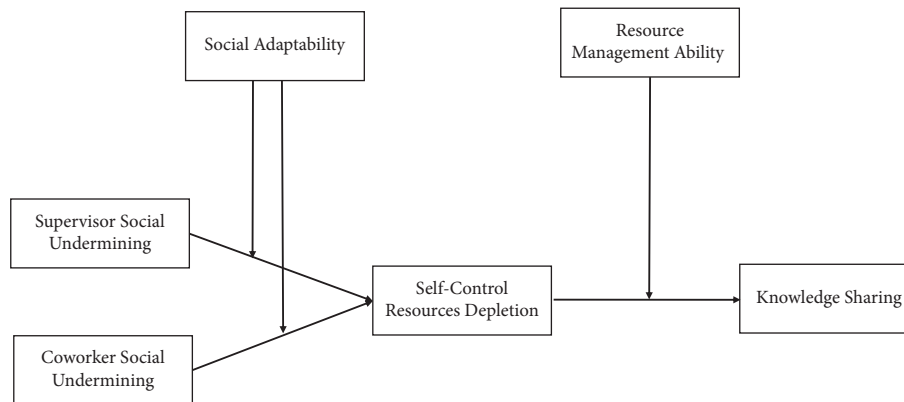
FIGURE 1: Proposed conceptual model.

a personal trait can affect individuals' responses to perceptions of social undermining. The ability to modify behaviors and adjust cognitions in response to shifting threats and situational demands is referred to as social adaptability [49]. According to Ployhart and Bliese [50], "It is [the] underlying characteristics of an individual that represents his or her ability, skill, disposition, willingness, and/or motivation to change or fit the different task, social, and environmental features" (p. 13).

In accordance with the integrative resource regulation perspective, resource management ability (i.e., individual differences in control beliefs) was investigated as a factor for mitigating the negative effects of mistreatment [51]. The construct of resource management ability was developed by Hochwarter et al. [52, 53] and refers to "one's ability to maintain and mobilize one's resources for personal benefit." According to Bolger and Zuckerman's [54] differential exposure-reactivity model, individual differences can affect how employees see stimuli as stressors and how they react to them, which fits well with the adopted theoretical perspective. In our study, we propose the buffering role of social adaptability (first-stage moderator) between the relationship of perceived undermining and self-control resource depletion and that of resource management ability (second-stage moderator) between the relationship of self-control resource depletion and knowledge behavior, which are posited to influence individuals in the workplace from a blended integrative resource regulation perspective. Consequently, we infer that individuals with better social adaptability and perceived resource management ability will exhibit more positive outcomes (i.e., self-control resource) and behavioral reactions (i.e., knowledge sharing) in response to perceived undermining than those who report low levels of social adaptability and resource management ability. Figure 1 depicts the conceptual model of the study.

3. Hypotheses Development

3.1. Social Undermining and Self-Control Resource Depletion.
According to existing resource depletion models [35, 37], social undermining impairs an individual's self-control resources [19]. It is recognized as a hindrance stressor with

several negative consequences for organizations and individuals [17]. Furthermore, it is a destructive work behavior of coworkers and supervisors that refers to "the negative form of social interaction characterized by active dislike and devaluing of an individual" [8, 55]. A point of agreement among undermining scholars is that perceiving undermining not only affects the recipient's moods, hedonic tone, and proactive socialization [8] but also harms [6] and entails a deliberate set of actions that would worsen the recipient's circumstances than what they otherwise would be [27]. As previously indicated, workplaces are frequently riddled with a plethora of stressors that necessitate individuals to exercise self-regulation [56–58]. The theory of self-regulation is a comprehensive theory that describes how individuals regulate their emotions, motivation, behaviors, and cognition to accomplish their objectives [35]. These resources are finite [59, 60], and interpersonal aggression is more likely to occur in cases of depletion because the individual lacks the self-control needed to restrain aggressive impulses [42]. As a result, individuals' psychological, mental, and physical resources (i.e., self-regulatory) are critical in assisting them in combating aggression and maintaining the effort. These resources can be depleted when individuals are involved in acts of self-regulation [61], reducing their ability to self-regulate [37], which leads to psychological strain [39]. Furthermore, academics have argued that being the target of intrapersonal aggression at work creates a conflict between the desire to take revenge and the higher-order objectives of acting by interpersonal norms or maintaining good relationships, which depletes self-control resources [33, 44].

> H1: supervisors' social undermining and coworkers' social undermining are positively associated with self-control resource depletion.

3.2. Self-Control Resource Depletion as a Mediating Mechanism.
According to Hypothesis 1, social undermining has a direct impact on individuals' self-control resource depletion. In this study, we examined how this impact may further affect individuals' knowledge-sharing behavior. Knowledge is regarded as a competitive advantage for organizations, and for success and long-term sustainability,

management of knowledge is critical [62]. On the other hand, scholars are increasingly realizing that employees, rather than technologies or even systems, are the main obstacles to knowledge management processes [63]. Even though knowledge sharing is one of the most important discretionary behaviors [64], it is significant to examine the circumstances under which individuals may or may not share their knowledge in today's advanced knowledge-based economy.

To identify potential behavioral outcomes, we employed a resource regulation perspective in conjunction with the literature on mistreatment [4, 26]. Existing research indicates that destructive social behavior (i.e., social undermining) may result in both deviant and prosocial behaviors (e.g., [65]), consistent with a recent study on the impact of resources for self-regulation on discretionary behaviors (e.g., [4, 66]). To achieve goals such as being helpful or abstaining from negative behavior, self-control is essential [67, 68]. However, employees are more likely to experience breakdowns in their capacity to control their subsequent behavior while at work because undermining depletes resources for self-regulation [43]. The consequences of resource depletion are frequently obvious as low-intensity, ambiguous, non-role-prescribed, and deviant behaviors [69], as this represents a burden that consumes regulatory resources that could instead be used by individuals at work [40, 70]. Therefore, resource-drained employees may engage in fewer sharing behaviors to protect the limited attentional resources that they still have instead of taking on more work that benefits others [40, 71]. Employees might not be as motivated to invest their remaining resources in sharing behavior [72] because it is unrelated to their official job duties [69]. Therefore, we propose that individuals who encounter social undermining may exhaust their reserves of self-control, further weakening self-regulation, reducing their ability to control their aggressive behaviors, and increasing their propensity to act destructively.

This is because knowledge sharing necessitates more costs or risks from individuals than other discretionary behaviors. It involves the sharing of special skills, information, expertise, and specialized knowledge, and individuals may require additional effort and time to engage in such behaviors. In addition, individuals within the organization might decide not to divulge insider information to others to keep their competitive advantages [63]. Thus, encouraging knowledge sharing can be particularly difficult unless individuals think doing so will have greater advantages [25, 73]. Consequently, it is critical to identify the factors that may prevent knowledge sharing among organizational members [74].

Typically, the presence of a stressor causes self-regulation impairment (e.g., social undermining) that depletes an individual's self-control resource [4], reducing the ability to control impulses and exhibit socially desirable behaviors [75]. Supervisors and coworkers are essential to an employee's relationships, work-related achievements, and reputation in the workplace; consequently, employees have strong reactions to undermining from these individuals (e.g., [27, 76]).

> H2: supervisors' social undermining and coworkers' social undermining have negative indirect effects on knowledge-sharing behavior through self-control resource depletion, such that social undermining increases resource depletion, which then decreases knowledge-sharing behavior.

3.3. Social Adaptability as a Buffering Mechanism.

Employees' perceptions of social problems (e.g., undermining) have a negative impact by taxing self-regulation processes and depleting the necessary self-control resources [36]. Employees' abilities to regulate their behaviors are debilitated as self-control resources are depleted. Individuals, rather than being passive bearers of threatening events, must constantly self-regulate to control the negative consequences of these events [33, 77]. Thus, it is likely that individual differences in the ability for self-control influence the negative impact of perceived social undermining on knowledge-sharing behavior by compromising self-control resources. Among the potential individual differences in self-regulation capacity, social adaptability plays a key role in the anti-stress response process generally (e.g., [26, 78]) and in the stressful nursing context specifically [79]. We propose that individual social adaptability (e.g., as a personal characteristic) serves as a stress-relieving resource for individuals at work when they perceive undermining from supervisors and coworkers. Theoretical underpinnings indicate that social adaptability provides the basis for examining how resources enable individuals to perceive and react to their surroundings. To respond, process, and comprehend social undermining (supervisors and coworkers), highly adaptable individuals may use social adaptability as a resource to reduce their need for self-regulation. Individuals' natural homeostatic balances are less likely to be disturbed when highly adaptable individuals' self-regulatory responses are less resource demanding [80].

As previously reported, perceived social undermining behaviors are insidious ([27], p. 332). Despite the veracity of previously confirmed relationships [20, 26], we propose that social adaptability can be a buffering influence of social undermining on behavioral outcomes through self-control resource depletion. By integrating a resource regulation perspective, we propose the effects of perceived social undermining as a function of variations in individual social adaptability, which is similar to Ployhart and Bliese's [50] conceptualization. We specifically contend that individuals who lack social adaptability are more likely to experience the adverse effects of stressful situations with undermining contexts because they lack or have exhausted their resources for self-control and are unable to control their behavior. By contrast, individuals with high social adaptability have the means and tools to control any potential negative effects of situations where social undermining behavior is perceived.

H3: social adaptability buffers the indirect relationship between supervisors' and coworkers' social undermining (via self-control resource depletion) and knowledge sharing, such that the mediated relationship is weaker when an individual has high (vs. low) social adaptability.

3.4. Resource Management Ability as a Buffering Mechanism for Social Undermining Effects. Individuals with more resources in an organization are better able to control their behaviors in response to workplace stress and successfully manage them (e.g., [81]). Integrating the resource regulation perspective, we posit that individuals' perceived undermining from supervisors and coworkers may interrupt the restoration of their self-regulatory resources, as evidenced by depleting self-control resources, which further affects their knowledge-sharing behavior. We hypothesized that such relationships depend on an individual's resource management ability. Although the arguments of the conservation of resources (COR) theory and resource-based self-regulation theory are conceptually similar and share many other similarities (see [82] for details), Halbesleben et al. [83] claimed that the self-regulation theory provides a potential lens to investigate the loss process, arguing that COR is less clear in the process of losing resources. Therefore, to clarify loss as a self-regulation impairment process, we opted for a blended integrative resource regulation perspective [26].

The resource regulation theory identifies resource management ability (i.e., "equipped to protect and acquire resources that include access to equipment, assistance, flexibility, and control over the pace of, and exertion towards, one's work" [81]) as a key source of employees' coping efforts [51]. Resource management ability is a unique characteristic that has been shown to improve health and well-being, especially in high-stress situations [81]. According to scholars (e.g., [84, 85]), the ability to manage resources is likely to offer affective and cognitive resources that make up for exhausting circumstances. Specifically, higher levels of employee resource management ability buffered the harmful effects of mistreatment on employee-reported behavioral outcomes [51, 81]. Among others, they promote effective coping with such stress-inducing demands because they provide individuals with a sense of self-control [52]. According to Halbesleben et al. [83], it is significant that an individual's ability to manage resources goes beyond the mere possession of resources by emphasizing an individual's capacity to make the best use of already-existing resources or acquire new resources that can protect against job stressors.

We argue that employees with high levels of resource management ability may be less susceptible to the damaging effects of self-control resource depletion on knowledge-sharing behavior because employee resources enable them to capably counterbalance demands. Empirical studies also recommend that resource management ability counters the depleting effects of stressors on employees' affective, cognitive, and behavioral work outcomes [51]. According to Frieder et al. [81], individuals with high levels of resource

management ability showed less emotional exhaustion, intention to quit, dissatisfaction, and decreases in work effort when dealing with mistreatment behavior. However, little attention has been given to examine how within-individual differences in individual characteristics may moderate the extent to which depleted self-control resources influence individual knowledge-sharing behavior. This oversight is regrettable for practical reasons because individual characteristics can be easily changed to help employees. If greater resource management ability provides individuals with resources to combat resource depletion, then organizations can address the issues caused by undermining behaviors. Integrating the resource regulation theory, we propose that perceived social undermining can interfere with the recovery of self-regulatory resources, resulting in impaired self-control, which affects behavioral outcomes (individual knowledge-sharing behavior). Therefore, we hypothesized that such relationships depend on individuals' resource management ability. The following hypothesis is proposed on the basis of the preceding discussion:

H4: resource management ability buffers the indirect relationship between supervisors' and coworkers social undermining (via self-control resource depletion) and knowledge sharing, such that the mediated relationship is weaker when an individual has high (vs. low) resource management ability.

4. Methods

4.1. Participants and Procedures. The respondents were nurses working at public hospitals in Lahore, Pakistan. We used a three-wave survey structure, with a 3-week interval between each wave, to control for common method bias [86] and followed the process described in our model. The respondents were assured of the confidentiality of their data and asked to place their completed surveys in envelopes, which they sealed and returned to the data collection team.

The distribution procedure for the survey packets to head-nurse and subordinate-nurse pairs was outlined in guidelines and communicated to our data collection team and administrative department. We asked the administrative personnel to compile a list of head-nurse and subordinate-nurse pairs before conducting the survey. Head nurses can easily obtain information about the behavior of their subordinate nurses because hospitals typically operate as teams with relatively active formal and informal communication among staff members. Head nurses who had the chance to observe the knowledge-sharing behaviors of their immediate subordinate nurses were given a rating form. Thus, the likelihood of self-selection bias is probably low.

At time 1, we collected information related to demographics, perceived social undermining (head-nurses and subordinate nurses), and social adaptability. At time 2, we gathered data on self-control resource depletion and resource management ability, and at time 3, the head nurses were asked to respond to questions pertaining to the demographics and knowledge-sharing behavior of their subordinates. Codes were used to match the responses of the

head and subordinate nurses. While not too long to make it likely that significant internal or external events occurred during the data collection, these time intervals were sufficient to alleviate concerns regarding reverse causality. The questionnaires were administered in English, which is regarded as an official language in Pakistan [87].

Initially, 650 head-subordinate nurse dyads were invited to participate in the survey, and 495 responses were received in three waves. After removing incomplete and mismatched responses, a final sample of 440 matched responses was collected, with a response rate of 67%. More than half (75.2%) of the respondents were female. The participants' mean (SD) age was 28.7 (4.01) years, and their mean (SD) tenure was 2.19 (1.19) years.

5. Measurement

5.1. Perceived Social Undermining. Perceived social undermining was assessed using measures from the study of Duffy et al. [27] which were widely used in earlier studies (e.g., [10, 17, 20]). The participants were requested to rate their supervisors' and coworkers' undermining behaviors, for example, whether they had behaved in ways that insulted them and hurt their feelings over the past week, on the basis of a 5-point Likert scale (from 1 = to no extent to 5 = to a great extent). The Cronbach alpha value was 0.98.

5.2. Social Adaptability. To measure social adaptability, a five-item scale was adopted from Baron and Markman [88] which was validated by Mackey et al. [26]. Nurses were asked to respond from 1 (strongly disagree) to 5 (strongly agree). A sample item is "I can easily adjust to being in just about any social situation." The Cronbach alpha value was 0.94.

5.3. Resource Management Ability. To measure resource management ability, six items were adapted from Hochwarter et al. [52] which have been used in previous studies [51, 81]. A sample item is "I am able to pace myself at work when things get hectic." The nurses were asked to respond on the basis of a 5-point Likert scale (from 1 = strongly disagree to 5 = strongly agree). A sample item is "When work is stressful, I am able to conserve my energy." The Cronbach alpha value was 0.85.

5.4. Self-Control Resource Depletion. The five-item scale used to measure the depletion of individual self-control resources was adapted from Johnson et al. [42] which was originally developed by Twenge et al. [89] and previously used in the self-control literature [46, 48, 90]. The item included "I felt drained." The Cronbach alpha value was 0.89.

5.5. Knowledge Sharing. Using a seven-item scale, immediate supervisors (head-nurses) assessed their subordinates' knowledge-sharing behavior, as adopted from Lee et al. [24]. A sample item is "The subordinate shares his/her special knowledge and expertise with others." The Cronbach alpha value was 0.94.

5.6. Control Variables. Similar to previous studies [4, 46, 48], this study controlled for several characteristics of the respondents, including age, gender, job tenure, and negative affect. Age and gender are significant demographic factors that can influence the respondents' behaviors [48, 91]. They might also impact the assessments of perceived undermining. For instance, females might be more vulnerable to its negative effects. Given the unfavorable nature of interpersonal interactions, it makes sense to assume that socially negative appraisals affect people's negative emotions. However, in line with the resource-based approach to self-control, we argued that the depletion of self-control resources will specifically mediate the effects of socially undermining appraisals on individual behaviors [77]. To support our claims, we controlled for negative affect by using a 10-item scale adapted from the Positive and Negative Affect Schedule [92]. The Cronbach alpha value was 0.93.

5.7. Common Method Bias. Confirmatory factor analyses of the study variables were performed using the AMOS software package [93]. The six-factor baseline model showed an acceptable fit (χ^2 = 2043.714, degrees of freedom (df) = 1006, χ^2/df = 2.03, Tucker–Lewis index (TLI) = 0.95, comparative fit index (CFI) = 0.96, and root mean square error of approximation (RMSEA) = 0.04) compared with the one-factor model (χ^2 = 8192.848, df = 1021, χ^2/df = 8.02, TLI = 0.70, CFI = 0.73, and RMSEA = 0.12). Table 1 shows the other comparison model. The results demonstrate no common method bias and verified that the constructs were sufficiently distinct. These results increase confidence that common method bias (CMB) is not a likely contaminant of the results observed in this study and that our measures are sufficiently free of overlap and consistent with previous studies [94–96].

6. Results

Table 2 shows the means, standard deviations, reliabilities, and intercorrelations among the study's variables. The unstandardized coefficients for the paths estimated in the model are shown in Table 3. Perceived social undermining (from supervisors and coworkers) was a significant predictor of individuals' self-control resource depletions (β = 0.300, 0.285, $p < 0.001$, respectively), thus supporting our Hypothesis 1. To test the indirect effect between individuals' perceived social undermining and knowledge sharing, we applied PROCESS macro model 4. As shown in Table 4, the negative indirect effect is significant (β = −0.043, −0.040; SE = 0.20, 0.19; and 95% CI = not crossing zero), and supporting our Hypothesis 2.

Hypothesis 3 (first-stage moderated mediation model) posits that the indirect relationship between nurses' perceived social undermining (supervisors and coworkers) and individuals' knowledge-sharing behavior through self-control resource depletion is weak when an individual has high social adaptability. PROCESS model 7 with 5,000 bootstrap iterations was applied to test the interaction effect of undermining adaptability on individuals' self-control resource depletion. In particular, we computed the

TABLE 1: Model comparison.

Model	Structure	χ^2	df	$\Delta\chi^2$ (Δdf)	CFI	TLI	RMSEA
Baseline model	Six-factor	2043.714	1006		0.96	0.95	0.04
Model 1	Five-factor	3430.321	1011	1386.607 (5)	0.91	0.89	0.07
PSU and PCU							
Model 2	Four-factor	5056.005	1015	1625.684 (4)	0.84	0.83	0.09
PSU, PCU, and SA							
Model 3	Three-factor	6172.611	1018	1116.606 (3)	0.80	0.78	0.10
PSU, PCU, SA, and SCRD							
Model 4	Two-factor	7000.920	1020	828.309 (2)	0.77	0.75	0.11
PSU, PCU, SA, SCRD, and RMA							
Model 5	One-factor	8192.848	1021	1191.928 (1)	0.73	0.70	0.12

PSU = perceived supervisor undermining; PCU = perceived coworkers undermining; SA = social adaptability; SCRD = self-control resource depletion; RMA = resource management ability.

TABLE 2: Descriptive statistics, internal consistency reliabilities, and correlation matrix.

Constructs	Mean	SD	1	2	3	4	5	6	7	8	9	10
(1) Gender (T1)	1.75	0.43										
(2) Age (T1)	28.77	4.01	−0.015									
(3) Job tenure (T1)	2.91	1.19	−0.016	0.051								
(4) Negative affect (T1)	3.44	1.15	−0.053	0.002	0.096*	(0.93)						
(5) PSC (T1)	1.70	0.99	−0.157**	−0.047	0.026	−0.017	(0.98)					
(6) PCU (T1)	1.63	0.95	−0.160**	−0.064	−0.037	−0.023	0.831**	(0.98)				
(7) SCRD (T1)	2.10	0.77	0.014	0.001	0.068	−0.077	0.372**	0.335**	(0.89)			
(8) SA (T2)	3.61	0.76	0.056	−0.011	0.044	0.009	−0.118*	−0.115*	−0.222**	(0.94)		
(9) RMA (T2)	4.17	0.89	0.090	−0.006	−0.001	0.022	−0.163**	−0.154**	−0.102*	0.499**	(0.85)	
(10) KS (T3)	3.72	0.86	0.062	−0.009	0.066	0.011	−0.163**	−0.171**	−0.175**	0.826**	0.560**	(0.94)

$N = 440$. Values of alpha are shown in parentheses. PSU = perceived supervisor undermining; PCU = perceived coworkers undermining; SA = social adaptability; SCRD = self-control resource depletion; RMA = resource management ability; KS = knowledge sharing; $T1$ = time 1; $T2$ = time 2; $T3$ = time 3; $T4$ = time 4; SCRD = self-control resource depletion. $^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

TABLE 3: Regression analyses.

	Self-control resource depletion			Knowledge sharing			
	M1	M2	M3	M1	M2	M3	M4
Gender	0.020	0.130	0.122	0.126	0.077	0.073	0.130
Age	0.030	0.004	0.005	−0.001	−0.003	−0.004	−0.001
Job tenure	0.050	0.057	0.059*	0.047	0.044	0.043	0.057
Negative affect	−0.056	−0.050	−0.049	0.006	0.003	0.002	−0.006
PSU		0.300***			−0.134**		
PCU			0.285***			−0.148**	
SCRD							−0.202***
R^2	0.012	0.157***	0.130***	0.008	0.032**	0.034**	0.041***
ΔR^2		0.145***	0.118***		0.024**	0.026**	0.033***

$N = 440$. Beta coefficients are unstandardized. $^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$. PSU = perceived supervisor undermining; PCU = perceived coworkers undermining; SCRD = self-control resource depletion.

simple slopes for social undermining in predicting self-control resource depletion when social undermining was high vs. low (i.e., ±1 SD [97]). Results yielded that social adaptability was a significant moderator of the within-individual relationship between undermining and self-control resource depletion (supervisors undermining: $\beta = -0.185$, SE = 0.044, and 95% CI = not crossing zero and coworkers undermining: $\beta = -0.162$, SE = 0.048, and 95% CI = not crossing zero). Simple slope analyses showed that

the relationship between social undermining and self-control resource depletion was significantly weaker among individuals with high social adaptability (supervisors undermining: $\beta = -0.020$, SE = 0.012, and not crossing zero and coworkers undermining: $\beta = -0.019$, SE = 0.013, and not crossing zero) than among those with low social adaptability (see Table 4 and Figures 2(a) and 2(b)). The moderated mediation index provides a formal test of moderated mediation [98] and produced significant results

TABLE 4: Bootstrap analysis of the direct and indirect effects.

Results of mediation analysis	Coefficient (SE)	LLCI	ULCI
Direct and indirect effects of supervisor undermining on knowledge sharing			
Total effect	−0.140** (0.406)	−0.220	−0.061
Direct effect	−0.098* (0.043)	−0.183	−0.012
Indirect effect	−0.043** (0.020)	−0.082	−0.003
Direct and indirect effects of coworkers undermining on knowledge sharing			
Total effect	−0.155** (0.043)	−0.239	−0.071
Direct effect	−0.115* (0.045)	−0.203	−0.026
Indirect effect	−0.040** (0.019)	−0.079	−0.005
Moderating effect of social adaptability			
Direct and indirect effects of perceived supervisor undermining on knowledge sharing			
Perceived supervisor undermining X social adaptability	−0.185*** (0.044)	−0.272	−0.097
Direct effect	−0.098* (0.043)	−0.183	−0.012
−1SD ED-A fit (low level)	−0.061** (0.028)	−0.114	−0.004
1SD ED-A fit (mean level)	−0.041** (0.019)	−0.076	−0.003
+1SD ED-A fit (high level)	−0.020** (0.012)	−0.048	−0.001
Index of moderated mediation	0.027*** (0.015)	0.001	0.057
Direct and indirect effects of perceived coworkers undermining on knowledge sharing			
Perceived coworkers undermining X social adaptability	−0.162** (0.048)	−0.256	−0.069
Direct effect	−0.115* (0.045)	−0.203	−0.026
−1SD ED-A fit (low level)	−0.056 (0.025)	−0.105	−0.007
1SD ED-A fit (mean level)	−0.038 (0.017)	−0.070	−0.005
+1SD ED-A fit (high level)	−0.019 (0.013)	−0.050	−0.000
Index of moderated mediation	0.024 (0.014)	0.001	0.053
Moderating effect of resource management ability			
Conditional indirect effects of perceived supervisor undermining on knowledge sharing			
Self-control resource depletion X resource management ability	−0.148** (0.049)	−0.244	−0.052
Direct effect	−0.045 (0.037)	−0.117	0.028
−1SD ED-A fit (low level)	−0.002 (0.021)	−0.041	0.044
1SD ED-A fit (mean level)	−0.036** (0.016)	−0.069	−0.005
+1SD ED-A fit (high level)	−0.071** (0.023)	−0.119	−0.028
Index of moderated mediation	−0.043** (0.018)	−0.078	−0.008
Direct and indirect effects of perceived coworkers undermining on knowledge sharing			
Self-control resource depletion X resource management ability	−0.151** (0.049)	−0.246	−0.055
Direct effect	−0.064 (0.038)	−0.138	0.011
−1SD ED-A fit (low level)	0.004 (0.020)	−0.038	0.041
1SD ED-A fit (mean level)	−0.033** (0.015)	−0.065	−0.005
+1SD ED-A fit (high level)	−0.067** (0.023)	−0.113	−0.026
Index of moderated mediation	−0.041** (0.017)	−0.075	−0.007

$N = 440$. Coefficients are unstandardized. LLCI = lower level of confidence interval; ULCI = upper level of confidence interval. $^*p < 0.05$; $^{**}p < 0.01$; $^{***}p < 0.001$.

in this study (supervisors undermining index = 0.027 and coworkers undermining index = 0.024; not crossing zero), thereby demonstrating support for Hypothesis 3.

Hypothesis 4 (second-stage moderated mediation model) predicted that the indirect effect of social undermining (via self-control resources depletion) on knowledge sharing would be weakened by high resource management ability. Following the same procedure as Hypothesis 3, we applied PROCESS macro model 14 and tested the effect of self-control resource depletion and resource management ability on individual knowledge-sharing behavior. Results confirmed that resource management ability was a significant moderator of the within-individual relationship between self-control resource depletion and knowledge sharing (supervisors undermining: $\beta = -0.148$ and SE = 0.049 and coworkers undermining: $\beta = -0.151$, SE = 0.049,

and not crossing zero). Simple slope analyses further confirmed that the relationship between self-control resources depletion and knowledge sharing was significantly weaker among individuals having high resource management ability (supervisors undermining $\beta = -0.071$; SE = 0.023; and coworkers undermining $\beta = -0.067$, SE = 0.023, and not crossing zero, respectively); than those having low resource management ability (see Table 3 and Figures 3(a) and 3(b)). The moderated mediation index also produced significant results (index = −0.043 and −0.041, not crossing zero, respectively), thereby demonstrating support for Hypothesis 4.

7. Discussion

Individual knowledge-sharing behavior is important for organizational sustainable competitive advantages and
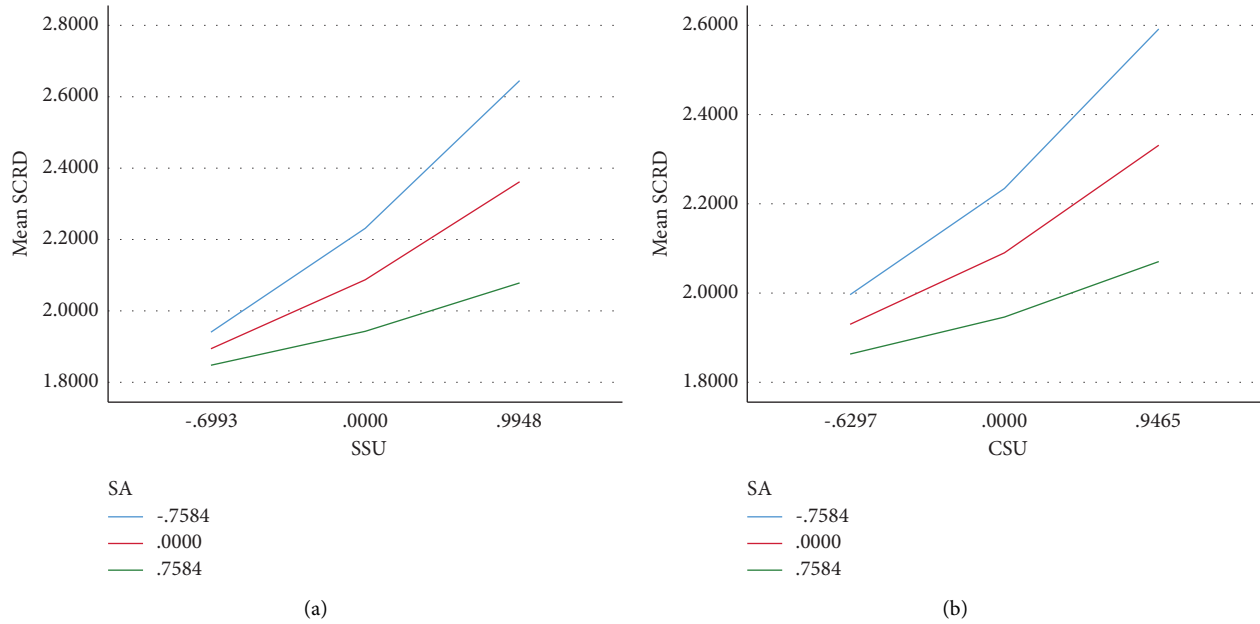
Figure 2: (a, b) The moderating effects of social adaptability.
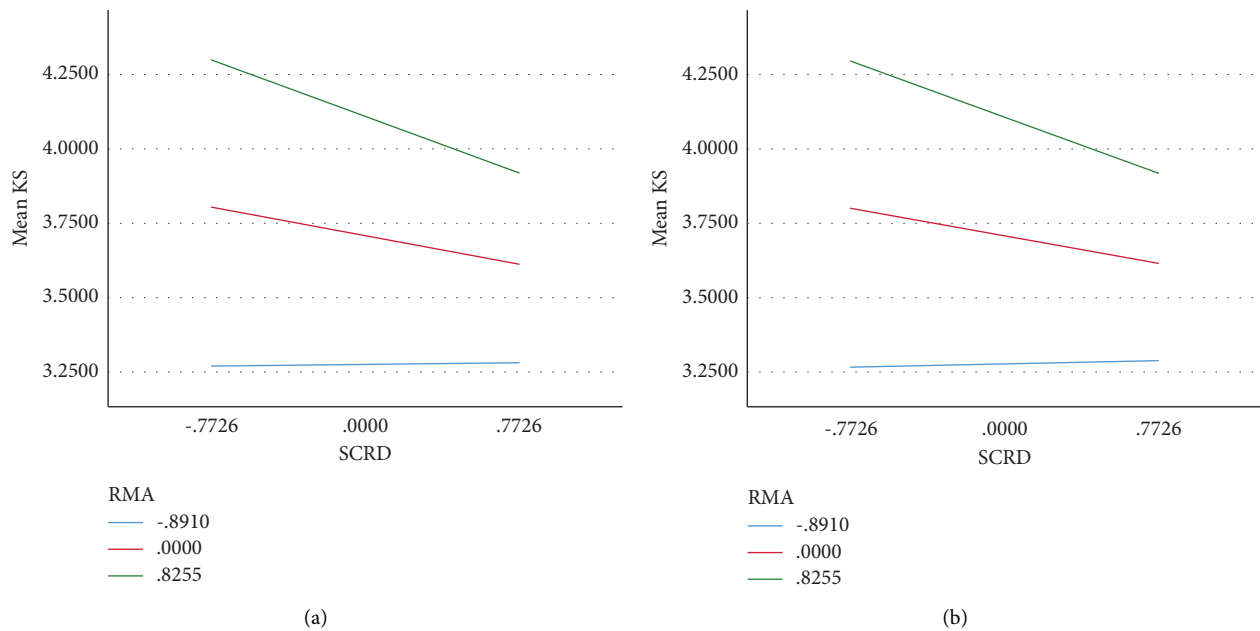
Figure 3: (a, b) The moderating effects of resource management ability.

effectiveness in the knowledge-based environment [24, 99]. Social interaction has a significant impact on how much individuals value their resources and how much effort they put forth to share their knowledge. This influence can either increase or decrease over time. This study used a resource-based self-regulation theory to examine how social undermining affects individual knowledge-sharing behaviors. We hypothesized and found that the social undermining perception experience explains dysfunctional outcomes. A focus on the detrimental aspects of social undermining provokes threat assessments, resulting in a taxing experience

that depletes self-control resources and renders individuals less capable of controlling their behavior through proper social norms. Social adaptability and resource management ability are influential characteristics in this undermining (stress) experience because they create a lens by which individuals cope with social undermining. This study also examined the intervening effect of self-control resource depletion between social undermining and knowledge sharing, moderated by social adaptability and resource management ability. Individuals experience self-control resource depletion as perceived undermining increases,

which reduces their knowledge-sharing behavior. Moreover, this mechanism is moderated by social adaptability and resource management ability. When social adaptability is high, the negative impact of social undermining on knowledge sharing through the depletion of self-control resources is mitigated.

7.1. Theoretical Implications. Individual knowledge sharing is becoming increasingly important in knowledge-based organizational environments [25]. Our findings point to several important insights that can provide a new, more complete explanation of knowledge sharing and social undermining.

In this study, we examined the important predictors of knowledge sharing, a key discretionary behavior in organizations [24]. First, we demonstrate that perceived social undermining hinders knowledge-sharing behavior. In a knowledge-based environment, it is important to identify factors that prevent knowledge sharing. From the blended integrative resource regulation perspective, our research confirms that when individuals experience undermining, they frequently use self-regulatory mechanisms first to restrain their urges and rationally comprehend the situation before directly engaging in retaliatory acts. This may deplete their self-control resources [61], negatively influencing their attitudes [40] and knowledge-sharing behavior [25]. We argued that to share their specialized knowledge, skills, or expertise, nurses may need to devote a fair amount of time and effort, as sharing behaviors involve actions and are likely to be complicated, over which individuals have some discretion. In light of this finding, encouraging knowledge sharing is more challenging than encouraging other optional behaviors such as organizational citizenship behavior.

Second, to investigate and expand our understanding of individual-situation interactions in the self-regulation impairment process [38], we examined the roles of social adaptability and resource management ability in assisting nurses to maintain physical and psychological functioning under interpersonal stress. Our findings support that social adaptability (first-stage moderator) and resource management ability (second-stage moderator) are protective factors that help buffer against self-regulation impairment and respond to the call of Fehr et al. [48] to examine the moderating factors (in the first and second stage) that buffer the effects of self-control resource depletion. This buffering effect occurs by weakening the stressor (i.e., perceived social undermining), strain (i.e., self-control resource depletion), and outcome relationship (i.e., knowledge sharing). According to Hypotheses 3 and 4, social adaptability lessens the stress reactions to initial stressors, whereas self-management skills make it easier to recover from the psychological strain that has already occurred. Although depletion makes it more difficult for employees to refrain from deviant and unethical behaviors (e.g., [34, 90]), individuals' self-management abilities are considered coping efforts [51] that enable them to override impulses, align behavior with social norms [77, 82], and buffer the harmful effects of

mistreatment, which help improve their discretionary behaviors [51].

Third, our study contributes to the literature on individual self-control by identifying the important but overlooked antecedent (i.e., social undermining) appraisals of individual self-control resource depletion that are driven by an interrelated set of psychological factors. Research on the organizational implications of self-control has focused on a narrow range of predictors, usually job demands. Some researchers have theorized that a broader range of phenomena may cause employees to feel depleted, but empirical research on the links between self-control and broader contextual factors is limited. Our findings are consistent with those of recent studies that self-control resources are significant to individuals' daily lives [42, 58, 100].

Fourth, our results enhance the understanding of undermined behavioral relationships by integrating the COR and self-regulation theories. Most existing studies have used these theories separately on the basis of mistreatment literature, and limited studies have opted to use a blended integrative resource regulation perspective [26]. Our findings demonstrate that individual perceptions of social undermining cause self-control resource depletion and result in non-discretionary behaviors. However, their within-individual tactics are likely defensive instead of assertive [101]. Thus, as a remedy, they symbolize individual differences that are contextually engaging [102] and characteristically proactive [50]. From a blended theoretical perspective, we contend that when examined in the context of social undermining, social adaptability and resource management ability are inextricably linked and have assimilative considerations.

The innovative contribution of our study is the development of a theoretical framework from a resource regulation perspective and the nuanced explanation it offers as to how and when the perception of social undermining impairs nurses' helping behaviors. In contrast to previous theories of social undermining, the theory that we propose states that the process leading from social undermining to knowledge sharing is partly dependent on individuals' willingness to disable self-sanctions against harm doing. To our knowledge, no prior theories, particularly in nursing studies, have included self-control resource depletion as a mediating mechanism in the undermining and behavioral response relationship. However, we explore this model even further by proposing that social adaptability (stage-one moderator) and resource management ability (stage-two moderator) can buffer resource impairment and moral disengagement (knowledge sharing) as a response to social undermining. The explanation of how perceived social undermining leads to deviant behaviors involves multiple stages in which social-contextual factors can reinforce or weaken the key mediating mechanism (i.e., self-control resource depletion).

7.2. Practical Implications. The effects of perceived social undermining on individuals' self-control resources and knowledge sharing suggest several important management

practices. First, our research shows that perceived social undermining is a significant stressor for individuals, reducing their self-control resources and leading to deviant behaviors. Even though hospitals invest in knowledge-management systems, they may not benefit from it if supervisors and staff undermine individuals. Therefore, organizations and managers should concentrate their time and energy on preventing social undermining and increasing awareness of harmful interpersonal interactions by implementing appropriate strategies. For instance, creating and offering coaching sessions or training programs to teach interpersonal relationship skills could help prevent social undermining. In addition, employing techniques for teamwork and conflict resolution in the workplace can help lessen instances of undermining [4].

Second, our results show that perceived social undermining depletes self-control resources and leads to deviant behavior. Therefore, it is necessary to find strategies to alleviate the detrimental effects of social undermining, as individuals' resources are limited [42, 59]. Our research reveals that social adaptability mitigates the negative effects of social undermining. Therefore, organizations and managers should pay more attention to employees' social adaptability and provide an environment that boosts healthy personnel or social interactions [6, 8]. Consequently, it is helpful for individuals to employ social practices that break the adverse links of undermining. Individuals with high social adaptability are not less affected by undermining, but their social adaptability is important for their discretionary behavior, that is, knowledge-sharing behavior [25, 103].

Third, although depletion makes it difficult to motivate individuals to engage in helping behavior, such effect can be mitigated. Moreover, owing to the extent that self-control resource depletion is an important underlying driver of deviant behaviors, individuals experiencing depletion have difficulty engaging in helping behaviors. Our study suggests that such effects can also be buffered by replenishing individuals' self-control resources. For instance, organizations can help employees regain their self-control resources by organizing self-affirmation training sessions to enable them to replenish depleted resources [46, 104]. Organizations can also help individuals conserve and regain resources and their resource management ability by providing counseling sessions (i.e., employee assistance programs [51] and through expressive writing interventions (see [105] for details). These research streams suggest a variety of interventions to reduce undermining in organizations.

7.3. Limitations and Future Directions. This study has several limitations. First, the authors relied on self-reported measures of perceived social undermining, self-control resource depletion, social adaptability, and resource management ability, which might have restricted our ability to objectively analyze social undermining activities, personnel characteristics, and resource impairment issues. Nevertheless, the self-reported characteristics of social undermining suit our research, as perceptions determine individual reactions [106]. In addition, previous studies have provided strong evidence that self-reported self-control practices yield accurate and trustworthy assessments of resource depletion (e.g., [68, 90]), social adaptability [26], and resource management ability [81]. Future studies are encouraged to employ objective metrics and solicit input from other groups of people.

Second, we measured social undermining from the same perspective as that in two undermining sources (head-nurse and subordinate-nurse) at the same time. Although our measurement followed the precedence of social undermining literature [27], the role of context was absent in this measurement. In addition, only head nurses reported knowledge-sharing behavior, which may not be the only reliable source of data because undermining head nurses reported the knowledge-sharing behavior of their direct subordinate nurses. Future research should collect data at different time waves and others' perspectives within-outside the organization (e.g., coworkers, patients, family members, and friends) and coworkers' perspectives regarding knowledge-sharing behavior.

Third, while we examined social adaptability and resource management ability as factors that influence within-individual interactions, future studies may expand our theoretical reasoning by adding other within- and between-personal factors. For example, sleep quality and quantity, job control, and trait resilience are important individual factors for coping with stressors [4, 68].

Fourth, our conceptual model was limited to two moderating variables, an independent variable, a mediating variable, and a dependent variable. Future research may consider a broad model with more than one variable that could describe the detailed underlying mechanism that affects the perceptions of and response to social undermining (the transactional model of stress [107]).

In addition, our research sample was restricted to head nurses and their immediate subordinates in hospitals within a single cultural context. Thus, the generalizability of the results of our study to other healthcare organizations in Pakistan and other cultural contexts might be limited.

Data Availability

The data used to support the findings of this study are available from the corresponding authors upon reasonable request.

Ethical Approval

This project was approved by the concerned authority of Mayo Hospital, Pakistan (ethical approval number: 06-003/2021).

Consent

Written informed consent was obtained from the participants.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

The Associations among Destructive Leadership, Job Demands and Resources, and Burnout among Nurses: A Cross-Sectional Survey Study

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Background. Nurses demonstrate high burnout prevalence. Moreover, destructive leadership, as well as job demands and resources, are associated with burnout. However, these associations, particularly in the context of nursing, warrant further investigation. *Objective.* To explore the associations of destructive leadership, as well as job demands and resources, with burnout in registered nurses. *Design.* A cross-sectional survey. *Participants.* 2115 registered nurses in Finland. *Methods.* The self-administered questionnaire survey was distributed nationwide to 106,000 members of the Finnish trade union for health and social care professionals via an online newsletter in February 2023. Nurses' burnout was measured with the Burnout Assessment Tool (BAT). The data were analysed through descriptive statistics and linear regression analysis. *Results.* Destructive leadership and job demands were positively associated with burnout ($\beta = 0.39$ and 0.32, respectively; both $p < 0.001$), whereas job resources and burnout were negatively associated ($\beta = -0.41$, $p < 0.001$). The associations of destructive leadership and job demands with burnout became less positive when job resources were added to the regression model ($\beta = 0.21$ and 0.14, respectively; both $p < 0.001$). *Conclusions.* Job resources led to the greatest reduction in burnout among registered nurses. Moreover, job resources reduced burnout by diminishing the negative effects of destructive leadership and job demands. Providing a sufficient amount of job resources might reduce burnout and diminish the negative effects of destructive leadership and job demands among nurses. These relationships warrant examination in other cultural settings.

1. Introduction

The global shortage of the healthcare workforce, particularly nurses, is a major issue; the World Health Organization (WHO) projects that this shortage will reach 5.7 million by 2030. Population ageing has led to an increase in the demand for health services. However, the nursing workforce is ageing as well; approximately, one of six nurses is expected to retire by 2030 [1]. Other challenges, including the COVID-19 pandemic, have exacerbated these issues. Working in healthcare is stressful; furthermore, the nursing staff work under extreme pressure, which can lead to health problems, such as burnout, and to insufficient personnel retention and recruitment [2, 3]. Therefore, facilitating mental health improvement among nurses through the improvement of

their demanding working conditions is crucial. To support European countries with severely burdened healthcare systems, the WHO proposed 10 effective policy and planning responses; one of them is "protect the health and mental well-being of the workforce" [2].

Complex burnout syndrome, which most commonly results from prolonged exposure to work-related stress, is characterised by the dimensions of exhaustion, cynicism, and inefficacy [4]. In particular, overwhelming exhaustion is often the first sign of work-related health issues. Over time, it leads to detachment and withdrawal from work, as well as cynicism, followed by negative self-evaluation and the feeling of incompetence. The role of a few of these dimensions, particularly inefficacy, in burnout development has been re-examined; as such, the definition of burnout has

been revised [5, 6]. Schaufeli et al. [6] indicated four core elements of burnout, namely, exhaustion, mental distance, emotional impairment, and cognitive impairment. Exhaustion refers to an extreme lack of physical and mental energy, which reduces an individual's capacity to regulate emotions (e.g., anger and sadness) and cognitive processes (e.g., memory and attention). This results in the development of a coping strategy involving mental withdrawal and detachment from the job. In a Delphi study, an expert panel unanimously defined burnout as prolonged work-related exhaustion [7]. Exhaustion, generally considered the most essential dimension of burnout, is included in most burnout questionnaires [6].

The average burnout prevalence among nurses varies in different studies, ranging from 11% [8] to 52% [9]. The studies show differences between geographical regions and specialties [8] and educational levels [9]. The review by Ge et al. found a prevalence of 30% and indicated an increased trend over time [10]. However, the accurate estimation of this prevalence can be challenging because appropriate diagnostic criteria for burnout are unavailable [11] and burnout is not considered a medical condition in the International Classification of Diseases 11th Revision [12].

Burnout has several physical, psychological, and occupational consequences on workers' health and well-being; these consequences include type 2 diabetes, coronary heart disease, various types of pain and injuries, insomnia, job dissatisfaction, absenteeism, and the need for disability pension [13]. In addition, a positive association between burnout and depression among nurses has been found [14]. Furthermore, higher burnout levels appear to lead to a stronger occupational turnover intention [15–17]. Burnout-attributed turnover and burnout result in a major financial burden on organisations and societies [18–20]. Moreover, nurse burnout affects perceived patient safety, satisfaction, and quality of care [21]. Therefore, burnout is a severe health issue with individual, organisational, and societal consequences [22].

The job demands-resources (JD-Rs) model was originally tested in a study on German nurses and subsequently developed into a theory [23–25]. According to this model, different physical, psychological, social, or organisational aspects of a job, particularly if they are imbalanced, can affect employee health outcomes. Job demands, such as a high workload, require sustained effort and are associated with exhaustion. Job resources are job aspects that support the achievement of work goals and personal growth and development, reduce job demands, and protect from burnout; examples of these resources are autonomy and job security. In the JD-R model, resource insufficiency is associated with disengagement [24]. In the current study, we used the JD-R model as the theoretical framework.

The effect of job demands and resources among nurses have been studied comprehensively, and the association of job demands with burnout has been established [22, 26–28]. Among nurses, a high workload is also correlated with decreased patient safety and quality of care [26]. In contrast,

job resources are negatively associated with burnout [29, 30]; they may buffer the effects of job demands on strain [31, 32] and burnout [33].

A major determinant in work-related health outcomes in nurses is leadership, and the favourable effects of positive leadership styles are well known [34–36]. Recent management research has focused on adverse leadership styles and their effects on followers and organizations. One such adverse leadership style is the so-called destructive leadership style [37, 38].

Destructive leadership is a process involving a supervisor's systematic and repeated hostile behaviour or incompetence as perceived by their followers or subordinates. Destructive leadership can be intentional or unintentional and physical or verbal and has harmful consequences on the well-being, job satisfaction, and performance of the workers, and the goals of the organisation, or both [37, 39, 40]. Most empirical studies on destructive leadership have examined abusive supervision using Tepper's [41] abusive supervision scale [38]. In contrast to destructive leadership, abusive supervision excludes physical contact [41] and aims to control workers by creating fear and intimidation [39]. Furthermore, under toxic leadership, a leader's destructive behaviour or dysfunctional personal qualities have a debilitating effect on their followers [42]. In the toxic triangle model, toxic leadership is derived from the interaction between the leader, their followers, and the conducive environment [43]. Petty tyranny is described as authoritarian behaviour where a leader uses power oppressively, capriciously, and vindictively over their subordinates [44]. Einarsen et al. [39] categorised the leadership styles as tyrannical (including humiliation, belittling, and aggression), derailed (including bullying, manipulation, harassment, absenteeism, and shirking), supportive -disloyal, and constructive; these behaviours can have destructive and constructive effects on different dimensions simultaneously.

Destructive leadership is positively related to nurses' psychological strain, burnout, and intention to quit the job or leave the profession [31, 35, 45]. It is also associated with decreased work effectiveness and performance [46] and nurse-reported adverse events and quality of care [31, 47]. Strengthening nursing and midwifery leadership is one of the policy priorities of the WHO Global Strategic Directions for Nursing and Midwifery 2021–2025 [48].

Despite increasing scientific interest in destructive leadership, knowledge regarding this detrimental phenomenon, particularly in nursing, remains limited [36]. Thus far, the associations of destructive leadership, as well as job demands and resources, with burnout among nurses have not been explored. By gaining further insight into the roles of leadership and working conditions in burnout development among nurses, healthcare organisations may be able to develop and implement burnout prevention strategies. In the current study, we explored the associations of destructive leadership and job demands and resources with burnout among registered nurses in Finland. We also

analysed burnout by different background characteristics. Our results may clarify the need for leadership development and education for maximum staff retention.

2. Methods

2.1. Study Design. This was a cross-sectional study conducted in accordance with the STROBE guidelines for cross-sectional studies [49].

2.2. Data Collection and Participants. The data were collected over a 3-week period in February 2023 by using an online self-administered questionnaire. Participants were recruited via an online newsletter of a Finnish trade union for health and social care professionals, distributed to 106,000 of its members. The sampling method can be, therefore, called purposive sampling. We also sent a weekly reminder to every member, requesting them to respond to the questionnaire. In total, 4575 responses were received; of them, 2370 were from registered nurses. After respondents who performed supervisor tasks ($n = 247$) were excluded, the final sample size was 2115. Considering the survey invitation and distribution methodology, the accurate survey response rate could not be calculated.

2.3. Measurement Tools. The survey collected the following background characteristics: age, gender, education level, work experience (years), and workplace. Moreover, three scales were used to measure burnout, destructive leadership, and job demands and resources.

2.3.1. Burnout. Burnout was measured using the 4-item Burnout Assessment Tool (BAT-4) [50]—a shortened version of the original 23-item BAT (BAT-23) [6]. BAT-23 was developed to assess the four core dimensions of burnout, namely, exhaustion, mental distance from work, cognitive impairment, and emotional impairment. The BAT-23 can be applied based on group or individual assessments [6]; its applicability for the cross-country comparison of burnout has also been reported [51]. The BAT-23 has been validated and noted to have good psychometric properties; moreover, both the 12-item BAT (BAT-12) and the BAT-4 have shown to reliably explore the dimensions of burnout. The BAT-4 is strongly correlated with the BAT-12 ($r = 0.94$) and BAT-23 ($r = 0.92$), and its Cronbach's α is 0.73 [50, 52]. In the BAT-4, each item assesses one core dimension as follows: exhaustion ("at work, I feel mentally exhausted"), mental distance from work ("I struggle to find any enthusiasm for my work"), cognitive impairment ("at work, I have trouble staying focused"), and emotional impairment ("at work, I am unable to control my emotions"). Here, the frequency-based responses are scored on a 5-point Likert scale—ranging from 1 (never) to 5 (always); a higher score is considered to indicate more burnout [50].

2.3.2. Destructive Leadership Scale. Destructive leadership was measured based on nine statements related to the employee's relationship with the immediate supervisor as follows: authoritarian leadership (e.g., "I am treated in an authoritarian (i.e., bossy or commanding) way"), abusive leadership (e.g., "I am treated in an unfair or discriminatory way"), and aggressive leadership (e.g., "I am treated in an aggressive manner"). Similar questions have been used to measure the vulnerability caused by management as a dimension of precarious employment (e.g., [53]). The responses were scored on a 5-point Likert scale—ranging from 1 (completely disagree) to 5 (completely agree); a higher score was considered to indicate a higher prevalence of destructive leadership.

2.3.3. Job Demands and Resources Scale. Job demands and resources were measured using items that assess working conditions; these items have been widely used in surveys such as the European working conditions surveys [3]. The scale included the following 18 statements: 8 describing job demands and 10 describing job resources. Statements on job demands included those related to time pressure ("I have to work really fast" and "I have to work hard"), physical workload ("my job requires a lot of physical effort," "I often have to lift or move heavy loads," and "I have to work for long periods in uncomfortable positions"), decision-making opportunities ("I have few opportunities to decide how I do my work"), and insecurity ("I have no certainty about the future of my job" and "there is a danger that I will soon lose my job"), whereas statements on job resources include those related to participation in decision-making ("I have the opportunity to make a lot of decisions about my work" and "I have a say in many at my job"), task variety ("I am given a lot of different tasks" and "I have the opportunity to learn new things at my job"), professionalism ("my job requires a high level of professionalism"), the amount of time ("I have enough time to do my work"), work ("I do not have an unreasonable amount of work"), and security ("I could quickly get a new job if I wanted to"). The responses were scored on a 4-point Likert-type scale—ranging from 1 (completely disagree) to 4 (completely agree); a higher score was considered to indicate more job demands or resources.

2.4. Data Analysis. Descriptive statistics of all variables were calculated as frequencies and percentages, as well as means and standard deviations (SDs). Missing value analysis demonstrated low rates between 0.01% and 0.4% per scale; it was the highest at 2.0% for the variable of age. For each scale, the missing values were replaced with their respective mean values. The mean values for the study variables were calculated, and ANOVA was used to compare the average levels of burnout in terms of age, education level, and work experience. Independent sample t tests were used with dichotomous gender variables. A p value of <0.05 was considered to indicate statistical significance.

Scale reliability was analysed by calculating Cronbach's α, and the relationships between the variables were calculated as Pearson's correlation coefficients (Table 1). Multicollinearity of the data was also assessed. Furthermore, linear regression analysis was used to explore the associations of burnout with destructive leadership, as well as job demands

TABLE 1: Background characteristics of the nurses ($n = 2115$).

	Mean (SD)	n	%
Age (years)	45.6 (10.9)		
<35		423	20.0
35–50		867	41.0
>50		782	37.0
Gender			
Male		142	6.7
Female		1956	92.5
Education level			
Vocational degree		573	27.1
Bachelor's degree		1361	64.3
Master's degree		173	8.2
Work experience (years)	17.1 (10.8)		
<5		387	18.3
5–10		327	15.5
>10		1398	66.1

TABLE 2: BAT-4 scores (overall and stratified by background characteristics, scale 1–5).

	Mean (SD)	p
BAT-4	2.62 (0.64)	
Exhaustion	3.21 (0.86)	
Mental distance from work	2.66 (0.95)	
Cognitive impairment	2.60 (0.83)	
Emotional impairment	2.00 (0.77)	
Age (years)		0.003
<35	2.69 (0.63)	
35–50	2.64 (0.64)	
>50	2.56 (0.64)	
Gender		0.038
Male	2.51 (0.67)	
Female	2.62 (0.63)	
Education level		0.165
Vocational degree	2.58 (0.63)	
Bachelor's degree	2.63 (0.64)	
Master's degree	2.60 (0.65)	
Work experience (years)		0.016
<5	2.60 (0.63)	
5–10	2.71 (0.62)	
>10	2.60 (0.64)	

BAT = Burnout Assessment Tool.

and resources. All models were adjusted for age, gender, and work experience. The assumptions of homoscedasticity and linearity of the models were tested and confirmed to not have been violated [54]. All statistical analyses were conducted using SPSS (version 27).

2.5. Ethical Considerations. There was no need for ethical approval; however, the Institutional Review Board of the participating trade union approved the study [55]. Our questionnaire cover letter included information regarding the study, and it indicated that by answering the questionnaire, the participants provided their informed consent. The questionnaire also included a privacy statement. No personal identification data were collected, and the data were stored on the university's secure server, protected by username and password. The data will be deleted three years after the end of the study.

3. Results

As listed in Table 1, the mean participant age was 46 years (range: 22–67 years). A majority of the participants were women (93%), had a bachelor's degree (64%), had >10 years of work experience (66%), and worked in the public sector (86%); of all the participants, 57% worked in hospitals, 21% worked in health and welfare centres and clinics, 13% were social service workers, 3% provided at-home services, 2% worked in private companies or were self-employed, and 4% provided other services such as state- or organization-level, or student, health services.

Table 2 presents the overall BAT scores as well as their distribution among different age, gender, education level, and work experience groups. The mean (SD) total BAT-4 score was 2.62 (0.64), with the score in the dimension of exhaustion being the highest (mean = 3.21 and SD = 0.86). Nurses aged <35 years demonstrated the highest BAT-4 scores, whereas those aged >50 years showed the lowest ($p = 0.003$). Women reported significantly higher scores

than men ($p = 0.038$). The mean scores among nurses with work experience of <5 and >10 years were similar; however, after post hoc correction, nurses with work experience of 5–10 years demonstrated the highest scores ($p = 0.014$). No significant differences were noted between the different education level groups.

The results of the destructive leadership scale are presented in Table 3. The statement "my bosses make me feel like I am easily replaceable" demonstrated the highest score (mean = 2.76 and SD = 1.35), followed by "I am treated in an authoritarian (i.e., bossy or commanding) way" (mean = 2.57 and SD = 1.23). However, "I am treated in an aggressive manner" demonstrated the lowest score (mean = 1.57 and SD = 0.94).

On the job demands scale, the highest scores were demonstrated by the statements related to having to work hard (mean = 3.23 and SD = 0.72) and quickly (mean = 3.01 and SD = 0.78). The respondents also reported low job autonomy (i.e., having only few opportunities to decide how they perform their work; mean = 2.57 and SD = 0.78). In contrast, the statements that demonstrated the lowest scores were related to the uncertainty about the future of the job (mean = 1.82 and SD = 0.94) and the fear of losing the job soon (mean = 1.45 and SD = 0.69).

On the job resources scale, the highest scores were noted for the statements related to needing a high level of professionalism (mean = 3.82 and SD = 0.45) and learning new things (mean = 3.78 and SD = 0.46). In contrast, the lowest scores were demonstrated by the statements regarding not having sufficient time to do the work (mean = 2.25, SD = 0.84) and not having an unreasonable amount of work (mean = 2.24 and SD = 0.84), preceded by the statements

TABLE 3: Destructive leadership scale scores (scale 1–5).

	Mean (SD)
My bosses make me feel like I am easily replaceable	2.76 (1.35)
I am treated in an authoritarian (i.e., bossy or commanding) way	2.57 (1.23)
If I were treated unfairly, I would not dare to argue	2.26 (1.19)
If I wanted better working conditions, I would be afraid to ask	2.21 (1.10)
I am treated in an unfair or discriminatory way	2.10 (1.18)
I have to worry about being fired if I were to participate in a strike	1.67 (0.97)
I have to worry about being fired when I temporarily do not work as well	1.65 (0.92)
I have to worry about being fired if I do not immediately do what I am told	1.61 (0.91)
I am treated in an aggressive manner	1.57 (0.94)

regarding having the opportunity to make a lot of decisions about work (mean = 2.49 and SD = 0.77) and having a say in many things at work (mean = 2.49 and SD = 0.78).

Table 4 presents Cronbach's α values and Pearson's correlation coefficients of all the variables. All Cronbach's α values were acceptable. Moreover, burnout was moderately and positively correlated with destructive leadership and job demands but negatively correlated with job resources.

The bivariate associations of destructive leadership, job demands, and job resources with burnout were analysed in model 0 (Table 5). Background characteristics (i.e., age, gender, and work experience) that demonstrated between-group differences (Table 2) were adjusted in this model. Consequently, the association between destructive leadership and burnout was noted to be positive. Assessed as adjusted R^2, destructive leadership (along with age, gender, and work experience) explained 16% of the variation in burnout. Moreover, the association between burnout and job demands was positive, explaining 11% of the variation in burnout. In contrast, job resources were negatively associated with burnout, indicating that job resources reduce burnout and explain 17% of the variation in burnout. All these associations were significant.

Multiple regression analysis was conducted for the associations of destructive leadership and job demands with burnout in model 1, and the job resources variable was added to model 2 (Table 5). The positive association of destructive leadership and job demands with burnout remained significant in model 1. Based on their adjusted R^2 values, these variables explained 19% of the variation in burnout. After job resources were added, in model 2, these associations became less positive and they explained 24% of the variation in burnout overall.

4. Discussion

This study aimed to gain insight into the factors related to burnout in nurses. Our findings indicated that destructive leadership, as well as job demands and resources, are associated with burnout among registered nurses in Finland. To our knowledge, this is the first study to explore this multivariate association in the context of nursing. Moreover, job resources were noted to provide the strongest explanation for the variation in burnout; in particular, they were

noted to be negatively correlated with burnout. Moreover, job resources were noted to diminish the negative effects of destructive leadership and job demands.

Burnout remains a major concern among nurses—as indicated by the mean exhaustion scores of 3.21 (on the 5-point Likert scale). Moreover, destructive leadership was significantly associated with burnout; therefore, destructive leadership may also be a serious threat to the well-being of nurses at work. The result was expected and is supported by previous relevant but scant research in the context of nursing [56, 57]. From the perspective of the JD-R model, destructive leadership can be considered a load factor. As a social and organisational factor, destructive leadership might lead to emotional exhaustion and a psychological withdrawal from the job [58]. Supervisors play an essential role in providing employees with job resources presented in the JD-R model (e.g., support, feedback, rewards, and various tasks) [24]. Therefore, a lack of job resources can be a result of destructive leadership. However, our results demonstrated that job resources can not only reduce burnout themselves but also mitigate the adverse effects of destructive leadership and job demands. Our results corroborate those of the JD-R model, which emphasises that job resources mitigate the negative effects of job demands [24].

Regarding the global shortage of nurses, our results indicated that the managers made the nurses feel easily replaceable, but they neither felt insecure about their job nor were they afraid about being terminated. In previous studies, nurses have reported that they felt easily replaceable, possibly because of a lack of professional respect and appreciation from their managers [59, 60]. In contrast, these feelings may occur in nurses who are temporary, from an agency or from a foreign country and have to prove their professional skills in several instances—all of which may lead to insecurity [61]. In nurses, significant associations have been noted between being temporary and vulnerability; this, in addition to some other factors, represents the feeling of being easily replaceable [62]. The amount of temporary work has increased in Nordic countries; in Finland, more than one-fifth of all nurses work under fixed-term contracts [63].

Our results also indicated that job demands are positively associated with burnout. Considering the current labour shortage, the most reported job demands include the workload and time pressure; these factors have generally

Table 4: Cronbach's α and correlation coefficients of all the study variables.

	Burnout	Destructive leadership	Job demands	Job resources
Burnout	0.731			
Destructive leadership	0.390*	0.897		
Job demands	0.328*	0.425*	0.719	
Job resources	−0.402*	−0.450*	−0.343*	0.665

*$p < 0.001$.

Table 5: Linear regression models for the associations of destructive leadership, job demands, and job resources with burnout.

	Model 0		Model 1		Model 2	
	B	SE	B	SE	B	SE
Destructive leadership	0.387*	0.016	0.306*	0.017	0.209*	0.018
Job demands	0.323*	0.026	0.193*	0.027	0.141*	0.027
Job resources	−0.406*	0.036			−0.262*	0.040
R^2			0.19		0.24	

Model 0: bivariate associations. Models 1 and 2: multivariate associations. Models are adjusted for age, gender, and work experience. B = standardised beta and SE = standard error. *$p < 0.001$.

been associated with increased burnout among nursing staff [64–66]. In contrast, job resources were noted to reduce burnout in the current study, which is in line with previous findings [65, 67]. In particular, in addition to job autonomy and learning opportunities [29, 67], social support and rewards are related to decreased burnout [65, 67]. The relationship between job resources and destructive leadership in nursing is unknown; however, in fields other than nursing, job autonomy has demonstrated protective effects similar to those of job resources. Job autonomy can buffer the impact of abusive supervision on factors such as job stress [68, 69]. Job crafting, which is a job resource, buffers the negative impact of abusive supervision on emotional exhaustion. The current respondents reported low job autonomy. Therefore, nurse managers should increase nurses' autonomy and decision-making opportunities, encourage them to proactively improve their work situation, and develop their job-related skills [58].

Burnout demonstrated a significant association with demographic characteristics among nurses. Notably, younger, less-experienced nurses reported the most burnout, whereas the oldest nurses demonstrated the least burnout. This result is supported by previous results [28, 70–72]. Older, more-experienced nurses might, therefore, cope better with job demands. In contrast, less-experienced nurses work longer shifts and overtime more often [73], both of which are related to higher levels of burnout [74, 75]. There might even be generational differences in work-life expectations and job resource perceptions among these age groups. For example, younger nurses report less satisfaction with the feedback and rewards they receive [76]; this feeling may be related to the feeling of not being acknowledged or respected [77]. In terms of the JD-R model, the lack of feedback and rewards are major predictors of disengagement [23]. Consequently, we suggest that these differences should be considered by supervisors from multiple generations;

nurse managers should foster respectful and appreciative behaviours, especially among temporary and young nurses; they have to concentrate on building trust and giving feedback about good work and, on the other hand, guarantee professional autonomy and decision-making opportunities [78].

In the current study, men demonstrated less burnout than women. However, although previous studies have reported contradictory results, comparing their results with ours is difficult because of the differences in the burnout measures used. In some studies, compared with women, men demonstrated more depersonalisation, but this difference was not found for the other burnout dimensions [70, 79, 80]. In a study of mental health nurses, male sex was positively associated with emotional exhaustion [81]. Moreover, male transplant nurses reported significantly higher levels of personal accomplishment than their female counterparts [82]. In a meta-analysis, most studies demonstrated that women were significantly more emotionally exhausted than men [83].

The relationships between the nurses' demographic variables and destructive leadership were noted to be nonsignificant, consistent with previous findings [38]. Notably, the perception of destructive leadership is subjective and perceptions demonstrate cultural differences [41, 84–86]. Cross-cultural research on cultural differences in the relationship between burnout and destructive leadership is warranted. In addition, to develop leadership practices, the organisational context needs to be considered; social, cultural, or institutional contexts can either facilitate or constrain leadership practices [87]. Furthermore, the need for accurate data collection tools in nursing is evident; very few measurement tools to quantify different destructive leadership styles have been developed [88]. In addition, empirical research with a longitudinal, qualitative approach may aid in gaining further insight into the impact of destructive leadership.

4.1. Implications for Nursing Management and Practice. To improve leadership quality within the nursing profession, it is essential to recognise and acknowledge destructive leadership styles in healthcare organisations. Targeted leadership intervention programs might help focus on supportive and transformational leadership styles to reduce burnout among nurses [89]. Burnout risk factors, such as excessive job demands and inadequate resources, should be regularly assessed by management, and necessary support should be provided to nurses. The support could include well-being promotion measures focusing on resilience building, stress management, and coping strategies to mitigate the impact of destructive leadership and high job demands. Burnout prevention and stress management skills must be considered in nursing education [90]. However, the best results are obtained by investing in sustainable solutions that address structural and systemic issues and focus on creating a positive work culture. Furthermore, the effects of destructive leadership on nurses' and patients' outcomes require further examination, considering various cultural and contextual factors.

4.2. Strengths and Limitations. A major strength of the current study was the large, nationwide sample of registered nurses. Because the assumptions of regression were met, our findings are also generalisable. However, despite the sufficient sample size, the lack of accurate response rate calculation must be considered a limitation. Furthermore, the cross-sectional design of the study remains a limitation in this study. Therefore, the causality of relationships noted in this study should be examined further. Furthermore, the burnout-related results could not be fully compared with those from previous studies because the BAT is a relatively new measurement tool; nevertheless, most burnout questionnaires also include exhaustion as a core dimension. In this study, the Cronbach's α for the burnout dimension was similar to that in the original study on the BAT-4 [50]. However, further research on the relationships between the BAT and different constructs in different cultural settings [6] is warranted.

5. Conclusions

The current results supplement and strengthen the scant evidence on the relationship between destructive leadership and burnout among nurses. Results also confirm that among nurses, the association between job demands and burnout is positive and that job resources may alleviate the adverse effects of destructive leadership and job demands.

In healthcare organisations, strengthening job resources is essential for improving work-related well-being in terms of burnout among nurses, particularly younger nurses. To further improve the nurses' working conditions, organisations should pay attention to the evaluation of job demands and leadership styles. Through the creation of health-promoting work environments, nurse turnover may be reduced. Improved work-related well-being affects nurses'

job performance, which is essential for healthcare organisations to function effectively and provide high-quality healthcare services.

The current results may be used when planning intervention studies on burnout prevention and reduction among nurses; they may also guide nurse leadership educators. However, additional studies on destructive leadership and burnout in different healthcare and cultural settings are warranted [91].

Data Availability

The survey data used to support the findings of this study have not been made available because it is part of the ongoing project.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Acknowledgments

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Research Article

Status and Influencing Factors of Nurses' Perception of Toxic Leadership Behavior: A Cross-Sectional Study

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Aim. The aim of this study is to analyse the toxic leadership behavior of nurse managers perceived by nurses and its related factors. *Background*. Toxic leadership is becoming more common as a risk factor in nursing. However, there is a scarcity of research on the elements that influence toxic leadership practices from the perspective of nurses' perceptions. *Methods*. A cross-sectional study was conducted with 455 nurses from August to October 2022. A demographic information questionnaire and a negative behavior scale for nurse managers were used. Descriptive statistics, Kruskal–Wallis H test or Mann–Whitney U test, and multiple linear regression were used to explore the relevant factors of nurses' perceived toxic leadership behaviors of nurse managers. *Results*. The population was dominated by 423 (92.97%) females, 318 (69.89%) married, and 420 (92.31%) with a bachelor's degree. The toxic leadership behavior scale score for nurse managers was 109 (87, 123) and the score for each entry was (2.94 ± 0.92). Gender, educational level, department, number of night shifts, and nature of employment were the influencing factors of the negative leadership behavior of nurse leaders as perceived by nurses ($P < 0.05$), explaining a total of 43.1% of the total variance. *Conclusion*. In general, nurses' perceived toxic leadership behaviors of nurse managers were at a moderate level. More toxic leadership behaviors were observed by nurses who were female, less educated, on busy units, with unstable nature of appointments, and with frequent night shift rotation. *Implications for Nursing Management*. Focus on the psychological condition of nurses who are female, less educated, work in busy units, have an unstable nature of employment, and rotate night shifts frequently. The negative impacts of toxic leadership behaviors might be lessened as a result.

1. Background

Nurse managers are critical to the efficient development of the nursing workforce, the maintenance of nurses' physical and emotional well-being, and the dynamic and efficient operation of nursing care [1]. High expectations and demands simultaneously determine the difficulties and challenges of the nurse manager profession [2]. Effective nurse managers can establish a healthy work environment, ensure patient safety, and facilitate the achievement of organizational goals [3]. It is important to emphasize, however, that not all nurse managers possess effective leadership abilities; there are indeed negative and ineffective leadership behaviors—toxic leadership behavior [4–7].

Toxic leadership behavior in nurse managers, as the dark side of leadership conduct, has been shown to have numerous negative repercussions on nurses, organizations, and patients. For nurses, it reduces job satisfaction and productivity [5], devalues professional worth and belief cognition [8], puts them at high-stress levels, resulting in absenteeism and high turnover intention [9], and makes them more likely to retaliate [10]. Although nurses may purposefully avoid toxic management, it could eventually

lead to greater exhaustion due to the inability to obtain important information or depletion of remaining resources [11]. For patients, nurses report more adverse events, nursing quality is poor [12, 13], and patient satisfaction decreases [14]. For organizations, it may put the nursing profession in a difficult position since it has been shown to negatively impact organizational performance [6], cause team relationship conflicts [15], generate a toxic organizational culture, and even legitimize harmful leadership behavior [16]. The negative impact is often greater than the positive impact; even the actual or potential dangers brought by low-level toxic leadership cannot be ignored. The prevention and avoidance of toxic leadership behavior are more important than the cultivation and promotion of positive leadership [17].

When it comes to the factors that promote the generation of the toxic leadership behavior, the toxic triangle [18] considers that toxic leadership is an integration of subordinate performance, leadership characteristics, and organizational environment during work interaction. Existing studies on the reasons of toxic leadership behavior by nurse managers focus on the nurse manager and organizational aspects, whereas nurses' personal opinions need to be expanded. According to Estes [19], nurse managers' feelings of organizational injustice, autocratic personalities, severe workload, and lack of management experience were all variables that contributed to toxic leadership. High-self-esteem [20] managers are more prone to develop a compulsive work passion that eventually causes self-exhaustion and more toxic leadership perceived by their subordinates. Nurse managers who work part-time, have little management experience, and have heavy management tasks lead to more toxic leadership. Naturally, the level and type of hospital where the nurse manager works also had an effect [21]. Studies have demonstrated that moral efficacy and moral concern can mitigate the negative effects of toxic leadership on nurses for both perceivers and victims [22]. However, which characteristics of nurses will experience the most negative effects? Özkan et al. [8] concluded that nurses in Turkey who actively chose nursing as a career, who were willing to work in the current unit, who had higher levels of education, and who had received on-the-job training were less influenced by toxic managers.

Different outcomes may result from cultural differences between nations [23]. Under the influence of traditional culture, China is a collectivist society with a clear organizational hierarchy and a large power distance [24, 25]. Thus, there may be distinct cultural factors that contribute to toxic leadership in China. This study was conducted in Chinese hospitals to understand the status of toxic leadership behaviors, identify the relevant factors affecting nurses' perceptions. Understanding these factors may help hospital managers pay attention to the prevention of toxic leadership behaviors of nurse managers, help nurse managers optimize their own management behaviors, and help nurses recognize their own shortcomings, thus further reducing the incidence and adverse effects. This study provides a reference for countries around the world to understand toxic leadership

behaviors and develop follow-up interventions to avoid negative effects.

2. Methods

2.1. Study Design, Setting, and Participants. According to the measures for the administration of the hospital grade in China, hospitals were divided into three levels, with the size of hospitals gradually increasing from primary hospital to tertiary hospital. Primary hospitals are community hospitals. Secondary hospitals are regional hospitals that provide medical and health services to multiple communities and undertake certain teaching and research tasks. Tertiary hospitals have comprehensive medical, teaching, and research capabilities and provide high-level specialist medical and health services to several regions. In this study, a convenience sampling method was used to select nurses from two tertiary hospitals and two secondary hospitals in Hubei, China. Table 1 shows the details and sample allocation for each hospital. Nurses who provided patient direct care and volunteered to participate were selected, excluding nurses on internship and long-term leave (≥3 months). The sample size was estimated according to the Kendall method, and the sample size should be 5~10 times more than the scale entries, considering that there may be 20% of invalid questionnaires, and the final sample size was 225~450.

2.2. Measures

Demographic Information Questionnaire. It was used to collect personal information about the surveyed nurses, including gender, age, marital status, education, family location, hospital grade, department, years of experience, technical title, monthly income, employment mode, and night shift frequency. The questionnaire was designed by the researcher and added with night shift frequency items guided by expert opinion.

Negative Behavior Scale for Nurse Managers. The scale was developed by the investigators through a literature review and qualitative interviews, combined with the results of Delphi expert consultation and was primarily used to evaluate the toxic leadership behaviors of Chinese nurse managers [26]. The scale has 36 items divided into 6 dimensions: neglect of needs (7 items), personal attack (5 items), entitlement abuse (9 items), unpredictable behavior (4 items), slackness at work (6 items), and improper supervision (5 items). It covers various toxic leadership behaviors of nurse managers against subordinates, themselves, organizations and work. The questionnaire uses a 5-point Likert scale, with 1 to 5 indicating "never," "occasionally," "sometimes," "usually," and "always," respectively. The higher the score, the more frequently the behavior occurred among nurse managers. The scale items gathered under six factors in the original scale explain 75.13% of the total variance. The previous study indicated that the reliability and validity of the scale were good, with a Cronbach's α of

TABLE 1: Detailed sampling allocation and response rate for each hospital.

Hospitals	Hospital level	Facility size	Total number of nurse managers	Total number of nurses
A	Tertiary	6905 beds	203	4102
B	Tertiary	3300 beds	110	1960
C	Secondary	630 beds	19	279
D	Secondary	578 beds	16	238

0.880 and a content validity index of 0.930. In this study, the Cronbach's α was 0.925.

2.3. Data Collection.

The study used an online questionnaire application (https://www.wjx.cn/) to collect data. Data collection started at the beginning of August 2022 and was finished by the end of October 2022. After obtaining permission from the nurse administrators at the identified hospitals, researchers directly distributed the online questionnaire links to nurses during their free time. Before distribution, the purpose, significance, content, precautions, and the principle of anonymity and voluntaries was explained. It can only be continued after study participants have given their consent, and they can withdraw at any time. Each ID account number can only be answered once, and only completed questionnaires can be submitted. Data from the platform were directly exported and entered using Excel 2019. The questionnaires were screened according to the exclusion criteria of the questionnaire, and abnormal questionnaires with too short (<1 min) or too long (>9 min) response times, answers in obvious patterns, or logical confusion were deleted.

2.4. Data Analysis.

The data were analysed by SPSS 24.0 (IBM Corp.). The Shapiro–Wilk test concluded that the continuous data were all non-normal distribution, so the data was represented by the medians and quartiles (p25-p75). The Kruskal–Wallis H test or Mann–Whitney U test was used to test for differences between groups. The residual of the dependent variable with a skewed distribution satisfied linearity, independence, homogeneity of variance, and normal distribution, so multiple linear regression analysis can be performed to analyse the factors that affect nurses' perceptions of harmful leadership behaviors [27]. The total score of the toxic leadership behavior was set as the dependent variable, and all variables with statistically significant differences in the univariate analysis were entered into a multiple linear regression model as independent variables (α in = 0.05, α out = 0.10). All tests were two-sided and the level of acceptable significance was assumed to be 0.05.

2.5. Ethical Considerations.

The study was approved by the Ethics Committee of Tongji Medical College of Huazhong University of Science and Technology (NO. S044). The whole protocol, in accordance with the ethical principles of the Helsinki Declaration and ensured the anonymity and confidentiality of the respondents.

3. Results

3.1. Relationship between Nurse Characteristics and Toxic Leadership Behavior.

A total of 500 questionnaires were distributed, and 455 valid questionnaires were recovered, with a valid recovery rate of 91%. The average age of the respondents was 33.55 years (SD = 6.30), and the average years of work experience were 10.76 (SD = 6.62). Female ($n = 423$, 92.97%), married ($n = 318$, 69.89%), and bachelor's degree ($n = 420$, 92.30%) were predominant. There were significant differences in toxic leadership behaviors perceived by nurses with different gender, education, years of experience, departments, employment modes, and night shift frequency (all $P < 0.05$, Table 2).

3.2. Scores of Toxic Leadership Behaviors.

Table 3 shows the overall score and average score for each dimension. The overall score of the negative leadership behavior scale was 109 (87, 123), and the average score of the item was 2.94 ± 0.92. Among all the dimensions, the score of improper supervision was the greatest ($M = 3.00$, SD = 0.86), and the score of personal attack was the lowest ($M = 2.87$, SD = 0.96).

3.3. Multiple Linear Stepwise Regression Analysis on Factors Influencing Nurses' Perception of Toxic Leadership Behavior.

The multiple linear stepwise regression results showed that gender (female) (($\beta = 0.119$, $P = 0.001$)), education(master's degree or above) ($\beta = -0.089$, $P = 0.013$), department (Pediatrics, Intensive Care Medicine) (($\beta = 0.161$, $P < 0.001$); ($\beta = 0.125$, $P < 0.001$)), night shift frequency (5~, ≥ 9) (($\beta = 0.447$, $P < 0.001$); ($\beta = 0.191$, $P < 0.001$)) and employment mode (personnel agency, formal establishment) (($\beta = -0.123$, $P = 0.001$); ($\beta = 0.290$, $P < 0.001$)) were significantly predicted nurses' perception of toxic leadership behavior, making it statistically significant ($R^2 = 0.441$, adjusted $R^2 = 0.431$, $F = 43.922$, $P < 0.001$), and explain a total of 43.1% of the variance of the dependent variable (Table 4).

4. Discussion

The average score for perceived abusive supervision is 2.94 ± 0.92, above the median of the questionnaire. This result indicates that nurses consider the negative leadership behavior of head nurses at a moderate level, which is consistent with a recent survey of 1240 nurses in Ghana [5], higher than the study by Labrague [12]. The highest scores are obtained for the dimension of improper supervision. This may be related to the nature of clinical nursing work,

Table 2: Relationship between nurse characteristics and toxic leadership behavior ($n = 455$).

Characteristics	N (%)	M (p25, p75)	z/H	P
Gender[a]				
Male	32 (7.03)	91.00 (76.00, 112.25)	−3.025*	0.002
Female	423 (92.97)	110.00 (88.00, 123.00)		
Age[b]				
<25	53 (11.65)	107.00 (82.50, 119.50)	6.111	0.191
25~	103 (22.64)	107.00 (88.00, 120.00)		
30~	140 (30.76)	112.00 (94.25, 126.00)		
35~	105 (23.08)	109.00 (85.00, 121.50)		
≥40	54 (11.87)	106.50 (81.75, 119.75)		
Marital status[b]				
Married	318 (69.89)	109.50 (89.00, 123.00)	1.221	0.543
Unmarried	130 (28.57)	109.00 (84.00, 120.00)		
Other[①]	7 (1.54)	111.00 (105.00, 135.00)		
Education[b]				
College degree or below	21 (4.62)	113.00 (87.00, 127.00)	12.710*	0.002
Bachelor's degree	420 (92.30)	110.00 (88.25, 123.00)		
Master's degree or above	14 (3.08)	81.00 (75.50, 85.25)		
Family location[a]				
Local	201 (44.18)	111.00 (86.00, 123.50)	−0.351	0.725
Nonlocal	254 (55.82)	108.00 (88.75, 122.25)		
Years of experience[b]				
<5	112 (24.62)	107.00 (84.00, 119.00)	13.387*	0.010
5~	110 (24.18)	112.50 (96.00, 125.25)		
10~	108 (23.73)	110.00 (91.00, 124.00)		
15~	85 (18.68)	113.00 (85.00, 125.00)		
≥20	40 (8.79)	102.00 (76.25, 115.75)		
Department[b]				
Internal medicine	110 (24.18)	109.00 (86.75, 119.00)	36.178**	<0.001
Surgery	108 (23.74)	107.00 (84.50, 118.75)		
Obstetrics and gynecology	55 (12.09)	101.00 (79.00, 120.00)		
Pediatrics	50 (10.99)	121.00 (108.00, 134.00)		
Operating room	67 (14.73)	107.00 (82.00, 125.00)		
Intensive care medicine	38 (8.35)	119.50 (107.00, 133.25)		
Other[②]	27 (5.92)	106.00 (89.00, 112.00)		
Hospital grade[a]				
Secondary hospital	189 (41.54)	108.00 (86.00, 120.50)	−1.102	0.270
Tertiary hospital	266 (58.46)	110.00 (88.00, 124.25)		
Employment mode[b]				
Labor dispatch	37 (8.13)	122.00 (85.25, 136.75)	48.236**	<0.001
Contract system	340 (74.73)	112.00 (94.00, 124.00)		
Personnel agency	40 (8.79)	80.00 (59.50, 108.50)		
Formal establishment	38 (8.35)	99.50 (81.00, 114.75)		
Technical title[b]				
Junior nurse	76 (16.70)	107.00 (85.50, 116.00)	5.825	0.120
Junior nurse practitioner	193 (42.42)	111.00 (88.50, 125.00)		
Supervising nurse practitioner	179 (39.34)	111.00 (84.00, 124.00)		
Associate chief nurse practitioner	7 (1.54)	106.00 (104.00, 108.00)		
Night shift frequency (month)[b]				
0	55 (12.09)	84.00 (69.00, 106.00)	120.939**	<0.001
1~	96 (21.10)	88.00 (73.50, 107.00)		
5~	279 (61.32)	117.00 (103.00, 128.00)		
≥9	25 (5.49)	112.00 (107.50, 118.00)		
Monthly income[b]				
<5000	47 (10.33)	109.00 (87.00, 125.00)	6.026	0.110
5000~	139 (30.55)	110.00 (89.00, 122.00)		
10000~	183 (40.22)	111.00 (92.00, 125.00)		
≥15000	86 (18.90)	102.50 (81.00, 116.50)		

[a]Mann–Whitney U test. [b]Kruskal–Wallis H test. *$P < 0.01$. **$P < 0.001$. [①]Divorced or widowed. [②]Including outpatient department, interventional radiology, general medicine, rheumatology, dermatology, and traditional Chinese medicine.

Table 3: Scores of toxic leadership behaviors ($n = 455$).

Dimensions	Total score M (P$_{25}$, P$_{75}$)	Average item score ($\overline{x} \pm$ SD)
Neglect of needs	20 (14, 26)	2.94 ± 0.94
Personal attack	14 (10, 18)	2.87 ± 0.96
Entitlement abuse	27 (21, 34)	2.93 ± 0.81
Unpredictable behavior	11 (9, 15)	2.93 ± 0.93
Slackness at work	18 (14, 22)	2.90 ± 0.85
Improper supervision	15 (12, 19)	3.00 ± 0.86

Table 4: Multiple linear stepwise regression analysis on factors influencing nurses' perception of toxic leadership behavior ($n = 455$).

Variables	B (95% CI)	SE	β	t	P
(Constant)	81.895 (75.506, 88.284)	3.251		25.192	<0.001
Gender: R = male					
Female	10.587 (4.398, 16.776)	3.149	0.119	3.362	0.001
Education: R = college degree or below					
Master's degree or above	−11.736 (−20.967, −2.506)	4.697	−0.089	−2.499	0.013
Department: R = Internal medicine					
Pediatrics	11.363 (6.372, 16.355)	2.540	0.161	4.474	<0.001
Intensive care medicine	10.360 (4.423, 16.298)	3.021	0.125	3.429	0.001
Night shift frequency (month): R = 0					
5~	22.216 (18.729, 25.703)	1.774	0.447	12.521	<0.001
≥9	18.967 (11.655, 26.278)	3.720	0.191	5.098	<0.001
Employment mode: R = labor dispatch					
Personnel agency	−10.058 (−15.827, −4.290)	2.935	−0.123	−3.472	0.001
Formal establishment	−24.080 (−29.985, −18.174)	3.005	−0.290	−8.014	<0.001

where nurses are short-staffed in a heavy and intense nursing workload, which requires high coordination and time management skills from the nurse managers. The lowest score on the dimension of personal aggression indicates that nurse managers pay more attention to the methods of communication with nurses in the workplace. It cannot be ruled out that, in the traditional context of China, the manager will conduct negative leadership in a more obscure way. There is a significant difference between male and female perceived negative leadership behavior scores of nurse managers, with female nurses' perceptions being higher, consistent with the findings of Li et al. [28]. Affective event theory points out that the evaluation of work events would be influenced by an individual's comprehensive understanding, feelings, and regulation of emotions [29]. Women's self-cognition mostly relies on external evaluation, while men generally acquire information from social comparison and self-cognition. In addition, compared with women, male nurses have stronger psychological endurance, more rigorous logical thinking, and problem-solving ability, which is a unique physical and psychological advantage [30] and enables them to be less affected by negative leadership in the work environment. This suggests that organizations should pay more attention to female nurses' psychological health. At the same time, female nurses need to strengthen their psychological resilience, clearly recognize themselves, and think rationally at work to avoid the influence of negative leadership behaviors of nurse managers.

Educational level is one of the factors that affect nurses' perceptions of negative leadership behaviors, with higher levels of education revealing less perceived. This is contrary to Özkan et al. [8] and Özer et al. [31] who concluded that nurses with graduate degrees were exposed to more toxic behaviors from their managers than other nurses. However, Han et al. [32] suggested that educational level can influence individual cognitive and psychosocial functioning, with higher levels of resilience among nurses with higher education. In this study, it is concluded that nurses with higher education have more professional theoretical level and clinical experience, have advantages in terms of career development and welfare benefits, have more initiative at work, can deal with problems more appropriately, and therefore have higher job satisfaction and less negative emotions. This suggests that managers should encourage nurses to constantly improve their educational level and increase their motivation for continuing education, thereby increasing their level of resilience. Organizations should also actively promote colleague support [33], provide group counseling training [34], and establish a social-level support system to reduce the negative impact of negative leadership behavior.

The department is one of the factors that influence nurses' perception of the negative leadership behavior of nurse managers. Different departments have differences in work intensity and personnel allocation. Patients in critical care units are in critical condition, and nursing staff is often under a high level of stress due to the intense mental and physical workload [35]. Similarly, pediatric nurses are usually faced with crying children and anxious parents, and pediatric care is more difficult [36]. Nurses in high-stress, high-intensity, and high-risk work environments are more sensitive to the perception of negative leadership behaviors and their more serious consequences [37]. The improvement

of nurses' psychological capital level is beneficial to reducing the level of perceived stress [38]. Therefore, nursing managers should pay attention to the influence of work intensity and work environment on nurses' perceived negative leadership behaviors, actively guide the psychological situation and stress management of nurses working at high intensity, and take appropriate measures according to the characteristics of different nurses to avoid their psychological fluctuations as much as possible and stabilize the nursing team.

The nature of employment predicts nurses' perceived toxic leadership behaviors toward nurse managers. Nurses employed in personnel agencies or formal establishments reported less toxic leadership behaviors than in labor dispatch, which is consistent with the findings of Mehta and Maheshwari [39]. Because of the lack of job stability and benefits for nurses on dispatch, their job security is always uncertain, and therefore they are more sensitive to negative leadership behaviors. On the contrary, the nurses who have the establishment are mostly the hard core of the department, with higher professional titles, who can participate in or directly manage the affairs of the department. Their labor behavior and work are valued, and their interpersonal relationship handling ability and the sense of decent work are stronger [40]. The nature of employment can be regarded as an incentive. When subordinates are paid attention to and satisfied with the nature of employment, their job satisfaction and organizational commitment can be improved. Therefore, nurse managers need to strengthen their care and support for nurses in the labor dispatch and contract system, further promote and implement equal pay for equal work, and increase the overall economic income of nurses. Actively guiding nurses in their career development and reducing their perceived negative leadership behavior can also lead to a higher quality of care [41].

Night shift frequency is one of the influencing factors for nurses' perceptions of the negative leadership behaviors of nurse managers. Night shifts require intense mental and physical work, and long-term multifrequency night shifts could reduce nurses' sleep quality and disrupt normal life status. Then there would be a series of physiological and psychological changes, resulting in the production of negative emotions [42] and an increase the work pressure [43]. Negative emotions will narrow the range of personal attention and cognitive [44]. At the same time, if there is a load other than negative emotions, it will lead to a lack of personal cognitive resources and affect the perception of things and personal performance. Nurses with frequent night shift work have more negative emotions and heavy emotional regulation tasks, and they are more inclined to think that they are subjected to negative leadership behaviors. This suggests that nurses should strengthen their adaptability to night shift rotation, and nurse managers should rationally allocate human resources and create a quiet and comfortable rest environment for night shift nurses in the department. The circadian rhythm disorder of nurses with high night rotation frequency can be focused on through various physical examination means. If necessary, aromatherapy and other intervention methods can be used to ensure sleep quality [45].

4.1. Limitations. The following are the study's shortcomings. First, social expectation bias is a clear restriction because this study relied on nurses' self-reported data from an anonymous online questionnaire. Second, the participants were all from one city, which may affect the inference of the results. Third, toxic leadership behaviors are equally influenced by the nurse leaders and organizational management. However, we only identified nurse factors. Finally, this was a cross-sectional study, and causal relationships between variables could not be determined. Despite these limitations, this study provides valuable data that can be used to develop appropriate preventive strategies.

5. Conclusions

In summary, this study was conducted under the Helsinki Principles and the nurses perceived their nurse managers' toxic leadership behaviors to be moderate. Among the nurses, those who were female, had low levels of education, high unit assignments, unstable nature of employment, and a high number of monthly night shifts. They reported an increase in toxic leadership behaviors. These impact variables can be taken into consideration when developing interventions to protect nurses from or reduce the negative impact of toxic leadership behaviors of nurse leaders.

6. Implications for Nursing Management

Nurse managers should fully encourage nurses' initiative when arranging tasks and provide reasonable appeal channels. Hospital managers need to ensure a reasonable hierarchy of nursing staff in the department, as well as rationalize nursing tasks and appraisals to ensure that nurses are not overly distracted from their work. In addition, the personal characteristics of nurses also have an impact on the perception of negative leadership behavior of nurse managers. This requires nurses to enhance their psychological construction, actively improve their professional knowledge and skills, and pay attention to the improvement of their communication skills to eliminate negative leadership behaviors due to their own reasons. Nurses' perceptions of themselves are influenced by social identity, and organizational support can reduce the negative effects of negative leadership behaviors [46]. Organizations need to recognize and praise nurses' work contributions, guide nurses to change their perceptions and attitudes toward the nursing profession and nurse managers, and find reasonable ways to relieve nurses' stress and bad emotions to avoid the negative effects.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Ethical Approval

An ethical approval was obtained from the Ethics Committee of the Tongji Medical College, Huazhong University of Science and Technology (No. S044).

Disclosure

Conflicts of Interest

We declare that there are no conflicts of interest.

Authors' Contributions

Xueqin Guo and Xin Li designed the study, performed investigation, curated the data , performed analysis, and wrote the original draft. Yuhan Wang validated the study, performed investigation, and curated the data. Yumei Wang investigated the study, curated the data, and wrote, reviewed, and edited the study. Huan Jin performed data analysis and proofread and revised the article. Xiao Fang and Yuting Xiang proposed a methodology and wrote, reviewed, and edited the study. Chenzi Xu and Yangjing Wang validated the study and wrote, reviewed, and edited the study. Jia He and Lijuan Xiong wrote, reviewed, and edited the study, supervised the study, and performed funding acquisition. All authors read and approved the final version for submission.

Acknowledgments

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Research Article

Structural and Psychological Empowerment in Explaining Job Satisfaction and Burnout in Nurses: A Two-Level Investigation

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Aim. The aim of the study was to test a two-level model of the relationships between structural empowerment in a hospital department and job satisfaction and burnout in nurses. We tested whether psychological empowerment is a mediator of these relationships. *Background.* We drew on empowerment theory to examine whether psychological empowerment mediates the association between organizational-level structural empowerment and nurses' job satisfaction and burnout at the individual level. The proposed two-level model takes into account the effect of both contextual and individual factors on individual nurse's job satisfaction and burnout. *Methods.* The study was conducted in 29 public hospital departments and included 309 participants employed as nurses or midwives. To analyze the results, we applied multilevel modeling and cross-level mediation analysis, with nurses as Level 1 and hospital departments as Level 2. *Results.* Structural empowerment at the hospital department level is positively related to nurses' individual sense of competence and autonomy, namely, to their psychological empowerment. Structural empowerment is also positively related to job satisfaction and negatively related to burnout in nurses. Psychological empowerment is a mediator between structural empowerment and nurses' job satisfaction as well as two dimensions of burnout: exhaustion and disengagement from work. *Conclusions.* These findings suggest that psychological empowerment is an underlying mechanism that may explain why structural empowerment in the hospital department is positively related to job satisfaction and negatively related to burnout in nurses. This has implications for theory by extending the multilevel nomological network of the constructs and for management practice by highlighting the role of structural empowerment for work design in public health institutions. *Implications for Nursing Management.* The results indicate that structural and psychological empowerment can play a significant role in creating supportive workplace conditions in hospitals. Organizing nurses' work in a way that empowers them promotes their sense of competence and autonomy, which in turn promotes their job satisfaction and reduces burnout.

1. Introduction

The nursing shortage is a global problem [1] caused, among other factors, by staff turnover, resulting from unsatisfactory work environments [1, 2] and burnout, which is prevalent among nurses worldwide [3]. Nurses are expected to provide patient care with empathy and patience, while working in a highly stressful environment, with few resources and excessive workloads, thus requiring from nurses to balance multiple pressures [4]. Given the nursing shortage, special attention should be paid to supportive work conditions that provide high job satisfaction and prevent burnout. Burnout, a great threat to healthcare professionals, especially to nurses

[5], develops as a result of excessive and unbalanced workplace demands and is expressed in exhaustion and disengagement from work [6]. Exhaustion is an effect of chronic tension caused by job demands, and nursing is one of the most exhausting professions as a result of various challenges in professional practice [4]. Disengagement from work is an attitude of withdrawal from patients, colleagues, and the whole context related to work [6]. Conversely, nurses' job satisfaction has been shown to be associated with a variety of positive outcomes, including higher task performance and retention, lower absenteeism, and lower turnover (see for review [7]). Therefore, a better understanding of the organizational practices which may lead

to higher job satisfaction, lower exhaustion, and lower disengagement from work among nurses' is important for healthcare management.

Some personal and organizational antecedents of burnout and job satisfaction in healthcare professionals have already been uncovered (for a review, see [4, 8]). However, the mechanisms that explain how organizational factors relate to individual outcomes in employees await further investigation. Human resource management strategies based on the empowerment theory [9, 10] have been observed to bring positive organizational outcomes and to prevent negative outcomes in a variety of organizations (e.g., [11]), including healthcare (e.g., [12]). There is also already evidence that empowerment is positively related to job satisfaction and negatively related to burnout in nurses (for reviews and meta-analyses, see [1, 13, 14]). However, most research to date, with rare exceptions (e.g., [10, 15]), has treated employee empowerment as an individual-level phenomenon. Too little attention has been paid to the fact that the relationships between organizational-level and individual-level constructs have a natural multilevel structure, i.e., empowerment strategies are implemented in healthcare organizations (i.e., at the organizational level) and their effects on job satisfaction or burnout are observed in individual employees. The multilevel approach may shed new light on the mechanisms linking organizational empowerment with its psychological consequences. Therefore, it remains to be investigated whether the results from single-level studies that dominate to date and were synthesized in reviews and meta-analyses (e.g., [1, 13, 14]) can be replicated in studies using multilevel designs.

To fill this gap, in the present study, we propose and test a theoretical model that postulates multilevel relationships between nurses' shared perceptions of empowerment at the unit level and nurses' individual-level job satisfaction and burnout. We also propose that psychological empowerment is an underlying mechanism that may explain these relationships. Given the inconsistencies in previous studies testing similar mediation mechanisms (e.g., [1, 16]), new multilevel evidence may shed light on this issue. The results of the study can serve as a basis for recommendations regarding the organization of nurses' work in hospital departments.

2. Theoretical Background

Empowerment theory has been widely applied in analyses of nurses' work [7, 9, 10, 17, 18]. It proposes a management strategy based on the implementation of systemic and consistent human resource management practices in the workplace that increase nurses' commitment by creating an atmosphere of openness and trust to improve their outcomes (e.g., [19]). The empowerment strategy obliges the organization's management to provide nurses with greater power and autonomy in performing their duties and making decisions related to their work. Empowerment enables the proper performance of duties and the pursuit of the hospital's interests; it also increases work motivation [20]. This happens when nurses gain more control over their work and want to participate in decisions that affect them [21].

In the organizational context, the term *empowerment* is used with reference to two perspectives [15]: structural (the organizational-level construct) and psychological (the individual-level construct). Structural empowerment is a set of purposeful management actions and polices that provide power, control, and authority to subordinates [15]. These practices are reflected in nurses' shared perceptions of structural empowerment in their work units, such as hospital departments [15]. These management practices aim to empower employees, that is, to make them stronger and more independent by creating an organizational context that leads to state empowerment or empowerment at the psychological level. *Psychological empowerment* refers to employees' sense of competence and autonomy [1, 22]. Consequently, organizational-level structural empowerment is expected to have an impact on individual-level psychological empowerment.

According to Kanter's [23] theory, structural empowerment is reflected in six dimensions [24]. (1) Access to opportunity is defined as with access to challenges, rewards, and opportunities for improvement, as well as full use of the employee's skills and knowledge. (2) Access to information means having knowledge about the values held in the organization and about the goals and policies of management and using this knowledge. (3) Access to support includes feedback from supervisors and peers, as well as advice on how to solve problems. (4) Access to resources is defined as the time needed to perform certain actions and access to the materials, equipment, and money needed to do the job. (5) Formal power is associated with job characteristics: flexibility, the employee's creative contribution to the achievement of the organization's goals, and the extent to which individual employees are authorized to make decisions. (6) Informal power refers to efficient communication between employees and management, cooperation in an atmosphere of friendship, and the employee's sense of being useful to colleagues and supervisors who look to him or her for support in problematic situations.

Creating empowering work conditions is considered an important organizational strategy that contributes to psychological empowerment and ultimately leads to positive work behaviors and attitudes [12, 25, 26]. Nurses who work for a particular organization and are provided with the information, support, and resources they need to do their jobs, as well as ongoing opportunities for development, may experience a greater sense of autonomy and job self-efficacy, which are essential to psychological empowerment [27, 28]. Psychologically empowered employees perform their work with a sense of control over what they do and are engaged in their work [11], and their productivity increases, and so does the effectiveness of their actions [27]. Of interest to this research, psychological empowerment improves job satisfaction (for review, see [13]) and reduces burnout in nurses (for review, see [4]) and consequently reduces nurse turnover [1]. However, the cross-level mechanisms explaining these effects (i.e., linking organizational and individual-level constructs) remain to be explored.

3. The Present Study

According to the theories of Kanter [23] and Spreitzer [28], workplace behaviors are determined by the social structures of the workplace. Thus, nurses' shared perceptions of structural empowerment in their work unit (e.g., hospital department) are expected to reflect organizational-level management practices specific to that unit, which in turn are reflected in the individual-level attitudes and behaviors of nurses. Psychological empowerment is thus a logical outcome of structural empowerment, and powerless individuals may be more susceptible to burnout and reduced job satisfaction [20, 29].

Based on these premises, we propose a two-level model (Figure 1) in which psychological empowerment is an underlying mechanism that explains why structural empowerment at the organizational level is related to job satisfaction and burnout at the individual (i.e., nurse) level. Because nurses are employed in specific hospital departments and because analyzing their work without considering the differentiation of managerial strategies at the department level seems to provide an incomplete picture of the analyzed relationships, our model explains cross-level links between constructs, with nurse at Level 1 and department at Level 2. Consequently, our research answers the research problem whether psychological empowerment is a mediator between structural empowerment at the organizational level and (1) job satisfaction and two dimensions of burnout: (2) exhaustion and (3) disengagement from work at the individual level. Below, we explain the cross-level mediations included in our model.

To examine the cross-level mechanism linking structural empowerment to job satisfaction through psychological empowerment, we first consider existing evidence on the individual relationships among these three constructs, which supports our model. Research has shown that structural empowerment is positively related to psychological empowerment [13], which culminates in positive outcomes at work [12, 25, 27, 29, 30]. A positive relationship between psychological empowerment and job satisfaction was found in many studies and supported by the results of systematic reviews and meta-analyses [1, 7, 13]. These consistent conclusions concern specific relationships between these three variables, while studies testing a mediation mechanism itself provide mixed evidence. The model postulating a mediating role of psychological empowerment between structural empowerment and job satisfaction was supported in a Canadian study [31]. However, longitudinal studies [32] and studies of Taiwanese nurses [33] did not support this relationship. Furthermore, a meta-analysis [1] found no empirical support for such mediation. Nevertheless, these studies were based on single-level data, and the analyses mainly included the total score of structural empowerment rather than its dimensions. Therefore, to address the discrepancies in previous findings and to answer the call for further studies [1], we propose a multilevel approach and formulate the following hypotheses:

Hypothesis 1. Nurses' psychological empowerment is a mediator between structural empowerment at the department level and nurses' job satisfaction.

Similarly, when looking for specific relationships between constructs included in the second mechanism explaining burnout, research shows negative relationships between psychological empowerment and job burnout (e.g., [34]). Research on nurse burnout indicates that psychological empowerment acts as a buffer against emotional exhaustion and disengagement from work [35, 36]. However, there are inconsistencies in the existing evidence regarding the mediating role of psychological empowerment between structural empowerment and burnout. Some studies support this mediation mechanism [3, 29, 35], while others do not [37]. To reconcile these discrepancies resulting from single-level research, we consider cross-level relationships. In our multilevel model, we postulate a mediating role of nurses' psychological empowerment between structural empowerment at the department level and nurses' burnout, which is reflected in the hypotheses regarding the two dimensions of burnout.

Hypothesis 2. Nurses' psychological empowerment is a mediator between structural empowerment at the department level and nurses' exhaustion.

Hypothesis 3. Nurses' psychological empowerment is a mediator between structural empowerment at the department level and nurses' disengagement from work.

Studies have shown that demographic characteristics (e.g., age, sex, and work experience) are significant predictors of structural empowerment, nurses' job satisfaction, and burnout [7, 14, 35, 38]. Therefore, in our analyses, we control for age, sex, nursing work experience, weekly working time, and extra work taken on.

4. Materials and Methods

4.1. Procedure. We obtained consent for the research from the hospital's management and the head nurse. Participants were informed of the purpose of the study; they were also informed that their participation was voluntary and anonymous and that they could withdraw at any time. They were asked to complete the paper-and-pencil questionnaires at a convenient time and place and return them to the special boxes provided in the hospital departments. To minimize the incidence of common method bias [39], we divided the questionnaire into sections—items related to different constructs were presented on separate pages.

The sampling criterion was employment as a nurse or midwife. Data were collected in 2019 in Poland in 29 public hospital departments (e.g., obstetrics and gynecology, surgical, orthopedic, and internal diseases departments).
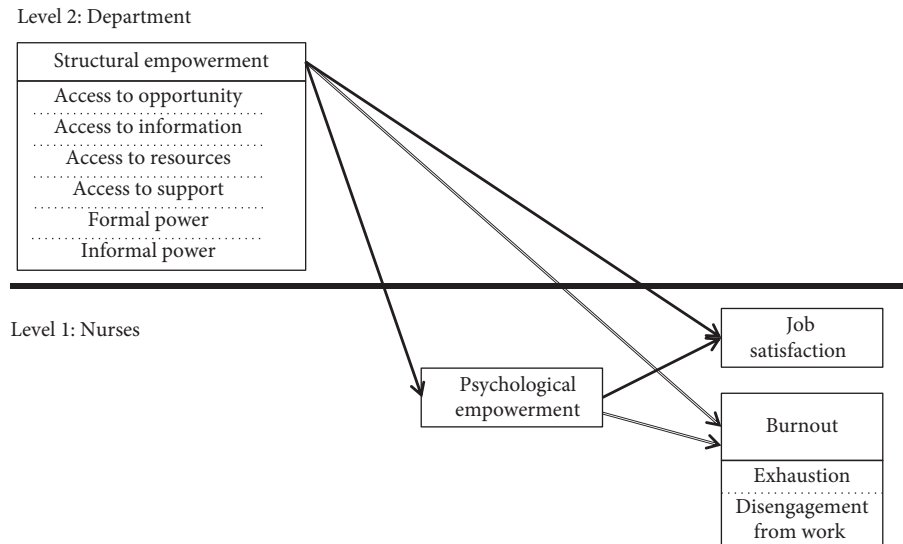
FIGURE 1: Conceptual two-level model of relationships between structural empowerment, psychological empowerment, job satisfaction, exhaustion, and disengagement from work.

4.2. Participants. The study included 309 respondents employed as hospital nurses (270, 87% of the sample) or midwives (39, 13%): 292 women and 17 men. Their age ranged from 21 to 65 years ($M = 43.59$, SD = 11.16). The majority of respondents had a master's (115) or bachelor's degree (111), 81 had secondary education, and two respondents had vocational education. Most of them (296) were employed full time. For the majority of respondents, this employment was permanent (270), 31 respondents had a fixed-term employment contract, and 7 worked on the basis of an order contract or other kind of contract. Their work experience in the profession ranged from one year to 44 years ($M = 19.65$, SD = 12.71), and the average length of employment with the current employer was over 16 years ($M = 16.51$, SD = 12.47). Participants worked an average of 41 hours per week (SD = 5.62); most of them worked both day and night shifts (239 respondents); 68 respondents (22%) reported working only day shifts, and one respondent reported working only night shifts. Seventy-three respondents had additional paid work (e.g., in an outpatient clinic and home care).

4.3. Measures. Structural empowerment was measured using the Conditions of Work Effectiveness Questionnaire II (CWEQ-II; [16]), as adapted into Polish by Orłowska and Łaguna [40]. The measure provides a total score for structural empowerment, as well as scores for its six dimensions. Each scale consists of three items, with the exception of the Informal Power scale, which consists of four items. The Access to Opportunity scale begins with the question: "How much of each kind of opportunity do you have in your present job?," followed by a list of opportunities (e.g., "Challenging work"). The Access to Information scale begins with the question: "How much access to information do you have in your present job?," followed by a list of information (e.g., "The goals of top management"). The

Access to Support scale begins with the following question: "How much access to support do you have in your present job?," followed by a list of types of support (e.g., "Specific information about things you do well"). The Access to Resources scale begins with the question: "How much access to resources do you have in your present job?," followed by a list of resources (e.g., "Time available to do necessary paperwork"). The Formal Power scale begins with "In my work setting/job," followed by workplace characteristics (e.g., "The rewards for innovation on the job"). The Informal Power scale begins with the question: "How much opportunity do you have for these activities in your present job?," followed by a list of opportunities (e.g., "Collaborating on patient care with physicians"). Responses are indicated on a 5-point scale, with anchors labeled according to the content of a given item (e.g., 1 = *none* to 5 = *a lot*). The reliability of the scales, as assessed by Cronbach's α, ranged from 0.79 to 0.93 (see Table 1).

To measure *psychological empowerment*, we used the Psychological Empowerment Instrument [28], adapted into Polish by Orłowska and Łaguna [41]. The questionnaire consists of 12 items (e.g., "My impact on what happens in my department is large") that make up the total score. The items are rated on a 7-point scale (1 = *very strongly disagree* to 7 = *very strongly agree*). The reliability is $\alpha = 0.89$.

To assess the level of *job satisfaction*, we used the Job Satisfaction Scale [42]. It is constructed in the same way as the Satisfaction with Life Scale [43] and consists of 5 items designed to assess the cognitive aspect of general job satisfaction (e.g., "In many ways, my work is close to my ideal"). The items are rated on a 7-point scale (1 = *strongly disagree* to 7 = *strongly agree*). The reliability is $\alpha = 0.86$.

To measure the level of *burnout*, we used the Oldenburg Burnout Inventory [44], adapted into Polish by Baka and Basińska [45]. The inventory consists of 16 items forming two scales, of 8 items each: Exhaustion (e.g., "I can tolerate the pressure of my work very well," reverse scored) and

TABLE 1: Descriptive statistics, reliability, and correlations between variables.

Variable	M	SD	α	1	1a	1b	1c	1d	1e	1f	2	3	4a	4b
											Correlation			
(1) Structural empowerment	60.75	13.24	0.93	1										
(1a) Access to opportunity	11.06	2.59	0.81	0.71***	1									
(1b) Access to information	9.19	3.23	0.91	0.77***	0.48***	1								
(1c) Access to support	10.25	2.85	0.91	0.82***	0.56***	0.63***	1							
(1d) Access to resources	9.72	2.48	0.85	0.73***	0.43***	0.45***	0.53***	1						
(1e) Formal power	7.65	2.94	0.85	0.73***	0.32***	0.46***	0.49***	0.48***	1					
(1f) Informal power	13.00	3.19	0.79	0.80***	0.47***	0.48***	0.60***	0.54***	0.53***	1				
(2) Psychological empowerment	59.46	10.65	0.89	0.55***	0.36***	0.41***	0.36***	0.42***	0.47***	0.48***	1			
(3) Job satisfaction	21.05	6.01	0.86	0.59***	0.39***	0.41***	0.46***	0.48***	0.36***	0.56***	0.49***	1		
(4a) Burnout-exhaustion	20.94	3.93	0.61	−0.40***	−0.21***	−0.27***	−0.23***	−0.39***	0.26***	0.25***	−0.35***	−0.47***	1	
(4b) Burnout-disengagement	19.51	3.23	0.77	−0.52***	−0.39***	−0.29***	−0.40***	−0.41***	−0.39***	−0.41***	−0.41***	−0.56***	0.64***	1

*** $p < 0.001$.

TABLE 2: Results of multilevel modeling explaining psychological empowerment, job satisfaction, exhaustion, and disengagement from work.

	Dependent variable (Level 1)											
Predictor (Level 2)	Psychological empowerment			Job satisfaction			Burnout-exhaustion			Burnout-disengagement		
	γ	SE	p	γ	SE	p	γ	SE	p	γ	SE	p
Model 1:												
Structural empowerment	1.70	0.52	0.003	0.29	0.07	0.001	−0.11	0.05	0.040	−0.09	0.03	0.002
Model 2.												
Access to opportunity	0.05	0.93	0.954	0.26	0.33	0.429	0.82	0.39	0.046	−0.08	0.19	0.676
Access to information	0.97	0.74	0.201	−0.38	0.47	0.432	−0.63	0.45	0.176	−0.21	0.20	0.291
Access to support	−1.40	1.53	0.371	0.57	0.56	0.323	−0.93	0.53	0.094	−0.51	0.29	0.098
Access to resources	0.03	0.78	0.972	1.50	0.33	<0.001	−0.07	0.34	0.848	−0.06	0.23	0.783
Formal power	0.05	0.82	0.949	1.30	0.48	0.014	−0.85	0.56	0.145	−0.32	0.24	0.197
Informal power	2.23	1.44	0.135	−0.78	0.60	0.207	0.97	0.43	0.033	0.47	0.23	0.057

γ = unstandardized coefficient; SE = standard error.

Disengagement from Work (e.g., "It happens more and more often that I talk about my work in a negative way"). The items are rated on a 4-point scale (1 = *strongly disagree* to 4 = *strongly agree*). Reliability is $\alpha = 0.77$ for Exhaustion and $\alpha = 0.61$ for Disengagement.

4.4. Data Analysis. Before moving on to hypothesis testing, we conducted preliminary analyses. First, because all constructs were measured with self-report instruments, we tested for potential common method bias using Harman's single-factor test [39]. Second, we examined descriptive statistics and intercorrelations between study variables. Third, we tested the variance of the dependent variables at both levels (see next section). Next, we analyzed the role of the control variables: age, sex, work experience in the nursing profession, weekly working time, and extra work taken on. If a given control variable was a statistically significant predictor, we included it in further analyses.

The data collected had a multilevel structure, with nurses as Level 1 and hospital department as Level 2. Department-level data were aggregated, that is, we calculated mean scores for the nurses working in a particular department. In the analyses, we applied multilevel modeling [46] using HLM7 software. We tested models explaining (1) job satisfaction and two dimensions of burnout: (2) exhaustion and (3) disengagement from work, including—in separate models—the global score of structural empowerment (Model 1) and its six dimensions (Model 2) as predictors (see Table 2). In accordance with the recommendations on centering [46], Level-1 continuous variables were group-mean centered, while Level-2 variables were first standardized and then entered uncentered. Categorical variables were entered uncentered at both levels. When reporting the results, we report unstandardized γ regression coefficients.

The final step was to test the mediation hypotheses using PRODCLIN [47]. This program allows the testing of cross-level mediation effects by computing confidence intervals (CI) for values from multilevel analyses with more accurate type I error indicators and greater power than other tests

[47]. If the CI does not include zero, this indicates a statistically significant mediation effect.

5. Results

5.1. Preliminary Analyses. First, we used Harman's single-factor test [39] to determine whether the total variance of all variables (respective scales' items) extracted by one factor exceeded 50%. The exploratory factor analysis with one factor showed that this factor explained about 28% of their variance. This indicates that the collected data are free from common method bias.

Second, we examined descriptive statistics and correlations, which are presented in Table 1. The statistically significant positive relationships of structural and psychological empowerment with job satisfaction and their significant negative relationships with both dimensions of burnout provide preliminary support for the hypotheses. It should be noted, however, that for two dimensions of structural empowerment (i.e., formal power and informal power), the direction of the relationship with burnout was positive—not negative, as expected.

Third, before the main analyses, we tested the unconditional multilevel model, which allowed us to estimate the variance of the explained variables at each level. The variance for job satisfaction was 32.14 at the nurse level and 4.10 at the department level; for burnout, it was 13.29 and 2.23, and for disengagement, it was 10.46 and 0.01, respectively.

Next, we tested whether the control variables were statistically significant predictors of the explained variables. For job satisfaction, none of the control variables tested proved to be a statistically significant predictor (all ps > 0.05). For exhaustion, the only statistically significant predictor was age ($\gamma = 0.07$, SE = 0.03, $p = 0.039$). In the case of disengagement from work, no statistically significant relationships were found for any of the control variables. Therefore, following the recommendation that only statistically significant predictors should be retained in a multilevel model [46], only age was included as a control variable to explain exhaustion in further analyses.

TABLE 3: Results of cross-level mediation analyses: indirect effects explaining job satisfaction, exhaustion, and disengagement from work.

Indirect effect	95% CI
Dependent variable: job satisfaction	
Structural empowerment-psychological empowerment-job satisfaction	0.19, 0.79
Access to opportunity-psychological empowerment-job satisfaction	−0.51, 0.54
Access to information-psychological empowerment-job satisfaction	−0.13, 0.69
Access to support-psychological empowerment-job satisfaction	−1.26, 0.45
Access to resources-psychological empowerment-job satisfaction	−0.43, 0.45
Formal power-psychological empowerment-job satisfaction	−0.45, 0.47
Informal power-psychological empowerment-job satisfaction	−0.17, 1.45
Dependent variable: burnout-exhaustion	
Structural empowerment-psychological empowerment-burnout-exhaustion	−0.40, −0.08
Access to opportunity-psychological empowerment-burnout-exhaustion	−0.26, 0.24
Access to information-psychological empowerment-burnout-exhaustion	−0.33, 0.06
Access to support-psychological empowerment-burnout-exhaustion	−0.21, 0.61
Access to resources-psychological empowerment-burnout-exhaustion	−0.21, 0.21
Formal power-psychological empowerment-burnout-exhaustion	−0.26, 0.24
Informal power-psychological empowerment-burnout-exhaustion	−0.71, 0.08
Dependent variable: burnout-disengagement	
Structural empowerment-psychological empowerment-burnout-disengagement	−0.42, −0.09
Access to opportunity-psychological empowerment-burnout-disengagement	−0.27, 0.26
Access to information-psychological empowerment-burnout-disengagement	−0.36, 0.07
Access to support-psychological empowerment-burnout-disengagement	−0.23, 0.65
Access to resources-psychological empowerment-burnout-disengagement	−0.23, 0.22
Formal power-psychological empowerment-burnout-disengagement	−0.24, 0.23
Informal power-psychological empowerment-burnout-disengagement	−0.75, 0.08

CI = confidence interval for the indirect effect.

5.2. Multilevel Analysis of Direct Effects. To test the hypotheses, we first verified the direct relationships postulated in the model (see Figure 1). The results of the multilevel modeling (Table 2) showed that the total structural empowerment score was a statistically significant predictor of psychological empowerment ($\gamma = 1.70$, SE = 0.52, $p = 0.003$). No statistically significant relationships were found between the dimensions of structural empowerment and psychological empowerment.

The analyses explaining job satisfaction (Table 2) revealed its statistically significant positive relationships with psychological empowerment ($\gamma = 0.28$, SE = 0.02, $p < 0.001$) and with structural empowerment total score (Table 2). The analyses conducted for the individual dimensions of structural empowerment revealed that two dimensions, namely, access to resources ($\gamma = 1.50$, SE = 0.33, $p < 0.001$) and formal power ($\gamma = 1.30$, SE = 0.48, $p = 0.014$), were statistically significant positive predictors of nurses' job satisfaction.

Analyses concerning exhaustion revealed its statistically significant negative relationships to psychological empowerment ($\gamma = -0.13$, SE = 0.02, $p < 0.001$) and structural empowerment total score ($\gamma = -0.11$, SE = 0.05, $p = 0.040$). The analyses for the dimensions of structural empowerment (Table 2) indicated that access to opportunity ($\gamma = 0.82$, SE = 0.39, $p = 0.046$) and informal power ($\gamma = 0.97$, SE = 0.43, $p = 0.033$) were predictors of exhaustion, and both relationships were positive.

Analyses concerning disengagement from work showed negative associations with psychological empowerment ($\gamma = -0.14$, SE = 0.02, $p < 0.001$) and with structural

empowerment total score ($\gamma = -0.09$, SE = 0.03, $p = 0.002$). None of the dimensions of structural empowerment were statistically significant predictors of work disengagement (Table 2).

5.3. Cross-Level Mediation. To test the hypotheses, we analyzed cross-level indirect effects. Using the coefficient values for direct effects from the multilevel analysis, we calculated CIs for mediation effects (Table 3). The results showed that psychological empowerment was a mediator between structural empowerment total score and job satisfaction, 95% CI [0.19, 0.79]. This supports Hypothesis 1. However, we found no statistically significant cross-level mediation effects for any of the dimensions of structural empowerment. Psychological empowerment was also a mediator between total structural empowerment score and exhaustion, 95% CI [−0.40, −0.08], supporting Hypothesis 2. Similarly, there was a mediation effect for work withdrawal, 95% CI [−0.42, −0.09], supporting Hypothesis 3. No significant cross-level mediation effects were found for the dimensions of structural empowerment (Table 3).

6. Discussion

In this study, we proposed a multilevel model postulating that psychological empowerment is an underlying mechanism that explains relationships between nurses' shared perceptions of structural empowerment practices in the hospital department and job satisfaction and burnout at the individual level in nurses. The empirical study in public

hospital units in Poland aimed to determine the cross-level relationships of structural empowerment with (1) job satisfaction and the two dimensions of burnout: (2) exhaustion and (3) disengagement from work, with psychological empowerment as a mediator.

The importance of nurses' job satisfaction has been demonstrated in numerous studies, which have found that it is associated with a variety of positive outcomes, including lower turnover [7], which is important in the context of the nursing shortage [1, 2]. The results of this study show that psychological empowerment is a mediator between structural empowerment introduced at the hospital department level and individual job satisfaction of nurses. Nurses who are empowered through supportive management practices are more likely to believe in their ability to contribute meaningfully to the workplace, which in turn increases their job satisfaction, as psychological empowerment is an important internal incentive factor [1, 22]. Our findings shed new light on the inconsistencies found in the results of previous studies, which are mostly based on single-level investigations [1, 13, 31–33]. We also add to rare multi-level evidence (e.g., [10]) and show that organizational leadership that creates empowering work conditions creates supportive practice environments [10]. Furthermore, our findings suggest that two dimensions of structural empowerment, namely, access to opportunities and formal power, are direct predictors of nurses' job satisfaction. This extends evidence from previous studies supporting these relationships for the total score of structural empowerment [7, 33, 48]. Our multilevel analysis reveals that nurses experience higher levels of job satisfaction when they are provided with opportunities at the department level, such as adequate time for each task, materials, equipment, and financial resources necessary to perform professional duties. In addition, nurses experience higher job satisfaction when they share perception of formal power. This means that they feel that their work is seen as innovative and flexible and is valued by their managers and colleagues.

Our research findings also shed more light on the relationships between empowerment and burnout that have been demonstrated in previous studies [4, 14, 20, 35, 36]. Multilevel analysis revealed that empowering working conditions implemented in the department were associated with higher psychological empowerment of nurses, which in turn was associated with their lower burnout. Not only the total score but also the informal power and access to opportunities dimensions of structural empowerment were significant predictors of nurses' burnout. Our findings add new multilevel evidence to single-level studies that mostly focus on the total score of structural empowerment [3, 5]. Cross-level mediation was supported, and psychological empowerment emerged as an underlying mechanism explaining why structural empowerment is negatively related to nurses' exhaustion and disengagement from work. Although no statistically significant mediation effects were found for any of the dimensions of structural empowerment, multilevel modeling yielded several interesting findings regarding exhaustion. Significant predictors of exhaustion were age, access to opportunities, and informal power. As in

other studies [35, 36], nurses' level of exhaustion increases with age. Interestingly, our analyses also show that nurses experience higher levels of exhaustion when the employer provides them with broad access to opportunities to improve their skills. It can be concluded that the employer's expectation to constantly improve professional skills, especially for nurses with many years of professional experience, may lead to increased exhaustion. Similarly, Cavus and Demir [35] found positive relationships between access to opportunities and one of the dimensions of burnout. Our results also suggest that higher levels of burnout may be experienced by nurses who are frequently called upon by colleagues and supervisors to help solve problems (informal power). The scope of a nurse's duties in a hospital is very broad [4] and requires collaboration with physicians and other hospital staff. Our findings suggest that this collaboration should be based on principles of reciprocity and partnership [24], and if collaboration with physicians increases nurses' workload, it may increase their exhaustion.

This study contributes to the literature in the following ways. First, it extends the multilevel nomological network of organizational-level structural empowerment and its individual-level outcomes among nurses, while shedding light on the psychological processes through which these relationships occur. Analyses include not only the total score of structural empowerment but also its six dimensions, providing a more nuanced picture of their relationships with job satisfaction and burnout. Second, this study advances the empowerment literature by suggesting that psychological empowerment may explain why empowering workplace conditions introduced in the hospital department make nurses more satisfied with their work and prevent them from burnout. Although previous evidence has shown that empowerment is positively related to job satisfaction and negatively related to burnout in nurses [1, 13, 14], this study adds value by attempting to unravel the cross-level mechanism behind it.

6.1. Limitations. The current study is not without limitations. The cross-sectional design limits the ability to make causal inferences. Future longitudinal or experimental research could further explore the causal relationships between the constructs analyzed. Our research was conducted just prior to the COVID-19 pandemic. Nevertheless, studies during COVID-19 have shown that leadership practices in emergency departments are positively associated with structural and psychological empowerment of nurses [49], demonstrating the importance of nurse empowerment also in the new epidemiological context. Moreover, our research was conducted in public hospitals in Poland. Therefore, it seems advisable to conduct further studies among nurses working in different settings (e.g., outpatient clinics, hospices, and nursing homes) and in other countries to test the generalizability of our findings.

6.2. Implications for Nursing Management. Working under stress due to numerous demands, nurses are expected to be empathetic and sensitive to deal with situations such as

costly recovery or non-recovery and death of patients [4]. This can lead to feelings of professional dissatisfaction, exhaustion, and disengagement from work. Therefore, remedies that can be implemented in healthcare organizations through leadership practices are important to reduce nurses' turnover intentions and improve quality of care. Leadership that creates empowering work conditions plays a fundamental role in creating supportive practice environments [10]. The present study shows that both structural and psychological empowerment can play an important role in creating such workplace conditions in hospitals. Our findings suggest that nursing and hospital management can enhance nurses' psychological empowerment through the development of structural empowerment practices.

Structural empowerment can be promoted through job design practices that include access to relevant information to perform one's job, effective feedback on performance and clear direction, and allocation of sufficient time for assigned tasks [11, 23]. An empowering work environment supports nurses by providing them with legitimate power and practicing transparency in management decisions [25], which may reduce their intention to leave [13]. Our findings show that empowering working conditions that ensure flexibility, time to perform professional duties, immediate help when needed, and appreciation from supervisors and colleagues are associated with higher job satisfaction among nurses. When trying to reduce job exhaustion, it is worthwhile to focus on creating a collaborative atmosphere in the department and cultivating nurses' partnership relationships with other hospital staff. It should be noted, however, that excessive demands related to continuous professional development may increase nurses' exhaustion. To promote psychological empowerment through structural empowerment, hospital managers also need to give nurses more autonomy in how they do their work, set clear goals, and promote teamwork and a cooperative atmosphere [11]. This can promote nurses' sense of efficacy, involvement in what is happening in the department, and a sense of being valued for their work. Open communication strategies, such as team briefings or a suggestion box, are also recommended to facilitate effective and transparent information sharing [11]. It is also worth noting that special programs have been developed, such as a psychodrama-based psychological empowerment program that increases psychological empowerment in nurses [50]. Thus, strategic planning for the professional development of health professionals can include the development of psychological empowerment in employees and the acquisition of competencies necessary for the implementation of structural empowerment practices by managers. All of these strategies are likely to promote structural empowerment and, through psychological empowerment, increase nurses' job satisfaction and their burnout and, consequently, reduce turnover [9].

7. Conclusions

The results of this study suggest that psychological empowerment is an underlying mechanism that may explain why structural empowerment at the hospital department level (i.e., organizational-level empowering work conditions) is positively related to job satisfaction and negatively related to burnout among nurses. This has implications for theory by extending the multilevel nomological network of the constructs examined and for management practice by highlighting the role of structural empowerment in work design in public health institutions.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Ethical Approval

This research project was approved by the Research Ethics Board at the authors' university.

Consent

All respondents gave their consent to participate in the study, which was conducted in accordance with the guidelines set out in the Declaration of Helsinki.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Authors' Contributions

Both co-authors were involved in all parts of the research. The article's publication has been approved by both co-authors.

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Research Article

A Study of Professional Quality of Life and Environmental Factors among Pediatric Registered Nurses

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Aim. This research study aims to investigate the professional quality of life (ProQOL) among pediatric registered nurses. *Background*. Professional quality of life encapsulates two fundamental components, namely, compassion satisfaction and compassion fatigue, which comprises burnout and secondary traumatic stress. *Methods*. A descriptive cross-sectional design was used in this study, which included 217 pediatric registered nurses. Self-administered questionnaires compiled sociodemographic and occupational characteristics before measuring Professional quality of life (Version 5) items were used to collect data. *Results*. Most respondents were 30 to 35 years of age (65%), female (99%), and hold a diploma certificate (63%). The ProQOL scores for compassion satisfaction was 35.9 (SD = 9.7), compassion fatigue (burnout) was 21.8 (SD = 9.64), and compassion fatigue (secondary traumatic stress) was 23.5 (SD = 9.7). A significant mean difference ($p < 0.001$) were found in the ProQOL level based on environmental factors related to pediatrics and family. *Conclusion*. The results of this study show a moderate compassion satisfaction level, a low burnout level, and a moderate secondary traumatic stress level among pediatric registered nurses. Different related environmental factors that can impact the professional quality of life of pediatric registered nurses. *Implications for Nursing Management*. Pediatric nurses will benefit from a supportive work environment, which fosters collaboration and respect among nurses and their pediatric patients' families to improve the health outcomes of pediatric patients. Hospitals should offer specialized training programs that address the unique needs of pediatric nursing, encompassing areas such as child development, communication techniques with children, and age-specific healthcare interventions. This will equip nurses with the necessary skills and knowledge to provide optimal care for pediatric patients. Also, the following support systems, such as regular debriefing sessions and counseling services, are established to help nurses cope with the emotional challenges they may encounter in their work and to foster a collaborative work environment that encourages effective teamwork among nurses and promotes positive relationships between nurses and the families of pediatric patients. This can be achieved by implementing interdisciplinary team approaches, regular team meetings, and open communication channels. In addition, to ensure that pediatric nurses have access to the necessary resources, such as up-to-date medical literature, technological tools, and equipment, to provide the best care possible. Adequate staffing levels should also be maintained to prevent excessive workloads, which can contribute to burnout and decreased job satisfaction.

1. Introduction

The healthcare sector in Saudi Arabia plays a significant role in achieving the goals of which focuses on providing high-quality healthcare and creating a vibrant society [1]. One crucial aspect of this sector is pediatric nursing, which is essential for ensuring the well-being of children. However, there is limited awareness in Saudi Arabia regarding the

impact of professional quality of life (ProQOL) on pediatric nurses. The quality of professional life is of utmost importance as it directly affects the well-being and job satisfaction of healthcare professionals, including pediatric nurses, high levels of ProQOL can lead to increased compassion satisfaction, positive emotions, and motivation in the work environment, resulting in effective and compassionate care for pediatric patients [2]. On the other hand,

a lack of compassion satisfaction among pediatric nurses can lead to negative consequences such as burnout and secondary traumatic stress, compromising the quality of care provided [3].

Hence, there is a need for further research specifically focused on professional quality of life in pediatric nursing, within the context of Saudi Arabia and shedding light on the daily challenges they face and improving their quality of life. The primary aim of this study is to examine the levels of compassion satisfaction and compassion fatigue among pediatric registered nurses. To achieve this, it is crucial to explore the environmental factors that impact ProQOL, including personal-related, work-related, pediatric-related, and family-related factors. Although previous studies have explored the relationship between ProQOL and environmental factors in healthcare providers, there is a gap in knowledge specifically concerning pediatric nursing.

Therefore, the second aim of this study is to investigate the significant mean differences between these factors and professional quality of life in pediatric nursing. By doing so, this study aims to promote the well-being and job satisfaction of pediatric nurses, ultimately leading to improved patient outcomes. The findings of this study can have important implications for enhancing working conditions for pediatric nurses. Regular surveys on ProQOL among pediatric nurses can inform policies and interventions that address their individual needs, contributing to the enhancement of patient outcomes.

2. Materials and Methods

2.1. Study Design. This quantitative study used cross-sectional to examine the ProQOL levels and various aspects of personal-related environmental factors (PEFs), work-related environmental factors (WEFs), pediatric-related environmental factors (PedEFs), and family-related environmental factors (FEFs) for pediatric RNs [4].

2.2. Study Setting and Sample. The study considers pediatric departments via two governmental health institutions included pediatric departments, namely, the Maternity and Children Hospital (MCH) and Heraa General Hospital (HGH) in Makkah, Saudi Arabia. Because there were nurses characterized by different levels of experience and different nationalities who provide basic services to the residents of Makkah and nearby villages, including Hajj-Umrah performers. The target population included the 532 pediatric nurses working in the aforementioned hospitals. It was then necessary to articulate sample criteria, with inclusion criteria enabling the recruitment of registered nurses in different positions working in pediatric departments at the MCH and HGH. Furthermore, nurses were required to speak the English language to communicate efficiently. Meanwhile, healthcare providers were excluded who were working in other departments, pediatric nurses who declined to participate, and internship nurses working in pediatric departments. The sample size was calculated using the SurveyMonkey by Momentive website: https://rb.gy/2si0i.

Moreover, assuming values that include a confidence level of 95% to ensure a degree of certainty concerns the selection of populations. A margin of error (e) was allowed (5%). The result was 224, and then 10% was added to the sample size for anticipated missing data and error chance. Consequently, the final sample included 246 pediatric nurses. This study sample allows for valid statistical conclusions and the generalizability of results beyond the sample used. In terms of sampling technique, a controlled quota sampling method has been adopted, with nonprobability sampling used to control data nonrandomly by determining the number of participants in each department. This method would be used to find results quickly and the findings conveniently to administer, minimizing time and cost [4]. First, the participants were divided into different strata based on the hospitals' departments, to identify the number of participants required in each stratum. Then, the proportion (quotas) of participants in each stratum was identified in the target population. After that, these same proportions were applied to the sample size. Consequently, participants were selected from each stratum following the proportions noted in the previous step.

2.3. Instrument. The self-reported questionnaire included two parts, one part was about sociodemographic and occupational characteristics and another part corresponded to the ProQOL tool (V5) [2]. In the sociodemographic and occupational characteristics part, the researcher undertook a thorough literature review to identify environmental factors that could operate as independent variables. Personal-related environmental factors (age, gender, sleep medication, and level of education), work-related environmental factors (job position and pediatric department), pediatric-related environmental factors (difficulty communicating with the family of a child and recovery time after the child's death), and family-related environmental factors (number of children living inside the home and marital status) were revealed to influence pediatric RNs' professional quality of life. Questions designed to capture these factors included 10 multiple-choice and dichotomous (closed-ended) questions constructed around the aims of obtaining more factual data, reducing the writing effort demanded of participants, and enabling quick analysis via the tabulation of answers, which increases efficiency. In the ProQOL part, 30 questions were included which were designed to measure the two following introduced domains. To measure CS, items 3, 6, 12, 16, 18, 20, 22, 24, 27, and 30 were included. To measure CF, items concerning burnout, namely, items 1, 4, 8, 10, 15, 17, 19, 21, 26, and 29 of the ProQOL tool and STS, namely, 2, 5, 7, 9, 11, 13, 14, 23, 25, and 28 were included. Responses to these items were given on a 5-point Likert scale, where $1 =$ never, $2 =$ rarely, $3 =$ sometimes, $4 =$ often, and $5 =$ very often [2]. In the main research study, the reliability of the ProQOL tool for this study was Cronbach's alpha of 0.89 for CS, 0.83 for BO, and 0.78 for STS. Thus, for all aspects, a Cronbach's alpha of 0.80 or higher is considered especially desirable [4]. Therefore, conceptual equivalence was assessed to check whether the construct has the same meaning across the different groups

[5]. Furthermore, there were no notable omissions. In short, the ProQOL tool was appropriate and could be used in this research study. A pilot study has been conducted to assess the research study's feasibility. The participant involved 30 (12%) of the sample size of registered nurses in different hospital pediatric departments. Also, the data would not be used as part of this study. The duration to answer the questionnaires was 10 to 15 min.

2.4. Data Collection. Data were collected using a web-based survey as a structured self-report measure. Pediatric nurses were invited to participate in the questionnaire via email sent from the internal communication department of each hospital, with a hypertext link to the Google survey sent to the emails received. Furthermore, a follow-up reminder was sent after five days if a participant partly completed the questionnaire, thanking them for their responses thus far and requesting more cooperation. This method could reduce time and financial costs. This procedure was conducted between January 2023 and March 2023.

2.5. Data Analysis. The software Statistical Package for the Social Sciences (SPSS) program (version 29) was used to organize and analyze data. Based on the quantitative analysis, the data analysis combined descriptive and inferential statistics, with descriptive statistics (univariate analysis) via frequency count, percentages, standard deviations (variance), and the central tendency such as mean, for each main variable of the study whether independent or dependent variables. Finally, inferential statistics (bivariate analysis) would be generalized from a sample to a population through parametric testing such as one-way analysis of variance (ANOVA) and independent sample t-test. Moreover, results to assess the normal distribution of the data performed the Kolmogorov–Smirnov test and using histogram graphs indicated that the data did conform to a normal distribution. According to the ProQOL manual, reversed answers items 1, 14, 15, and 17, into (1 = 5) (2 = 4) (3 = 3) (4 = 2) (5 = 1). In the end, the sum answers were ≤22 the ProQOL was at a low level, the sum answers were 23–41 the ProQOL was at a moderate level, and the sum answers were ≥42 the ProQOL was at a high level [2]. This research would consider the mean difference significant at the 0.05 level.

2.6. Ethical Considerations. Ethical considerations were an essential requirement for this scientific research. First, approval to use the ProQOL tool was obtained from the ProQOL office at the Center for Victims of Torture. Next, the Institutional Review Board of the study setting was obtained (H-02-K076-0123-873 and KSU-HE-22-781). In the end, according to ethical considerations was sent a cover letter to pediatric nurses containing information about the nature, location, and title of the study as well as the ability for them to answer the questionnaire at any time without cost. Furthermore, to address the potential concerns of participants, the letter explained that participation could be voluntary and confidential.

3. Results

The questionnaires were e-mailed to 246 potential participants, and 231 participants were agreed to take part in this research study, resulting in a response rate of 93.90% of the sample size. However, during the cleaning of the data, a pattern of missing values was discovered as randomly distributed; it could be due to respondents skipping a question or not being able to provide a response. Moreover, to address this issue and minimize bias in the analysis, it applied a complete-case analysis deletion technique [4]. As a result, the dropout rate was 5.6%, leading to the exclusion of 14 participants. Therefore, the number of questionnaires analyzed was 217, with a response rate of 88.21% out of 246.

In PEFs, characteristics included mostly female nurses (99%, $n = 214$) and the ages were between 30 and 35 years (65%, $n = 141$). Most common was pediatric registered nurses hold a diploma certificate (63%, $n = 137$). Regarding the WEFs 92% ($n = 199$) were nurse specialists or nursing assistants, 63% worked in pediatric intensive care unit (ICU) and pediatric emergency departments (ER) ($n = 136$). For the PedEFs, sixty-one percent ($n = 132$) of participants faced difficulty communicating with the family of a child, while 93% ($n = 202$) did not take recovery time after a child's death and 70% ($n = 151$) married participants with one or more children living at home (64%, $n = 138$) (see Table 1).

To examine the compassion satisfaction and compassion fatigue levels of pediatric registered nurses in Makkah, Saudi Arabia, it was analyzed that descriptive statistics from the data were collected. Table 2 presents the results of the ProQOL scores for each scale (CS and CF) among the pediatric registered nurses. The mean ± SD for CS level was 35.95 ± 9.77, while for BO and STS levels, and it was 21.88 ± 9.64 and 23.52 ± 9.76, respectively. These results indicate that pediatric registered nurses in Makkah have low levels of BO and moderate levels of CS and STS.

As presented in Table 3, the results showed a significant difference in mean CS levels based on age ($p = 0.04$). However, the Tukey HSD post hoc test revealed that there was no significant difference in pairwise comparisons between specific age groups since their corresponding p value was above the threshold of 0.05. The results also indicated that gender was significantly related to mean CS and BO levels ($p = 0.002$), respectively, but not to mean STS level ($p = 0.40$). Also, there were significant mean differences in CS level due to the work in pediatric departments ($p \leq 0.001$), in BO level ($p \leq 0.001$), and in STS level ($p \leq 0.001$); however, the Tukey HSD post hoc test indicates that there was a significant difference between multiple comparisons and department groups since the corresponding p value was significant at the 0.05 level. In PedEFs, there were no significant mean differences in CS level due to recovery time after child death (vacations) ($p = 0.36$), at BO level ($p = 0.49$), and at STS level ($p = 0.17$). According to FEFs, there were no significant mean differences in the CS level as a result of the marital status of participants ($p = 0.27$), at the BO level ($p = 0.23$), and at the STS level ($p = 0.46$).

Table 1: The characteristics of environmental factors of participants in the research study sample ($n = 217$).

Environmental factors		Count	%
Personal-related environmental factors			
Age	23–29 years	57	26
	30–35 years	141	65
	Above 35 years	19	9
Gender	Male	3	1
	Female	214	99
Sleep medications	Yes	29	13
	No	188	87
Level of education	Diploma certificate	137	63
	Bachelor's certificate	80	37
Work-related environmental factors			
Job position	Head nurse or charge nurse	18	8
	Nurse specialist or nursing assistant	199	92
Work pediatric department	Pediatric ICU or ER departments	136	63
	Pediatric outpatient clinics	18	8
	Other pediatric departments	63	29
Pediatric-related environmental factors			
Difficulty communicating with the child family	Yes	132	61
	No	85	39
Recovery time after child death (vacations)	Yes	15	7
	No	202	93
Family-related environmental factors			
Number of children living inside the home	Non	79	36
	One and more	138	64
Marital status	Single	54	25
	Married	151	70
	Widowed	2	1
	Divorced	10	5

Table 2: Scoring results for professional quality of life levels of participants.

ProQOL	M	±SD	Level
CS	35.95	9.77	Moderate[a]
BO	21.88	9.64	Low[b]
STS	23.52	9.76	Moderate[a]

Note. [a]Normal range of moderate level: 23 to 41. [b]Normal range of low level: ≤22.

4. Discussion

The study focused on examining compassion satisfaction, burnout, and secondary traumatic stress among pediatric registered nurses. Results showed that pediatric RNs had moderate levels of CS, low levels of BO, and moderate levels of STS. These findings align with a previous study conducted in Southern California, which also reported moderate levels of BO, STS, and CS among emergency pediatric nurses [6]. This suggests that the experiences of pediatric RNs in various contexts may lead to similar levels of CS, BO, and STS.

Further analysis of the data highlighted the influence of personal-related environmental factors on ProQOL levels. Specifically, significant gender-related differences were observed in CS and BO levels, with female pediatric RNs more likely to experience BO compared to their male counterparts. This finding contradicts a study conducted in Portugal, which concluded that gender did not affect the quality of work life among pediatric nurses [7]. However, it is important to consider that these gender differences may be influenced by other social and cultural factors, which contribute to varied experiences and well-being among pediatric RNs.

The study also shed light on the relationship between sleep medication use and ProQOL levels among pediatric RNs. It was revealed that the use of sleep medication significantly impacted ProQOL in a negative manner. This finding aligns with other studies that have emphasized the detrimental effects of heavy workloads and insufficient sleep on the well-being and perception of workload among pediatric nurses [6–8]. Considering the consistent findings across these studies, it becomes evident that sleep and medication use play crucial roles in the ProQOL of pediatric RNs. Therefore, healthcare organizations should focus on implementing strategies to promote better sleep hygiene and support the overall mental health and job satisfaction of their nursing staff.

In examining the influence of education levels on ProQOL, it was observed that participants holding bachelor's certificates tended to exhibit higher levels of ProQOL. This finding aligns with a study conducted on pediatric nurses, which revealed that those with master's level education had significantly higher scores of compassion fatigue compared to their counterparts at other education levels in pediatric clinics [9]. However, it is important to consider contrasting findings reported in other studies, such as the study

Table 3: Significant mean difference between difference between environmental factors and professional quality of life (ProQOL) level of pediatric registered nurses.

Environmental factors	ProQOL								
	CS		P value	BO		P value	STS		P value
	M	±SD		M	±SD		M	±SD	
Personal-related environmental factors (PEFs)									
Age[a]**									
23–29 years	47.69	11.59	0.04*	51.4	10.1	0.21	50.3	1.33	0.76
30–35 years	50.41	9.23		49.8	9.75		50.0	1.08	
Above 35 years	53.80	9.20		46.8	11.1		48.4	1.12	
Gender[b]									
Male	61.89	3.27	0.01*	41.0	1.85	0.002*	46.7	5.28	0.40
Female	49.83	9.96		50.1	10.01		50.0	10.04	
Sleep medications[b]									
Yes	58.49	9.41	<0.001*	40.8	8.80	<0.001*	41.44	8.82	<0.001*
No	46.67	8.09		53.5	7.98		53.34	8.31	
Level of education[b]									
Diploma certificate	45.92	7.10	<0.001*	53.9	7.22	<0.001*	54.6	7.34	<0.001*
Bachelor's certificate	56.98	10.40		43.2	10.50		41.9	8.81	
Work-related environmental factors (WEFs)									
Job position[b]									
Head nurse or charge nurse	61.0	7.15	<0.001*	38.6	7.13	<0.001*	41.9	7.29	<0.001*
Nurse specialist or nursing assistant	49.0	9.62		51.0	9.59		50.7	9.90	
Work pediatric department[a]									
Pediatric ICU and ER departments	45.1	6.24	<0.001*	54.5	6.77	<0.001*	55.0	7.20	<0.001*
Pediatric outpatient clinic departments	65.2	3.77		34.2	4.09		32.2	2.20	
Other pediatric departments	56.1	10.1		44.5	9.77		44.0	7.09	
Pediatric-related environmental factors (PedEFs)									
Difficulty communicating with child family[b]									
Yes	46.5	7.93	<0.001*	53.4	8.20	<0.001*	53.8	8.39	<0.001*
No	55.3	10.5		44.6	10.2		43.9	9.31	
Recovery time after child death (vacations)[b]									
Yes	45.9	14.7	0.36	55.5	14.9	0.49	57.7	13.2	0.17
No	50.2	9.54		49.5	9.45		49.4	9.51	
Family-related environmental factors (FEFs)									
Number of children living inside home[b]									
Non	47.6	10.4	0.008*	52.0	9.40	0.02*	51.8	10.6	0.03*
One and more	51.3	9.47		48.84	10.1		48.9	9.47	
Marital status[a]									
Single	47.8	11.7	0.27	52.2	10.4	0.23	51.5	11.5	0.46
Married	50.6	9.14		49.2	9.78		49.6	9.41	
Widowed	54.3	8.03		44.5	10.2		48.2	11.0	
Divorced	51.9	12.1		50.0	9.84		46.8	9.82	

Note. [a]F = one a way ANOVA test, [b]t = test. *Significance two-sided ($p < 0.05$). **No significance in Tukey HSD test ($p > 0.05$).

conducted in Portugal that found no significant impact of education level on the quality of work life among pediatric nurses [7]. The variation in results may be attributed to the specific focus of each study, the sample size used, and other contextual factors. Hence, future research endeavors should aim to explore the relationship between education levels and ProQOL in diverse healthcare settings, employing larger sample sizes to enhance the generalizability of the findings.

Regarding age-related differences, the present study did not find significant associations between age and ProQOL levels among pediatric RNs. However, there are discrepancies in the literature regarding the impact of age on ProQOL in this population. For instance, Buckley et al. [3], in a scoping review of existing literature, reported that aged pediatric nurses were affected by burnout levels. The

methodological differences between the two studies may explain the contrasting findings, as the present study used quantitative measures, while Buckley et al. [3] conducted a scoping review.

As a result, pediatric RNs' WEFs have a significant impact on their ProQOL levels. The study found that job positions significantly influenced the ProQOL levels of pediatric RNs, with head nurses and charge nurses being affected at the CS level while nurse specialists and nursing assistants were affected by CF levels. Lopez et al. [6] suggested that pediatric emergency nurses need continued support from those in leadership positions to decrease burnout and secondary traumatic stress while continually supporting compassion satisfaction. Therefore, understanding the challenges associated with different

pediatric job positions is essential in providing appropriate support and resources to address the challenges associated with different pediatric job positions.

While those in pediatric ICU and ER departments had significant levels of CF, which are components of ProQOL. Previous research conducted in Brazil found that neonatal ICU nurses faced higher levels of burnout compared to other ICU departments, indicating the specific challenges faced by pediatric RNs in this setting [9]. In pediatric ER departments, the fast-paced and unpredictable nature of the work may contribute to constant stress and fatigue, leading to emotional exhaustion and detachment.

Communication with a child's family was identified as a significant factor impacting ProQOL levels among pediatric RNs, whereas no significant mean differences were found regarding recovery time after a child's death. This supports previous research conducted by Koyuncu and Arslan [10]; which indicated that communication problems were reported by 24.2% of pediatric nurses. It is essential to recognize the beneficial implications of interactions with child fatalities on the intervention skills of pediatric nurses but also acknowledge the adverse effects during their working hours. These detrimental effects may extend beyond a single shift and influence subsequent shifts, potentially leading to compassion fatigue. Hence, providing sufficient time and support to address and overcome the negative consequences of child mortality is crucial.

The results of this study indicate that there were significant mean differences between family-related environmental factors and ProQOL levels based on the number of children living in the home. Specifically, pediatric RNs who were living with one or more children had higher levels of compassion satisfaction (CS). This finding is supported by a previous study conducted by Lopez et al. [6]; which found that nurses with one child at home had notably higher CS scores compared to those with two children. On the other hand, no significant mean differences were observed in ProQOL levels based on marital status, consistent with the results of a study conducted by Said et al. [7]; which found no significant difference in the quality of life based on marital status.

In conclusion, understanding the various factors that influence the ProQOL of pediatric RNs is crucial in providing appropriate support and resources. Personal-related environmental, work-related environmental, pediatric-related environmental, and family-related environmental factors all play significant roles in pediatric nurses' ProQOL. By recognizing these factors and addressing their impact, healthcare organizations can better support pediatric nurses in maintaining their professional quality of life.

4.1. Limitations of the Work. Web-based questionnaire as a structured self-report, it enabled the examination of a wide range of variables (environmental factors) that may influence these nurses' professional quality of life. In particular, it could make data collection faster and help in reaching a higher response rate. Moreover, the main limitation of using a cross-sectional design in this research study is that it provides only a snapshot of the current situation. Thus, any

inferences about relationships based on the data from this study would be limited, and the results may be equivocal. In addition, the primary limitation of using the control quota sampling technique in this research study would be the potential challenges. Because it is a nonprobability sampling technique, the sample set generated through this technique could introduce bias and lack the generalizability often found in probability-based sampling methods and provide limited information that may not reflect the complexity of the pediatric nurses' environment.

5. Implications for Nursing Management

QWL is considered an essential component of quality of life, and high QWL is associated with high quality of life. To remain competitive, hospitals must provide nurses with tailored support and resources that address the challenges associated with different pediatric positions as well as by adopting policies that address occupational health and safety, such as ergonomic standards, workload management, and stress reduction programs. Hospital policies should emphasize the development of supportive work environments that foster collaboration and respect among nursing staff, pediatric patients, and patients' families. It would be useful for nurse mangers to provide adequate resources that needed to support nurses in their work and improve the health outcomes of the pediatric patients.

6. Conclusion

The pediatric nurses have low levels of burnout and moderate levels of compassion satisfaction and secondary traumatic stress. The gender, sleep medication, level of education, job position, pediatric department, difficulty communication, and number of children were affected on professional quality of life. Otherwise, the age, recovery time, and marital status were not affected by the professional quality of life among pediatric nurses. It recommended further research studies with different research approaches and different low-resource settings such as the remote cities to address the professional quality of life level. The nursing administration in the hospital should provide a healthy environment for pediatric registered nurses, to increase compassion satisfaction levels, keep decreasing burnout level, and manage the secondary traumatic stress level which in turn has a relationship with the professional quality of life level.

Data Availability

The data that support the findings of this study are available from the corresponding author (KB) upon reasonable request.

Ethical Approval

This study was approved by the Institutional Review Boards at King Saud University (KSU-HE-22-781), and from MOH to carry out the study (H-02-K076-0123-873). All ethical standards of the 1964 Declaration of Helsinki and its later amendments ethical standards were adhered to by the researchers.

Consent

The informed consent was sent with a web-based questionnaire through emails to participants.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this article.

Authors' Contributions

KB performed the design of the work, performed the data collection, analyzed and interpreted the study data, and was a major contributor in writing the manuscript. MA revised the study design, drafted and reviewed the work, and gave the final approval of the version to be published. All the authors listed in the study meet the authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors. All the authors read and approved the final manuscript. The authors agree to take responsibility for ensuring that the choice of statistical approach is appropriate and is conducted and interpreted correctly as a condition to submit to the journal.

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Research Article

Sustainable Employability of Emergency Nurses: The Effects of Precarious Work and Mental Toughness on Capabilities and Mental Health

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Studying the sustainable employability of emergency nurses is important, given the precarious environment in which they work. This study used a cross-sectional survey of 204 emergency nursing professionals to investigate their sustainable employability in a South African context from the perspectives of precarious work, mental toughness, capabilities, and mental health. The Precarity Position Profile, Mental Toughness Questionnaire-Short Form, Capability Set for Work Questionnaire, and Flourishing-at-Work Scale-Short Form were administered. Three precarious work dimensions negatively predicted emergency nurses' capabilities. Significantly, precarious work conditions and professional development were associated with most work capabilities. Emergency nurses' capability set positively affected their mental health, with mental toughness moderating the effect of poor salary (a component of precarious work) on capabilities. Precariousness regarding salary, work conditions, and professional development affected emergency nurses' mental health indirectly and negatively through a poor capability set, while mental toughness indirectly and positively affected their mental health through a strong capability set.

1. Introduction

Precarious work is a global concern [1]. It is rising, resulting in adverse effects for the individual, workplace, and community [2, 3]. Pervasive uncertainty, characterised by dependence on others and vulnerability to others, is the core of precarity [4]. Therefore, work that exposes individuals to social and economic risk due to poor remuneration, job insecurity, and a lack of workplace protection can be considered precarious [5]. The work of emergency nurses ("emergency nurse" refers to any nurse (professional or lower categories) working in the emergency department of a hospital providing Level 1 or Level 2 trauma care) is precarious, with potential adverse mental health outcomes [6, 7]. Significantly, precariousness extends beyond poverty, unemployment, and poor employment conditions. Some of the demands contributing to the precariousness of emergency nurses include violent and abusive patients and families, treatment uncertainty [8], unfavourable management styles, a lack of appropriate support systems [9], and changes in the work environment, such as the implementation of complex information technology systems [10]. In addition, the SARS-CoV-2 outbreak, resulting in a global pandemic (COVID-19), placed a burden on emergency nurses due to the influx of patients and the rapid and continual changes in processes, reduced contact with patients, families, and colleagues, visitor and caretaker restrictions, lockdowns, and distancing requirements [11]. Furthermore, poor salaries and working conditions and increased job insecurity result in a precarious workplace that

puts the sustainable employability of emergency nurses at risk [9, 11].

The quality of emergency nurses' working life is vital for sustainable development. The United Nations (UN) and International Labour Organisation [12] have argued its importance in the UN's Sustainable Development Goal 8 (SDG 8: Promote sustained, inclusive, and sustainable economic growth, full and productive employment, and decent work for all). Present-day workers regard the value of work as a significant aspect of the quality of their working life and sustainable employability [13, 14]. A key aspect of sustainable employability (SE) is that emergency nurses can achieve tangible opportunities through their capabilities during their working lives [13]. Consequently, their health and well-being are safeguarded, and they can contribute to society now and in the future. To exploit these opportunities, emergency nurses must have an enabling work environment and the attitude and motivation to take advantage of opportunities.

The quality of work continues to be transformed by forces such as globalisation, income inequality, organisational restructuring, eroding social safety nets, and digitalisation [1, 15]. Pfeffer [16] suggests that work environments adversely affect individual well-being and organisational performance, which may worsen because work is becoming increasingly precarious. Precarious work involves uncertainty regarding the work itself and how to cope with unexpected consequences due to a lack of social power and resources. Specifically, precarious work puts individuals' SE at risk because it affects their security [17], psychological safety [18], and mattering [19], which results in poor mental health outcomes. Therefore, it is critical to study how the quality of individuals' work relates to their mental health [6].

Emergency nurses' sustainable employability holds implications for them personally, the hospital or institution where they are employed, and eventually society at large [15]. Precariousness among emergency nurses can result in poor mental health, which, in turn, can lead to them resorting to unfavourable behaviours (such as disengagement or withdrawal) to protect themselves [15]. Significantly, precarious work can have an impact on emergency nurses' work capabilities [20], affecting their mental health. For institutions to provide proper emergency care, they need capable nurses to uphold quality patient care while ensuring sustainable employability.

From a social justice perspective, emergency nurses need the freedom to choose from many opportunities to engage in work activities they consider meaningful. This perspective implies that well-being is unattainable without fairness [19]. The capability approach (CA) uses social justice as a framework for studying employees' well-being, suggesting that people need to have the freedom to choose a life they have reason to value [21, 22]. Although the effects of inner resources and external barriers (and their interaction) on individual behaviours are continuously debated, Sen [23] maintains that people need to feel secure and free to develop their capacities and take effective action [24]. The core elements of the CA [23, 25] are capabilities, which refer to what people can do and be, and functionings, which are the corresponding accomplishments.

Within the SE framework, personal resources such as mental toughness influence emergency nurses' ability to convert available resources into tangible opportunities. Emergency nurses' level of mental toughness can mitigate the effects of precarious work on their capability set and their ability to realise valued work outcomes [13]. Therefore, mental toughness is a psychological resource that emergency nurses can utilise to pursue valued goals when navigating challenges and stressful situations [26].

Precarious work (as an external constraint) and mental toughness (as a personal resource) can affect emergency nurses' work capabilities and mental health (as a functioning) [13]. Emergency nurses with precarious jobs and low mental toughness, who lack work capabilities, are expected to have suboptimal mental health. Furthermore, the effects of precarious work and mental toughness on emergency nurses are largely unexplored in the South African context. Thus, the present study aimed to investigate the sustainable employability of emergency nurses from the perspectives of precarious work, mental toughness, capabilities, and mental health at work.

2. Sustainable Employability

Emergency nurses require relevant work capabilities to function well in their unique work environment. In this regard, Van der Klink [27] points out that the conceptualisation of work, health, and employability lacks a focus on work values. The sustainable employability model [13] aims to address this shortcoming by building on the CA [21] and, subsequently, emphasising work values. Therefore, the sustainable employability model offers a framework for investigating emergency nurses' capabilities and functionings. Within this framework, it is essential to investigate what work outcomes emergency nurses consider necessary, whether the work context enables them to achieve these outcomes, and whether they are achieving them. Accordingly, the CA focuses on people's capabilities, that is, what they can ultimately do (activities) and be (states), and whether they present with the capabilities to engage in valued functionings [28].

2.1. Capabilities. The capability approach (CA; [21]) conceptualises well-being as an ability to achieve valuable states (through capabilities) rather than economic utilities. In this sense, for people to have a flourishing life, they require resources and freedoms to create equal opportunities [29]. The CA acknowledges and is sensitive to human diversity and socio-cultural contexts [28], emphasising capabilities and not merely resources and functionings [21, 23, 25]. Capabilities are the true freedoms people have in being who they want to be (beings or states) and doing what they consider valuable (doings or activities) [30]. A person's capabilities originate from the freedoms produced by institutions, companies, and social relations in converting available resources into tangible opportunities (known as

a capability set) that can be used to realise valued achievements (i.e., functionings).

Conversion factors are critical elements within the CA framework, as people potentially differ in their ability to convert available resources into capabilities. Consequently, conversion factors have an impact on whether individuals can convert resources at their disposal into realised functionings. Conversion factors are classified into three categories: (a) personal conversion factors that are internal to the person (such as age, gender, and education); (b) social conversion factors that are social norms and cultures, ethnic profiles, gender roles, and power relations; and (c) environmental conversation factors that include climate and transportation [28].

Van der Klink et al. [13] argue that increasing workers' capabilities (i.e., their freedom to achieve work values) will improve their sustainable employability, resulting in increased resilience and well-being. Abma et al. [31] identify seven work capabilities: (a) using knowledge and skills; (b) developing knowledge and skills; (c) involvement in important decisions; (d) building and maintaining meaningful contacts at work; (e) setting own goals; (f) earning a good income; and (g) contributing to something valuable. The sustainable employability framework argues that a capability set includes individuals' abilities and opportunities to achieve work goals they have reason to value. Capabilities form part of emergency nurses' capability sets, depending on whether individuals perceive them as important, are enabled to use them, and achieve them. Conversion factors important among workers include: (a) organisational conversion factors, i.e., cultural aspects, power relations, shortage of personnel, and policies for self-management; (b) work conversion factors, i.e., social contacts, communication, workload, tasks, and schedules; and (c) personal conversion factors, i.e., experienced work stress, motivation, and the ability to achieve values informally within the company [32].

2.2. Precarious Work.

Precarious work, low earnings, and insufficient employee representation are rising [3], which has an impact on employees' physical and mental health [33–35]. Precarious work shares some of its characteristics with other models of poor work such as underemployment [36] and the inverse of decent work [37]. However, such work differs from these models because of the focus on uncertainty, insecurity, and instability [6]. The ILO's decent work agenda emphasises the importance of productive and sustainable work, enhancing social protections for workers, building social dialogue among stakeholders, and protecting worker rights [12]. Accordingly, decent work includes safe working conditions, fair pay, and access to healthcare [37]. Precarious work, in contrast, exposes workers to poor working conditions, poor salaries, restrictions on advocating workplace benefits [6], insecurity [38], and low control over working conditions [39]. Precarious work refers to any form of waged work identified with several precariousness dimensions [38, 40] and is, therefore, not restricted to nonstandard employment (such as temporary or contract work) or a specific employment type [41].

Precarious work has been defined as a construct comprising objective work characteristics, such as short-term contracts or low wages [6]. However, it has also been conceptualised as subjective experiences of work precarity (or perceived job precariousness) and refers to individual experiences of job insecurity, instability, and powerlessness related to one's work [42]. Separating objective and subjective work precariousness can be beneficial, as emergency nurses' subjective experiences of external conditions are potentially a better predictor of outcomes (such as capabilities or mental health) than objective ones [6].

Precarious work is essentially composed of the following work components: (a) nonstandard, atypical, alternative, nonregular, or contingent work; (b) low economic security due to insufficient remuneration; (c) limited power and control to workers; (d) poor workplace protection and rights; and (e) exposure to unsafe working conditions [6]. Consequently, individuals who experience precarious work are losing their jobs, fear losing their jobs, or lack alternative employment opportunities [5, 43]. Koranyi et al. [40] point out that precarious work entails accumulating unfavourable job quality dimensions. Therefore, precarious work is not necessarily the result of a single dimension; it is a multidimensional construct of employment insecurity, income inadequacy, and a lack of rights and protection [44]. Moreover, it extends beyond the confines of uncertainty about the continuity of one's work to the uncertainty of one's ability to cope with unexpected situations due to insufficient social power and resources [45].

Individuals evaluate their job quality according to their expectations and experiences, the standards of the community, and what they see from others' experiences [46]. Therefore, precarious work is characterised by a compilation of poor job quality dimensions such as temporary work, job insecurity, vulnerability, poor work control and employee rights, poor work scheduling, limited development opportunities, and a poor salary [34]. Moreover, precarious work is considered as nonstandard working arrangements that put workers and their families at risk, producing adverse health outcomes [47].

Creed et al. [42] argue that job precariousness consists of four factors: (a) perceived job conditions; (b) remuneration; (c) security; and (d) flexibility. A systematic review revealed that precariousness comprised poor salaries, poor working conditions, and job insecurity [44]. However, as precarious work is primarily the accumulation of poor job quality dimensions, emergency nurses' precarious work could focus on their experiences of job quality [41]. A high-quality job has a sufficient salary, benefits, good working conditions, and professional development opportunities [46]. Therefore, in this study, precarious work comprises four primary dimensions: (a) poor salary; (b) poor working conditions; (c) job insecurity; and (d) poor professional development.

Emergency nurses' sustainable employability depends on the opportunities available to them to pursue meaningful work while fostering good health and well-being [31] and having the freedom to choose a life they have reason to value

[13]. Precarious work may have an impact on emergency nurses' capabilities and capability sets because it affects the enablement and achievement of valued aspects of their jobs [31]. Within the SE framework, constraints such as precarious work have the potential to have a negative impact on emergency nurses' capabilities [13]. Murangi et al. [20] found that precarious work negatively affected special school educators' capabilities, such as using and developing knowledge and skills, involvement in important decisions, building and maintaining meaningful relationships at work, setting their own goals, earning a good income, and contributing to something valuable.

2.3. Personal Resources: The Role of Mental Toughness.

Mental toughness is a positive psychological resource that individuals apply to navigate several challenging and stressful situations. Mental toughness has been conceptualised as "a state-like psychological resource that is purposeful, flexible, and efficient in nature for the enactment and maintenance of goal-directed pursuits" ([26], p. 18.). It affects an individual's stress tolerance and ability to consistently perform at optimal capacity, regardless of the circumstances [48]. Therefore, it is a personal variable separate from process, outcome, task, relationship, or culture. As mental toughness is conceptualised as a resource, it forms part of a larger group of concepts. These concepts can either be centrally valued by the person (such as self-esteem or health) or represent a means to obtain valued ends (such as money or social support) [26].

Mental toughness draws from the three components of hardiness [49]: (a) challenge (the acceptance of stress and adversity as a part of life and a requirement for growth and development); (b) commitment (remaining in stressful situations that produce meaning); and (c) control (the capacity to remain true to influence outcomes). A meta-analysis on hardiness confirmed its ability to protect individuals from the adverse outcomes of stress regarding their performance and health [50]. Apart from the three concepts derived from hardiness, confidence is added to form mental toughness, distinguishing it from hardiness (see [26]). Mental toughness has been operationalised as a four-factor construct; however, it has also been found to be unidimensional [51].

A systematic review showed that mental toughness is associated with numerous positive psychological traits, improved coping mechanisms, and better mental health. Furthermore, it showed that mental toughness could be advantageous in various contexts (e.g., education, workplace, and military). Persons with high mental toughness are able to display confidence when faced with demanding situations, which contributes to psychological well-being. They are also more inclined to portray higher inhibitions to commit to their tasks and adopt problem-focused coping strategies for managing stress, such as motivational imagery and self-enhancing humour [52].

Emergency nurses work in a demanding environment where they are required to commit to tasks and be able to react to unique situations instantaneously. Therefore, their level of mental toughness can potentially serve as a personal resource, reducing the negative impact of precarious work on their capabilities and contributing to their mental health. Precarious work negatively affects the accumulation of work capabilities, which, in turn, influences mental health [20]. Mental toughness, as a resource, assists people in achieving goals, while navigating challenging and stressful situations. Therefore, within the sustainable employability framework, it serves as a personal resource, enabling emergency nurses to achieve valued work outcomes (i.e., work capabilities), despite precarious work [13]. For instance, precariousness regarding work context is expected to reduce the enablement and achievement of emergency nurses. Mental toughness can assist emergency nurses to persevere in achieving valued work outcomes when faced with adverse working conditions.

2.4. Mental Health as a Functioning.

Within the sustainable employability framework, the capability set of emergency nurses affects their functionings such as mental health at work [13, 21]. Mental health has been conceptualised by Keyes [53] as a syndrome of symptoms comprising positive feelings and functionings in life. The mental health continuum [54, 55] suggests that although mental health and mental illness are related, they are distinct in that a lack of psychopathology does not solely produce positive mental health. A person presenting with positive mental health is described as flourishing, whereas a lack of mental health is viewed as languishing. Thus, mental health is expressed through a continuum between languishing and flourishing. Accordingly, poor mental health does not indicate the presence of mental ill-health (e.g., depression, posttraumatic stress disorder), although an extended state of languishing could potentially produce mental ill-health [56]. Also, flourishing (compared to languishing) individuals are more likely to recover from a mental illness [57]. Consequently, in this study, mental health is viewed as a continuum of positive mental health, varying from flourishing (i.e., a combination of feeling good about and functioning well in life) to languishing (i.e., not feeling good about and not functioning well in life) [58]. Negative affect, which indicates low mental health, is used as an additional indicator of (poor) mental health. Anger, sadness, anxiety, boredom, frustration, and guilt are common unpleasant emotions associated with adverse events and a lack of need for gratification [59].

Based on the conceptualisation of Keyes [53, 54, 58], Rautenbach and Rothmann [60] define mental health (varying from flourishing to languishing) at work as consisting of three dimensions: emotional, psychological, and social well-being. Emotional well-being refers to experiencing positive affect and job satisfaction. Emergency nurses with high emotional well-being generally exhibit positive emotions and are satisfied with their jobs. Psychological well-being entails autonomy, competence, relatedness, engagement, meaningful work (finding meaning in one's work), and learning. Finally, social well-being includes social acceptance, social actualisation, social coherence, social contribution, and social integration. Subsequently,
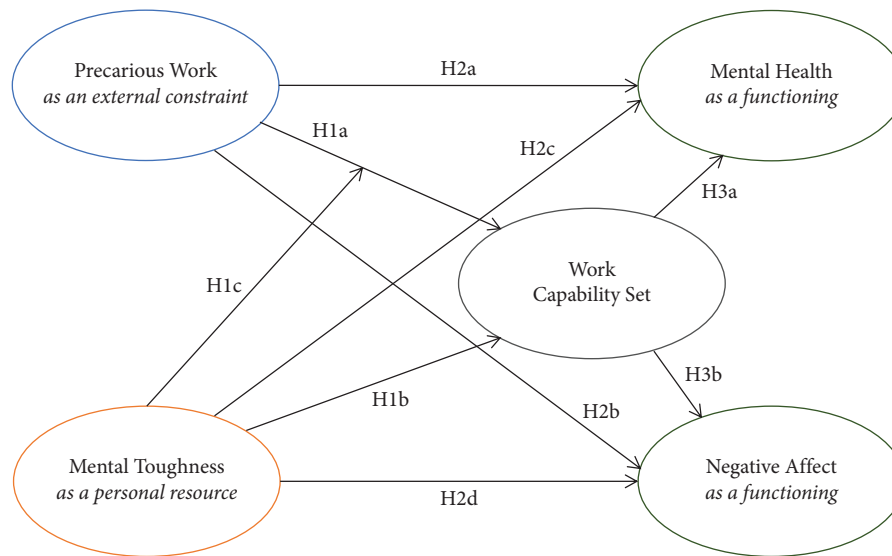
FIGURE 1: The effect of precarious work and mental toughness on capabilities, mental health, and negative affect. Note: H4 (not included in Figure 1) concerns the indirect effects of precarious work on mental health and negative affect via the work capability set.

emergency nurses with a high level of social well-being present with a high sense of being part of the hospital and contributing to its development and functioning, believing they are contributing towards something meaningful. Also, emergency nurses with a high sense of mental health at work will typically be able to positively assess their work and perform effectively with high productivity levels.

For emergency nurses to be sustainably employable, they need the freedoms and opportunities to enjoy personal, social, and environmental conditions, allowing them to make meaningful contributions to the world without putting their health and well-being at risk [31]. Therefore, they need to identify what they value and what matters at work to ultimately pursue a working life they have reason to value [13]. The first empirical study on work capabilities investigated three functionings of Dutch workers: (a) work-role functioning; (b) workability; and (c) work performance [31]. A study in Namibia showed that seven work capabilities had a positive impact on educators' emotional, psychological, and social well-being [20]. Similar results were found among South African secondary school teachers [61]. Thus, capabilities are vital in promoting mental health at work [20, 61]. Furthermore, within the sustainable employability framework, precarious work can negatively affect emergency nurses' mental health [35, 62]. Precariousness regarding work conditions and job insecurity were found to negatively influence emotional, psychological, and social well-being, while precarious professional development affected psychological and social well-being [20].

3. Current Study

Emergency nurses require capabilities to achieve valued work outcomes, affecting their mental health. However, external conditions such as precariousness can have an impact on these nurses' ability to realise capabilities (enablement and achievement of valued work aspects).

The extent to which emergency nurses perceive their work as precarious (poor salary, poor working conditions, job insecurity, and poor professional development) can shape their capability set (accumulation of realised capabilities), affecting their mental health. Based on the sustainable employability model, personal factors can determine the conversion of available resources into capabilities. Consequently, emergency nurses' willingness and motivation to capitalise on their surroundings will have an impact on their capabilities. Therefore, the effects of precarious work on emergency nurses' capabilities will be lower for those with high (versus low) mental toughness levels.

Precarious work and mental toughness will affect emergency nurses' work capability set, influencing their mental health and, ultimately, contributing to the sustainability of their employment as emergency nurses. Therefore, the study aimed to investigate emergency nurses' precarious work and mental toughness within the South African context and the effect of these on their work capabilities and mental health at work.

The following hypotheses were set (see Figure 1):

Hypothesis 1: Precarious work negatively affects emergency nurses' capability set (hypothesis 1a), while their mental toughness positively affects their capability set (hypothesis 1b). Also, emergency nurses' mental toughness interacts with their experiences of precarious work to affect their capabilities (hypothesis 1c).

Hypothesis 2: Precarious work negatively affects emergency nurses' mental health at work (hypothesis 2a) and is associated with their negative affect (hypothesis 2b). Mental toughness is positively associated with mental health (hypothesis 2c) and negatively associated with negative affect (hypothesis 2d).

Hypothesis 3: Emergency nurses' capability set is positively associated with their mental health

(hypothesis 3a) and negatively associated with negative affect (hypothesis 3b).

Hypothesis 4: Precarious work indirectly affects mental health (hypothesis 4a) and negative affect (hypothesis 4b) via the capability set of emergency nurses.

4. Methods

4.1. Participants. South Africa's healthcare system consists of public and private sectors that run parallel to each other. The government funds the public healthcare system, which serves close to 71% of the South African population. In comparison, the revenue of the private healthcare system is mostly from medical aid schemes and health insurance paid for by the individual [63]. The study surveyed persons working as nurses in the emergency department of hospitals providing Level 1 or 2 trauma care. A Level 1 trauma care hospital can provide leadership and total care for every aspect of injury (from prevention to rehabilitation) while providing 24-hour availability of all primary specialities and a trauma surgeon as director. A Level 2 trauma care hospital can provide 24-hour medical cover for initial definitive trauma care, regardless of injury severity (including the typical specialities) [64]. Permission was obtained from 13 private hospitals and one public hospital in the Gauteng province. The final sample consisted of 204 emergency nurses.

Table 1 shows that more females (71.57%) than males (26.47%) participated in the study. Most participants were aged between 30 and 39 years (28.43%), with a higher certificate (25.98%), a three-year diploma (24.02%), and a bachelor's degree (20.59%). Most nurses had between one and five years of emergency nursing experience (25.49%), followed by those in the category of six to 10 years (24.02%). A total of 75% of the participants were in permanent positions.

4.2. Measuring Instruments. Emergency nurses' perceptions of precariousness in their job were assessed using the *Precarity Position Profile* (PPP; [20]) questionnaire. The PPP consists of 16 items measuring four components: (a) salary (two items, e.g., "My current salary allows me to cover my basic needs."); (b) work conditions (five items, e.g., "At work, I am treated in an unjust manner."); (c) job insecurity (six items, e.g., "I feel insecure about the future of my job."); and (d) professional development (three items, e.g., "I am able to advance my knowledge and skills at work."). The items were rated on a Likert-type scale, ranging from 1 (*never*) to 5 (*always*). In a study among Namibian special education teachers, Murangi et al. [20] found the PPP to be reliable ($\omega = 0.61$ to 0.79) and valid.

Emergency nurses' mental toughness was investigated via the *Mental Toughness Questionnaire-Short Form* (MTQ-10; [65]. The MTQ-10 consists of 10 items rated on a five-point Likert-type scale (1 = *strongly disagree* to 5 = *strongly agree*). An example of an item is "Even when under considerable pressure, I usually remain calm." Papageorgiou et al. [65] reported test-retest reliability ($\alpha = 0.74$ and $\alpha = 0.75$), and Dagnall et al. [51] also reported satisfactory reliability in their study ($\alpha = 0.77$).

The *Capability Set for Work Questionnaire* (CSWQ; [31] was used to measure emergency nurses' work capabilities. The CSWQ measures seven predetermined work values: (a) using knowledge and skills; (b) developing knowledge and skills; (c) involvement in important decisions; (d) building and maintaining meaningful relationships at work; (e) setting own goals; (f) earning a good income; and (g) contributing to something valuable. For each of these seven values, the emergency nurses were requested to indicate whether (a) they considered the work value important (importance: e.g., "How important is it to you to be able to use your knowledge and skills at work?"), (b) their work was offering them sufficient opportunities to achieve it (enablement: e.g., "Does your current work offer you enough opportunities to do that?"), and (c) they succeeded in achieving it (achievement: e.g., "To what extent do you succeed in doing so?"). The items were rated on a Likert scale, ranging from 1 (*totally not*) to 5 (*to a very great extent*). The CSWQ has convergent, predictive, and incremental validity [66] and is reliable ($\omega = 0.77$) [20, 67].

The *Flourishing-at-Work Scale-Short Form* (FAWS-SF; [60] was administered to measure emergency nurses' workplace mental health. The FAWS-SF consists of 17 items that measure an employee's well-being on a continuum that ranges from languishing to flourishing. The scale items are scored on a six-point Likert-type scale, ranging from 1 (*never*) to 6 (*every day*), indicating the frequency with which respondents experience each identified symptom of well-being. The FAWS-SF consists of three scales, namely, (a) emotional well-being (three items, e.g., "During the past month at work, how often did you experience satisfaction with your work?"), (b) psychological well-being (nine items, e.g., "During the past month at work, how often did you feel that the work you do serves a greater purpose?), and (c) social well-being (five items, e.g., "During the past month at work, how often did you feel this organisation is becoming a better place for people like you?"). In a study by Rautenbach and Rothmann [60]; the reliability coefficients of all the scales were acceptable ($\rho \geq 0.70$). Scale reliabilities ranged between 0.75 and 0.95, indicating acceptable internal consistency [68]. The findings of their validation study support the construct validity and internal consistency of the FAWS-SF. Murangi et al. [20] found acceptable McDonald's omega coefficients for the three dimensions among Namibian special education teachers ($\omega = 0.80$ to 0.88).

4.3. Research Procedure. The North-West University Health Research Ethics Committee (NWU-HREC) provided ethics clearance for the study (NWU-00273-21-A1). Following the granting of ethics clearance for the study, the researcher obtained permission from four private hospital groups, the corresponding hospitals, and emergency department management. Additionally, the Provincial Department of Health and the participating public hospital gave permission for the study. Data was collected via an online platform (i.e., QuestionPro) and hard-copy booklets. The researcher explained the research purpose, that participation in the study was voluntary, and that all information and responses

TABLE 1: Characteristics of participants ($N = 204$).

Demographic variable	Grouping	n	%
Gender	Male	54	26.47
	Female	146	71.57
	Missing values	4	1.96
Age	18–29 years of age	27	13.24
	30–39 years of age	58	28.43
	40–49 years of age	30	14.71
	50–59 years of age	18	8.82
	60+ years of age	2	0.98
	Missing values	69	33.82
Highest qualification	Grade 12 (NQF 4)	19	9.31
	Higher certificate (NQF 5)	53	25.98
	Three-year diploma (NQF 6)	49	24.02
	Bachelor's degree (NQF 7)	42	20.59
	Honours degree (NQF 8)	28	13.73
	Master's degree (NQF 9)	1	0.49
	Other	5	2.45
	Missing values	7	3.43
Emergency nursing experience	Less than 1 year	8	3.92
	1–5 years	52	25.49
	6–10 years	49	24.02
	11–20 years	24	11.76
	21–30 years	8	3.92
	31+ years	1	0.49
	Missing values	62	30.39
Contract type	Permanent contract	153	75.00
	Fixed-term contract	17	8.33
	Agency placement	30	14.71
	Missing values	4	1.96

would be kept confidential and anonymous. Participation was predominately through hard-copy booklets (91.18%).

4.4. Data Analysis. Data analyses were performed using SPSS Version 27 [69] and Mplus Version 8.8 [70]. Structural equation modelling (SEM) was performed to test measurement and structural models. The robust weighted least squares (WLSMV) estimator was used to perform confirmatory factor analysis (CFA). Model fit was assessed through multiple goodness-of-fit indices and information criteria to select the best model fit for the data [71]: the chi-square statistic (the test of absolute fit of the model), standardised root mean residual (SRMR), root mean square error of approximation (RMSEA), Tucker–Lewis index (TLI), and comparative fit index (CFI). A TLI and CFI score higher than 0.90 indicates an acceptable value, with a score higher than 0.95 indicating an excellent fit. For SRMR and RMSEA values to be acceptable, a score below 0.08 is required with a 90% confidence interval, not including zero [72]. Scale reliability was investigated using the McDonald's omega coefficient (ω).

Pearson correlations were used to investigate the relationships between precarious work, mental toughness, and mental health [73]. Point biserial correlations were used in determining the associations of work capabilities with precarious work, mental toughness, and mental health at work. An analysis of the effect of work precariousness on the capabilities of emergency nurses moderated by mental toughness was conducted using PROCESS Version 4.0 (model number 1) [74]

in SPSS Version 27 [69]. The focal predictor's conditional effect at the moderator's values was investigated using the Johnson-Neyman (JN; [75]) technique. When a moderator (i.e., mental toughness) has a significant effect on a dependent variable (the capability set), the JN method is used to determine the values for which the moderator is significant [76].

Multivariate analysis of variance (MANOVA) was used to investigate the difference in precarious work among emergency nurses based on biographical information. Jamovi Version 2.3 [77] was used to conduct the analysis.

5. Results

5.1. Testing the Measurement Model. Confirmatory factor analysis (CFA) was used to test one- and four-factor measurement models of precarious work and one-, two-, and three-factor measurement models of mental health (i.e., flourishing at work). The respective survey items were the latent variable indicators of the model, which were as follows: (a) precarious work: salary (two items), work conditions (five items), job insecurity (six items), and professional development (three items); (b) mental toughness (six items); (c) the work capability set consisting of using knowledge and skills, developing knowledge and skills, involvement in important decisions, meaningful relationships at work, earning a good income, setting own goals, and contributing to something valuable (three items each); (d) mental health, consisting of emotional well-being (four items),

TABLE 2: Measurement models of precarious work, mental toughness, capabilities, mental health, and negative affect.

Model	χ^2	df	CFI	TLI	RMSEA	95% CI	SRMR
One-factor	3777.26**	1175	0.74	0.73	0.10	[0.10, 0.11]	0.125
Precarious work: 1-Factor	2226.25**	1162	0.90	0.89	0.07	[0.06, 0.07]	0.09
Precarious work: 4-Factor (a)	**1697.53****	**1144**	**0.95**	**0.94**	**0.05**	**[0.04, 0.05]**	**0.07**
Precarious work: 4-Factor (b)	1769.32**	1158	0.94	0.94	0.05	[0.05, 0.06]	0.08
Mental health: 1-Factor	1824.48**	1147	0.93	0.93	0.05	[0.05, 0.06]	0.08
Mental health: 2-Factor	1770.20**	1139	0.94	0.93	0.05	[0.05, 0.06]	0.07
Mental health: 3-Factor (a)	1645.16**	1130	0.95	0.94	0.05	[0.04, 0.05]	0.07
Mental health: 3-Factor (b)	**1697.53****	**1144**	**0.95**	**0.94**	**0.05**	**[0.04, 0.05]**	**0.07**

Notes. χ^2 = chi-square; df = degrees of freedom; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square error of approximation; CI = confidence interval; SRMR = standardised root mean square residual; **$p < 0.01$; precarious work: 4-factor (a) = four first-order factors, (b) = four second-order factors; mental health: 3-factor (a) = three first-order factors, (b) = three second-order factors. The bold values highlight the precarious work and mental health measurement models that were selected for the purposes of the study (i.e., precarious work = four first-order factor structure and mental health = three second-order factor structure).

psychological well-being (nine items), and social well-being (five items); and (e) negative affect (three items). The fit statistics of the measurement models are reported in Table 2.

Three precarious work measurement models were tested, namely; (a) a four-factor model; (b) a one-factor model; and (c) a four-factor model with work precariousness as a second-order factor. From Table 2, it is evident that a model consisting of four correlated factors fitted the data best. Allowing for a second-order factor (work precariousness) did not significantly improve the model.

The tests of the competing measurement models were performed based on precarious work (four first-order factors: salary, work conditions, job insecurity, and professional development), mental toughness (one first-order factor), capability set (one first-order factor), and mental health (three second-order factors: emotional well-being, psychological well-being, and social well-being). Confirmatory factor analysis showed that the four negatively phrased mental toughness items did not load sufficiently on mental toughness. Consequently, it was decided to remove the following four negatively phrased items from the model: item 2 ("I tend to worry about things well before they actually happen."), item 3 ("I usually find it hard to summon enthusiasm for the tasks I have to do."), item 6 ("I just don't know where to begin is a feeling I usually have when presented with several things to do at once."), and item 7 ("When I make mistakes, I usually let it worry me for days after."). The fit statistics of the measurement model that fitted the data best were as follows: $\chi^2 = 1697.53$ (d$f = 1144$, $p < 0.001$); RMSEA = 0.05 [0.04, 0.05], $p = 0.666$; CFI = 0.95; TLI = 0.94; SRMR = 0.07. All the fit indices showed acceptable fit compared to the cut-off values. The sizes of the factor loadings of the items on their target factors were acceptable: salary: $\lambda = 0.78$ to 0.97 (mean = 0.88); work conditions: $\lambda = 0.60$ to 0.86 (mean = 0.79); job insecurity: $\lambda = 0.66$ to 0.84 (mean = 0.74); professional development: $\lambda = 0.70$ to 0.95 (mean = 0.81); capability set: $\lambda = 0.67$ to 0.87 (mean = 0.79); mental toughness: $\lambda = 0.56$ to 0.83 (mean = 0.68); emotional well-being: $\lambda = 0.75$ to 0.83 (mean = 0.78); psychological well-being: $\lambda = 0.69$ to 0.86 (mean = 0.76); social well-being: $\lambda = 0.81$ to 0.92 (mean = 0.86); and negative affect: $\lambda = 0.75$ to 0.98 (mean = 0.83). Therefore, the factors were well-defined and aligned with theoretical expectations.

5.2. Construct Validity of the Precarity Position Profile.
The construct validity of the Precarity Position Profile (PPP) instrument was investigated using confirmatory factor analysis. The result of the analysis is reported in Table 3.

As shown in Table 3, all factor loadings were significant ($p < 0.001$ for all items). The standardised factor loadings for all the items were above the suggested value of 0.50 [80], with most above 0.70. The omega reliability of the four factors of precarious work were as follows: 0.81 (salary), 0.86 (work conditions), 0.81 (job insecurity), and 0.81 (poor professional development).

5.3. Descriptive Statistics, Reliabilities, and Correlations.
The McDonald's omega reliabilities, means, standard deviations, and Pearson correlations of the variables used in the study are reported in Table 4. McDonald's omega coefficients above 0.70 were obtained for all the scales, indicating acceptable reliability [68].

Table 4 shows that all four precarious work components had a significant ($p < 0.01$) association with emergency nurses' capability set (medium effects), of which professional development was the strongest ($r = -0.49$). Emergency nurses' mental toughness and capabilities were significant and positively related (medium effect). Regarding their functioning, emergency nurses' capability set had a significant relationship with their mental health constituents. Capabilities were positively associated with emotional, psychological, and social well-being (large effects) and negatively with negative affect (medium effect).

Not shown in Table 4 are the associations between precarious work and capabilities. Except for precariousness about salary with using and developing knowledge and setting own goals and precariousness about work conditions with using knowledge and skills and setting own goals, all the correlations were statistically significant ($p < 0.01$).

The difference in emergency nurses' precarious work based on their gender and level of education was investigated through a multivariate analysis of variance (MANOVA). No statistically significant differences were found between precarious work experiences (i.e., salary, work conditions, job insecurity, and professional development) of different genders and education groups.

TABLE 3: Precarity position profile factor loadings.

Factor	Item text	λ	SE
Salary	My current salary allows me to cover my basic needs	0.97	0.10
	My current salary allows me to cover unexpected expenses	0.78	0.09
Work conditions	At work, I feel afraid to demand better working conditions	0.60	0.06
	I feel defenceless towards unfair treatment by my superiors at work	0.84	0.04
	At work, I am treated in an unjust manner	0.79	0.05
	At work, my superior makes me feel that I can be easily replaced	0.85	0.03
	I cannot freely express my views at work	0.86	0.03
Job insecurity	Chances are, I will soon lose my job	0.84	0.04
	I am sure I can keep my job	0.75	0.05
	I feel insecure about the future of my job	0.69	0.05
	I think I might lose my job in the near future	0.78	0.04
	I think I will not be relevant to my work in the near future	0.72	0.05
	I think I will not be able to find another job in the near future	0.66	0.07
Professional development	I am able to advance my knowledge and skills at work	0.70	0.06
	I am afforded the time and resources to further my knowledge and skills at work	0.78	0.05
	The job gives me a chance to use my personal initiative or judgement in engaging in developmental activities of my choice	0.95	0.05

Notes. λ = standardised factor loadings; SE = standard error; all $p < 0.001$.

TABLE 4: Descriptive statistics, reliabilities, and correlations of the scales.

Variable	ω	Mean	SD	1	2	3	4	5	6	7	8	9
(1) Salary	0.81	3.79	1.04	—	—	—	—	—	—	—	—	—
(2) Work conditions	0.86	2.65	1.04	0.31**	—	—	—	—	—	—	—	—
(3) Job insecurity	0.81	2.11	0.86	0.23**	0.68**	—	—	—	—	—	—	—
(4) Professional development	0.81	2.65	1.02	0.22**	0.37**	0.52**	—	—	—	—	—	—
(5) Capability set	0.82	0.50	0.33	−0.44**	−0.41**	−0.41**	−0.49**	—	—	—	—	—
(6) Mental toughness	0.79	4.00	0.64	−0.02	−0.12	−0.43**	−0.32**	0.39**	—	—	—	—
(7) Emotional well-being	0.83	4.23	1.14	−0.30**	−0.48**	−0.45**	−0.54**	0.61**	0.48**	—	—	—
(8) Psychological well-being	0.89	4.66	0.93	−0.21**	−0.46**	−0.44**	−0.52**	0.59**	0.55**	0.92**	—	—
(9) Social well-being	0.92	3.91	1.40	−0.26**	−0.52**	−0.42**	−0.56**	0.60**	0.44**	0.87**	0.84**	—
(10) Negative affect	0.84	2.82	1.38	0.26**	0.48**	0.38**	0.34**	−0.33**	−0.18**	−0.64**	−0.55**	−0.58**

Notes. Positively worded items on salary and job insecurity were reverse-scored when dimensions were created; ω = McDonald's omega coefficient; SD = standard deviation; ** $p < 0.01$; $r < 0.30$ = small effect; $0.30 < r < 0.50$ = medium effect; $r > 0.50$ = large effect.

Regarding emergency nurses' functioning, all the capabilities had significant ($p < 0.01$) relationships (medium effect) with their emotional, psychological, and social well-being, apart from setting own goals (small effect). Emotional well-being was associated with using ($r = 0.35$) and developing ($r = 0.34$) knowledge and skills, involvement in important decisions ($r = 0.37$), meaningful relationships at work ($r = 0.32$), earning a good income ($r = 0.40$), and contributing to something valuable ($r = 0.38$). Psychological well-being was related to using ($r = 0.34$) and developing ($r = 0.35$) knowledge and skills, being involved in important decisions ($r = 0.30$), meaningful relationships at work ($r = 0.35$), earning a good income ($r = 0.37$), and contributing to something valuable ($r = 0.37$). Social well-being was associated with using ($r = 0.34$) and developing ($r = 0.36$) knowledge and skills, being involved in important decisions ($r = 0.35$), building and maintaining meaningful relationships at work ($r = 0.33$), earning a good income ($r = 0.38$), and contributing to something valuable ($r = 0.42$).

The three highest significant ($p < 0.01$) relationships between negative affect and work capabilities were earning a good income ($r = −0.29$), being involved in important decisions ($r = −0.23$), and using knowledge and skills ($r = −0.21$).

5.4. Testing the Structural Model.
Confirmatory factor analysis was used to test the structural model of precarious work, mental toughness, capabilities, and mental health (see Table 5).

From Table 5, it is evident that emergency nurses' precariousness regarding their salary ($\beta = −0.31$, $p < 0.001$), work conditions ($\beta = −0.24$, $p < 0.014$), and professional development ($\beta = −0.26$, $p < 0.001$) had negative effects on their capability set, while mental toughness had a positive effect ($\beta = 0.26$, $p < 0.003$). One reason for the insignificant relationship between job insecurity (as a component of precarious work) and the capability set in the structural model, was the strong correlation between precariousness about work conditions and job insecurity ($r = 0.59$, $p \leq 0.001$). Therefore, hypotheses 1a, 1b, and 1c were accepted. Furthermore, emergency nurses' precariousness regarding their work conditions ($\beta = −0.35$, $p < 0.001$) and professional development ($\beta = −0.28$, $p < 0.001$) had a negative impact on their mental health, while mental toughness

($\beta = 0.33$, $p < 0.001$) and the capability set ($\beta = 0.28$, $p < 0.001$) positively influenced their mental health. Finally, the precarious work conditions ($\beta = 0.35$, $p < 0.001$) affected emergency nurses' negative affect. Hypothesis 2a was accepted for three dimensions of the impact of precarious work on mental health: (a) salary, (b) work conditions, and (c) professional development. Hypothesis 2b was only accepted for the effect of precarious work conditions on negative affect. Hypothesis 2c was accepted, while hypothesis 2d was rejected. Hypothesis 3a was accepted, while hypothesis 3b was rejected.

Figure 2 shows the structural model of emergency nurses' precarious work, mental toughness, capabilities, mental health, and negative affect.

As depicted in Figure 2, low precariousness (regarding salary, work conditions, and professional development) and mental toughness positively affected emergency nurses' capability set ($R^2 = 0.58$, large effect). Furthermore, low precariousness about work conditions and professional development, mental toughness, and a strong capability set were the best predictors of mental health ($R^2 = 0.38$, large effect).

5.5. Moderating Effects.
With the capability set as the dependent variable, the four factors of precarious work (predictors) were entered in the first step, followed by mental toughness (moderator) in the second step. Interaction scores between precarious work factors and mental toughness were entered in the third and final step to examine the possibility of a moderating effect. A significant interaction term between a predictor and a moderator indicates a moderating effect [76].

The interaction between salary (as a factor of work precariousness) and mental toughness (beta = −0.17, $p = 0.049$ [−0.34, 0.00]) accounted for a significant addition of 1% in the variance of the capability set (F (6, 197) = 29.59, $p < 0.001$). Precariousness about salary interacted with mental toughness to affect the capability set. To examine the interaction effects that emerged, the simple slopes of the precariousness about salary–mental toughness at the 16th, 50th, and 84th percentiles [76] were inspected. We also tested whether each slope was statistically significant for the moderating effect (see Figure 3).

TABLE 5: Structural model of precarious work, mental toughness, capabilities, mental health, and negative affect.

Dependent variable	Independent variable	β	SE	EST	p values
Capability set	Salary	−0.31	0.08	−3.86	<0.001**
	Work conditions	−0.24	0.10	−2.43	0.014**
	Job insecurity	0.09	0.11	0.81	0.416
	Professional development	−0.26	0.08	−3.19	0.001**
	Mental toughness	0.26	0.09	2.97	0.003**
Mental health	Salary	0.01	0.06	−0.14	0.888
	Work conditions	−0.35	0.08	−4.41	<0.001**
	Job insecurity	0.14	0.10	1.34	0.181
	Professional development	−0.28	0.08	−3.80	<0.001**
	Mental toughness	0.33	0.07	4.59	<0.001**
	Capability set	0.28	0.07	4.09	<0.001**
Negative affect	Salary	0.08	0.08	1.01	0.313
	Work conditions	0.35	0.09	3.70	<0.001**
	Job insecurity	0.00	0.10	0.01	0.992
	Professional development	0.12	0.10	1.25	0.213
	Mental toughness	−0.08	0.10	−0.91	0.363
	Capability set	−0.06	0.01	−0.52	0.602

Notes. β = standardised regression coefficient; SE = standard error; EST = estimate; ** $p < 0.01$.
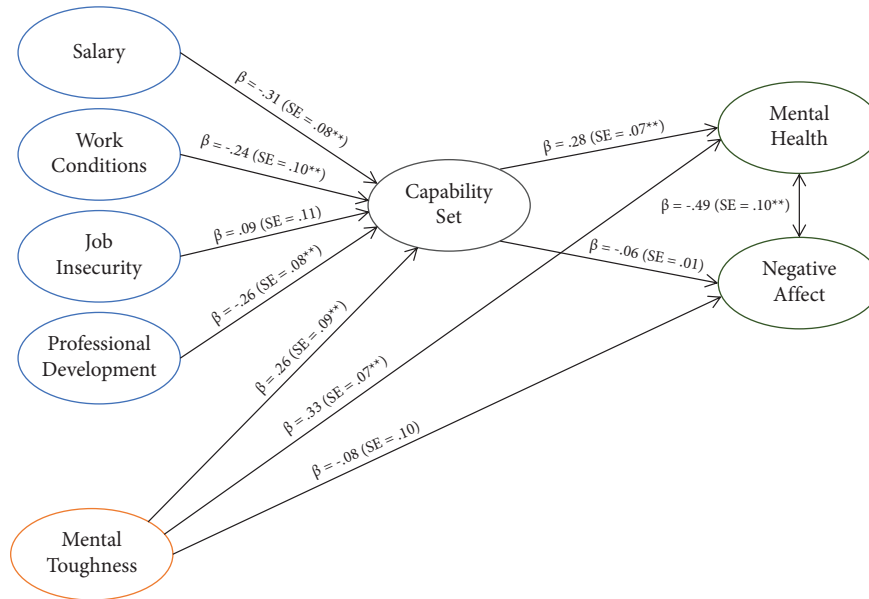
FIGURE 2: Structural model of precarious work, mental toughness, capabilities, mental health, and negative affect. Notes: β = regression coefficient; SE = standard error; ** $p < 0.01$.

Figure 3 shows that the three lines in the figure have different slopes. Each of these lines reflects the conditional effects of mental toughness on the capability set. A simple slope analysis showed that precariousness about salary had a statistically significant effect on the capability set among those with low (value = 0.52, effect = −0.17, $t = −2.49$, $p = 0.014$ [−0.30, −0.03]), moderate (value = −0.02, effect = −0.25, $t = −5.54$, $p < 0.001$ [−0.34, −0.16]), and high (value = 0.45, effect = −0.33, $t = 0.06$, $p < 0.001$ [−0.44, −0.22]) scores on mental toughness. The steepest slope (the strongest positive association between low precariousness about salary and the capability set) occurs for individuals who reported high mental toughness. In contrast, the flattest slope (the weakest association) occurs for individuals who reported low mental toughness. The weakest

association between low precariousness about salary and the capability set occurred for emergency nurses who reported low mental toughness. Therefore, mental toughness strengthens the association between low precariousness about salary and the capability set.

Probing the interaction using the JN technique (see Figure 4) shows that the conditional effect of precariousness about salary on the capability set was statistically significant across 88.73% of the scores on the moderator (i.e., mental toughness). The analysis identified a mental toughness score of −0.64 as the transition point. The predicted value of the capability set was statistically significant between low and high precariousness about salary at mental toughness scores above −0.64. Therefore, hypothesis 1c was accepted for precariousness about salary.

FIGURE 3: Interaction: precariousness about salary and mental toughness (MT).

5.6. Mediating Effects. Next, the indirect effects of precarious work and mental toughness on mental health and negative affect (via the capability set) were computed using the procedure suggested by Hayes [76].

The significant indirect negative effects of three precarious work dimensions on mental health via a poor capability set included: (a) salary ($\beta = -0.09$ [−0.21, −0.04]), (b) work conditions ($\beta = -0.07$ [0.17, −0.02]), and (c) professional development ($\beta = -0.08$ [−0.17, −0.03]). Also, mental toughness had a significant positive indi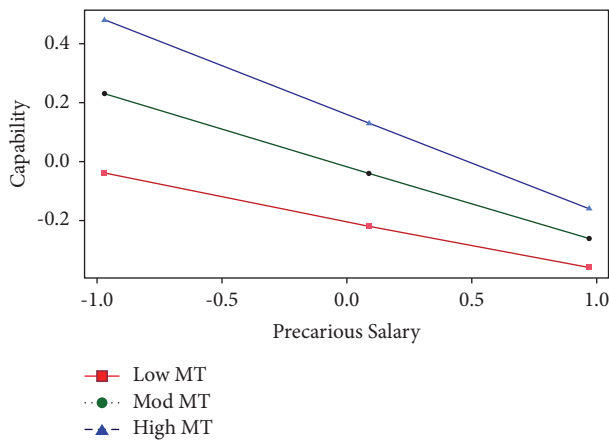rect effect on mental health via a strong capability set ($\beta = 0.07$ [0.02, 0.16]). None of the indirect effects of precarious work and mental toughness on mental health and negative affect were significant. Hypothesis 4 was accepted only for the indirect effects of three precariousness dimensions (salary, work conditions, and professional development) on mental health via the capability set of emergency nurses.

In conclusion, it is evident that emergency nurses' work capabilities are negatively associated with precarious work. Hypothesis 1a is therefore accepted in that an increase in emergency nurses' perceptions of their work being precarious will decrease the realisation of their work capabilities (achievement and enablement of work values). There was a positive relationship between emergency nurses' mental toughness and their work capabilities. Hypothesis 1b is thus accepted in that an increase in their mental toughness is associated with increased work capabilities. Mental toughness moderated the relationship between emergency nurses' precariousness about salary and their work capability set. The hypothesis (H1c) that emergency nurses' mental toughness interacts with their experiences of precarious work to affect their capabilities is therefore accepted for precarious salary.

Three precarious work components (i.e., salary, work conditions, and professional development) had a negative association with emergency nurses' mental health at work. In comparison, only precariousness about work conditions had a negative relationship with their negative affect. Furthermore, mental toughness had a positive relationship with mental health. Consequently, the hypothesis that an increase

in precarious work will decrease emergency nurses' mental health is accepted for salary, work conditions, and professional development (H2a), and work conditions for negative affect (H2b). The hypothesis that an increase in emergency nurses' mental toughness will increase their mental health is accepted (H2c). The hypothesis (H2d) that increased mental toughness will decrease emergency nurses' negative affect is rejected as the relationship between the two variables was insignificant.

Emergency nurses' capability set was positively associated with their mental health, and the relationship between their capability set and negative affect was insignificant. Therefore, hypothesis 3a, that an increase in emergency nurses' capability set will increase their mental health, is accepted. However, the hypothesis (H3b) that it will decrease their negative affect is rejected.

Only precariousness about salary, work conditions, and professional development indirectly affected emergency nurses' mental health through their work capability set. However, the indirect effect of precarious work on their negative affect via the work capability set was insignificant. Thus, the hypothesis that precarious work indirectly affects mental health via their work capability set (H4a) is accepted, while the hypothesis that it indirectly affects their negative affect (H4b) is rejected.

6. Discussion

This study investigated emergency nurses' sustainable employability in South Africa from the perspective of precarious work, mental toughness, work capabilities, and mental health. The results confirmed that the work precariousness of emergency nurses was indeed negatively associated with their work capabilities. Emergency nurses' capability set positively affected their mental health, with mental toughness moderating the effect of poor salary (a component of precarious work) on capabilities. Precariousness regarding salary, work conditions, and professional development affected emergency nurses' mental health indirectly and negatively through a poor capability set, while mental toughness indirectly and positively affected their mental health through a strong capability set.

Three precarious work dimensions (i.e., salary, work conditions, and professional development) were negatively associated with emergency nurses' capabilities and mental health. In line with the findings of previous studies (e.g., [20, 31]) and the conceptualisation of SE [13], emergency nurses' capability set and mental toughness affected their mental health at work. Mental toughness moderated the negative impact of precariousness caused by a poor salary on their capabilities.

Conditions of injustice (arising from precarious work) can restrict and damage the capability development of individuals [19], negatively affecting their mental health. Sen [23, 25] articulates the connection between social justice and well-being in the CA. Social justice constitutes individuals' opportunities to achieve valued beings and doings, e.g., work capabilities [27]. Although inner resources (e.g., mental toughness) may impact individuals' capabilities, external
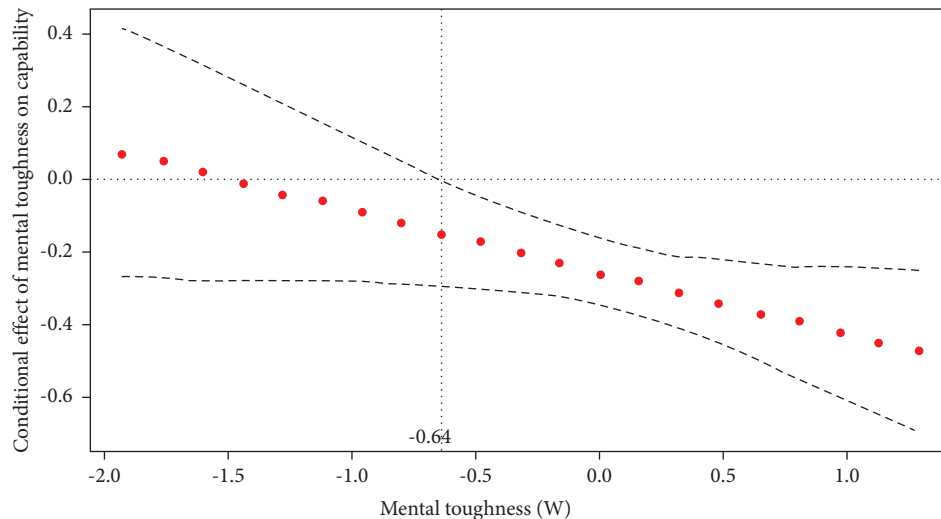
FIGURE 4: Conditional effect of mental toughness on salary precariousness on the capability set.

conditions of justice play a vital role in capability development. Therefore, individuals must feel secure and free to develop their capabilities [23, 24].

The structural model of mental health showed that precariousness regarding salary, work conditions, and professional development was significantly and negatively associated with emergency nurses' work capability set, which confirms the findings of Allan et al. [6], Morphet et al. [7], and Murangi et al. [20]. Emergency nurses who experience their work as precarious may not have the opportunity to develop their capabilities because they have a short time perspective (and, therefore, limited time and space to consider their future) and little control over their life choices [24].

Three precarious work dimensions and the emergency nurses' capability set impacted their mental health. Regarding emergency nurses' functioning at work, all capabilities were positively related to their emotional, psychological, and social well-being. These results confirm the findings of De Wet and Rothmann [61] among secondary school educators in South Africa. Furthermore, three work capabilities, namely earning a good income, involvement in important decisions, and using knowledge and skills, were associated with the reduced negative effect of emergency nurses. Negative affect indicates low mental health [58] and is associated with a lack of need fulfilment [59].

As a personal resource, emergency nurses' mental toughness directly shaped their capabilities and mental health (specifically emotional, psychological, and social well-being). An additional 1% of the variance in emergency nurses' capability sets was explained through the interaction between their precariousness about salary and mental toughness. Low precariousness about salary mattered most for the capability set when mental toughness was moderate to high. Emergency nurses' mental toughness strengthened the effect of low salary precariousness on their capability set. Therefore, it was evident that moderate to high scores on mental toughness (as a personal resource) moderated the

effect of emergency nurses' precariousness about salary on their work capabilities [52]. Their mental toughness (as a personal resource) assisted them in achieving work capabilities when precariousness about salary was low. Negative affect was not significantly associated with mental toughness and the capability set.

Precariousness regarding salary, work conditions, and professional development affected emergency nurses' mental health indirectly and negatively through a poor capability set, while mental toughness indirectly and positively affected their mental health through a strong capability set. Consequently, emergency nurses with mental toughness and a comprehensive capability set are expected to present with higher mental health at work, lessening the impact of precarious work on it, especially when perceiving their salary, work conditions, and professional development as poor [13, 52].

The results of this study support the value of the CA [23, 25, 28] and, specifically, the sustainable employability model [13, 27, 31] for understanding the effects of precarious work and mental toughness on emergency nurses' capabilities and mental health (emotional well-being, psychological well-being, social well-being, and negative affect). Indeed, work can be better conceptualised as a means of flourishing when emergency nurses' values are incorporated into evaluations of their employment [30].

The findings of this study contribute to the literature in the following ways. First, it showed that precariousness regarding salary, work conditions, and professional development impacted emergency nurses' capability set, which, in turn, affected their mental health at work. Emergency nurses' mental toughness (as a personal resource) assisted them in achieving valued work outcomes and contributed to their mental health. Second, the study produced new information on the associations among precarious work components, mental toughness, capabilities, and mental health of emergency nurses. Third, the study showed that high mental toughness moderated the negative effects of precariousness regarding salary on emergency nurses'

capabilities. Fourth, the results of this study confirmed that precariousness regarding salary, work conditions, and professional development affected emergency nurses' mental health indirectly and negatively through a poor work capability set.

6.1. Practical Implications. Policymakers should address employees' precariousness at work and assist them in developing work capabilities to improve their mental health, contributing to their sustainable employability [13]. Interventions directed at emergency nurses' precariousness regarding their salaries, work conditions, and professional development should be implemented. The CA offers a useful framework to address precariousness at work [4]. Therefore, interventions need to focus on improving emergency nurses' support and resources to reduce their precariousness at work. For example, emergency nurses' precariousness regarding their salary could be improved by re-evaluating current financial and nonfinancial reward policies to determine the best possible reward models for these professionals. Given that emergency nurses' mental toughness is related to their capabilities and mental health, research and interventions focusing on the personal resources of nurses should be conducted [51]. Mental toughness can be improved through individual interventions (such as visualisations and affirmations) or, more complexly, mentor-mentee interventions (such as reality training and stress acclimatisation) (see [79]). Interventions should be implemented to decrease precarious work, assist them in achieving work capabilities, and improve their mental health [13, 27, 31].

6.2. Limitations and Recommendations for Future Research. This study had limitations that need to be acknowledged. First, the sample was drawn from a single province (i.e., Gauteng–the largest economic hub), mainly in the private sector. Future research, including different samples (e.g., other provinces and the public sector), could strengthen the generalisability of the results. Second, while the work values included in this study were considered sufficient [20, 31, 67], unique work values might exist in a South African context. Therefore, qualitative studies of the work values of emergency nurses are essential. Third, although the results supported the PPP as acceptable in measuring emergency nurses' precariousness at work, a larger, more diverse group across different demographics and occupations over time could add further evidence regarding the reliability and validity of the instrument.

7. Conclusion

Precarious work negatively affected emergency nurses' capabilities, negative affect, and emotional, psychological, and social well-being (as dimensions of positive mental health). Emergency nurses' mental toughness affected their capabilities and mental health positively. Specific dimensions of precarious work that impacted individuals' capabilities and positive mental health were salary, work conditions, and professional development, while only work conditions influenced negative affect. Furthermore, mental toughness

and capabilities, such as using knowledge and skills, developing new knowledge and skills, being involved in decision-making, developing and maintaining meaningful work relations, setting own goals, earning a good income, and contributing something valuable, mediated the relation between work precariousness and emergency nurses' positive mental health. A lack of capabilities, such as earning a good income, being involved in important decisions, and using knowledge and skills, was associated with negative affect.

Data Availability

The datasets generated for this study can be found in Rothmann, Sebastiaan; Barnard, Neil [80]; "Precarious Work, Mental Toughness, Capabilities, and Mental Health," Mendeley Data, V1, doi: 10.17632/7cb8t29stj.1

Additional Points

The article forms part of a research focus under Optentia Research Unit's Human Flourishing in Institutions Research Programme. The research focus is on work capabilities (enabled and achieved work values) and functionings at work (such as burnout, mental health, work engagement, and intention to leave), as well as precariousness. To ensure collaboration, comparison, transferability, consistency, and reusability, the measurement instruments, conceptualisations, and wording of the constructs/phenomena within this research focus have been standardised. Therefore, while the constructs and research approach of this article might share similarities with other research articles within this focus area (such as [20, 67, 80, 81]), the aim, population, and results are different and make separate, unique contributions.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Authors' Contributions

N.B.B. conceptualized the study, contributed to literature review, performed analysis, wrote the article, edited the article, and provided references. S.R. performed project leadership, performed analysis, reviewed the article, edited the article, and provided references. L.T.dB. and W.L. reviewed the article and edited the article. All authors have read and agreed to the published version of the article.

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Review Article

Telerehabilitation for Family Caregivers of Stroke Survivors: A Systematic Review and Meta-Analysis

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Aim. This systematic review aimed at evaluating the effectiveness of telerehabilitation on family caregivers of stroke survivors. *Background*. After discharge from the hospital, family caregivers of stroke survivors faced physical and psychological stress. Telerehabilitation seems crucial for family caregivers. However, the impact of telerehabilitation on family caregivers' health outcomes remains to be studied. *Evaluation*. Six databases (PubMed, Embase, Cochrane Library, Web of Science, CINAHL, and PsycINFO) were searched up to June 16th, 2022, without language restrictions. The Revised Cochrane Risk-of-bias Tool for Randomized Trials was used to assess the quality of included studies. The GRADEpro (Grading of Recommendations Assessment, Development, and Evaluation Profile) tools were applied to assess the synthesized evidence quality. The subgroup analysis was performed according to the intervention formats. Statistical analysis was conducted using Review Manager 5.3, and the publication bias was calculated by Stata 14.0. *Key Issue(s)*. A total of 16 studies containing 992 caregivers were pooled in this systematic review. Telerehabilitation significantly improved the caregiver burden (SMD = −0.18, 95% CI = −0.35~−0.02, $P = 0.03$, moderate-quality evidence), knowledge (SMD = 0.75, 95% CI = 0.03~1.47, $P = 0.04$, very low-quality evidence), and competence (SMD = 1.35, 95% CI = 0.82~1.88, $P < 0.001$, very low-quality evidence) but not depression (SMD = −0.04, 95% CI = −0.3~0.21, $P = 0.74$, moderate-quality evidence), anxiety (MD = 0.68, 95% CI = −0.68~2.04, $P = 0.32$, low-quality evidence), and self-efficacy (SMD = −0.30, 95% CI = −1.22~0.61, $P = 0.52$, very low-quality evidence) in family caregivers of stroke survivors. The subgroup analysis demonstrated that multi-form telerehabilitation (SMD = 1.86, 95% CI = 1.32~2.40, $P < 0.001$) was significantly effective in improving caregiving competence. *Conclusion*. Telerehabilitation can effectively reduce the caregiver burden as well as improve the knowledge and competence of stroke caregivers. *Implications for Nursing Management*. The emergence of telerehabilitation can help relieve caregivers' stress and provide a new form for nursing managers to make discharge plans for stroke.

1. Introduction

Stroke remains the second-leading cause of death and the third-leading cause of death and disability combined worldwide [1]. It is estimated that the total global direct and indirect costs of stroke are $891 ($746~1077) billion, accounting for 1.12% of the global gross domestic product [2]. Almost 70%–80% of stroke survivors have complications such as cognitive impairment, motor dysfunction, and swallowing dysfunction [3]. In addition, 25%–50% of stroke survivors become partially or entirely dependent on others in activities of daily living [4]. According to a recent

systematic review, the average medical cost of a stroke family is about 5,798.15 to 140,048 euros [5]. A series of stroke complications, massive demand for rehabilitation, and heavy economic pressure may overwhelm stroke survivors and family caregivers.

After discharge from the hospital, family caregivers such as parents, spouses, children, and siblings provide informal and unpaid care for stroke survivors. The lack of professional guidance and reasonable rehabilitation plans often lead to poor knowledge, belief, and behavior for caregivers and poor home rehabilitation effects for stroke survivors [6]. According to a survey, 82% of family caregivers provided stroke care for more than 8 hours a day [7]. This challenging care may bring adverse outcomes to family caregivers' physical and mental health. A longitudinal study in Singapore showed that the health status of stroke caregivers gradually declined within 12 months after patients suffered a stroke [8]. Approximately 21.4% (95% [Confidence Interval, CI]: 11.6%~35.9%) of family caregivers experienced anxiety symptoms, while 40.2% (95% CI: 30.1%~51.1%) experienced depression symptoms during the period of caring for stroke survivors [9]. The vast majority of family caregivers felt lifestyle changes and faced varying degrees of caregiving burden [7]. To solve these problems, routine rehabilitation is carried out for stroke caregivers including on-site and face-to-face guidance such as outpatient follow-up, home visits, etc. [10]. Routine rehabilitation could help doctors comprehensively evaluate patients through visual touch and listening. However, according to a survey, stroke caregivers need to spend $1,167 on healthcare services, resulting in an increase of $726 in total home care costs. [11]. In addition, routine rehabilitation makes it difficult for nurses to effectively supervise the rehabilitation effects, resulting in discontinuity of care and adverse effects on stroke survivors and caregivers.

Therefore, the implementation of remote interventions may help satisfy the needs of family caregivers, providing them with stroke-related knowledge and skills to adapt to life and role changes. Telerehabilitation uses information and communication technology (telephone, mail, and video conferencing) and computer science technology (applets, websites, and mobile applications) to provide services remotely [12]. According to a practice guideline published by American Congress of Rehabilitation Medicine Stroke International Special Interest Group, telerehabilitation could benefit family caregivers in several ways, including (1) reduction of direct and indirect costs: despite the high costs of placing network devices at home, telerehabilitation reduces outpatient and round-trip costs; (2) breaking geographical restrictions: it provides more opportunities for patients in rural and remote areas and improves the accessibility of medical services; (3) providing prompt diagnosis and quick response: experts can use communication technology to achieve timely consultation and treatment; (4) reduction in the spread of infectious diseases such as COVID-19 [13].

Despite the various advantages of telerehabilitation, current research focuses too much on patient health outcomes, resulting in caregivers often being neglected. Multiple systematic reviews have demonstrated the effectiveness of telerehabilitation in enhancing patients' motor function, generic quality of life, and activities of daily living [14, 15]. However, the vulnerability and sensitivity of stroke caregivers still deserve attention. There have been randomized controlled trials (RCTs) comparing the differences between telerehabilitation and routine rehabilitation for stroke caregivers [16–18]. Conflicting evidence on caregiver health outcomes has led to a lack of consistent findings and difficulties for healthcare practitioners to make appropriate judgments [19, 20]. Therefore, this study evaluated and synthesized evidence to explore the effectiveness of telerehabilitation on the health outcomes of stroke caregivers.

2. Materials and Methods

This systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 checklist and was registered in PROSPERO (https://www.crd.york.ac.uk/prospero/) with a registration number of CRD42022358364.

2.1. Search Strategy.
Six databases were comprehensively searched, including PubMed, Embase, Cochrane Library, Web of Science, CINAHL, and PsycINFO. Databases were searched up to June 16th, 2022, without any language restrictions. The search strategy was designed based on the PICOS framework (e.g., P: stroke, family caregiver, informal caregiver, and carer). Free terms were employed to supplement the MeSH terms. The references of the included studies were manually searched to identify any additional studies. The complete list of search strategies is listed in Supplementary Table 1.

2.2. Eligibility Criteria.
The inclusion criteria were as follows: (1) stroke survivors aged ≥18 years; (2) family caregivers such as parents, spouses, children, and siblings provided home care for stroke survivors; (3) telerehabilitation was applied to family caregivers of stroke survivors to provide them with caregiving skills or improve their health outcomes; (4) the interventions may include videoconferencing, telephone sessions, applets, virtual reality, etc., and the routine rehabilitation in the control group may include on-site and face-to-face rehabilitation; (5) outcomes reported caregiver burden, competence, knowledge, depression, anxiety, or self-efficacy; (6) RCTs. The exclusion criteria were as follows: (1) conference abstracts and posters; (2) protocols did not report results; (3) family caregivers received both telerehabilitation and on-site rehabilitation.

2.3. Study Selection and Data Extraction.
Firstly, two reviewers used EndNote X9 to screen the searched records back-to-back and compared the records to reach an agreement. Any disagreements were resolved by a third reviewer. Secondly, two reviewers completed the data extraction independently. The extracted contents included author, year, country, sample size, age of patients, age of

caregivers, interventions, intervention format, intervention duration, and outcomes. Lastly, the extracted results were cross-checked by two reviewers to determine the final results. Caregiver burden was identified as the primary outcome, while caregiving competence, knowledge, depression, anxiety, and self-efficacy were identified as secondary outcomes. The definition and evaluation methods of each outcome were elaborated in the previous protocol [21].

2.4. Quality Assessment. Two reviewers utilized the Revised Cochrane Risk-of-Bias Tool for Randomized Trials (ROB 2) to assess the quality of the included studies from five domains, including the randomization process, deviations from the intended interventions, missing outcome data, measurement of the outcome, and selection of the reported results. Overall bias was calculated according to the algorithm provided by the Cochrane Collaboration [22]. All disagreements were resolved by an expert in evidence-based medicine.

2.5. Data Synthesis and Analysis. Review Manager 5.3 was used to conduct the systematic review and meta-analysis. Since all outcomes in this study were continuous variables, the mean difference (MD) or standardized mean difference (SMD) with 95% CI was used to calculate the effects according to whether the same scale was employed. Data available from the included studies were processed to estimate missing values. The P value less than 0.05 was considered statistically significant. The I^2 statistic was used to measure the heterogeneity of the included studies. The fixed effects model was utilized only if $I^2 \leq 50\%$ with $P > 0.1$; otherwise, the random effects model was utilized. The subgroup analysis was used to compare different intervention formats (single-form telerehabilitation and multiform telerehabilitation). The sensitivity analysis was conducted to test the robustness of results by changing effects model. The single-form telerehabilitation was defined as the use of only one remote intervention for stroke caregivers, while multiform telerehabilitation used two or more remote interventions for stroke caregivers, including network, videoconferencing, telephone sessions, applets, virtual reality, etc. The GRADEpro (Grading of Recommendations Assessment, Development, and Evaluation Profile) Guideline Development Tool (GDT) was applied to assess the quality of synthesized evidence. When at least ten studies reported the same outcome, the publication bias was evaluated using Stata 14.0. Egger's test with $P < 0.1$ considered the presence of publication bias.

3. Results

3.1. Search Results and Selection. There were 11,851 identified via six databases. No additional records were identified by manual search. After duplicated records were removed, 7081 records were sought for retrieval. Later, 6966 unrelated records, 36 records without caregiver outcomes, 27 protocols without results, 23 records did not receive telerehabilitation, 9 records received mixed interventions, and 4 non-RCTs were excluded. According to the eligibility criteria, three three-arm studies [16, 18, 23] and three four-arm studies [24–26] removed redundant arms. A total of 16 RCTs were pooled in this systematic review finally. The flow diagram of study selection is shown in Figure 1.

3.2. Study Characteristics. The characteristics of the included studies are described in Table 1. A total of 16 RCTs containing 992 caregivers were pooled in this systematic review. The included studies were published between 2007 and 2021 in America ($n = 5$), China ($n = 3$), Korea ($n = 2$), Australia ($n = 2$), Netherlands ($n = 2$), New Zealand ($n = 1$), and Malaysia ($n = 1$). One article was published in Korean [16], one in Chinese [20], and the others in English. Although one study was a study protocol registered in the United States National Library of Medicine, it reported detailed results and was therefore included in this systematic review [24]. The intervention formats of telerehabilitation varied among all the studies. The main intervention formats included web-based software, websites, e-mail, DVD, telephone sessions, video conferencing, and applets. Six studies used multiple intervention formats of telerehabilitation [17, 19, 20, 26, 27, 32], while the rest used only one intervention format [10, 16, 18, 23–25, 28–31].

3.3. Quality Assessment. According to ROB 2, the quality assessment of each study is displayed in Supplementary Figure 1. Of the 16 RCTs, 2 studies (12.5%) were at a low risk, 4 studies (25%) were at a high risk, and the rest (62.5%) remained some concerns. The summary evidence of a bias risk for each outcome is detailed in Supplementary Table 2. The GRADEpro GDT determined the moderate quality of synthesized evidence on caregiver burden and depression symptoms. Synthesized evidence of anxiety was rated as low quality. The evidence of caregiving knowledge, competence, and self-efficacy was rated as very low quality. Studies with a risk of bias and a small sample size were the main factors affecting the evaluation results.

3.4. Meta-Analysis of the Outcomes

3.4.1. Caregiver Burden. Twelve studies applied four scales (Caregiver Burden Index, Expanded Caregiver Burden Index, Zarit Burden Interview, and the Zarit Burden Interview-Short Form) to assess caregiver burden. Among these studies, one study treated caregiver stress as a classified variable, with 20.5% of caregivers in the intervention group and 34.8% of caregivers in the control group at a high-stress level [10]. Finally, 11 studies were enrolled in the meta-analysis. The fixed-effects model in Figure 2(a) shows that the caregiver burden is significantly lower in the telerehabilitation group than in the routine rehabilitation group (SMD = −0.18, 95% CI = −0.35~−0.02, $P = 0.03$, $I^2 = 36\%$). Sensitivity analysis showed that the results were not significant after changing into the random effects model (SMD = −0.16, 95% CI = −0.38~0.06, $P = 0.15$, $I^2 = 36\%$). The subgroup analysis in Supplementary Figure 2a shows
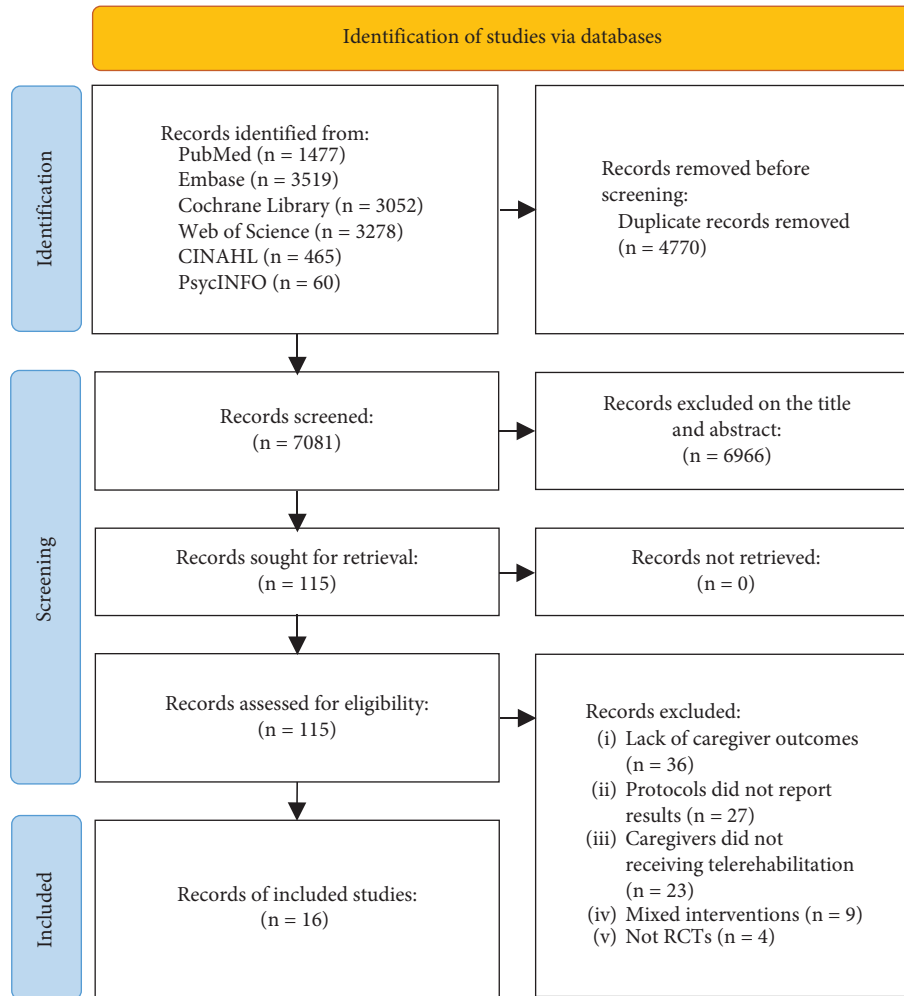
Figure 1: Flow diagram of study selection.

that compared with routine rehabilitation, single-form telerehabilitation yields lower caregiver burden (SMD = −0.35, 95% CI = −0.58∼−0.12, P = 0.003, I^2 = 0%). There was no statistical difference between multiform telerehabilitation and routine rehabilitation in improving caregiver burden (SMD = 0.04, 95% CI = −0.34∼0.42, P = 0.84, I^2 = 58%). Egger's test observed no publication bias (P = 0.453).

3.4.2. Depression. Eight studies applied four scales (Center for Epidemiologic Studies Depression Scale, 10-item Center for Epidemiological Studies for Depression Scale, Hospital Anxiety and Depression Scale, and Patient Health Questionnaire-9) to assess depression symptoms. Because I^2 < 50% with P < 0.1, the random-effects model was used for a conservative estimate of pooled data. The meta-analysis in Figure 2(b) shows that the telerehabilitation group has no significant effect on depression symptoms to the routine rehabilitation group (SMD = −0.04, 95% CI = −0.3∼0.21, P = 0.74, I^2 = 45%). Sensitivity analysis showed that the result was stable. The subgroup analysis in Supplementary Figure 2b shows that compared with routine rehabilitation,

neither single-form rehabilitation (SMD = −0.26, 95% CI = −0.63∼0.12, P = 0.18, I^2 = 50%) nor multiform rehabilitation was significant in improving depression symptoms (SMD = 0.20, 95% CI = −0.08∼0.47, P = 0.17, I^2 = 0%).

3.4.3. Anxiety. Three studies applied the Hospital Anxiety and Depression Scale to assess anxiety symptoms. Thus, MD was used to calculate the effect size. The fixed-effects model in Figure 2(c) shows that the telerehabilitation group has no significant effect on anxiety symptoms to the routine rehabilitation group (MD = 0.68, 95% CI = −0.68∼2.04, P = 0.32, I^2 = 0%).

3.4.4. Caregiving Knowledge. Three studies applied different scales (Kong's Caregiving Knowledge Scale, Knowledge of Stroke Questionnaire, and Comprehensive Competence Assessment Questionnaire for Stroke Caregivers) to assess caregiving knowledge. The random-effects model in Figure 2(d) shows that the caregiving knowledge in the

TABLE 1: The characteristics of included studies.

Author, year	Country	Sample size (EG/CG)	Age of patients (EG/CG) (Mean ± SD)	Age of caregiver (EG/CG) (Mean ± SD)	Interventions (EG/CG)	Intervention format	Intervention duration	Outcomes
Radomski, 2007 [18]	USA	EG: n = 5 CG: n = 5	47–72/24–81	—	EG: habit training via a wireless device during a four- to five-week practice period CG: usual and customary practice (received no therapeutic intervention during the home visits)	Web-based software	5 weeks	Caregiver burden
Pierce et al., 2009 [17]	USA	EG: n = 36 CG: n = 37	63 ± 15/ 63 ± 13.3	54 ± 12.2/ 55 ± 13.1	EG: caring-web intervention: (1) linked websites about stroke care; (2) customized educational information to carers' needs; (3) an e-mail forum to ask any questions in private; and (4) a nonstructured e-mail discussion amongst all participants facilitated by the nurse CG: non-web user group	Website + e-mail	12 months	Depression
Kim and Park, 2011 [16]	Korea	EG: n = 17 CG: n = 17	59.6 ± 9.5/ 58.5 ± 8.8	38.3 ± 12.6/ 42.9 ± 12.0	EG: web-based stroke prevention education program CG: usual care	Website	12 weeks	Caregiving knowledge
Harwood et al., 2012 [25]	New Zealand	EG: n = 39 CG: n = 39	61.5 ± 13.9/ 61.3 ± 14.8	—	EG: DVD and take charge session. 80-minute DVD about recovery and 80-minute individualized assessment CG: written materials about stroke for patients and their families	DVD	12 months	Caregiver burden
Redzuan et al., 2012 [10]	Malaysia	EG: n = 44 CG: n = 46	63.7 ± 12/ 59.4 ± 11	—	EG: received a video to guide therapy at home. The video consisted of 6 sections and included a 45-minute self-instructional therapy in 2 languages CG: verbal instruction and outpatient appointments once a week	DVD	3 months	Caregiver burden

Table 1: Continued.

Author, year	Country	Sample size (EG/CG)	Age of patients (EG/CG) (Mean±SD)	Age of caregiver (EG/CG) (Mean±SD)	Interventions (EG/CG)	Intervention format	Intervention duration	Outcomes
Eames et al., 2013 [27]	Australia	EG: $n = 31$ / CG: $n = 30$	61.4±12.7/ 55.2±16.7	61.4±12.7/ 55.2±16.7	EG: stroke education and support packages were applied to patients and caregivers. Telephone sessions at intervals of approximately 1 month, over a 3-month period / CG: standard care	Website + telephone sessions	3 months	Caregiver burden; anxiety; depression; self-efficacy; caregiving knowledge
Kim et al., 2013 [28]	Korea	EG: $n = 18$ / CG: $n = 18$	67.4±7.3/ 63.9±7.4	49.8±14.8)/ 57.3±11.5	EG: the web-based stroke education program included nine video-based lectures within 9 weeks / CG: standard care	Website	9 weeks	Caregiving competence
Blanton, 2016 [24]	USA	EG: $n = 21$ / CG: $n = 11$	56.5±12.6/ 60.1±14.0	56.5±12.6)/ 60.1±14.0	EG: CARE-CITE education program carepartners (caregivers participated in online CARE-CITE education while stroke survivors received constraint-induced movement therapy) / CG: traditional education carepartners (carepartners participated in traditional education while the stroke survivor received constraint-induced movement therapy)	Website	1 month	Caregiver burden; depression; self-efficacy
Berg et al., 2016 [19]	Australia	EG: $n = 31$ / CG: $n = 32$	64.5±18.5/ 70.1±12.4	—	EG: an 8-week caregiver-mediated training program with support using a customized exercise app loaded onto a tablet / CG: usual rehabilitation care	Web-based software + video conferencing	8 weeks	Caregiver burden; self-efficacy
Chen et al., 2017 [29]	China	EG: $n = 27$ / CG: $n = 27$	66.52±12.08/ 66.15±12.33	—	EG: the home telesupervising rehabilitation program consisted of a network data system, therapist end, and patient end / CG: conventional outpatient rehabilitation	Web-based software	24 weeks	Caregiver burden

Table 1: Continued.

Author, year	Country	Sample size (EG/CG)	Age of patients (EG/CG) (Mean ± SD)	Age of caregiver (EG/CG) (Mean ± SD)	Interventions (EG/CG)	Intervention format	Intervention duration	Outcomes
Cheng et al., 2018 [30]	Hong Kong	EG: n = 64 CG: n = 64	71.16 ± 11.89/ 70.59 ± 10.36	49.08 ± 12.09/ 49.11 ± 12.90	EG: the psychoeducational program is composed of (1) two structured individual face-to-face stroke education sessions; and (2) six biweekly telephone problem-solving skills training sessions. An information booklet was developed as reference material for caregivers. CG: routine care (interdisciplinary rehabilitation services and postdischarge outpatient medical follow-up)	Telephone sessions	26 weeks	Caregiver burden; depression; caregiving competence
Kootker et al., 2019 [31]	Netherlands	EG: n = 23 CG: n = 27	≥18	59.6 ± 10.2/ 59.8 ± 12.5	EG: computerized cognitive training with 13–16 sessions. Each session will take two 20–25 minute-blocks divided by a 10–15 minute-break. CG: cognitive behavioral therapy augmented with movement or occupational therapy	Web-based software	4 months	Caregiver burden; anxiety; depression
Vloothuis et al., 2019 [32]	Netherlands	EG: n = 32 CG: n = 34	60.53 ± 14.82/ 59.26 ± 15.01	53.91 ± 14.90/ 54.00 ± 12.26	EG: caregiver-mediated exercises at least five times a week for 30 minutes CG: usual care	Telephone session + video conferencing + e-mail	8 weeks	Caregiver burden; anxiety; depression; self-efficacy
LeLaurin et al., 2021 [26]	USA	EG: n = 13 CG: n = 14	70.6 ± 10.7	60.3 ± 10.1	EG: eight-week intervention (the intervention was based on the RESCUE website and delivered via telephone in 8 weekly sessions lasting 30 to 60 minutes each) CG: standard care	Website + telephone sessions	8 weeks	Caregiver burden; depression
Woodward et al., 2021 [23]	USA	EG: n = 54 CG: n = 58	≥18	69.8 ± 13.8/ 58.1 ± 15.5	EG: SWCM + MISTT website (the MISTT website included a range of resources and stroke-related information) CG: usual care (the health-related brochures were mailed at 1, 4, and 8 week postdischarge)	Website	60 days	Depression

TABLE 1: Continued.

Author, year	Country	Sample size (EG/CG)	Age of patients (EG/CG) (Mean ± SD)	Age of caregiver (EG/CG) (Mean ± SD)	Interventions (EG/CG)	Intervention format	Intervention duration	Outcomes
Zhao et al., 2021 [20]	China	EG: $n = 38$ CG: $n = 39$	$62.50 \pm 12.02/$ 62.95 ± 10.21	$43.87 \pm 11.35/$ 44.54 ± 11.56	EG: Internet combined with information, motivation, and behavior model CG: usual care	Web-based software + WeChat	5 weeks	Caregiver burden; caregiving competence; caregiving knowledge

Note. EG, experimental group; CG, control group; SD, standard deviation; SWCM, social work case management; MISTT, Michigan stroke transitions trial.

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight (%)	Std. Mean Difference IV, Fixed, 95% CI	Std. Mean Difference IV, Fixed, 95% CI
Berg et al., 2016	4.4	2.84	31	3.35	3.03	32	11.4	0.35 [−0.15, 0.85]	
Blanton et al., 2016	3.78	0.71	19	4.01	0.98	10	4.8	−0.28 [−1.05, 0.49]	
Chen et al., 2017	3.04	1.51	27	3.33	1.95	27	9.9	−0.16 [−0.70, 0.37]	
Cheng et al., 2018.	4.05	3.55	55	5.73	3.4	49	18.5	−0.48 [−0.87, −0.09]	
Eames et al., 2013	6.5	3.4	25	6.2	3.7	28	9.7	0.08 [−0.46, 0.62]	
Harwood et al., 2012	3.1	2.9	32	4.4	3.2	31	11.3	−0.42 [−0.92, 0.08]	
Kootker et al., 2019	5.6	3.1	16	5.8	3.4	17	6.0	−0.06 [−0.74, 0.62]	
LeLaurin et al., 2021	16.9	7.3	10	13.3	8.6	13	4.0	0.43 [−0.41, 1.27]	
Radomski et al., 2007	25	19.494	5	37.66	7.57	5	1.6	−0.77 [−2.09, 0.54]	
Vloothuis et al., 2019	5.72	3.14	29	5.35	2.95	23	9.4	0.12 [−0.43, 0.67]	
Zhao et al., 2021	32.45	8.53	38	37.64	9.13	39	13.5	−0.58 [−1.04, −0.12]	
Total (95% CI)			287			274	100.0	−0.18 [−0.35, −0.02]	

Heterogeneity: chi² 15.58, df = 10 (P = 0.11); I² = 36%
Test for overall effect: Z = 2.14 (P = 0.03)

(a)

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight (%)	Std. Mean Difference IV, Random, 95% CI	Std. Mean Difference IV, Random, 95% CI
Blanton et al., 2016	7.84	1.97	19	9.86	2.72	10	7.6	−0.87 [−1.68, −0.07]	
Cheng et al., 2018	0.86	1.49	55	1.65	2.19	49	17.6	−0.42 [−0.81, −0.03]	
Eames et al., 2013	4.5	3.8	25	3.5	2.5	28	12.7	0.31 [−0.23, 0.85]	
Kootker et al., 2019	4.9	3.7	16	5.1	4.1	17	9.6	−0.05 [−0.73, 0.63]	
LeLaurin et al., 2021	12.9	10.4	10	11.6	10.7	13	7.3	0.12 [−0.71, 0.94]	
Pierce et al., 2009	12.3	9.8	36	9	9.1	37	15.1	0.35 [−0.12, 0.81]	
Vloothuis et al., 2019	3.21	2.71	28	3.5	3.24	24	12.7	−0.10 [−0.64, 0.45]	
Woodward et al., 2021	2.95	3.71	48	2.65	3.83	51	17.4	0.08 [−0.32, 0.47]	
Total (95% CI)			237			229	100.0	−0.04 [−0.30, 0.21]	

Heterogeneity: tau² = 0.06; chi² 12.66, df = 7 (P = 0.08); I² = 45%
Test for overall effect: Z = 0.33 (P = 0.74)

(b)

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight (%)	Mean Difference IV, Fixed, 95% CI	Mean Difference IV, Fixed, 95% CI
Eames et al., 2013	8.1	4.6	25	6.9	4.1	28	33.1	1.20 [−1.16, 3.56]	
Kootker et al., 2019	6.2	3.9	16	5.6	4.3	17	23.5	0.60 [−2.20, 3.40]	
Vloothuis et al., 2019	4.96	4.08	28	4.63	3.5	24	43.4	0.33 [−1.73, 2.39]	
Total (95% CI)			69			69	100.0	0.68 [−0.68, 2.04]	

Heterogeneity: chi² = 0.30, df = 2 (P = 0.86); I² = 0%
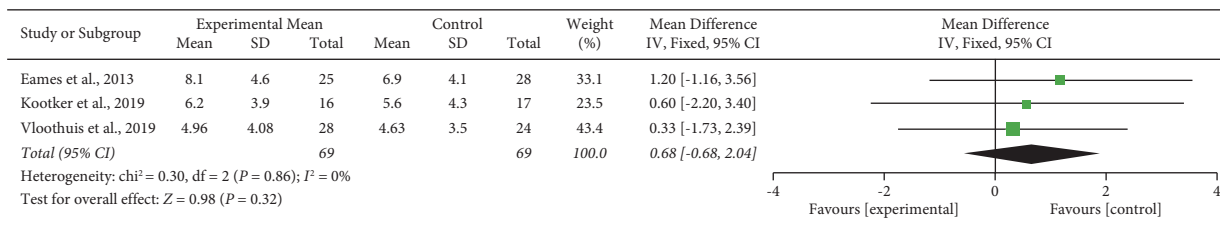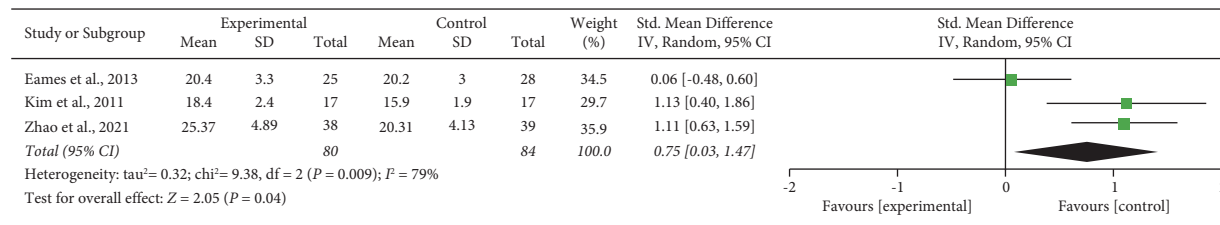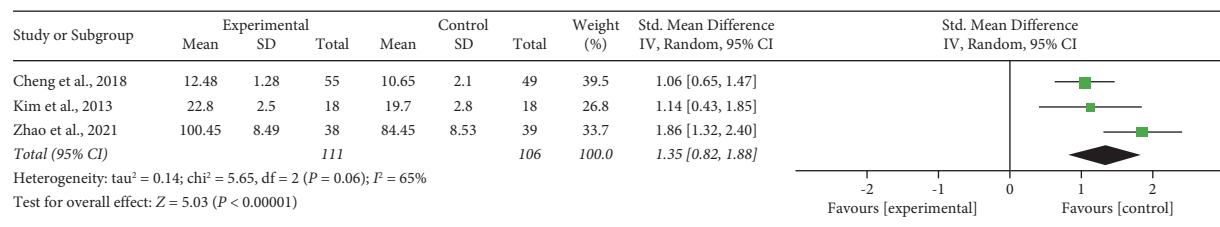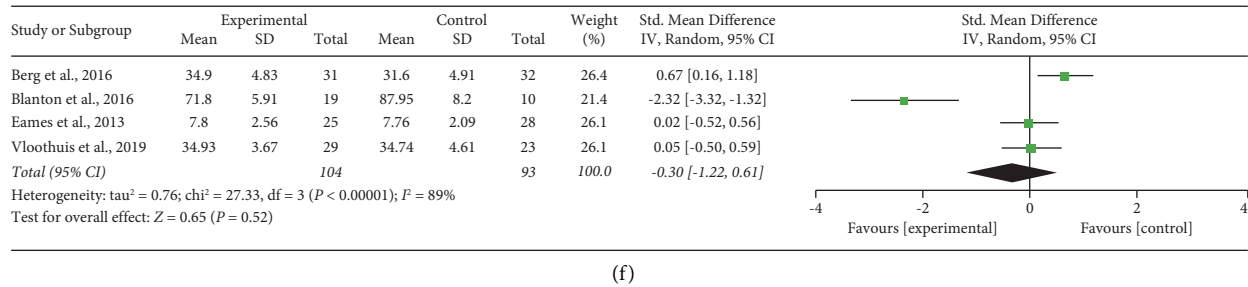Test for overall effect: Z = 0.98 (P = 0.32)

(c)

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight (%)	Std. Mean Difference IV, Random, 95% CI	Std. Mean Difference IV, Random, 95% CI
Eames et al., 2013	20.4	3.3	25	20.2	3	28	34.5	0.06 [−0.48, 0.60]	
Kim et al., 2011	18.4	2.4	17	15.9	1.9	17	29.7	1.13 [0.40, 1.86]	
Zhao et al., 2021	25.37	4.89	38	20.31	4.13	39	35.9	1.11 [0.63, 1.59]	
Total (95% CI)			80			84	100.0	0.75 [0.03, 1.47]	

Heterogeneity: tau² = 0.32; chi² = 9.38, df = 2 (P = 0.009); I² = 79%
Test for overall effect: Z = 2.05 (P = 0.04)

(d)

Study or Subgroup	Experimental Mean	SD	Total	Control Mean	SD	Total	Weight (%)	Std. Mean Difference IV, Random, 95% CI	Std. Mean Difference IV, Random, 95% CI
Cheng et al., 2018	12.48	1.28	55	10.65	2.1	49	39.5	1.06 [0.65, 1.47]	
Kim et al., 2013	22.8	2.5	18	19.7	2.8	18	26.8	1.14 [0.43, 1.85]	
Zhao et al., 2021	100.45	8.49	38	84.45	8.53	39	33.7	1.86 [1.32, 2.40]	
Total (95% CI)			111			106	100.0	1.35 [0.82, 1.88]	

Heterogeneity: tau² = 0.14; chi² = 5.65, df = 2 (P = 0.06); I² = 65%
Test for overall effect: Z = 5.03 (P < 0.00001)

(e)

Figure 2: Continued.

| Study or Subgroup | Experimental | | | Control | | | Weight | Std. Mean Difference | Std. Mean Difference |
	Mean	SD	Total	Mean	SD	Total	(%)	IV, Random, 95% CI	IV, Random, 95% CI
Berg et al., 2016	34.9	4.83	31	31.6	4.91	32	26.4	0.67 [0.16, 1.18]	
Blanton et al., 2016	71.8	5.91	19	87.95	8.2	10	21.4	-2.32 [-3.32, -1.32]	
Eames et al., 2013	7.8	2.56	25	7.76	2.09	28	26.1	0.02 [-0.52, 0.56]	
Vloothuis et al., 2019	34.93	3.67	29	34.74	4.61	23	26.1	0.05 [-0.50, 0.59]	
Total (95% CI)			104			93	100.0	-0.30 [-1.22, 0.61]	

Heterogeneity: tau² = 0.76; chi² = 27.33, df = 3 ($P < 0.00001$); $I^2 = 89\%$
Test for overall effect: $Z = 0.65$ ($P = 0.52$)

(f)

Figure 2: Forest plot of each outcome. (a) Caregiver burden. (b) Depression. (c) Anxiety. (d) Caregiving knowledge. (e) Caregiving competence. (f) Self-efficacy.

telerehabilitation group is significantly higher than in the routine rehabilitation group (SMD = 0.75, 95% CI = 0.03~1.47, $P = 0.04$, $I^2 = 79\%$). The high heterogeneity may result from different measurement tools.

3.4.5. Caregiving Competence. Three studies applied different scales (Six-item Care Giving Mastery Scale, Caregiving Competence Scale, and Comprehensive Competence Assessment Questionnaire for Stroke Caregivers) to assess the competence of family caregivers. The random-effects model in Figure 2(e) shows that the caregiving competence in the telerehabilitation group is significantly higher than that in the routine rehabilitation group (SMD = 1.35, 95% CI = 0.82~1.88, $P < 0.001$, $I^2 = 65\%$). Different measurement tools may be one of the potential sources of high heterogeneity.

3.4.6. Self-Efficacy. Four studies applied three scales (Self-efficacy Scale, Caregiving Self-efficacy Score, and General Self-efficacy Scale) to assess anxiety symptoms. The random-effects model in Figure 2(f) shows that the telerehabilitation group has no significant effect on self-efficacy to the routine rehabilitation group (SMD = −0.30, 95% CI = −1.22~0.61, $P = 0.52$, $I^2 = 89\%$). The high heterogeneity may result from different measurement tools.

4. Discussion

Previous studies paid more attention to the effects of telerehabilitation on stroke survivors. This is the first systematic review and meta-analysis focused on the impact of telerehabilitation on the health outcomes of stroke caregivers. Although some published systematic reviews attempted to compare the outcomes of stroke caregivers receiving telerehabilitation, they only performed descriptive analyses without further meta-analysis [33, 34]. This study pooled 16 studies and found that 3/4 of the studies implement telerehabilitation through websites and software, which demonstrated that more and more medical institutions tend to cooperate with Internet companies to build new platforms to realize medical modernization and intelligence. Stroke patients and caregivers can enjoy high-quality medical and nursing services without leaving home. Only RCTs were included in this study to ensure study quality and accuracy.

However, 87.5% of the RCTs had some risk of bias due to poor design and missing data. The total sample size of the studies reporting anxiety, knowledge, competence, and self-efficacy was insufficient, resulting in an inferior quality of synthesized evidence for the four outcomes. Although the quality evaluation was rigorous, this study yielded some surprising results.

Moderate-quality evidence indicated that telerehabilitation can ease the burden and reduce the strain on stroke caregivers. A previous systematic review found that the caregiver strain index of stroke caregivers was comparable, which was consistent with the results of this study [34]. A qualitative study found that caregivers of stroke survivors were experiencing a stressful period [35]. New responsibilities leave family caregivers feeling resentful and guilty of self-sacrifice. Meanwhile, outpatient follow-up is stressful for stroke caregivers due to scheduling, transportation, and expenses. Telerehabilitation improved the feasibility and acceptability of the interventions. In Lelaurin's study, 80% of stroke caregivers considered telerehabilitation very or even extremely useful [26]. However, the majority of caregivers receiving telerehabilitation interventions have a high level of education. For caregivers with low education levels and poor network resources, receiving telerehabilitation makes them feel burdensome instead. This problem is also a major problem that needs to be overcome when implementing telerehabilitation.

Very low-quality evidence suggested that family caregivers have a substantial demand for caregiving knowledge and skills, which can be solved by telerehabilitation. An evidence-based guideline for stroke caregivers recommended websites as critical platforms to provide caregivers with information about stroke treatment and prognosis (level 3) [36]. Zhao's study suggested that the low competence of stroke caregivers is due to a lack of knowledge and skills [20]. Almost all 16 RCTs in this study mentioned the importance of improving the knowledge and skills of stroke caregivers, but only four assessed the results specifically. Thus, it is necessary to assess the knowledge and skills of stroke caregivers in various ways. After all, the knowledge and skills of caregivers directly affect the effects of home rehabilitation in patients with stroke.

Multiform telerehabilitation can improve caregiving competence. However, the effects of multiform telerehabilitation on depression were not significantly different

from those of routine rehabilitation. Multiform telerehabilitation mainly provides interventions through at least two media to ensure patients and caregivers master knowledge and skills. This phenomenon indicates that multiform telerehabilitation has higher requirements for network equipment configuration than single-form telerehabilitation and routine rehabilitation. Unfortunately, no RCT has yet proven the hypothesis that multiform telerehabilitation may cause a waste of resources and increase the economic burden. In addition, more RCTs with direct and indirect comparisons between multiform telerehabilitation and single-form telerehabilitation are needed. In the near future, a network meta-analysis of multiform telerehabilitation, single-form telerehabilitation, and routine rehabilitation may be necessary.

The emotional state of stroke caregivers deserves attention, but it is often ignored. The current study cannot demonstrate the effectiveness of telerehabilitation in improving anxiety, depression, and self-efficacy. This finding did not mean that telerehabilitation cannot affect caregivers' emotions. Due to the inconsistent duration of intervention, caregivers' anxiety, depression, and self-efficacy may require long-term observation. Besides, limited studies also lead to nonstatistically significant differences. At present, telerehabilitation mainly provides caregiving knowledge and skills to help stroke survivors get better care and indirectly relieve the anxiety and depression of family caregivers. There is a lack of direct telerehabilitation interventions for caregivers' anxiety and depression symptoms. Healthcare providers should pay close attention to the psychological and emotional changes of stroke caregivers for a long time and take timely treatment measures.

The prospect of telerehabilitation for family caregivers of stroke survivors is broad and promising. Nevertheless, some challenges come along (1) the education level and digital literacy of stroke caregivers need to be taken into account while implementing telerehabilitation; (2) healthcare facilities need to complete the mechanism of telerehabilitation supervision to ensure the safety and effectiveness; (3) remote consultation and therapies need to be provided based on caregivers' physical and psychological stress. Most of the family caregivers in this study were aged between 25 and 84, indicating that the design of telerehabilitation should be more accessible and meet the personalized needs of different age groups.

Several limitations should be acknowledged in this systematic review. Firstly, most of the telerehabilitation programs were offered to stroke survivors and their family caregivers simultaneously, leading to the possibility of some interaction effects. Secondly, although we used SMD to combine the effect size, different measurement tools may bring potential heterogeneity. Finally, due to limited studies, subgroup analysis and sensitivity analysis were only performed in caregiver burden and depression. Thus, more high-quality RCTs should be carried out to support our results.

5. Conclusion

Providing telerehabilitation for family caregivers of stroke survivors can improve caregiver burden, knowledge, and competence. Multiform telerehabilitation plays a positive role in improving caregiving competence. High-quality studies and individualized telerehabilitation are needed to be tailed for family caregivers of stroke survivors.

6. Implications for Nursing Management

After stroke survivors are discharged from the hospital, their family caregivers typically take on the main caregiving role. Sudden caregiving task makes stroke caregivers more vulnerable to physical and mental stress, which is often neglected by medical staff. The emergence of telerehabilitation can help relieve caregivers' stress and improve their adverse outcomes. In addition, telerehabilitation provides a new form for nursing managers to make discharge plans for stroke.

Data Availability

The data supporting this study are from previously reported studies and datasets, which have already been cited.

Conflicts of Interest

The authors declare no conflicts of interest.

Acknowledgments

Supplementary Materials

Supplementary Table. 1. Search strategy. Supplementary Figure 1. Risk of bias graph. Supplementary Figure 2. Subgroup analysis. Supplementary Table. 2. Overall evidence quality of each outcome. (*Supplementary Materials*)

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Research Article

Toxic Absence: Why Leader Presence Matters in Times of Crisis

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Aims. This study examines the importance of senior-leader presence on the "frontline" in times of crisis. *Background.* The COVID-19 pandemic placed unprecedented demands on nurses charged with delivering critical care. Extant research suggests that the active presence of ward-level leaders has an important role to play in supporting frontline staff and mediating the negative impacts of stress and burnout. There is little evidence on the impact of senior leader presence or absence on the experience of frontline critical care nurses, particularly at times of crisis. *Methods.* A three-phase qualitative interview study of critical care nurses in the UK and Ireland. A total of 107 semistructured interviews with 54 nurses representing 38 different healthcare units. *Results.* Senior-leader presence at the time of crisis serves as an important symbol of organisational support. Where senior leaders are not meaningfully present, they risk allowing the necessary pain of difficult work situations to become toxic. Toxicity is manifested with increased staff stress, emotional ills, absence, and turnover. *Conclusions.* Senior leaders must balance their responsibilities for strategy and structures with the frontline presence required to shape a positive emotional climate. *Implications for Nursing Management.* Senior managers should consider supplementing their strategic focus with punctuated returns to the floor. Symbolically, leaders who get their hands dirty embody a sense of mutual struggle and practical support. Managerially, time on the floor increases the opportunities for collecting primary data to improve decision-making and support.

1. Introduction

Presence is an important component of nursing care [1, 2]. It describes an immersive interpersonal engagement with the patient as a person, tending to their specific claims, concerns, and needs as part of high-quality care. There is a small but growing body of evidence to suggest that presence might also be a central component in the support of nurses themselves. Ward-leader presence can help support and develop nurses in their work and careers [3, 4]. What is less well understood is the role "senior-leader" presence has on nursing work and well-being, particularly during times of crisis.

1.1. Critical Care, Presence, and Organisational Pain. At the best of times, critical care nursing is characterised by a "predictably unpredictable environment of chaos" [5]. The pandemic only heightened this sense with major changes in structures, routines, processes, location, staff, disease mix, and work environment. As infections, admissions, and deaths rose, critical care nurses fought to save patients who were sedated, intubated, often ventilated, and regularly isolated from those they loved [6]. Through it all, frontline nurses continued to provide much-needed human presence, where presence is about being there, face-to-face with the patient, and accepting responsibility for a unique individual

who should never be reduced to a disease type or patient category [1].

Presence is linked to, but goes beyond, daily routines, technical competencies, and the task-based concerns that characterise so much nursing work [7]. It speaks to a holistic, nontechnical practice that fundamentally shapes patient experiences of care and is associated with the alleviation of suffering and distress, reduced isolation, empowerment, enhanced cooperation, and improved outcomes [1, 7, 8]. As such, presence is a central tenet of compassionate, high-quality nursing care [8–10].

The presence at the bedside of the patient took a painful toll during the pandemic for nurses encumbered by PPE [11] and traumatised by the effects of COVID-19 working [12]. A 2021 UK survey found substantial rates of probable mental health disorders and thoughts of self-harm amongst ICU staff' with "nearly one in five nurses...working in ICU report(ing) thoughts of self-harm or suicide" [12]. These difficulties were "especially prevalent in nurses" [12], who were substantially more likely to suffer serious mental health problems during the pandemic compared to other health-care occupations. High levels of anxiety, depression, and PTSD in nurses on the frontline have also been found in similar studies in China [13], Italy [14] France [15], Turkey [16], and Canada [17]. In the USA, 66% of critical care nurses surveyed considered leaving nursing in light of pandemic experiences [18]. In organisational terms, these are the toxic effects of painful work.

1.2. Toxicity, Presence, and Leaders. Frost [19] notes that pain is a fact of organisational life. People make un-reasonable demands, communication goes badly, coworkers are insensitive, and leaders may be hurtful. Work can also be excessively demanding–especially at times of crisis [20]. These painful experiences become toxic when they are left unrecognised and untreated, particularly in the face of "emotionally insensitive attitudes and actions on the part of managers" [19]. Untreated, everyday organisational pain can poison "a person or an entire system: toxins spread and seep, often undetected" [19]. As in the case of critical care nursing during the pandemic, these toxins manifest as emotional distress, absence, and turnover on the part of workers [12, 18]. And yet, toxicity can be ameliorated [21].

Frost [19] contends that leaders have a significant role in tackling the sources and effects of toxicity. He specifically notes the importance of leaders "maintaining a presence in the face of great suffering" [19], where presence infers person-centredness, compassion, active listening, and acknowledging and responding to the needs of others (note the overlaps between the prescription for leader presence at the site of toxicity and nurse presence at the bedside of the patient [1, 3, 4, 7, 8, 19]). Indeed, within the context of ward-level management, leader presence is positively associated with nurse development, better communication, and improved formal and informal support [3, 22, 23]. Beyond healthcare, there is a growing body of research that recognises the im-portance of dealing with the sources of pain identified by Frost [19], whether this is through the presence of HR

departments in handling pain [24], boards of directors guarding against toxic cultures [25], managers promoting ethics of care [26, 27], or reflective leaders pursing com-passionate rather than harmful decisions and behaviours [20, 28, 29]. Within the context of COVID-19, there has also been a growing emphasis on the need for leaders to dem-onstrate a commitment to evidence-based decisions, effective communication, shared purpose, empathy, well-being, and trust [20, 30–33].

What is not clear—particularly in respect of critical care nursing—is the role that meaningful *senior-leader presence* may have in tackling organisational pain and preventing toxicity at times of crisis. For the purposes of this study, senior leaders are identified as nurses in band 7 or above. Often referred to as "Senior Sisters" within the UK NHS, these nurses take on management responsibilities, have highly specialised knowledge (often at Masters level), and may undertake tasks usually associated with doctors. Senior leaders also include medical consultants and nonclinical leaders above ward level (e.g., CEOs, heads of human re-sources). These categorisations are also reflected in the data (below) where nurses at level 7 or above are referred to as "seniors" by respondents.

Focusing on these more senior leaders is important given that extant studies tend to be small-scale and focused on ward-level leadership [3, 4]. Where research does talk about the role of more senior leaders (see [22], it has little to say about either the presence or absence during times of crisis. Analysing the interview data from 54 critical care nurses in the UK and Ireland, we consider how nurses perceived the presence and absence of their senior leaders on the frontline during the first two waves of the COVID-19 pandemic. We assess the conditions in which critical care nurses worked, the impact of those conditions on their well-being, and the extent to which senior-leader presence and absence ame-liorated or exacerbated those conditions.

2. Methods

2.1. Sample. A study of critical care nurses was undertaken so that we might better understand the work and experiences of those working at the extreme edge [34, 35] of the COVID-19 pandemic: work rendered extreme by virtue of proximity to death, personal physical danger, and gruelling working con-ditions. Participants were targeted through a call on a social media platform by the British Association of Critical Care Nurses (BACCN). A total of 54 nurses were recruited from 38 hospitals in the UK ($n = 52$) and Ireland ($n = 2$). All partici-pants were critical care nurses, with between 2 and over 30 years' experience, who worked in an adult intensive care unit during the COVID-19 pandemic.

2.2. Data Collection and Instruments. The data were gath-ered through longitudinal, semistructured interviews. Three phases of interviews were conducted with a view to considering whether particular issues, concerns, or themes persisted, diminished, or emerged as the crisis unfolded (e.g., did pandemic working have a cumulative impact on

nurses; did support improve over time?). The first phase of interviewing commenced in September/October 2020, the second in January/February 2021, and the final phase in May/September 2021. The timing of the interviews was both to accommodate participants' availability but also to capture "critical moments of change and transitions" [36] throughout the pandemic. Table 1 presents the attrition rates and average duration of interviews across the three phases (reflecting increasingly restricted availability due to work and ill-health).

Interviews were conducted using video conferencing software (e.g., Zoom, Teams, Facetime) to comply with the social distancing requirements and enable swift access to participants nationally. Semistructured interview guides identified key issues for discussion (career, experience, COVID-19, support, emotions, challenges, and changes) while retaining flexibility to consider emergent issues and concerns. Conscious of the potentially emotional nature of interviews, we provided a direct referral pathway to free counselling through BACCN for participants.

2.3. Data Analysis. The interviews were professionally transcribed. The data were analysed through NVivo using an inductive thematic approach based on a constant comparative method [37] with a view to examining and comparing the actions, experiences, processes, reactions, and interpretations of those engaged in critical care COVID-19 work. Detailed reading and coding of the data by the first and third authors individually was followed by careful comparison of emergent codes, themes, and patterns before reanalysis. This iterative process resulted in eleven primary themes (see Table 2) that were then collated under three meta-headings. Within the analysis (below), quotes are used to represent a wider class of issues/codes, with longer or multiple quotes being used to build a narrative sense of the category, issues, and lived experience.

3. Results

3.1. The Organisational Pain of Crisis. All of the nurses interviewed experienced a sense of personal and professional upheaval in the face of the pandemic. The scale of demand threatened to overwhelm critical care units. Nurses were required to transition from dealing with one or two patients in the ICU to caring for up to six critically ill COVID-19 patients at a time. Treatment plans were unclear, and the initial prognosis was bleak for prevaccine patients. Normal modes of working were undone. New protocols were devised, implemented, and changed to cope with the emergent disease and develop knowledge. Uncomfortable and depersonalising PPE became mandatory (though not always available during the first wave). Wards were isolated, expanded, or moved. Noncritical care specialists drafted from other wards had to be trained and overseen. Death tolls rose, and families were excluded. The impact on critical care nurses was immediate, enduring, and profound.

TABLE 1: Interview numbers and duration.

	Phase 1	Phase 2	Phase 3
Participants	54	29	24
Average interview duration (minutes)	75	55	30

"I'm trying not to use swear words here. It was shit. It was awful". (CCN20-phase1)

Bearing witness to large-scale deathscapes, patient suffering, and family trauma took an emotional toll on nurses. Some spoke of being "in counselling now" (CCN29-phase1) while for others the strain of long shifts, inadequate provision, and patient suffering led to hysteria.

"I went for a run to the park... I thought I'd lost my mind. I had to stop running and I was just hysterical crying in the middle of a park and I couldn't calm it down... [Next] morning, from the moment I opened my eyes, hysterical, again" (CNN42-phase1).

In each phase of interviewing nurses spoke of how the burden of dealing with difficult emotions during successive COVID-19 waves led to emotional pain and psychological suffering. Examples included "night terrors" (CCN44-phase1) sectioning and suicidal thoughts:

"... more nightmares and like flashbacks about my patients; and yeah–this is the bit that will like shock you now–I was sectioned twice over the summer under Section 2" (CNN16-phase1)

"I had a really, really down month where I was feeling really suicidal and all I could think in my head was I just want to go into work and get some drugs and just kill myself" (CNN16-phase3).

In some hospitals' sickness, absenteeism, and nurse turnover led to "a really bad staffing crisis" because "everyone's dropping like flies" (CNN2-phase2) as the toxic effects of COVID-19 working manifested through "a lot of nurses off sick with stress, anxiety, and posttraumatic stress disorder" (CNN48-phase2). Faced with these painful experiences, nurses spoke of the need for support, coupled with frustration where it was absent.

3.2. Toxic Absence. Nurses spoke highly of informal peer support on the wards (among band 5s and band 6s) though this was limited by the closure of staff rooms, lack of time, and difficulties communicating through the strictures of PPE and social distancing. There was also gratitude for what Søvold et al. [38] label "short-term mood boosters" such as free food, pampering, and clapping. Counselling or debriefing after difficult shifts was wanted but was all too often unavailable or inaccessible.

Primary themes	Meta-theme
Experience Pain Impact on nurses (burnout, exit, illness, and dismay)	Organisational pain and crisis
Need for support Absence Abandonment Toxicity	Toxic absence
Lack of understanding Demands and decisions Performative/show Desired presence/hands dirty	Detached leadership

Immediate collegiate support was contrasted with what many described as the failures of hospital leadership and management. There was a perception that leaders (from band 7 upward) neither understood nor supported nurses on the ground.

"The only people that has supported us is each other... I don't think our management have got any real understanding of what the intensive care nurses have been through, and I don't feel like we've been offered any real support really.... We're all really scared at the minute" (CNN23-phase1)

Many felt abandoned by senior leaders who appear to have "hid in their office."

"It's almost like they [senior-leaders] hid in the office. ... It's almost like you were PPE'd up and they pushed you in and shut the doors, and then they're like, "You've got to stay in there now." It's like, "Are you joking?" (laughs). Completely abandoned. Honestly, that's the only word I can describe it with, abandoned by the senior team. It was awful." (CNN26-phase1)

Others referred to nurses being used as "cannon fodder" (CNN012-phase1) by senior leaders who would rather stay in their offices than share the risks that nurses faced hourly.

"When we were working shifts, gruelling shifts–we'd have seniors sort of passing messages through the door because they didn't want to come in; and just sort of opening the door and shouting things; "this has to be done." (CNN045-phase1)

"It's an ongoing joke in my work that we never saw any of our band 7s in the pandemic and we were like, maybe they were on holiday because we–I never saw one of my band 7s in PPE once! It just didn't happen." (CCN22-phase1)

Similar criticism was levelled at leaders from other professions. Doctors in particular were singled out. Compared to nurses as "cannon fodder," doctors were positioned as too important to be risked on COVID-19 wards.

"There was definitely that sort of hierarchical, "we're doctors, we're important, if we get it, then who's going to look after the patients." We were like, you're not even looking after the fucking patients, it's us that's looking after the patients." (CNN12-phase1)

"What you found as well is that none of the doctors, not even the consultants, nobody liked being on the unit. You felt really alone. Really unsupported and in a dangerous environment if I'm perfectly honest. We were really isolated." (CCN23-phase1)

"And a lot of us did say that the doctors, that there should be more–there should have been more of a presence." (CCN41-phase1)

For some, the absence of senior leaders stood as a repudiation of the suggestion that nurses and their leaders were "all in it together."

"They tell us "we understand. Our door's always open. Come and talk to us. We're all in this together." More and more of us are thinking well, "no we're not, are we? We're not in this together. You have never been on the unit in full PPE for hours on end. You've never dealt with the relatives. You've never dealt with the distressed patients." We really feel like we're just sort of, I don't know, almost pawns that are just being sent down the pit, if you like." (CCN47-phase1)

Symbolically, the absence of senior leaders fed a discourse of abandonment. That leaders appeared unwilling to serve alongside critical care nurses on the frontline fed a narrative of neglect, disillusionment, and ultimately demotivation. The apparent desire to protect seniors and other occupational groups reinforced a sense of nurses as low-value players "pawns" readily sacrificed at the start of a longer campaign by leaders who "don't really care about how you are doing; how hard it was for you" (CNN22-phase1). For nurses, it spoke to a lack of understanding rooted in detachment.

3.3. Detached Leadership. For nurses, absent leaders lacked the on-the-ground knowledge and understanding required to "give any support" (CNN20-phase2) to the frontline:

"So the management never came in. Not once did they walk through the door. So, they couldn't even see the chaos of stock and patients and all this kind of stuff. Then every now and again you'd get a little note saying "Please ensure the mouth care is done on these patients" and you'd think, sod off (laughs)!" (CCN37-phase1)

In the above extract, lack of meaningful presence is linked to organisational failings associated with "chaos" and out-of-touch leaders whose requests engender resistance. The perceived detachment of senior leaders from the lived experience of COVID-19 work meant that top-down decisions were seen by nurses as misplaced, unhelpful, or

unrealistic. There was disillusionment and anger at being criticised for not having completed business-as-usual organisational tasks such as performance reviews.

"when the second wave was over, within the first week . . . I had an e-mail saying, "You've got eight PDRs that are all out of date. When are you getting the—?" It's like, right, that's over with now, you crack on and get back (laughs) to your normal job (CCN21-phase2).

By phase three, the result was "a lot of bad feelings towards managers who are just shovelling more work your way and not supporting you" (CCN33-phase3). What nurses wanted was meaningful leader presence. They wanted a physical, temporal, and relational commitment to being there, helping, understanding, and caring for those who risked and laboured at the frontline. Cursory or "other" focused leader appearances that were "just for show" (CNN33-phase1) did more harm than good.

"I think one of the band sevens, I think I saw her on there once, and that was because she was showing the chief exec around. It caused a bit of bitterness really" (CNN47-Phase1)

'As soon as a camera comes around to report, they're [doctors] in PPE and they're in there and they're pretending that they're always there." (CCN25-phase2)

"watching the sevens parade around in a yellow apron and an FFP3 but not actually interact with us, it kind of stung . . .. and you could hear people just having a bit of a weep" (CCN6-phase1).

The above examples of leader presence for "show" served to increase toxicity by invoking contempt, bitterness, and tears. Nurses wanted leaders who could make decisions based on visibility and first-hand understanding of conditions on the ground.

"I think looking back, I think having our unit manager, matron, more visible. Get your PPE on, come in and help us roll patients. Don't worry about paperwork over there, that can be done another day. I suppose it's understanding what pressures we're under. . . it's for senior people to take that on board and listen." (CNN46-phase1)

"I think if they were more visible I think that would have helped. . . I think if you had proper leadership, it would've been so much easier" (CNN26-phase1)

Occasional examples of where leaders were meaningfully present and were seen as supportive stood in sharp relief to the experiences of absence and abandonment. As one critical care nurse noted:

"I mean some of the senior nurses are absolutely fantastic–the majority of them are. . .. if everyone's supporting each other, I think people feel less stressed, which you know, is definitely going to have a positive impact on

everything really, you know, work, getting things done, looking after people efficiently." (CCN9-phase1)

Where senior leaders were present and nurses felt supported, they were far more likely to report positively on their ability to work through and cope with crisis. They responded positively to senior leaders who were present to ask "how are you feeling, how are you getting through this" (CNN45-phase1) and applauded matrons whose presence meant they were able to "see what's needed" and were willing to "shout loud" in order to provide support (CCN41-phase2). Senior leader's (medical or nursing) willingness to get their hands dirty —"to clean a patient up, full of poo" (CNN46-phase1)—was also taken as a sign of togetherness. In these contexts, presence mattered.

4. Discussion

This paper has focused on critical care nurse accounts of senior-leader absence during a period of crisis. The crisis—the global COVID-19 pandemic—radically transformed the nature, quantity, and experience of work for those on the frontline of our critical care units. An already dynamic and complex nursing environment was further complicated by uncertainty, changing rules, excessive demands, long days, and difficult patient/family encounters that took a painful toll on nurses. As observed elsewhere, the organisational impacts included increased stress, exhaustion, mental illness, absenteeism, and exit on the part of nurses [39].

While the extant literature acknowledges the important role that leadership has to play in exacerbating or ameliorating pain and toxicity [24, 25, 28, 29] with the latter work shedding some light on the impact of the global pandemic [33, 40], there is limited understanding of the role of leadership presence/absence, particularly where people work at the edge of crisis [35]. Our research addresses this gap, extending and explaining Frost's [19] original contention that leaders should be present in the face of suffering. Specifically, we show how the absence of senior leaders from the crisis frontline exacerbated the organisational pain and personal suffering of nurses to the detriment of individuals and their organisations (with ill-health, sectioning, and professional exit being included among the more negative effects). Where senior leaders failed to maintain a "presence in the face of great suffering" [19], nurses talked of being abandoned and sacrificed by those more senior than themselves. Rather than being supported, there was a feeling that senior leaders did not care about or understand the experiences of COVID-19 nursing. Without "being-there" nurses struggled to see how senior leaders could make decisions that facilitated rather than hindered their work.

We recognise that there are good reasons why leaders might be absent: poor resourcing, time pressures, role conflicts, unrealistic expectations, and an overemphasis on surveillance metrics and measurement [3, 5, 9] which combine to relegate relational work to an afterthought. Nor are we suggesting that senior leaders should abandon their

strategic and operational tasks in favour of permanent residence on the crisis frontline. What we do call for is a recognition on the part of senior leaders that their behind-the-scenes work may be undermined if they are never seen on the floor, particularly in times of crisis.

As Kanter [41] notes, senior leaders are "responsible for the big structures that serve as the cornerstones of confidence and for the human touches that shape a positive emotional climate to inspire and motivate people" [41]. This requires contextually sensitive balancing of strategic and relational responsibilities that must be finessed over time. While the "ward manager who wants to exercise nursing leadership, has to take time and be present in daily work" [3], senior-leader presence is more punctuated and adaptive depending on the issues and context (e.g., less during periods of relative stability, more at times of crisis). Such an approach responds to frontline nurse demands for senior leaders who are willing to take the time to "see things with their own eyes" [23].

Building on Frost [19], we would argue that taking time to "be there," maintaining a meaningful presence in the face of worker suffering, is a prerequisite to providing support and preventing painful working situations from becoming toxic. While other studies emphasize the need for pandemic leaders to base decisions on evidence and work to develop a shared purpose [31], we would add that in certain contexts—such as critical care—presence on the ground is often a prerequisite to such endeavours. A degree of relational presence is part of caring and emotionally sensitive management rooted in listening and decision-making based on first-hand information [20]. It is only by visibly understanding and sensitively addressing the pain experienced by critical care nurses in times of crisis that leaders can hope to prevent difficult situations from becoming toxic.

Finally, there is the symbolic value of presence. Where leaders are seen getting their hands dirty in nursing tasks, they may reduce any sense of discriminatory hierarchy and the toxic implications of a them-and-us culture. Such presence also counters any sense of frontline workers being abandoned or sacrificed in so far as leaders can be seen to share (in some limited way) the risks and rigours faced by nurses.

4.1. Limitations. The study provides a timely, in-depth account of one of the most important (and extreme) care contexts during the pandemic, as experienced by those who arguably spent most time with the critically ill and dying. It reverses the tendency in management research to focus on the views and evaluations of organisational elites (though future research might compare elite and frontline perspectives). Future studies might also offer comparisons of different geographies as well as national, ethnic, and organisational cultures.

5. Conclusion and Implications

Our contention is not that senior leaders were the primary cause of the difficulties experienced by critical care nurses. Nor are we suggesting that leaders themselves were unaffected by the multiple demands and pain of pandemic work [11].

Our point is that senior leaders must balance their responsibilities for strategy and structures, with the frontline presence required to help address organisational pain and shape positive emotional climates [20]. Symbolically, leaders who get their hands dirty embody a sense of mutual struggle and practical support. Managerially, time on the floor increases the opportunities for collecting primary evidence on the impact the specific circumstances, actions, and resourcing with a view to improved decision-making and support.

Data Availability

Informed consent was not gained to release the raw qualitative data for third party use due to ethical, confidentiality, and privacy concerns arising from the sensitive nature of the data as it pertains to individuals and their places of employment.

Ethical Approval

Ethical approval for the research was received from Durham University in May 2020.

Disclosure

BACCN were not involved in the research, analysis or dissemination.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

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Research Article

What Are the Factors That Influence Job Satisfaction of Nurses Working in the Intensive Care Unit? A Multicenter Qualitative Study

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Aim. To explore and describe the factors that influence the job satisfaction of nurses working in the intensive care unit (ICU). *Background.* High turnover and dropout rates of nurses currently put pressure on the accessibility and quality of ICU care. Job satisfaction is an important predictor for turnover. However, there is little knowledge about the factors that enhance or frustrate the job satisfaction of ICU nurses. *Methods.* A qualitative descriptive study was conducted from March to July 2022. Semi-structured interviews were held with 23 registered nurses who were purposively sampled from the ICU in four hospitals in the Netherlands. Interview transcripts were analyzed by using a thematic content analysis approach. *Results.* Six themes emerged: (1) being part of a solid team; (2) professional autonomy; (3) competence development; (4) appreciation of work by others; (5) work content; and (6) human resource management. Interviewees described the importance of being part of a team, having professional autonomy and opportunities to develop and remain challenged as a professional. In practice, these needs are often not met. Interviewees expressed their own role in meeting these needs by taking charge in situations, being eager to learn, and actively looking for ways to keep work attractive. Recognition and appreciation for their work are important catalysts for staying motivated. Monotonous work, poor leadership, and bureaucracy reduced their job satisfaction. *Conclusion.* Our findings provide deeper insight into a range of factors that influence the job satisfaction of ICU nurses and may also apply to nurses in other settings. Practical recommendations are given for keeping the nursing profession attractive for the current and future generation. *Implications for Nursing Management.* Findings emphasize the importance of optimizing nurses' work conditions by investing in their social embeddedness, professional autonomy, opportunities for competence development, and appreciation of work.

1. Background

Due to an increasing demand for healthcare and a growing shortage of nursing staff, healthcare services are increasingly experiencing difficulties in providing accessible and high-quality care on a continuous basis [1, 2]. Moreover, staff shortages can jeopardize patient safety, especially in clinical departments where highly qualified nurses are needed, such as in the intensive care unit (ICU) [3, 4].

Job satisfaction is an important predictor for the turnover (intention) of nurses [5–7], which in turn contributes to staff shortage. Job satisfaction can be defined as the degree to which individuals feel positive or negative about their job [8]. Others described job satisfaction as an attitude or emotional response to one's tasks as well as to the physical and social conditions of the workplace [9], or as a pleasurable emotional state resulting from one's job [10], which is often determined by the degree of motivation in doing job activities and the extent to which basic psychological needs at work are met, namely, autonomy, relatedness, and competence [11, 12]. High turnover rates among nurses in many countries show that job satisfaction among this group of professionals is under pressure [13–15]. A recent meta-analysis of 18 cross-sectional studies including ICU nurses from 23 countries showed that more than 27% had the intention to leave the ICU or the nursing profession [16]. In addition, the corona pandemic has taken its toll on the nursing workforce and increased the risk of drop out due to

mental problems. Recent nationwide surveys among ICU nurses in the Netherlands showed that one in three are considering quitting their job [17, 18]. As a result of the growing shortage of ICU nurses, the workload increases, and this puts additional pressure on the remaining staff [18, 19].

Despite its predictive value on the turnover of nurses, insight into the factors that enhance or frustrate ICU nursing satisfaction lacks. A large body of literature focused on nursing satisfaction levels and contributing factors. However, reviews showed that studies including ICU nursing staff were performed more than a decade ago and generally used quantitative methods, which are insufficient for fully understanding the underlying factors for (dis)satisfaction [20, 21].

A better understanding of the factors that enhance or frustrate job satisfaction among ICU nurses, based on their daily experiences, is needed to find ways or support current initiatives for improving job satisfaction in order to retain nurses for the ICU profession. Moreover, this understanding could also be beneficial for managers outside the ICU setting dealing with high nursing staff shortage and turnover. Therefore, we conducted a qualitative study among ICU nurses to explore what factors influence job satisfaction in daily ICU practice.

2. Methods

2.1. Design, Setting, and Participants. This study used a qualitative descriptive design to understand the ICU nurses' perspectives on factors influencing job satisfaction. Registered nurses with a postgraduate qualification or specialized training in critical or intensive care nursing and employed (fulltime or part-time) by the ICU were eligible for participation. Unit or nurse team leaders were excluded as we wanted to gain insight into the perceptions of those who are primarily responsible for delivering bedside care and not from those who are (partly) responsible for creating and maintaining optimal working conditions for ICU nurses. The nurses were recruited at one academic and three regional hospitals in the eastern part of the Netherlands. Like in most other high-income countries, there is a shortage of specialized ICU nurses in the Netherlands which can impact nurses' job satisfaction. Moreover, the percentage intention to leave and the burnout prevalence among Dutch ICU nurses are fairly generalizable compared to other high-income countries [16, 22]. Therefore, we assumed that the insights on job satisfaction from this Dutch study sample would also be of value to the nursing audience outside the Netherlands. Purposive sampling was used to recruit a heterogeneous sample across a number of characteristics (age, work experience, and hospital/department) in order to obtain as many different perspectives as possible. Eligible candidates were identified through contact persons and interviewees themselves (snowball sampling) and then approached by e-mail to participate in the study.

2.2. Data Collection. After obtaining informed consent, 23 interviews were held between March and July 2022. The interviews were semistructured and conducted face-to-face

at the participant's work location by one of the authors (FB). Interviews were held in a private room with a closed door to allow participants to talk openly about their job satisfaction. The interviewer, a registered hospital nurse following a two-year master program in Public Administration, was trained in conducting interviews prior to this study. Interviews were held using a guide with initial questions and probes (Supplement 1, interview guide). The interview guide was developed using sensitizing concepts found in the literature on determinants of job satisfaction and in discussion with researchers with a background in health and organizational sciences (GH, MZ). Sensitizing concepts, a starting point for much of qualitative research, give guidance when approaching a phenomenon or experience but do not prescribe what the researcher should see; rather, they suggest where a researcher might want to look and sensitize them to possible lines of inquiry [23]. Interviewees were encouraged in the interviews to substantiate their perceptions on the basis of concrete experiences. Interviews lasted between 21 and 54 minutes.

2.3. Data Analyses. All interviews were audio recorded, transcribed verbatim, and then systematically analyzed according to the principles of thematic content analysis [24]. The analysis started with reading and re-reading the first three transcripts to become familiar with and gain an overall sense of the content. Subsequently, FB generated initial codes by providing conceptual labels to relevant text passages representing an influencing factor. The generated codes were based on the data itself and driven by theoretical models on job satisfaction and work motivation [11, 12]. This resulted in the development of an initial codebook that, after being discussed and revised by GH and FB, acted as a blueprint for the coding of new transcripts. After the analysis of each new transcript, FB critically examined the list of codes for relevance, uniqueness, and formulation and made revisions when needed. Codes that referred to the same underlying concept were grouped into categories and then placed in overarching themes. In several rounds, codes, categories, and themes were discussed between two researchers (FB and GH) to reach agreement on structure, wording, and relevance. In case of disagreement, a third researcher (MZ) was consulted. Data collection and analyses stopped after no new findings emerged, and data saturation was reached. Illustrative quotes were selected to support the main findings. Data analyses were supported by using a qualitative data analyses software program (Atlas.ti Version 22). The themes, categories, and quotes were translated into English by GH and checked on spelling, grammar, and content by FB and MZ.

2.4. Ethical Considerations. The local medical ethical committee "CMO Arnhem-Nijmegen" approved the study (identification number: 2021–8156). Written informed consent was obtained prior to the interview. Participants were informed that they could refuse to answer any questions or withdraw from the study at any time. Participant

TABLE 1: Participant characteristics ($n = 23$).

Characteristics	Score
Gender	
Female, n (%)	15 (65.2)
Male, n (%)	8 (34.8)
Working experience as an ICU nurse, median (range)	15 (2–32)
Age in years, median (range)	42 (24–57)
Age category	
24–30 years, n (%)	4 (17.4)
31–40 years, n (%)	6 (26.1)
41–50 years, n (%)	7 (30.4)
>50 years, n (%)	6 (26.1)
Hospital type	
Academic, n (%)	14 (60.9)
Regional, n (%)	9 (39.1)
ICU = intensive care unit	

confidentiality was ensured by deidentifying interview transcripts, and only research members had access to the data.

2.5. *Rigor.* The research was conducted and reported with accordance with the Standards for Reporting Qualitative Research (SRQR) to ensure study trustworthiness [25]. Transferability is supported by providing contextual information such as age, hospital type/work setting, and working experience in the ICU (Table 1). This allows the reader to determine if the findings apply to other similar populations. By frequently reflecting on the interviews and the meaning of data with a group of researchers with different professional backgrounds, we have tried to limit the influence of personal experiences and subjectivity in the research process and meet the requirements of reflexivity [26]. To ensure credibility, at the end of each interview, the conversation was summarized and interviewees were given the possibility to reflect and comment on the accuracy and validity of the obtained information.

3. Results

3.1. *Participant Characteristics and Identified Themes.* Demographic characteristics of the 23 participants are presented in Table 1. Most participants were female (65%) with a median age of 42 years (range 24–57). Most of the interviewees were experienced ICU nurses (median 15 years) and worked in the ICU of a university hospital (61%). Educational level was almost equally distributed. The analysis resulted in 21 categories from which six themes emerged. The themes, categories, and interview quotes are shown schematically in Supplement 2 (Supplement 2, Table with themes, categories, and interview quotes). The findings are discussed in more detail below for each theme.

3.2. *Being Part of a Solid Team.* All interviewees indicated the importance of *stable teams and team membership*. Being part of a close-knit team of colleagues makes it easier to give and receive professional and personal support, and to share joys and sorrows. It also provides more room for small talk and a pleasant collegial *atmosphere*. Interviewees argued that these aspects are important in their work where they are structurally dealing with emotional situations and work under pressure with a lot of responsibility. According to interviewees, the importance of working in a team became particularly clear during the corona pandemic. While some could fall back on the social ties and support within their team, this was missed by others due to constantly changing team compositions.

> *We're dealing with complex and difficult work here. A lot of people don't make it anyway. And you need a very strong team for that, around you, to be able to handle all of that. [Nurse 1]*

3.3. *Professional Autonomy.* Experiencing autonomy—or the lack of it—also impacted the job satisfaction of many interviewees. With professional autonomy interviewees meant the ability and freedom to act independently and influence treatment decision based on their own professional nursing insights.

> *The fact that I experience little autonomy affects my job satisfaction. (...) I also just want to have some autonomy and be able to determine things myself without a doctor always having to look over my shoulder, telling me things to do or having an opinion about my work. [Nurse 4]*

Interviewees experience a *varying degree of professional autonomy*. Many referred to the *work culture* in their ICU as an important factor limiting or increasing their autonomy. On the other hand, interviewees described that professional autonomy of nurses in their ICU is also strongly determined by nurses' *personal characteristics* such as assertiveness and working experience.

> *We are too humble. We let others lead us too easily. This also applies to me. I don't always grab that autonomy when it's there. And why? I think that's because we lean back too much and then we start to complain that we don't have it while we don't take it either. [Nurse 14]*

3.4. *Competence Development.* Having *opportunities to develop and specialize* in the field of nursing and ICU care was also often cited as an important factor for job satisfaction. Interviewees referred to the importance of following education, visiting symposia, participating in working groups, and picking up areas of interest on specific care themes such as pressure ulcer prevention, and palliative and comfort care. Apart from enriching their day-to-day bedside work, interviewees indicated that these activities also help them to increase their career prospects. Interviewees indicated that competence development needs to be stimulated and facilitated by the hospital and ICU management providing sufficient budget and available time for abovementioned activities.

The feeling that those opportunities are there and that they are offered from the department, that's reassuring to me. That you can develop further if you wanted to. [Nurse 10]

Job satisfaction is also influenced by the presence or absence of a *learning mindset* of ICU nurses themselves, for example, by being open to new working methods and by approaching complex patient cases as a challenge and learning opportunity instead of a problem or burden.

Finding joy in work is mainly about keep challenging yourself and being able to grown as a professional (...) For example, by having the right mindset when you are dealing with a complex patient case. [Nurse 16]

Furthermore, *variation in job tasks and working with different patient categories* contributes to job satisfaction, according to most interviewees. On the contrary, performing monotonous work leads to boredom and dissatisfaction.

I like doing things besides taking care for patients. For example, I participate in several committees. So variety of work is very important to me. If I had to do the same thing every day, day in, and day out. I would find that very boring. [Nurse 14]

3.5. Appreciation of Work by Others.

Interviewees derive great satisfaction from the *appreciation of their nursing care by patients and relatives*, for example through thank-you cards and the feedback they receive from colleagues in the post-ICU clinic. These forms of appreciations are important to them as it directly touches their core motive for being a nurse, namely to make a difference for someone in need of care. *Appreciation from supervisors and co-workers* via a compliment or a pat on the back were also mentioned as important drivers for job satisfaction.

Of course everyone wants to be seen and appreciated. That's vital for enjoying work. Without that, you won't be seen and everything stops. [Nurse 6]

According to interviewees, salary does not directly affect their job satisfaction. However, most of them do experience *an imbalance between the amount of their salary and the nature of their work* (e.g., irregular working hours, major responsibilities, and emotional impact). According to them, this imbalance contributes to a negative atmosphere of underappreciation and frustration in the workplace that, in turn, negatively affects their job satisfaction.

When I compare my wage and the responsibilities in our work to other professions, I don't think it's very equally and fairly distributed. (...) It doesn't necessarily affect my job satisfaction though. I chose this job and I knew what I was getting into. I knew I wasn't going to sit in an office and paid tree times more than what I'm earning right now. (...) But because everyone is talking about that, especially after COVID, it does make you think about it and feel: "Oh, what we are doing is not fully appreciated". [Nurse 12]

3.6. Work Content.

Interviews show the positive and negative impact of ICU nurse activities on job satisfaction. In addition to providing patient care and *supervising nursing students*, many interviewees derive great satisfaction from family *counseling*. The impact of an ICU admission on family members—due to the uncertain course and unstable condition of most ICU patients and the limited communication possibilities with the patient—makes this guidance role very meaningful to them.

A couple of work activities were frequently mentioned as factors reducing job satisfaction. Performing *basic nursing tasks* such as cleaning and mobilizing ICU patients were regarded as necessary but less enjoyable, or at least, not the tasks for which they became ICU nurses and draw energy from. Furthermore, interviewees were frustrated by the *administrative tasks* they often regarded as unnecessary and time consuming. Moreover, the administrative work comes at the cost of activities they perceive more valuable and derive satisfaction from, namely, the care and attention for ICU patients, and their loved ones.

Figuring out how to then get a certain bed or material to the department, for example. (...) Those are not the things that make my job more fun. It's mainly the extra effort and amount of paper work that makes it less attractive. [Nurse 21]

Finally, some interviewees indicated that their job satisfaction has decreased since the more complex and specialized care is no longer provided in their hospital and work mainly consists of less complex and standard nursing care.

3.7. Human Resource Management.

Several interviewees described how the active *involvement of managers* and their action-driven approach regarding problems in the ICU positively affected their joy in work. However, the majority experienced the opposite: upper management is often invisible, lacks empathy, and is unaware of what is going on in the workplace. Problems and concerns that exist at the work floor, for example, regarding workload and care-specific themes, are not sufficiently addressed. This experienced *gap between management and the work floor* frustrates interviewees. Especially, since in their view, the management is responsible for creating the conditions within which they can do their work well and with joy. Interviewees also described their frustration with *bureaucracy* in the hospital. The realization of promising quality improvement initiatives, developed bottom-up, are often hindered by the involvement, and formal approval needed from many parties.

Practical ideas for improving care or tackling a problem in the ICU are often hindered by bureaucracy. Such practical initiatives have to pass a x-number of people and require formal approval. (...) In the beginning it motivated me, but at a certain moment I started to notice that nothing really happens. When new ideas are mentioned I tend to think: "Never mind, forget it." [Nurse 16]

TABLE 2: Recommendations for policy-makers, managers, and health professionals to improve job satisfaction of ICU nurses.

Category	Recommendations
Recognition and appreciation	(i) Pay attention to what is performed well by ICU nurses, and tell them where their specific knowledge and skills have made the difference (ii) Value and facilitate the (provision of) feedback of former ICU patients and relatives (e.g., through aftercare clinic or mirror talks) so that ICU nurses are better informed of the value of their work
Leadership	(i) Provide leadership and mentorship training for team leaders and senior nurses so that they are able to perform their roles well (e.g., visible, accessible, empathetic, and action-oriented)
Social bonding and team spirit	(i) Provide solid team structures; limit constant personal changes within the teams (ii) Provide adequate means to promote social contact among colleagues (e.g., budget and space for social activities)
Work-life balance	(i) Promote self-care and provide ways for recuperation from work (e.g., sufficient breaks, healthy food and drinks, space for relaxation and leisure time) (ii) Offer nursing shift flexibility and choice by the use of a self-rostering system
Autonomy and role	(i) Encourage ICU nurses to act independently (within set boundaries) and express confidence in doing so (ii) Encourage the active participation of ICU nurses in treatment decisions. This requires a work environment in which all professional opinions are valued and taken seriously
Professional development	(i) Coach ICU nurses in their individual career aspirations and prospects within the ICU (ii) Provide budget and time for ICU nurses to follow courses and training programs and visit symposia/congresses (iii) Encourage ICU nurses to work on quality improvement on a certain topic of interest (e.g., participation in a committee) (iv) Create possibilities for job variation (e.g., via nurse exchange programs between ICUs in the region) and job-sharing (e.g., working partly in the ICU and in the emergency department or as an EMT/ambulance nurse)
Administrative tasks	(i) Review administrative duties of ICU nurses and eliminate those that do not contribute to quality improvement or are not necessary for accountability purposes

ICU = intensive care unit; EMT = emergency medical technician.

Interviewees furthermore referred to the *availability of basic work facilities* at the workplace as factors influencing job satisfaction, such as sufficient parking space, healthy food and drink options, and a dedicated place in the ICU for professionals to destress and relax. Finally, the absence of self-rostering or having a little *influence in scheduling work shifts* was often mentioned as a factor reducing joy in work.

4. Discussion

This qualitative study provides a deeper understanding of the factors that positively and negatively influence job satisfaction of ICU nurses. In accordance with the previous literature [20, 21], the findings show that job satisfaction is largely determined by the extent to which certain needs are met. ICU nurses indicated specific need for (1) working with the same colleagues on a permanent basis to ensure interpersonal bonding and emotional support, (2) freedom to act independently and the ability to influence treatment decisions based on their nursing expertise, and (3) opportunities and incentives to remain challenged and grow as a professional. The interviews showed that—due to external factors such as a working culture focused on accountability, inadequate management of human resources, and the corona pandemic—these needs are often not met in daily practice, thereby reducing the job satisfaction of ICU nurses. In addition to the external factors, ICU nurses expressed their own role in meeting these needs, for example by taking charge in situations, being eager to learn, and looking actively for ways to keep work attractive. Although hospital nurses are being regarded as the main person responsible in the healthcare team when it come to an holistic understanding of what the patient needs, this does not always coincide with the freedom to act accordingly [27].

Our findings also show that job satisfaction among ICU nurses stems from their intrinsic motivation to be of value to ICU patients and their loved ones. Recognition and appreciation for their work—by patients, relatives, colleagues, and managers—are in that respect important motivational drivers for ICU nurses. Other studies already addressed the importance of these factors for other nursing groups [28, 29]. Furthermore, the interviews showed that job satisfaction in the ICU is reduced by monotonous work, inefficient administrative work, poor leadership, and bureaucracy. Contrary to several other studies [30, 31], external drivers such as salary and workload seem to have less direct influence on job satisfaction. Existential motives prevail. Drennan et al. [32] reported how one nurse felt: "Pay is important, but most people don't come into nursing expecting high salaries—they have other motivations." However, the perceived imbalance between salary level and the nature of their work does contribute to a widespread feeling of undervaluation among ICU nurses and thus indirectly influences their job satisfaction.

4.1. Recommendations. This study shows that increasing job satisfaction requires a joint effort. On the one hand from policy-makers, managers, and ICU physicians by creating an attractive work environment, and on the other hand from ICU nurses themselves by finding ways to keep their profession attractive. Nurses who are proactive and show leadership experience greater job satisfaction and are less likely to leave the profession [33]. Based on our findings and inspired by previous papers [34, 35], we listed several recommendations for practice across seven domains which may help to increase job satisfaction among ICU nurses and thereby retain them for the ICU (Table 2). Although the list focuses on ICU nurses, many of the recommendations we propose here may equally apply to the retention of nurses in other healthcare settings as nurse job dissatisfaction and high turnover are common in other healthcare settings as well [36, 37].

4.2. Limitations. Our study has several limitations. First, although we purposively sampled participants to ensure diversity of opinions and experiences, our study population was relatively small and consisted of only Dutch ICU nurses. Most participants worked in an academic setting and had several years of work experience. Findings may therefore not be representative for the entire ICU nursing workforce including those who are less experienced and working in other healthcare systems and settings (e.g., with other nurse-bed ratios, responsibilities, wages, or incentives for personnel). Our findings may also be influenced by country-specific nurses' perceptions of role responsibilities and views on professional autonomy [38, 39], which may limit the transferability of the findings to countries with a different cultural context.

Nevertheless, many of the factors found are common phenomena in the hospital setting [20, 21], that most likely also occur in other ICU settings regardless of the type of health care system or hospital. Therefore, we believe that our findings are likely to be recognizable to ICU nurses outside the Netherlands. The results are thus a starting point for further understanding, validation (using both quantitative and qualitative methods on an international scale), and improvement on this theme. Second, job satisfaction is a multidimensional concept that lacks a clear and uniform definition [40]. Despite the use of a working definition in the interviews and in the data analysis, participants may have confused job satisfaction with related concepts such as mental and psychosocial well-being which may have affected our data. Finally, in qualitative research, the researchers' background plays an important role in data collection and analyses, which can be both a strength and a limitation. The nursing background of the main researcher (FB) may have influenced the collection and interpretation of the data.

5. Conclusion

This study contributes to the increased understanding of factors that currently influence job satisfaction among ICU nurses and shows the importance of (support for the development of) nurse leadership as a mean to improve job satisfaction among ICU nurses. Although future research is warranted to extrapolate the findings on a larger scale, we

believe our findings are valuable for ICU health professionals, policy-makers, and managers in a variety of hospitals and countries in their efforts for keeping this profession attractive for the current and future generation of ICU nurses and keeping ICU care sustainable.

Data Availability

The data (de-identified) that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Gijs Hesselink conceptualized the study, designed the methodology, performed the software analysis, performed the formal analysis, validated the study, wrote the original draft, and reviewed and edited the manuscript. Floor Branje carried out data acquisition, provided resources, performed the formal analysis and software analysis, curated the data, wrote the original draft, and reviewed and edited the manuscript. Marieke Zegers conceptualized the study, administrated the project, validated the study, and reviewed and edited the study.

Acknowledgments

Supplementary Materials

Supplementary 1: interview guide. Supplementary 2: table with themes, categories, and interview quotes. (*Supplementary Materials*)

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Research Article

What Healthcare Workers Told Us about Working through the COVID-19 Pandemic: A Qualitative Analysis of Digital Audio Stories

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Aims. The purpose of this article is to share the qualitative results of digital stories from 21 healthcare workers during the second wave of the pandemic and compare them with stories analyzed during the first wave. *Background.* Everyone has personal COVID-19 experiences and memories. Yet, the literature is lacking in how the stories from the healthcare team during the pandemic affected the individual healthcare worker at that time. *Methods.* A descriptive qualitative study analyzing digital stories was conducted during the second wave of the pandemic of a large Midwest healthcare system. *Results.* Twenty-one audio stories were analyzed. Four themes revealed were negative emotional response/impact, feelings/statements of optimism and hope, imposed or changing role expectations, and leadership/administration concerns. These themes aligned with the first wave analysis. *Conclusions.* Healthcare workers during COVID-19 experienced profound upheaval in their usual daily rhythm. This study revealed that there was a paradox of experiences consistently shared through their own stories including perceptions healthcare workers had of their leadership and the perceived system failure. *Implications for Nursing Management.* The pandemic resulted in healthcare teams expressing anxiety in caring for COVID patients, yet trying to remain hopeful. They also expressed awareness of how their own roles changed and the leadership failures during this time. Strong leadership is required to create a path forward for healthcare workers.

1. Introduction

The experiences during the COVID-19 pandemic, over the past two years, have resulted in an incomprehensible impact on everyday life. Everyone has personal COVID-19 experiences and memories, and none are more vivid than those of healthcare workers. As the time passes, memories may fade, yet stories will remain. It would be wise to examine the stories shared by healthcare workers as a reminder of what happened and what we can learn from those experiences.

Storytelling has demonstrated benefits as an effective tool to educate, build self-efficacy, strengthen coping strategies, and process adverse life events [1]. Telling stories is one of the most powerful means we have as a culture to document, share, learn, and promote connections. The use of digital audio storytelling is becoming more common as a tool to use in health promotion and wellness [1–3].

Everyone has a story. Yet, the literature is lacking in how the stories from healthcare workers during the pandemic affected the individual healthcare worker at that time or how

these stories are embedded in patient care and healthcare systems. The purpose of this article is to explore the results from a qualitative analysis of audio stories captured during the second wave of the COVID-19 pandemic and second to compare these results to a prior analysis of audio stories captured during the first wave of the COVID-19 pandemic. These digital stories are one facet of a larger study conducted during the first year of the pandemic. Examining this data collected over time will add to the identification and support needed to change within the healthcare system.

2. Methods

2.1. Design, Setting, and Study Population. A descriptive qualitative study was conducted within a large healthcare system in Southeast Michigan. Data collection began in April 2020 through January 2021. Audio diaries were collected during the first and second waves of the pandemic in Michigan, as measured by the number of patients hospitalized with COVID-19 across the study healthcare system (see Figure 1). The second wave analysis focused on stories collected from November 11, 2020, to January 21, 2021 (see Figure 1). Recruitment targeted all healthcare workers, not just those on the frontline or involved in direct patient care. Invitations to participate were periodically included in daily COVID-19 update emails sent out by the health system's communication department to all employees and contracted providers.

2.2. Data Collection. The recruitment announcements directed interested participants to a study website, where they could consent to participate in the study, provide basic demographic information, and submit an audio recording. The consent form included the following statement: *you can talk about whatever you would like to share. This might include stories about your own experience, stress, or emotional response; observations regarding the health system or individual preparedness, responsiveness, or adaptation regarding the pandemic; or anything regarding individual or collective ability to care for our patients and ourselves.* There were no specific prompts once they completed demographic data collection and proceeded to the recording webpage. A list of support resources was provided in case participants were in distress. Participants were asked to not include any personal or patient identifiers in their recordings. The audio recording was limited to 5 minutes. Participants had the option to return to the website and record as often as they desired.

2.3. Data Analysis. Each story was recorded using Camera Tag® which included both the audio recording and corresponding written transcription. A grounded theory approach was used to analyze the audio diary content, and both audio recordings and written transcripts were analyzed concurrently. Two reviewers, using an open-coding method, created a line-by-line analysis. After their independent review, a comparative iterative process was used to synthesize results and refine the themes. A third reviewer examined the results for further refinement, clarity, and reduction of bias [4]. In addition, in order to minimize investigator biases,

researchers coding the second wave of audio stories were unaware of the results of the analysis of the first wave of stories. Once the second wave analysis was carried out, results were reviewed by both teams, and similarities and differences in outcomes using a constant comparative process were identified.

2.4. Ethics Approval. Study participation was anonymous and voluntary. Ethical approval was obtained by the institutional review board.

3. Results

3.1. Demographics. There were twenty-one audio stories submitted between November 11, 2020, and January 21, 2021. The demographic and participant characteristics captured were age, gender, and role in patient care (see Table 1). The participants ranged in age from 18 to 74 years old, with approximately one-half (54.2%) under 44 years old. Interestingly, there was 23.8% of respondents in the 55–64-year age range and 9.5% in the 65–74-year age range. These groups from 55 years and over are approaching retirement age yet were working during this time. More women (61.9%) participated than men (38.1%).

Also, lastly, 71.3% of participants stated they were involved in some area of direct patient care: 19% a medical provider, 19% nursing, and 33.3% in the other healthcare provider category. This also included 19% in administrative roles. Many of the audio diaries included the roles participants were engaged in during their recordings.

3.2. Audio Stories. The qualitative analysis revealed four themes. They were as follows: negative emotional response/impact, leadership/administrative failures, imposed or changing role expectations, and concerned feelings/statements of optimism and hope. Findings are summarized in Table 2. Their stories revealed a rich tapestry of experiences, feelings, interpretations, and actions needed to be taken and how they adapted to the COVID-19 pandemic. The following paragraphs display the range of statements found in each theme.

3.3. Negative Emotional Response/Impact. Statements describing the intense emotions related to living and working in health care during the pandemic were found in this theme. Fifteen of the twenty-one diaries (71.4%) included words, phrases, and audible emotions. Statements from participants such as "it was a total nightmare" (diary #1), "most difficult time of my life" (diary #14), "it is stressful, every day is still stressful" (diary #10), and "lots of anxiety" (diaries #2, 5, 10, 12, and 16) were present. Audible emotions, such as deep sighing, pausing, and even being obviously choked up, were heard. The following direct statements are included:

> "*I don't think anyone who has not actually worked for 12 hours ... with COVID patients can understand, not administrators, not supervisors. It was unreal, it started*
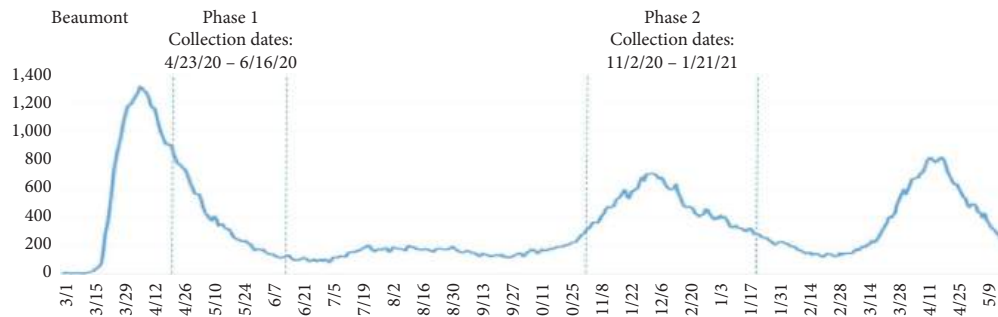
Figure 1: Timeline of data collection correlated with COVID-19 cases in the health system.

Table 1: Characteristics of the participants.

	Count	%
Number of participants	21	100.0
Age		
18–24 years	1	4.8
25–34 years	5	23.8
35–44 years	5	23.8
45–54 years	3	14.3
55–64 years	5	23.8
65–74 years	2	9.5
Gender		
Male	8	38.1
Female	13	61.9
Gender other	0	0.0
Involved in patient care	13	61.9
Role		
Administrative support services	2	9.5
Administrator/manager	2	9.5
Clerical	1	4.8
Clinical support services	1	4.8
Medical provider	4	19.0
Nurse	4	19.0
Other	4	19.0
Other healthcare provider	3	14.3

with the shutdown when we told not to wear masks..., "I would cry every single day" (diary #5).

Another participant stated:

"this has just been really, really hard. People are dying every day; all the time and we're supposed to keep going like nothing is wrong" (diary #11)

Also, another comment is as follows:

"in the ICU it was very traumatic period...many times I was the last face people saw and I held their hand and talked to them before they were intubated...many of them did not survive" (diary#15).

These are examples of the feelings from healthcare workers, from their own lens, as they lived and worked during the COVID-19 crisis all the while trying to do their best.

3.4. Leadership/Administrative Failures and Concerns. The leadership theme captures the words and phrases regarding leadership responses 8–11 months after the onset of the pandemic. Seven diaries (33.3%) contained words or phrases expressing their thoughts on how leadership responded. Participants used phrases such as "mixed messages" (diary #5), "leadership response was a disgrace" (diary #9), "felt dissociated from administration" (diary #15), "seemed to be in the bunker" (diary #15), and "healthcare hero did not include all staff" (diary #10) as well as "felt hospital did the best they could" (diary #5).

The deeper stories told a tale of negative perceptions towards healthcare leadership and administration. One participant shared:

"the response of the hospital has been a disgrace. They have done nothing to keep the staff, the patient's, the doctors or providers safe. They've made this terrible pandemic worse in every way and fashion. We have to beg for the ability to get protective equipment. They've provided no universal testing, no clear guidance on how to deal with colleagues that are positive, and limited support, I'm completely disappointed" (diary #9).

Also, another stated:

"I felt very disassociated from administration because they seem to be in a bunker and put out information that oftentimes was false and misleading. Unfortunately, the anesthesia contract was canceled during COVID which made for really poor morale. Because of the administration's actions the environment has become more and more toxic period. It's an unfortunate period and believe I will have PTSD as a result of this experience" (diary #15).

Also,

"There were mixed messages from the administration about when we were supposed to work and when we were to stay home.... I do not hate my hospital but the fallout always ended on the nurses" (diary #5).

While another stated:

TABLE 2: COVID hero audio diary theme descriptors.

COVID hero audio diary theme descriptors	
Themes	Descriptors
Negative emotional response/impact related to living through and with the pandemic. These were found in the following words, phrases, and audible emotions. Overall summary is that those closest to bedside care described (experienced) far more emotional, scary, fearful comments. The audible emotions were apparent in tone, words, and language	(i) "It was a total nightmare" (ii) Audible sighing and deep breathing as they told their stories (iii) "Most difficult time of my life" (iv) Used words such as "anxious," "PTSD," "depression," "increased stress, anxiety, and depression"; only frontline workers can truly understand what we went through (v) Fear of unknown (related to changing PPE requirements, begging for PPE, and what happens if they get sick (must use own PTO time)) (vi) Actions required to be safe from the virus. Protecting self, the best they could (vii) Cautious of interacting with others (viii) Fear of getting others sick (ix) Feelings/awareness of isolation (x) Separation from family (sent children to live elsewhere) (xi) Developing habits to minimize risk to family (taking clothes off in garage, showering before joining family). (xii) Overall awareness that there is much stress, and it has led to many mental health issues (xiii) Loss of control led to feelings of hopelessness (xiv) "Hardest thing is isolation; can't combat because we can't come together"
Leadership/administration failures and concerns. These are statements surrounding how healthcare workers felt their leadership was guiding this crisis. This demonstrates a gap in leadership action and staff perceptions. The following are examples of this theme	(i) Leadership was a "disgrace" or "disappointment" (ii) Leaders lacked the ability to keeping people safe (iii) No clear guidance (iv) "Toxic" workplace (v) Financial implications due to lack of bonus checks and lack of hazard pay (vi) Felt dissociation from administration, they would go to their "bunkers" and not be present for staff (vii) Mixed messages from administration (viii) Felt hospital did their best but did not anticipate the fallout (ix) Felt frontline managers were transparent and supportive, but upper management was mostly absent
Imposed or changing role expectations. These are statements voiced of how their roles changed due to the pandemic. Some were deployed, some were put in other roles, some were in usual roles with new or added responsibilities, dealing with variable staffing issues, and lastly, some were working remotely. There was an overall awareness of how the work has changed. Sense of and description of the adaptation to how their roles changed	(i) Assigned to COVID unit either volunteered or administration assignment. "I volunteered for a COVID unit" (ii) "I believe there will be more deployments (iii) Frontline nurses felt like they bore the brunt of caring for COVID patients. They were expected to fill in (iv) Awareness of adaptation needed to perform new roles (v) Learning new skills (vi) Moving to new units (overlap with positive teamwork) (vii) Being put in roles/jobs they did not feel very comfortable or competent (viii) Changing policies and procedures (ix) Increased volume of care needs

TABLE 2: Continued.

COVID hero audio diary theme descriptors	
Themes	Descriptors
Feelings/statements of optimism and hope. These were statements related to how this experience impacted the individual personally. There were comments of what they learned, pride in how they coped, and personal outcomes from going through this struggle. Acknowledging the magnitude of these moments, there were statements of hope for the future and optimism for positive outcomes	(i) Hope for vaccine (ii) "Staying positive and focused" (iii) "More confident in knowing what to do next time" "I hope it will be better next time (deployments)" (iv) Stated awareness of opportunities the COVID-19 pandemic offered (v) Adaptation to new roles they would not have had normally (vi) Grateful to be able to work remotely (1) More time with family, able to catch up with other work due to changing time demands of role (vii) Stated it brought out the best in many (viii) Statements related to their own improvement over the struggle. Overall gratitude of being able to help. Willingness to help (in any capacity, such as "helpers," changing units, and changing shifts) (ix) Stated it brought out the worst in many
Other comments of relevance	"Don't feel like a hero" (stated multiple times). "There are heroes everywhere" Underlying staffing issues embedded in the stories. Staffing issues related to vacancies, put in roles not truly qualified for, or lack of support staff

"We didn't get healthcare hero support on the nightshift. We were basically ignored... everything about the night-shift was forgotten...and it really hurt morale" (diary #10).

These are the stories of how participants perceived leadership's failure to communicate effectively and support all healthcare workers. Healthcare workers felt that they bore the brunt of care and that there was an expectation of something more from their leadership.

3.5. Imposed or Changing Role Expectations. These statements uncover the awareness of the participants on how their own roles changed due to the pandemic. Some were deployed from their home area to other areas in the hospital, and others were asked to do other roles beyond their usual assignments. More were in usual roles with new or added responsibilities, and lastly, some were working remotely. There was an overall awareness of how their day-to-day lives, regardless of whether they worked in direct care or indirect care even including home life, changed. Seven of the diaries (33.3%) included statements that reflected an awareness of how their roles changed. The following displays the actual stories shared:

"Many of my departments were redeployed to bedside care, um, none of us having clinical care expertise um, in many years.... we didn't feel we could provide safe patient care.... We could assist the primary RN as much as possible during a very difficult time.... We feel there are many ways we could help including being family liaisons or just RN helpers.. that is my experience, um..thank you" (diary #2).

Also,

"I volunteered for a COVID unit and it definitely brought us together as a work family. I volunteered on a unit I hadn't worked before and it didn't take long for them to make me, include me like family on the team...they were happy to have me" (diary #14).

Also, other role changes resulted from roles outside of the hospital. One story included

"I worked in the trades is very stressful because we did cut at this facility and it was hard and I had to do a lot of extra work at home to support my wife" (diary #21).

These statements all share how healthcare workers were aware of the significant changes in work roles, work as-signments, and balancing home life needs.

3.6. Feelings/Statements of Optimism and Hope. These were statements related to how their experiences had some measure of goodness. Their stories revealed descriptions of what they learned, pride in how they coped, and positive personal outcomes. Acknowledging the magnitude of these moments, there were statements of hope for the future and

optimism for positive outcomes. Nine of the diaries (42.8%) included statements related to hope and optimism. Words of hope related to vaccine development and maintaining positive personal outlook were found. Specific statements are as follows:

"With the second surge, I think I am more confident now, not like before, being afraid. Thank God there is now a vaccine out. Let's hope that the vaccine will work" (diary #13)

Other stories included statements, such as

"I feel very lucky to have had the COVID, experience it's been an interesting time in history... I really liked being at home with my kids more than in the past. I feel like before COVID came around I was having a hard time with my work life balance where I was spending you know much more energy on working than I was on my family" (diary #7),

Also, lastly,

"I got to learn how to wear special equipment...that would keep me safe ...it gave me a chance to try new things" (diary #6)

"I know our lives are changed but I hope we can be better people for this...I am hoping 2021 will be a better year" (diary #19)

"there is more hope right now since the vaccine is available" (diary #13).

During these remarkable times, maintaining hope and optimism remains. These stories told us while many rec-ognized the horror of caring for people during the COVID-19 pandemic, they were still able to look forward seeking a better tomorrow.

4. Discussion

These stories revealed the complex, multifaceted, and emotional response of healthcare workers in a wide variety of roles. Each audio diary contained at least one to three of the above mentioned identified four themes.

Comparing the first and second audio diary analyses from the larger study offered the following insights [5]: First, there was a continuation of stories relating to both fear and hope. The first analysis labeled the themes as paradoxical. Paradoxical Theme 1: harsh work environ-ment resulted in psychological distress, contrasting with personally rewarding experiences which aligned with negative emotional response/impact and feelings/state-ments of optimism and hope. It is unclear at this point what conclusions can be drawn from these results. One might suggest that each day brought a new challenge with no clear endpoint. Yet, it certainly demonstrates the deep impact of their perceptions, interpretations, and memo-ries of living through a pandemic. Giving voice to one's

experiences, finding meaningful purpose, and maintaining hope during critical times in one's life are an essential coping strategy [6–8].

While the first two themes appeared in the previous analysis during the first wave of the pandemic [5], the themes of leadership failures and changing roles emerged during the second surge of the pandemic. Though many studies also reported similar findings related to the first two themes, relatively few studies have highlighted leadership issues and changing role expectations during the pandemic [9, 10]. It might be purported that it was so early in during the crisis that the priorities of care left little time for leadership to fully understand the role needed to lead and support the staff. As COVID-19 unfolded, the information and directions changed constantly as infections spread and death rates climbed. The immediate focus was on PPE, staffing, isolation, or standards of care, and that was the leadership focus. The staff's need for direction and support followed the awareness of changing roles as care needed to be adapted, staffing issues became more apparent, and resources were changed.

Leadership failures/concerns were not an expected result. Comments ranging from no clear guidance or mixed messages are overshadowed with more severe comments of "disgrace" to "toxic workplace." During times of crisis, people look to their leaders for direction, meaning making, and/or empathy [11, 12]. These results revealed there was a perceived lack of direction, meaning making, and empathy displayed by their healthcare leader. For healthcare workers, these stories acknowledge the intense uncertainty that persisted, and yet, they still expected leadership to safely guide them.

The literature refers to these unprecedented situations as "wicked problems" [13]. Wicked problems are defined as those problems with a social or cultural context that is difficult or impossible to solve for as many as four reasons: incomplete or contradictory knowledge, the number of people and opinions involved, the large economic burden, and the interconnected nature of these problems with other problems [14]. Clearly, healthcare workers perceived that their leadership failed in supporting their work as they were presented with many "wicked problems" from supply shortages, staffing, and a huge loss of life. It is not surprising that workers were confused by the day-to-day changes made in protocols, staffing, and processes or the challenges of keeping up with communication in a large system. Nonetheless, leadership must acknowledge these perceptions and address them up front to renew faith with their workers.

4.1. The Benefits of Capturing Stories. The fallout from working during these times has resulted in poor morale, changes in quality standards, severe staffing shortages, and morale distress [10]. It is not about what is right or wrong but what comes next. Now is the time for leadership to take a breath and lean into addressing the concerns of staff so that the system can recalibrate towards a postpandemic world [15].

These audio diaries may have provided some therapeutic benefits for the staff responding by being able to put their thoughts into words and "get it out." Using the stories directly

from healthcare workers opens an intimate lens to their experience "through their own eyes." From the researcher's perspective, hearing the audio recordings while reading the transcripts also offered the ability to witness the participant's emotional prosody, the nonverbal tone of the speech, which includes loudness, speech rate, and pauses. Hearing the vast array of emotions added depth and clarity. Stories are powerful. Using stories, Bennett el al. [9] explored the impact of the pandemic on healthcare workers with similar results. Their study was conducted within the first wave of the pandemic and also identified the disconnection between leadership and frontline staff. Other studies using stories during this time reported comparable themes related to emotional response, hopelessness, and hopefulness but no leadership concerns [9]. Furthermore, there is a belief that being able to articulate their own experiences with limited structure or judgement may be therapeutic to the storyteller [1].

Understanding healthcare workers stories today will allow leaders to address the concerns of healthcare workers for the future. The first step starts with the awareness of the issues. While these audio dairies captured a moment in difficult times, the awareness of the leadership failures correlates with the awareness of role change from frontline workers. Their stories told us that the staff did not feel their leaders were present, gave clear messages, or displayed empathy. Protocols were changed rapidly, and social isolation contributed to the fragmented communication. Simply stated, healthcare workers' stories reveal not only a failure of leadership but also of an acute need for effective leadership. It is essential for leaders to use all tools available to address these issues as avoiding it will only increase the anguish of the lived experience from the pandemic [16]. Clearly, now would be a time for leaders to reflect on what worked and what needs improvement.

4.2. Limitations. The study's limitations include a relatively small convenience sample from a single large healthcare system in the Midwest United States. The sample size represented a wide range of healthcare positions, from intensive care staff to administrative roles. It is unclear how various roles differed in their experiences during the pandemic. It may only represent people who had a particularly distressing or rewarding experience. Respondents represented those who were comfortable and able to use the audio recording, and recording could be carried out in any location with an Internet connection. It is also unclear where and when the respondents chose to record their stories and how this may have influenced their responses. Participants were able to sign in to recording their stories as many times as they wished; yet, no one signed in more than once or used the entire five minutes for their story. Generalizability is limited.

4.3. Implications for Nurse Leaders. The audio diary study represents a small snapshot into the daily lives of healthcare workers captured through their own stories during the second surge of the pandemic. As the pandemic unfolded, understanding the changes in lived experiences allows for

a better response in preparation should another healthcare crisis, however unlikely, occur. The use of storytelling is a valuable tool to capture real-time thoughts, perceptions, and practices [17]. It allows for connection through discussions of shared experiences and adds to the growing body of knowledge, documenting the fear and emotional toll for healthcare workers, identified avenues for hope, and finally clearly revealed acute care leadership shortcomings [3]. Further research is needed as healthcare continues to address the multitude of the COVID-19 issues challenging healthcare systems.

While no one could have predicted a pandemic, not addressing the resultant fallout would be reckless. The outcomes of the COVID-19 pandemic are complex and complicated. Addressing the impact from COVID-19 goes beyond developing new protocols or treatments. The postpandemic healthcare world has created a cultural shift. One example is the severe nurse staffing shortage. Nurses remained at the frontline of caring for the very ill and were considered heroes by the public. Yet, the vaccine mandates forced nurses to resign, adding to the many other reason's nurses left the bedside [6]. New technology filled the gap as healthcare workers were limiting their exposure to infected patients, allowing for the telemedicine practice to emerge [18]. In regard to leadership, the current healthcare research and commentary is filled with suggestions on how leaders can motivate workers, how to recognize intent to leave, and negative perceptions about work place culture [19]. Carruci and Hogan [19] state that having meaningful conversations and focusing on priorities not on productivities are strategies that leaders can use to rebuild their teams. How does this relate to the audio diary study? Sharing stories can create connection. Looking forward to solutions for today's problems, storytelling, and shared experiences can create the opportunity for meaningful conversations, identifying priorities, and rebuilding teams.

5. Conclusion

While this is a small study, the results of this study are consistent with those of other studies that were conducted during this time [9, 17, 20, 21]. As the COVID-19 pandemic moves into an endemic phrase, healthcare systems, leaders, and staff will begin to take a breath and begin the process of recovery, from a system perspective and a human perspective. These stories will serve as a powerful reminder as memories may fade and open up a new viewpoint for rebuilding. It is our hope that storytelling will become a valuable tool to increase understanding, process improvement, and hopefully healing.

Data Availability

The audio diary data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

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Research Article

Work Engagement and Safety Behavior of Nurses in Specialized Cancer Hospitals: The Mediating Role of Self-Efficacy

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Aim. This paper aimed to examine the current state of nurse safety behavior, and the effect of work engagement on it, and to explore the mediating effect of self-efficacy between work engagement and nurse safety behavior in specialized cancer hospitals. *Background.* Nurse safety behavior affects the quality of care and outcomes for patients with cancer. The research proves that self-efficacy is associated with work engagement, but the relationship between self-efficacy, work engagement, and nurse safety behavior needs to be clarified. *Methods.* This study used a convenience sampling method to survey 957 nurses from January to February 2023. The survey included tertiary specialized cancer hospitals in five provinces in China. Sociodemography information, the Work Engagement Scale, the Self-Efficacy Scale, and the Nurse Safety Behavior Scale were used for the survey. A Questionnaire Star program collected all the data automatically. The Statistical Package for the Social Sciences version 24 was employed for Pearson correlation and multiple regression analysis to examine the association between work engagement, self-efficacy, and nurse safety behavior. Structural equation models were built using Analysis of Moment Structures version 24.0 software. *Results.* The results showed that the nurse safety behavior was at a high level in specialized cancer hospitals. There was a significant positive relationship between the variables work engagement, self-efficacy, and nurse safety behavior with coefficients ranging from 0.244 to 0.564. The results of structural equation modeling revealed that self-efficacy partially mediated the effect between work engagement and nurse safety behavior, accounting for 25.3% of the total effect. *Conclusion.* Self-efficacy mediates the relationship between work engagement and nurse safety behavior, and by increasing self-efficacy, nurse safety behavior can be improved, thus ensuring patient safety. *Implications for Nursing Management.* Managers should promote high work engagement and nurse safety behaviors by fostering nurses' self-efficacy.

1. Introduction

Patient safety has become the focus of the medical and healthcare industries worldwide. It is the basic principle of medical behavior [1]. It is a risk control process to prevent and reduce risks, errors, and injuries caused to patients in medical procedures [2]. In China, the government and hospital institutions are also placing increasing emphasis on patient safety. In 2018, the notice on further strengthening patient safety management was issued, which for the first time included patient safety in the overall planning of medical quality management and medical institution management. It comprehensively strengthened the construction of patient safety [3].

In 2019, the World Health Organization (WHO) designated 17th September as the World Patient Safety Day. It published "10 facts about patient safety," noting that adverse events caused by unsafe nursing behaviors are among the top 10 causes of death and disability in the world [4]. In developed countries, one in ten patients are injured by adverse events when receiving hospital treatment and about 50% can be prevented. In low- and middle-income countries, about 134 million adverse events are caused by unsafe care each year, resulting in at least 2.6 million deaths. This demonstrates the importance of nurse safety behavior in promoting patient safety and improving patient outcomes [5].

Nurses have the longest and most frequent contact with patients in clinical work, and their level of safety behavior is

related to the implementation of patient safety goals. If the nurse safety behavior decreases, it will have several negative effects, increasing patients' pain, prolonging their hospital stay, and affecting their rehabilitation. It will even affect the overall image of the nursing team and the hospital. Nurses in specialized cancer hospitals care for specific targets. Cancer patients will experience physical symptoms such as pain, fatigue, malnutrition, and severe psychological problems during diagnosis and treatment, such as psychological distress, fear of disease progression, and fear of recurrence, during diagnosis and treatment, which increase their risk of suicide [6, 7]. The negative emotions of cancer patients and the heavy clinical nursing work make nurses more prone to compassion fatigue, job burnout, and even resignation intentions, which can easily cause potential safety hazards and increase the incidence of adverse events [8, 9]. Therefore, it is important to investigate the nurse safety behavior in specialized cancer hospitals.

Current clinical research has shown that nurse safety behavior is influenced by many factors such as patients' perceptions of safety culture, safety leadership, safety performance, and nursing work environment [10–12]. Studies in the construction industry have shown that employees who are actively involved in their work have higher levels of safety behavior [13]. However, there are no studies on work engagement and nurse safety behavior in healthcare. Nurses who receive a better deal for their work are more engaged, which improves not only their performance but also their overall productivity and quality of care [14]. This suggests that high levels of work engagement may have a positive impact on nurse safety behavior.

There is a paucity of research on nurses' work engagement in specialized cancer hospitals, focusing mainly on studies that examine the factors that influence it and its relationship with variables such as structural empowerment and self-efficacy. One of these studies suggests that self-efficacy can positively influence nurses' work engagement [15]. Research has also shown that nurses' self-efficacy in specialized cancer hospitals can strengthen their communication skills, and professional values, and effectively reduce their burnout, and psychological distress, resulting in higher levels of safety behavior [16–18]. Therefore, we hypothesized that self-efficacy may mediate the relationship between work engagement and nurse safety behavior.

In summary, this study aimed to examine the relationship between work engagement and nurse safety behavior. The mediation effect model verified the mediating effect of self-efficacy between work engagement and nurse safety behavior. To provide a clinical reference for hospital administrators to formulate and implement measures for nurse safety behavior, reduce nursing errors and deficiencies, ensure nursing safety, and improve nursing quality.

1.1. Theoretical Framework and Hypotheses

1.1.1. Nurse Safety Behavior.
Nurse safety behavior refers to the behavior state of nursing staff when performing nursing tasks for patients, including compliance with the nursing code of conduct and core system, and implementation of safety nursing measures [19]. This is an essential component of ensuring patient safety, improving nursing quality management, and preventing adverse events [20].

1.1.2. Work Engagement and Nurse Safety Behavior.
Work engagement is a positive and work-related emotional and cognitive state of caregivers characterized by vitality, dedication, and concentration [21]. Vitality means that nurses are not afraid of difficulties and can voluntarily participate in work in a complete working state. Dedication means that nurses have a strong sense of meaning and pride in their work, as well as full enthusiasm for the work, and the courage to face the challenges in work. Concentration means that the nurse is totally absorbed in the creation and takes pleasure in it.

This study is based on Bakker's work demand-resource model [22]. The model suggests that work engagement depends on the balance between work demands and resources. Work must require the individual to make continuous physical, psychological, cognitive, and emotional efforts to complete all aspects of the work. Nurses with high levels of work engagement have a positive emotional and mental state and can communicate better with patients [23]. They will be full of energy at work, and their physical strength will be easy to recover. They will have high safety behavior and provide better quality care to patients to improve patient safety and promote patient recovery. Work resources can offset the negative effects of work demand, stimulate individual work enthusiasm, improve work participation, and produce good work outcomes. Therefore, the hypotheses of the study were as follows:

> H1. Work engagement has a positive impact on nurse safety behavior

1.1.3. The Mediating Role of Self-Efficacy.
The essence of the work demand-resource model is that the internal motivation and external conditions work together, with external conditions driving the individual's internal motivation. Self-efficacy is an individual's ability to complete a task, which creates internal motivation and plays an important role in an individual's cognition and behavior [24, 25]. Nurses' self-efficacy mainly refers to their ability to realize self-value in nursing and to be competent in nursing work. Research shows that the higher nurses' self-efficacy, the more enthusiasm, and energy they can put into their work, maintain a positive work attitude, take the initiative to undertake work, complete nursing work effectively, and improve patient safety [26]. Mache et al. verified the correlation between self-efficacy and work engagement and pointed out that self-efficacy is an essential resource of personal psychology that can complement the physical and mental consumption of nurses required by work and reduce burnout [26]. Nurses' self-efficacy can improve work pressure and job burnout, improve work engagement, and thus improve nursing safety behavior, ultimately providing high-quality nursing services

for patients, and promoting patient safety and health [27, 28]. Therefore, the hypotheses of the study were as follows:

H2. Self-efficacy can improve nurse safety behavior in specialized cancer hospitals

H3. The variable of self-efficacy mediates the relationship between work engagement and nurse safety behavior

2. Methods

2.1. Study Design. A cross-sectional design was used.

2.2. Participants and Settings. Nurses from tertiary specialized cancer hospitals in five Chinese provinces were selected to participate in the survey from January to February 2023 using a convenience sampling method. Inclusion criteria were as follows: (i) age ≥ 18 years; (ii) postclinical nurses who have obtained registered nurse qualification certificates; and (iii) informed consent and voluntary participation in this study. Exclusion criteria were as follows: (i) nurses on maternity leave or sick leave and (ii) nurses in postgraduate study and practice.

The sample size for this study was calculated based on the principle that the questionnaire items were 10 to 20 times the main research variable. A total of 31 questionnaire items were designed for this study, taking into account 20% of invalid questionnaires, so a sample size of between 372 and 744 was required. The final sample consisted of 957 cases that met the requirements.

2.3. Variables and Instruments. A general data questionnaire is designed by consulting previous research literature, including gender, age, educational level, job position, title, employment form, years of service, monthly income, marital status, weekly working hours, the total number of adverse events experienced in career, and safety training courses attended.

The Utrecht Work Engagement Scale (UWES) was developed by Schaufeli et al. [29] in 2006 to simplify the original (UWES-17), resulting in a simplified version of the 9-item version (UWES-9). The Chinese version was translated and back-translated by Chinese scholar Li et al. [30]. The scale consists of three-dimensions, namely, vitality, dedication, and focus, with a total of nine items. The Liken 7-point scale was used, with scores ranging from 0 to 6 on a scale from "never" to "always," with higher scores indicating higher levels of work engagement. The internal consistency coefficient of the total scale in this study was 0.946, and the Cronbach's alpha coefficient of each dimension is 0.864, 0.907, and 0.854, respectively.

The General Self-Efficacy Scale (GSES) was initially prepared by Schwarzer and Born [31] and translated and revised by Wang et al. [32]. The scale has a total of 10 items and is a single-dimensional scale. Likert's four-level scoring method is used. The score ranges from 1 to 4 points, from "completely wrong" to "completely right." A higher score is associated with a greater sense of self-efficacy. In this study, the Cronbach's alpha coefficient for the scale was 0.889.

The Nurse Safety Behavior Questionnaire (NSBQ) was developed by Shih et al. [33] and translated into Chinese by Rong [34]. The questionnaire is one-dimensional with 12 items. It is scored on a five-point Likert scale, with 1 being "never" and 5 being "always." The higher the score, the better the nurse's performance in patient safety behavior. The Cronbach's alpha coefficient of the scale in this study is 0.899.

2.4. Pilot Study. A pilot study was conducted to assess the clarity and time required to complete the questionnaire. In the pilot study, 50 nurses from the participating hospitals were recruited for a pre-test, and these nurses were then excluded from the study sample. Nurses were instructed to understand the content of the scale and to complete the questionnaire, which took approximately 15–20 minutes to complete. The results showed that the questionnaire had high reliability and validity and met the study criteria.

2.5. Procedure. This study was approved prior to data collection. The researcher then obtained the appropriate hospital consent by contacting the nursing department of the hospital concerned. The online questionnaire Star platform was used to distribute and collect the questionnaire. The head nurse of the department was contacted to explain the purpose and significance of this survey, and who and how to complete it. The matron then distributed the questionnaire to the department's WeChat group with a deadline of 5 days for submission. The first page of the questionnaire was written in a consistent language to explain the purpose, method, and requirements for completing the survey. Once the questionnaire was developed, each IP only had to complete it once and the questions were presented in a flip page format. Subjects could not submit until all questions had been answered online. The study was voluntary. At the end of the survey, two researchers checked the questionnaires submitted by the respondents, one by one, and immediately eliminated incomplete questionnaires. A total of 1100 questionnaires were distributed and 1023 questionnaires were returned. After excluding 20 questionnaires with all the same answers and 23 questionnaires with incomplete information, the number of valid questionnaires was 957, with a valid return rate of 93%.

2.6. Data Statistics. The data were analyzed using IBM SPSS v24.0 and Amos 24.0. To describe the general information of clinical nurses and the current situation of safety behavior, the count data were expressed as frequency and composition ratio, and all data were tested for normal distribution, the measurement data were expressed as mean ± standard deviation. A validation factor analysis was carried out and Cronbach's alpha was calculated to ensure the reliability of the scale items used in this study. Pearson correlation analysis was used to analyze the correlation between the variables. The multiple regression analysis was performed

with NSBQ as the dependent variable and two statistically significant variables (UWES and GSES) in the correlation analysis as independent variables. First, based on the results of Pearson's correlation analysis, AMOS 24.0 software was applied to construct a mediating effects model to explore the relationship among work engagement, self-efficacy, and nurse safety behavior of specialized cancer hospitals. In addition, the maximum likelihood ratio method was used to fit the data and modify the model. The model fit indices and suggested cut-off values were examined for results including incremental fit index (IFI > 0.8), goodness-of-fit index (GFI > 0.8), adjusted goodness-of-fit (AGFI > 0.8), comparative fit indices (CFI > 0.90), and root mean square error of approximation (RMSEA < 0.08). Finally, bootstrapping was performed using 5000 bootstrap samples and 95% bias-corrected confidence intervals (CI) to test the significance of direct and indirect effects [35]. $P < 0.05$ was considered to be a statistically significant difference.

2.7. Ethical Consideration. According to Chinese law and institutional guidelines, no ethical review was required for this study. The study strictly adhered to institutional requirements and ethical standards, participants were informed of the purpose and use of the study during the examination process, informed consent was obtained, and participation was voluntary. The study was conducted anonymously to ensure that nurses' privacy was not violated. In addition, the study is an anonymous investigation that does not involve unethical behavior or human clinical trials and does not result in any adverse health consequences, physical or mental, for the participants.

3. Results

3.1. Descriptive Statistics of Sociodemography Information. A total of 957 nurses from specialized cancer hospitals, as shown in Table 1. The majority of participants were female (94.6%) and married (62.3%). 72.4% had a bachelor's degree in nursing and had a mean of 9 years of experience with a standard deviation of 8 years. The mean age of the sample population was 32 years, with a standard deviation of 7 years. Of the respondents ($n = 957$), the majority of the study participants were employed on a contract basis (75.5%) and had a monthly income between 5,000 and 10,000 yuan (60.5%). In addition, Table 1 shows that the majority of the study participants had experienced no more than 10 total adverse events during their careers (94.7%), and most had received safety training (94.7%).

3.2. Reliability and Validity. Confirmatory factor analysis was used to verify the measures that were used. First, the Kaiser–Meyer–Olkin (KMO) test and Bartlett's sphericity test were used to test the adequacy of sampling. The results showed that the KMO and Bartlett's sphericity test values for the nurse safety behavior scale were 0.935 ($P < 0.001$), for the work engagement scale 0.925 ($P < 0.001$), and for the self-efficacy scale 0.925 ($P < 0.001$). The factor loadings for all the constructs used in this study were greater than the

recommended value of 0.7 [36], indicating support for the construct validity of the scales. Reliability was also analyzed to verify that the items of the scales met Cronbach's alpha. The results of the study showed that the Cronbach's values for all scales and their dimensions ranged from 0.854 to 0.946, meaning that the overall internal consistency reliability of the scales was high.

3.3. Work Engagement, Self-Efficacy, and Nurse Safety Behavior Score in the Specialized Cancer Hospitals. In the specialized cancer hospital, the nurse work engagement score was (47.81 ± 10.62) at a moderate level. The self-efficacy score was (31.30 ± 14.65), which was mild to high. The safety behavior score was (57.31 ± 4.41) at a high level (Table 1).

3.4. Correlation Study. Pearson correlation analysis showed that work engagement was positively correlated with self-efficacy ($r = 0.564$ and $P < 0.001$). Nurse safety behavior was weakly positively correlated with work engagement and self-efficacy ($r = 0.264$, $r = 0.244$ and $P < 0.001$) (Table 2).

3.5. Regression Analysis of Nurse Safety Behavior. The multiple regression analysis was performed with NSBQ as the dependent variable and two statistically significant variables (UWES and GSES) in the correlation analysis as independent variables. The Adjusted R^2 value was 0.081, showing that the UWES and GSES models explained 8.1% of the variance in the NSBQ (Table 3).

3.6. A Test of the Hypothesized Model Is Conducted. The model was fitted, validated, and modified using the maximum likelihood ratio method with AMOS version 24.0. As a result, the following results were obtained: $X^2/\mathrm{d}f = 2.592$, GFI = 0.996, AGFI = 0.984, CFI = 0.998, IFI = 0.998, and RMSEA = 0.071. According to the model fit index (Figure 1), the model was acceptable. The mediating effect was investigated using a Bootstrap sampling test. The results showed that for the effect of work engagement on nurse safety behavior, 5000 random samples were repeated from the original data. Mediating effects of nurses' self-efficacy in specialized cancer hospitals had a 95% confidence interval of 0.032 to 0.153, excluding 0, which was statistically significant ($P < 0.01$). The findings indicate that self-efficacy mediates the effect and accounts for 25.3% of the total effect (Table 4).

4. Discussion

This study explores the current status of nurse safety behavior in the specialized cancer hospital and the relationship between nurses' self-efficacy, work engagement, and safety behavior. The detailed results were as follows: the nurse safety behavior score in the specialized cancer hospital was at a high level. Work engagement is a positive predictor of nurse safety behavior. Self-efficacy plays a part-mediating role between nurses' work engagement and nurse safety behavior.

Table 1: Sociodemography information of participant nurses ($N = 957$).

Characteristics	Categories	Mean ± SD or n (%)
Gender	Male	52 (5.4)
	Female	905 (94.6)
Age (years)		32.00 ± 7.90
Education level	Junior college	138 (14.4)
	Adult college entrance examination	114 (11.9)
	Undergraduate	693 (72.4)
	≥Postgraduate	12 (1.3)
Job position	None	843 (88.1)
	Tutor	71 (7.4)
	Head nurse	43 (4.5)
Title	Nurse	242 (25.3)
	Nurse practitioner	367 (38.3)
	Supervisor nurse	315 (32.9)
	≥Deputy chief nurse	33 (3.4)
Years of service		9.94 ± 8.44
Employment form	Formal incorporation	149 (15.6)
	Contract employment	723 (75.5)
	Personnel agency	85 (8.9)
Monthly income	1 k–5 k	142 (14.8)
	5 k–10 k	579 (60.5)
	10 k–15 k	199 (20.8)
	15 k–20 k	35 (3.7)
	>20 k	2 (0.2)
Marital status	Married	596 (62.3)
	Single	361 (37.7)
Weekly working hours	≤40	712 (74.4)
	>40	245 (25.6)
Total number of adverse events experienced in career	<10	886 (92.6)
	10–50	48 (5.0)
	>50	5 (0.5)
	Unknown	17 (1.8)
Safety training courses	Attended	906 (94.7)
	Not-attended	51 (5.3)
Work engagement		47.81 ± 10.62
Self-efficacy		31.30 ± 4.65
Nurse safety behavior		57.31 ± 4.41

Table 2: Association analysis of work engagement, self-efficacy, and nurse safety behavior in specialized cancer hospitals ($n = 957$).

Variable	Work engagement	Self-efficacy	Nurse safety behavior
Work engagement	1	—	—
Self-efficacy	0.564**	1	—
Nurse safety behavior	0.264**	0.244**	1

**$P < 0.001$.

Table 3: Regression analysis of nurse safety behavior ($n = 957$).

Variable	B	SE	β	t	P
Norm	141.983	9.791	—	14.502	<0.001
Work engagement	0.077	0.016	0.186	4.954	<0.001
Self-efficacy	0.132	0.036	0.139	3.707	<0.001

$R^2 = 0.083$, adjusted $R^2 = 0.081$, $F = 43.251$, $P < 0.001$.

As an important participant in the provision of medical services, nurses' safety behavior can ensure patient safety, improve the quality of care and prevent the occurrence of adverse events. The results of this study show that the nurse safety behavior score in specialized cancer hospitals is $(57.31 ± 4.41)$ points, which is at a high level, higher than the psychiatric nurse safety behavior score $(47.98 ± 7.45)$ points [37], and the nurse safety behavior score in the emergency department of tertiary hospitals is 55 (49,58) points [38]. In recent years, the Chinese government has promoted the safety and quality management of medical institutions [39], all medical institutions have actively carried out the implementation of quality control and the construction of a patient safety culture, which has improved the safety awareness of nurses to a certain extent and made them show higher safety behaviors [10]. Many studies have shown that
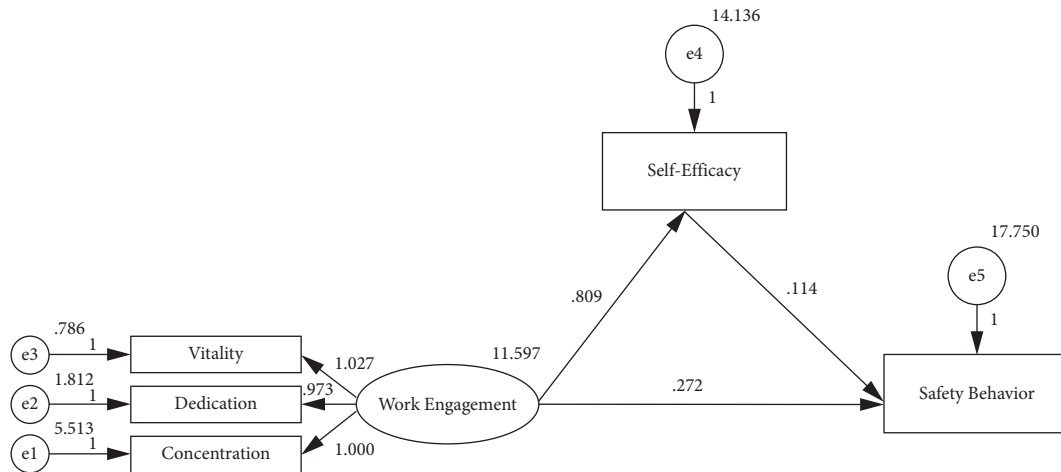
FIGURE 1: Fitting model of the mediating effect of self-efficacy.

TABLE 4: Moderating effect of self-efficacy between work engagement and safety behavior of nurses in specialized cancer hospitals ($n = 957$).

Effects	Structural paths	Impact	SE	P	95% CI	%
Direct effects	UWES $\longrightarrow$ NSBQ	0.272	0.055	<0.001	0.174–0.389	74.7
Mediating effects	UWES $\longrightarrow$ GSES $\longrightarrow$ NSBQ	0.092	0.031	0.003	0.032–0.153	25.3
Total effects	UWES $\longrightarrow$ NSBQ	0.364	0.049	<0.001	0.277–0.174	

Note. UWES = work engagement, GSES = self-efficacy, NSBQ = nurse safety behavior.

the construction of a patient safety culture improves nurse safety behavior, patient safety, and medical quality and affects patient outcomes [40–42]. Cancer patients have physical and psychological problems such as pain, fatigue, and fear of disease progression, recurrence, and prognosis, which lead to potential safety hazards of self-injury and suicide [6, 7, 43]. Nurses will improve risk awareness and increase safety behavior when facing cancer patients. Nurses will face occupational exposure to radiation and antineoplastic drug when nursing cancer patients, increasing their awareness of self-protection and improving safety behavior. However, in the face of cancer patients and high occupational exposure risks, nurses in specialized cancer hospitals will bear more pressure, even if they show vital safety behaviors, resulting in job burnout and even resignation intention [44, 45].

This study shows that the nurse work engagement score in the specialized cancer hospital is (47.81 ± 10.62), which is at the middle level and is similar to the result of Xu's nurse work engagement score in China's cancer hospitals [15], which indicates that nurse work engagement in specialized cancer hospitals needs to be improved. This study is the first to verify that the higher the degree of engagement of nurses, the higher their safety behavior, which is consistent with the research results of Saleem et al. [13] within the construction industry, and Wang and Lu [46] in the coal industry. Work engagement is a positive, happy, work-related emotion and cognitive state characterized by vitality, dedication, and focus, which reflects the sense of identity and focus in work [21]. Work input can improve nurses' satisfaction and job burnout, increase their willingness to stay on duty [47, 48], and improve nurses' work results and quality [49]. Nurses in

specialized cancer hospitals have a moderate level of work engagement, reducing their safety behavior to a certain extent. This may be due to the negative impact of heavy work, compassion fatigue, occupational exposure risk, and other adverse effects on their work enthusiasm and professional identity, which has seriously affected the degree of work engagement, leading to a decline in the level of safety behavior [50, 51].

The structural equation model shows that nurses' self-efficacy in specialized cancer hospitals can directly and positively affect work engagement and safety behavior. Self-efficacy plays a partial intermediary role in the impact of work engagement on safety behavior, and the intermediary effect value accounts for 25.3% of the total effect. Self-efficacy is an individual's belief in his ability to complete tasks, which plays a role in controlling and regulating behavior. It plays a vital role in an individual's cognition and behavior [24, 25]. In the work demand-resource model, work demand is the internal factor of individual work engagement. Several studies have shown that [24, 25, 52] a higher sense of self-efficacy can stimulate nurses to have the internal drive to meet challenges, overcome difficulties, and better complete tasks, and can enable nurses to devote themselves to nursing work with a positive attitude and dedication. Work resource is the external factor of individual work engagement. The research shows that [53–56] external factors such as a good working environment, beneficial medical and nursing cooperation, and high sense of motivation make them more actively and diligently participate in nursing work. Self-efficacy, as the internal driving force in the creation of nurses, can make them more actively participate in safety training and acquire safety knowledge, which can be

reflected in their behavior. A higher sense of self-efficacy can improve nurses' ability to cope with work pressure and occupational risks and improve their safety behavior. This study validates that nurses' self-efficacy is a way to translate high levels of work engagement into nurse safety behavior.

5. Limitations

This study used a convenience sampling method by posting the link to the online questionnaire via WeChat. Although questionnaires were collected from several hospitals, the total number of nurses in each specialist oncology hospital was not surveyed beforehand, thus conducting quota sampling and stratified sampling, resulting in an uneven sample size of hospitals and weakening the representativeness of the data. This study was a cross-sectional study, and the results showed a weak correlation between the coefficient of correlation between nurse safety behavior and work engagement and self-efficacy, and the low variability explained in the regression analysis affected the stability of the model. However, the influence between the three was positive. Future studies should attempt to include more influential factors to fully explore the factors influencing nurse safety behavior and to conduct longitudinal studies to further validate them.

6. Conclusions

This study explains how developing nurses' self-efficacy is an intervention mechanism that promotes their work engagement and enhances nurse safety behavior. Self-efficacy and nurse work engagement improve safety behavior, and self-efficacy partially mediates work engagement and safety behavior among nurses in specialized cancer hospitals.

7. Implications for Nursing Management

Nursing managers should focus on cultivating nurses' self-efficacy. They can improve nurse safety behavior, reduce nursing errors and defects, and improve nursing quality by creating a good working environment, establishing a healthy healthcare partnership, increasing nurses' sense of professional interest, and appropriately empowering nurses to mobilize their motivation and professional identity so that they can devote themselves to nursing work and increase their work participation. We can improve nurse safety behavior by exploring new safety management models, strengthening a diverse patient safety culture, creating a safe environment, creating a safe atmosphere, and formulating safe production processes.

This study is significant as it has a solid theoretical basis in proposing relationships between research variables. In addition, this study provides ideas for care managers to effectively control patient safety.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Conflicts of Interest

The authors declare that they have no conflicts of interests.

Acknowledgments

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Research Article

Work Experience of Chinese Male Nurses Based on the Job Demands-Resources Model: A Cross-Sectional Study

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Aim. This study aimed to quantitatively compare the effects of perceived social support, resilience, and task load on occupational burnout and flow at work in male nurses, as well as the complex relationships among these variables. *Background.* Male nurses play a vital role in the healthcare system. However, little is known about the key factors that may improve the work experience of male nurses. *Methods.* A cross-sectional study was conducted from June to December 2021. A convenience sample of 356 male nurses completed measures of general information, burnout, flow at work, perceived social support, resilience, and task load. Dominance analysis and network analysis were used to explore the associations between the variables studied. *Results.* Among the variables studied, perceived social support most strongly predicted burnout, while perceived social support and resilience had equal predictive weights in flow at work. The network analysis found that resilience was the bridge indicator with the strongest connections to other variables. *Conclusion.* The interventions focused on the perceived social support and resilience of male nurses could help improve their work experience. *Implications for Nursing Management.* Nursing administrators should give male nurses more support and understanding to reduce burnout at work. At the same time, administrators can conduct psychological lectures to improve male nurses' resilience, thereby increasing their flow at work. Providing challenging tasks that match male nurses' skills could also help improve their work experience.

1. Introduction

The latest data from the National Bureau of Statistics of China in 2022 showed that the number of registered nurses (RNs) in China had reached 5.02 million, of which 150,000 were male nurses. In the case of the shortage of nursing human resources, male nurses had unique advantages. For example, they were physically stronger, good at dealing with complex devices, and handled problems more rationally [1]. However, since the time of Nightingale, nursing is often considered a domain of women [2, 3]. Male nurses have a lower sense of professional identity and higher turnover intention due to many factors such as traditional beliefs, self-concept, social status, and income [4, 5]. How to attract more male nurses to stay in the nursing profession has become a concern for nursing administrators.

Previous studies showed that nurses' work experience, such as burnout, significantly predicted their turnover rate. For example, a longitudinal study of 1688 nurses showed an 11.62% increase in the likelihood of turnover for a unit increase in the emotional exhaustion dimension of burnout [6]. Occupational burnout, as one of the most concerned work experiences in the field of occupational health, refers to a state of emotional exhaustion, cynicism, and reduced personal accomplishment experienced by individuals in the human-serving professional field [7]. Actually, burnout continues to be a persistent and concerning problem for male nurses. A previous study showed that the burnout rate of male nurses in China was as high as 59.1%–69.1% [8]. Occupational burnout not only affects the physical and mental health of individuals [9] but also causes a series of adverse effects, such as the decline in nursing quality and

doctor-patient conflict [10]. These further increase the work instability of male nurses. Although many studies have been conducted globally to reduce nurses' burnout, the focus on male nurses is still lacking.

Flow at work (FaW), as a positive work experience, has received increasing attention in recent years with the flourishing development of positive psychology. Bakker proposed that FaW was a short-term peak experience at work characterized by absorption, work enjoyment, and intrinsic work motivation [11]. According to the broaden-and-build theory, this positive state leads to a series of positive outcomes for the individual at work, including positive experiences, thoughts, and feelings that promote optimal functioning and well-being [12]. Some studies were conducted to explore the positive effects of flow. For example, FaW was found to be associated with higher performance [13], more positive emotions, and lower turnover intentions [14], thus playing an important role in improving the professional identity and attitudes of nurses [15, 16]. However, most of the recent studies used the entire nursing team as the research object, and the attention on male nurses' FaW was lacking. Hence, this study aimed to explore the key factors that enhanced the work experience of male nurses from the perspectives of burnout and FaW.

The job demands-resources (JD-R) model is a theoretical framework most widely used in occupational health research. The main assumption of the model was that each occupation has factors associated with job stress, which can be classified into two categories: job demands and job resources. Previous studies found that the JD-R model could predict the experiences of burnout and work engagement [17]. As a job demand in the clinical nursing field, most previous studies found that the task load could positively predict burnout [18, 19]. Regarding job resources, previous research showed that the perceived social support (PSS) and resilience could improve the work experience of nurses. As an external resource, PSS refers to an individual's subjective perceptions of support from other people [20], including family support, friends' support, and other supports (such as colleague support). PSS enables nurses to seek assistance to cope with stressors in the workplace [21], and can reduce burnout and enhance the flow experience [22, 23]. Resilience, as one of the internal coping resources, refers to the ability of an individual to recover from failure, adversity, uncertainty, or overpowering change [24]. Individuals with higher levels of resilience can overcome the negative effects of workplace adversity and challenges, resulting in less burnout and more flow experiences [25, 26].

However, little research has quantitatively compared the effect of the aforementioned variables on nurse burnout and FaW. The traditional multiple regression determines the relative importance of predictors, usually using standardized regression coefficients or R^2 values. However, if the analyzed predictors are correlated, for instance, nurses with greater PSS demonstrate higher levels of resilience [21], and the regression analysis results tend to be dependent on the existing model. In addition, using standardized regression coefficients to determine the relative importance may exaggerate or reduce the effect of predictors [27]. The

dominance analysis calculates the average direct effect of each variable (only considering the variable itself), the overall effect (depending on all predictive variables in the full model), and the partial effect (depending on all other predictive variables in the subset model). This method explains the relative weights of predictive variables while comparing all possible subset models. Therefore, it is more accurate and intuitive to determine the sequence of relative importance among predictors by using this method. In this context, the present study compared the relative predictive weights of PSS, resilience, and task load on the work experience of nurses using dominance analysis.

In this study, the dominance analysis was conducted based on the sum scores of self-report measures of the participants. However, both burnout and FaW, which represented the work experience of male nurses, and PSS and task load, which were predictor variables, all have different components (i.e., different dimensions). Therefore, exploring the relationships among variables only based on the total scores may still be problematic, as it may overlook different associations between variable dimensions and restrict the development of intervention methods. In recent years, network analysis has gained increased attention for its ability to provide inter-relationships among the factors [28]. In general, the network structure consists of nodes (variables of interest) and edges (connections between variables). It allows for studying the complexity of a selected structure. At the same time, it also provides centrality indices that characterize the nodes in the network, thus reflecting which nodes are more important in the network. Thus, on the one hand, using network analysis may contribute to the existing knowledge by elucidating the relationships between predictor variables (PSS, resilience, and task load) and work experience (burnout and FaW) at a component level. On the other hand, the bridge centrality strength index (i.e., the sum of the value of all edges connecting a specific node to other community nodes) for all nodes was estimated to find the bridge node, thus providing more references for the development of targeted interventions.

Taken together, the aim of this study was (1) to investigate levels of occupational burnout and FaW in male nurses, (2) to compare the relative predictive weights of job demands-resources-related variables (PSS, resilience, and task load) on the work experience of male nurses (occupational burnout and FaW) through dominance analysis, and (3) to further explore the complex relationship among multiple variables and identify the key variables in connecting the network using the network analysis while considering both burnout and FaW. The conceptual map of study variables is shown in Figure 1.

2. Materials and Methods

2.1. Design. This study adopted a cross-sectional design.

2.2. Sample. Participants were recruited from 10 public hospitals in Jinan, Shandong Province, China. The inclusion criteria were as follows: (a) having a Chinese RN license and
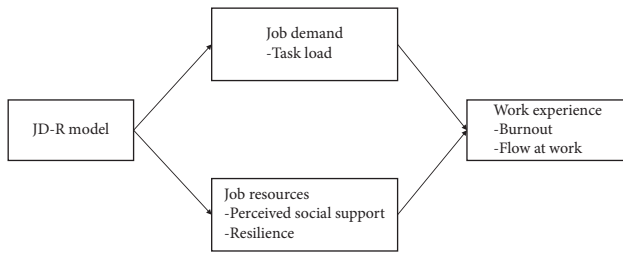
Figure 1: The conceptual map of study variables.

(b) male nurses engaged in nursing work for ≥1 year. The study nurses or nurses on leave were excluded. In this study, a total of 402 electronic questionnaires were collected. After excluding the questionnaires with less than 5 min of response time, 356 questionnaires were finally included in the analysis. The sample size ranges up to 350, so high specificity, moderate sensitivity, and edge weights correlations can be properly seen in the network model [29].

2.3. Measures.

The sociodemographic and work-related data were assessed with a researcher-designed questionnaire, mainly including age, marital status, child status, economic conditions, education level, work department, professional title, position, hospital level, work seniority, and the number of night shifts per month.

The Maslach Burnout Inventory-General Survey (MBI-GS) is a widely used burnout assessment tool [30]. This scale consisted of 15 items including the following 3 subdimensions: emotional exhaustion (five items), cynicism (four items), and personal accomplishment (six items). Each item was rated on a 7-point scale (0 = never and 6 = very frequent). The first two subdimensions were scored positively, while the personal accomplishment subdimension used reverse scoring. Higher scores indicated more severe occupational burnout. In this study, Cronbach's α was 0.854 for the entire scale and 0.964, 0.948, and 0.945 for emotional exhaustion, cynicism, and personal accomplishment, respectively.

This study used the work-related flow inventory (WOLF) revised by Zhu [31] to measure the FaW of nurses, which was a revision of the original version developed by Bakker [32]. The scale contained three subdimensions of FaW: absorption, work enjoyment, and intrinsic work motivation. The participants were asked to rate their agreement with each item on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Higher scores indicated higher FaW experiences. The Cronbach's α coefficients for the whole scale and subdimensions were 0.952, 0.908, 0.958, and 0.903, respectively, in the present study.

The Perceived Social Support Scale was used to measure the subjectively perceived levels of social support among male nurses [33]. This scale included three subdimensions of family support, friends' support, and other support, using a Likert 7-point scoring (1 = strongly disagree and 7 = strongly disagree). The total score ranged from 12 to 84, with higher scores indicating more PSS. The Cronbach's α coefficients for the whole scale and subdimensions in this study were 0.969, 0.936, 0.950, and 0.926, respectively.

The 10-item Connor F02D Davidson Resilience Scale (CD-RISC-10) was used to measure the resilience level of individuals [34]. This was a 5-point Likert scale, and each item was scored from 0 to 4 (0 = never, 1 = rarely, 2 = sometimes, 3 = often, and 4 = always). The total score was the sum of the scores of all items, and a higher total score indicated a higher level of resilience. In this study, the Cronbach's α for this scale was 0.965.

The task load was measured using the NASA-Task Load Index (NASA-TLX) scale proposed by Hart [35]. The original scale had six items. In this study, the revised Chinese version was used [36], which retained four items. Each item was a subdimension, namely, mental effort (ME), physical effort (PE), time pressure (TP), and effort level. Each item was scored from 0 to 20, represented by a line divided into 20 equal parts, with "low" and "high" marked at each end of the line. The higher the score, the heavier the task load. The Cronbach's α of the total scale in this study was 0.887.

2.4. Data Collection.

Data collection for this study was conducted from June to December 2021. After explaining the purpose and methods of the study, approval was obtained from the nursing principal of each hospital surveyed. The survey host of "So Jump" was used for collecting the questionnaires online. Participants accessed the survey by scanning the QR code and clicking on the secure link.

2.5. Data Analysis.

All the analyses were conducted with SPSS version 26.0 (IBM Corp, NY, USA) and R software version 4.2.0 (R Foundation for Statistical Computing, Vienna, Austria). Continuous variables were presented as means (M) and standard deviations (SD), while the categorical variables were described using frequencies (N) and percentages (%). Pearson's correlation analysis was used to analyze the correlations of study variables.

The dominance analysis [37] was developed by Budescu to compare the relative importance of predictors in multiple regression by examining the R^2 values for all possible subset models ($2^P - 1$, where P is the number of predictors in the full model). This approach was used in the present study to compare the relative importance of PSS, resilience, and task load for occupational burnout and FaW. According to the theoretical basis of a dominance analysis, we conducted seven regression analyses to test all possible combinations of the predictor variables and obtained averaged ΔR^2 values to compare the weight of the predictors.

In this study, we estimated a Gaussian graphical model (based on polychoric correlations) containing PSS (three nodes), resilience, task load (four nodes), occupational burnout (three nodes), and FaW (three nodes) to explore the connections between these nodes. A Gaussian graphical model is an undirected weighted network suitable for association analysis among continuous variables, in which edge weights can be understood as partial correlation coefficients (i.e., controlling the effects of all other items in the network). An extended Bayesian information criterion (EBIC) least absolute shrinkage and selection operator (LASSO) procedure was used for network modeling to

obtain a more concise network. The network was visualized using the qgraph package. In the network structure, "edges" are the lines between nodes representing regularized partial correlations. Two nodes are connected by an edge when their partial correlation coefficient is not equal to zero. The thicker the edge, the stronger the association. For a deeper understanding of which indicator was most closely connected to other constructs, we subsequently estimated the bridge centrality strength for all nodes. In addition, we used the bootnet package of R software to calculate the correlation stability (CS) coefficient to evaluate the stability of the network. A previous study suggested that the CS-coefficient ≥0.5 indicated that the network model had better stability [38]. All variables on different scales were normalized to avoid the potential impact. The related codes are available in the Supplementary File.

All statistics were two-tailed, and P values <0.05 indicated statistically significant differences.

2.6. Ethical Considerations. The research ethics committee of the affiliated institution approved the study, and informed consent was obtained from all participants before questionnaire collection, ensuring that the responses were voluntary and anonymous.

3. Results and Discussion

3.1. Sociodemographic and Work Characteristics. A sample of 356 male nurses from 10 public hospitals who met the inclusion criteria was obtained. The participants were aged 20–53 years ($M = 30.6$; SD = 5.8). Among the participants, 7% were from surgical wards, 12.6% from medical wards, and 44.7% from an emergency or intensive care ward. The mean number of working years was 8.5 (range 1–32) for 356 male nurses, and they had an average of 7.2 (range 0–26) night shifts per month. More details are presented in Table 1.

3.2. Descriptive Statistics and Correlation Analysis. The scores of emotional exhaustion, cynicism, and low personal accomplishment for male nurses in this study were (9.76 ± 7.90), (6.09 ± 6.05), and (18.73 ± 9.63), respectively. The FaW score was (44.50 ± 10.98). As shown in Table 2, resilience, PSS, and task load were all negatively correlated with burnout ($r_s = -0.164$ to -0.432 and $P < 0.01$) and positively correlated with FaW ($r_s = 0.155$–0.516 and $P < 0.01$). Notably, all job demands-resources-related variables were correlated with one another ($r_s = 0.259$–0.741 and $P < 0.01$), indicating that the dominance analysis rather than multiple regression was needed to compare the predictive weight [39].

3.3. Dominance Analysis. Table 3 presents the results of the dominance analysis. The numbers in the table represent the average ΔR^2 of each predictor when added to regression equations with different subsets of the other predictors. When the outcome variable was occupational burnout, PSS accounted for 14.6% of the average variance, making it the most important predictor. When the outcome variable was

TABLE 1: General information of participants ($n = 356$).

Variables	$\overline{x} \pm$ SD (n)	Range (%)
Age/years	30.6 ± 5.8	20~53
Marital status		
Married	240	67.4
Other (single or divorced)	116	32.6
Have child or not		
Yes	218	61.2
No	138	38.8
Economic conditions		
Well	187	52.5
General	92	25.8
Poor	77	21.6
Educational level		
Junior college	67	18.8
Undergraduate	260	73.0
Master	29	8.1
Department		
Medical ward	45	12.6
Surgical ward	25	7.0
Emergency or intensive care ward	159	44.7
Other	127	35.7
Professional title		
Junior	203	57
Intermediate	140	39.3
Senior	13	3.7
Work position		
Nurses	308	86.5
Nurse assistant	48	13.5
Hospital level		
Tertiary	304	85.4
Secondary and below	52	14.6
Work experience/years	8.5 ± 5.3	1~32
Monthly night shift/days	7.2 ± 4.5	0~26

SD, standard deviation.

TABLE 2: Correlation coefficients (rs) among study variables ($n = 356$).

Variables	1	2	3	4	5
(1) Resilience	1				
(2) PSS	0.741**	1			
(3) Task load	0.259**	0.266**	1		
(4) Burnout	−0.364**	−0.432**	−0.164**	1	
(5) Flow at work	0.515**	0.516**	0.155**	−0.438**	1

Note. **P means $P < 0.01$. PSS, perceived social support.

FaW, both PSS and resilience accounted for 18.1% of the average variance. In both analyses, the task load was the least significant predictor.

3.4. Network Analysis. In the present study, the purpose of network analysis was to explore the association between different dimensions of variables and to further discover bridge nodes. Given the complexity of the network analysis approach and the purpose of this study, only the main findings were highlighted as follows. The Gaussian network was constructed with the normalized scores of each

TABLE 3: Dominance analysis: average R-square across subsets ($n = 356$).

Outcome variable	Number of predictors in the model	PSS	Resilience	Task load
Burnout	0	0.187	0.133	0.027
	1	0.145	0.088	0.012
	2	0.106	0.045	0.002
	General dominance	0.146	0.089	0.014
Flow at work	0	0.266	0.266	0.024
	1	0.177	0.177	0.008
	2	0.101	0.101	$\Delta R^2 < 0.001$
	General dominance	0.181	0.181	0.011

PSS, perceived social support.

subdimension of the research variables, and the CS-coefficient for the strength of the networks was 0.67, indicating that the centrality stability was excellent. Figure 2 shows the network of research variables, where the nodes of the same color represent different dimensions of the same variable, solid lines indicate positive correlations among variables, and dashed lines indicate negative correlations among variables. The stronger the correlation among variables, the thicker the line in the graph. The results showed that most variables were correlated. Strong correlations were found between different dimensions of the same variable, except between cynicism and reduced accomplishment. Among different variables, resilience and friend support had the strongest correlation. In addition, resilience, which had the highest bridge centrality strength among all nodes (see Figure 3), suggested that resilience was the bridge node in this network.

4. Discussion

The present study indicated that the work experience of male nurses needs to be improved, and further clarified the relative predictive weights of job demands-resources-related variables on work experience. Furthermore, we examined the mutual interactions and structures of PSS, resilience, task load, burnout, and FaW among Chinese male nurses. These findings enriched the research in the occupational health field of male nurses and improved public awareness of the male nurse group.

Compared with previous findings on Chinese nurses [40], the male nurses in this study had slightly lower levels of emotional exhaustion and cynicism and higher levels of low personal accomplishment. It is possible that the current nursing work is not challenging enough for male nurses. Coupled with the influence of traditional concepts, it is not easy for them to be recognized by patients and families, and therefore it is difficult to realize their personal value. The results showed that the FaW score of male nurses was lower than that found in previous studies in the entire nursing population [41]. This indicated that FaW among male nurses still needed to be improved to promote job performance and reduce turnover.

The results of this study suggested that the most important predictor of the occupational burnout of male nurses was PSS. Higher PSS was associated with lower burnout, which was consistent with previous findings [22]. When male nurses receive support from friends, family, and others (e.g., colleagues), their emotional exhaustion reduces and personal accomplishment increases, thereby reducing occupational burnout in clinical practice. In terms of FaW, the dominance analysis showed that PSS and resilience were equally important. Previous research on music teachers and students suggested that work resources such as social support were important antecedents of flow experiences [11]. Csikszentmihalyi's flow theory [42, 43] stated that the fit between the skills and the challenges is a prerequisite for flow to occur. And the study showed that support from colleagues promoted a balance between challenges and skills [11]. Also, the results of a study conducted on athletes showed that brief mindfulness training could significantly increase their flow by improving resilience [26]. This suggests that individuals with higher levels of resilience are more resilient to stress and can easily focus on their work, thus resulting in higher levels of flow. Thus, PSS and resilience, as individual internal and external resources, respectively, might help male nurses recover from frustration more quickly when faced with the constraints of traditional beliefs and work-related pressure, thereby facilitating the generation of flow experiences.

In the present study, the task load had the least effect on both burnout and FaW, which was inconsistent with previous findings [44]. Moreover, the task load negatively correlated with burnout and positively correlated with FaW. According to the job enrichment theory [45, 46], certain job characteristics associated with more complex work and roles, such as increased task diversity and enhanced worker motivation along with positive responses, were expressed as factors associated with increased job satisfaction and reduced burnout. The male nurses in this study might be prone to boredom and burnout due to the high repetition of daily nursing operations and the lack of task richness. Besides, Csikszentmihalyi identified that skill-challenge balance was a prerequisite for flow [47]. In the workplace, employees experienced FaW only when the job requirements and professional skills were balanced and at a high level. This might explain the association of a higher task load with more FaW.

The present study also found resilience important in connecting the final Gaussian network that included all the variables being studied. Both PSS and task load (mainly ME)
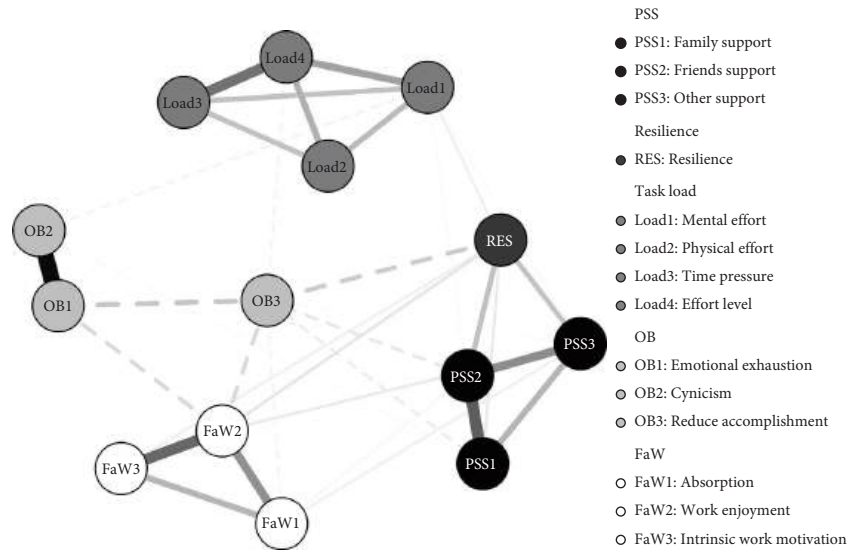
Figure 2: Visualization of the network ($n = 356$).
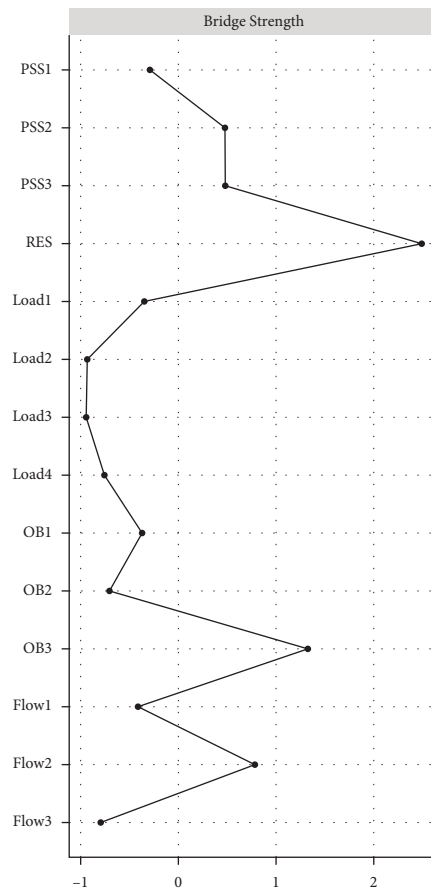
Figure 3: Bridge centrality strength of study variables ($n = 356$).

could affect burnout and FaW through resilience. This suggested a link between nurses' resilience and the ability to maintain healthy psychological characteristics in order to positively cope up with workplace challenges [48]. In addition, higher resilience reduced burnout by promoting FaW

(especially work enjoyment). It is possible that male nurses with higher resilience tend to respond more positively when facing various pressures, and hence they were prone to experience FaW. Individuals in the state of flow had clear goals, enjoyed their work, and were unaware of the passage

of time [49], which reduced the occurrence of burnout. The results of network analysis also showed the strongest correlation between resilience and friend support among different variables, reflecting that the support from friends was crucial for improving the resilience of male nurses.

This study had some limitations. First, the present findings did not support inferences on the causal relationships among the examined variables or it did not capture the intrapersonal dynamic of the relationships over time because the design of this study was cross-sectional. Second, the study sample included only a part of male nurses from one Chinese province, thus reducing the generalizability of research findings. Furthermore, given the variety of factors that influenced work experience, the findings were likely to be further shaped by certain factors that were not focused on in this survey.

5. Conclusions

Male nurses generally have poorer professional recognition and work experience under the influence of many factors such as traditional concepts and stereotypes. Nursing managers should pay attention to the professional development of male nurses and provide them with support at work. At the same time, managers can conduct psychological lectures to improve male nurses' resilience levels. In addition, the results of this study suggest that managers should assign challenging tasks to male nurses based on their individual abilities to leverage their unique strengths.

6. Implications for Nursing Management

This study quantitatively compared the relative weights of PSS, resilience, and task load on the burnout and FaW of male nurses using dominance analysis. The findings revealed that PSS was the strongest predictor for occupational burnout among Chinese male nurses, while PSS and resilience were equally important for FaW. The results of the network analysis revealed complex relationships among variables, further suggesting that the interventions aimed at improving the work experience of male nurses could benefit from enhancing resilience. Thus, the interventions might be helpful for nursing managers to take action in order to reduce burnout and to improve FaW among male nurses.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon request.

Disclosure

Yiming Gao and Jian Li are co-first authors.

Conflicts of Interest

The authors declare that they have no conflicts of interest.

Authors' Contributions

Yiming Gao and Jian Li contributed equally to this work.

Supplementary Materials

The related codes for network analysis are available in the Supplementary File. (*Supplementary Materials*)

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Research Article

Working Hours Associated with the Quality of Nursing Care, Missed Nursing Care, and Nursing Practice Environment in China: A Multicenter Cross-Sectional Study

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Aim. The aim of the study was to examine the effect of the length of working hours on missed nursing care, quality of nursing care, and perceptions of the nursing practice environment. *Methods.* A multicenter cross-sectional investigation using online questionnaires was conducted from April 2 to May 10, 2022, in twenty nine hospitals (13 Level-III hospitals and 16 Level-II hospitals). We collected data on the working hours of nurses and nurse-reported outcomes, including missed nursing care, quality of nursing care, and nursing practice environment. Restricted cubic spline (RCS) regression models were used to examine relationships between the hours per shift and nurse-reported outcomes. *Results.* We investigated 12,703 nurses with a response rate of 97.33%. Nurses worked on average 7.72 (SD = 1.16) hours on the day shift and 8.92 (SD = 2.20) hours on the night shift, respectively. On the day shift, working 7.5 hours shift showed minimal missed nursing care; meanwhile, working 7–7.5 hours were correlated with the highest satisfaction of the nursing practice environment and better quality of nursing care. On the night shift, the highest missed nursing care was found for a working duration of 12 hours to the working 7 hours, with the lowest satisfaction while better quality was observed. The percentage of nurses who reported working overtime was 30.33%. Nurses who worked overtime reported lower satisfaction and poorer quality of nursing care on all shifts; moreover, working overtime showed the positive correlation to missed nursing care on the day shift, while on night shift was not statistically significant. *Conclusion.* Positive outcomes were observed for nurses who reported working 7–7.75 hours on the day shift and 12 hours (no more than 15 hours) on the night shift. *Implications of Nursing Management.* The results reemphasized the need for managers to reduce the working hours, overtime work, and the frequency of the night shift.

1. Introduction

Although the working hours for nurses predominately fall between 36 and 40 hours weekly, the reality of the number of hours nurses work, especially per shift, is still up for debate. Prevailing shift patterns can be categorized into morning, day, evening, and night depending on what time the work started[1]. Generally, the day shift starts at 6 am or 7 am and ends before 9 pm, whereas the evening or night shift frequently lasts from 6 pm to 2 am or 11 pm to 7 am [2, 3].

On the other hand, shift patterns are usually classified into quickly forward rotating shift and slowly rotating shift based on the shift length. The rapidly rotating shift with approximately 8 hours per shift time is usually adopted in China [4] and Korea [5]. It is associated with a shorter duration (<12 hours) of about 4, 8, or 10 hours. Meanwhile,

the slowly rotating shift is longer, commonly over 12 hours and even up to 24 hours. In the UK, US, and several European Union countries, longer shifts have become a controversial topic, specifically ones that last a consecutive 12 hours [3].

Many research studies investigated the correlation between work shift or the length of working hours of nurses and nurses' or patients' outcomes. Recent studies have actively examined the effect of different shift lengths on nurse-reported outcomes and found that long working hours per shift can shorten the handover times and reduce the overlap to provide continuous patient care [6, 7]. Some nurses preferred working long shifts for the benefits, including better work-life balance and more time off [1].

However, inappropriate working hours had a harmful impact on nurse, hospital, and patient outcomes. For the nurse, previous studies showed a strong positive relationship between long daily working hours and adverse nurse outcomes, including fatigue [8], burnout [9], lapses of attention, sleepiness [10], and increased rates of sick leave [11]. For the hospital, excessive working hours often lead to an overly stressful work environment, which was a reason that nurses reported leaving their jobs [9]. In turn, high turnover rates further exacerbated the shortage of nurses and increased overtime work. Experience from Magnet hospitals demonstrated that improving the practice environment could reduce job dissatisfaction, burnout, or intention to leave [12].

Furthermore, for the patient, insufficient breaks for nurses were considered as a factor that was harmful to patients' outcomes. Much evidence supported that overtime work was positively correlated with missed nursing care (MNC), which caused mediation errors and increased patients' fall with injury [13, 14]. A study reported that all shifts >8 hours were associated with increasing rates of MNC [15]. In addition, nurses working 12 hours or longer was positively associated with poor quality of nursing care, high errors rates, and poor patient safety [16]. D'Sa et al. conducted a 2-year longitudinal study and found that excessive monthly working hours was related to increased patients' infection rates as well as higher mortality rates [17].

To maximize the benefits of shift nursing work, managers and researchers developed different work schedules. In Korea, a survey of 312 nurses reported working the day shift for an average of 8.87 hours and the night shift for 10.57 hours [18] and 33.3% of the nurses (out of 2,568 nurses) worked more than 12 hours per shift in the UK. In contrast, nurses in Cambodia were on call for 24 hours and worked normal 8-hour shifts [19]. In the US, the government policy limited nurses' hours to less than 12 hours per day [20]. A large cross-sectional survey indicated that most day shifts were 8 hours in European countries [15]. The discussion of the night shift referenced circadian rhythm with 8, 10, and 12 hours being acceptable durations for work. Current studies also indicated that the long shifts (+12 hours) and the short shifts were less common [1]. From the nurses' opinion, the 10- and 12-hour night shifts were sustainable to balance juggling children, families, and work schedules with their partners.

In general, clinical managers introduced mixed patterns with nurses alternating between working a long and then a short shift [21]. There were many studies that investigated the relationship between mixed shifts and their outcomes, showing that mixed patterns led to a higher cost and resource use and made it easier to ignore patients' needs [15, 22]. Nonetheless, the outcomes of different working hours in diverse shift, especially by day and night shifts, combined with the circadian rhythm are ambiguous. Although previous studies and practices have documented advantages of different nurse work schedules; however, they were limited to small sample sizes and the lack of recommended length of work, and more evidence is needed to consider both work scheduling and working hours.

We conducted a multicenter cross-sectional study to describe Chinese nurses' work schedule characteristics. We discussed the impact of the length of different shifts on nurses' perception of the nursing practice environment (NPE), MNC, and quality of nursing care (QNC). Furthermore, we recommended beneficial working hours based on day and night shifts. We intend to provide a reference for managers' scheduling and improve quality of nursing care. For policymakers, this study provided great foundation for the physical and mental health of nurses that can be used to develop work schedules with fair working hours.

2. Materials and Methods

2.1. Design and Sample.
We conducted a hospital-based, multicenter, cross-sectional investigation in Hubei province, China, from April 2 to May 10, 2022. Registered nurses were investigated in this study. At one Level-III hospital and one Level-II hospital, we utilized random cluster sampling from each prefecture-level city in Hubei province. According to China's hospital grading system, hospitals were classified into three levels from Grade III to Grade I and Grade III hospitals represent the advanced medical level and nursing competence [23]. Since 3 cities did not have Level-III hospitals, a total of 29 hospitals were enrolled, including 13 Level-III hospitals and 16 Level-II hospitals. Nurses were included if they were (a) registered nurses working in an inpatient department unit and (b) willing to participate in the study. Nurses who were not on duty due to vacation, sick leave, or training were excluded. The researchers submitted the questionnaire and informed consent online which would create a link. The participants filled out questionnaires via the online link. Questionnaires and instructions for data collection were emailed to the nursing directors of each hospital to distribute and conduct the survey.

2.2. Independent Variable

2.2.1. Working Hours.
Working hours were measured based on nurses' self-report. Nurses were asked about scheduling, scheduled working hours, actual working hours, and overtime based on their last shift. Overtime was defined as work time in which nurses exceeded the scheduled working hours specified for their shift.

2.3. Dependent Variables

2.3.1. Quality of Nursing Care.
Nurses reported the quality of care in their unit as "poor," "average," "good," or "excellent" during their last shift. As demonstrated in earlier studies, the quality of nursing care by nurses' self-report was reliable and valid [24–26].

2.3.2. Missed Nursing Care.
MNC was considered an error of omission, in which nursing activities prescribed for the patient were either partially or completely omitted or significantly delayed. It was measured using the Chinese version of the Missed Nursing Care Scale (MNCS) developed by Kalisch and Williams [27] and translated by Si [28]. The scale included two parts. Part A describes 24 nursing activities rated based on the frequency of them being missed as follows: (0) "never," (1) "rarely," (2) "occasionally," (3) "frequently," and (4) "always." Total scores of the subscale part A range from 0 to 96, with higher scores indicating higher levels of MNC. Part B uses 19 items to investigate the causes with 4 dimensions as follows: management, communication, labor resources, and material resources. The reasons nursing care was missed were expressed as (3) "significant reason," (2) "moderate reason," (1) "minor reason," and (0) "no reason." Total scores of subscale part B ranged from 0 to 57. The higher the score, the more it proved to be the main reason for missed nursing care. The content validity with a S-CVI 0.93, a Cronbach's α of 0.924 in part A, and a S-CVI of 0.98, a Cronbach's α of 0.916 in part B. The range of factor loading was between 0.487 and 0.855 and explained 64.308% of ANOVA.

2.3.3. Nursing Practice Environment.
In the current study, the NPE was measured by the Practice Environment Scale-Revised, which contains 10 dimensions, 36 items, and 1 overall evaluation item [29]. Each item was assigned a value of 0–100 points, with "0" indicating very dissatisfied or strongly disagree and "100" indicating very satisfied or strongly agree. That means the total scores of this scale range from 0 to 3700, with higher scores indicating a better practice environment. The NPE had a good construct validity with a RMSEA of 0.043, a GFI of 0.943, and a AGFI of 0.930. The overall Cronbach's α coefficient of the scale was 0.983, and each dimension's Cronbach's α ranges from 0.846 to 0.94.

2.4. Control Variables.
The included covariates were based on the nursing staff demographic characteristics, complexities, severity, and nursing grades. The following control variables were considered as follows: (1) nursing staff demographic characteristics: age, gender, education level, working seniority (<2 years, 2–5 years, 5–10 years, 10–20 years, and >20 years), and professional and technical title (nurse, senior nurse, nurse in charge, assistant director nurse, and above) and (2) department characteristics: (a) working department included internal medicine, surgery, gynecology and obstetrics, pediatric, neonatology, others inpatient department, intensive care unit (ICU), neonatal intensive care unit (NICU), pediatric intensive care unit (PICU), and specialist intensive care unit (specialist ICU). (b) The nurse-to-patient ratio (N-P ratio) refers to the number of patients reported by nurse in the last shift. (c) The patient-care grade ratio refers to the number of patients with different patient-care grades in the last shift. The patient-care grade was divided into special-level nursing, first-level nursing, second-level nursing, and third-level nursing, which classified based on the health industry standard WS/T431-2013 of China considered patient's condition and the Barthel Index. The higher the degree of dependence and the more severe the disease, the higher the patient-care grades, so the highest grade was special-level nursing and the lowest grade was third-level nursing [30]. (d) Nurse's overtime work situation (yes/no).

2.5. Statistical Analysis.
Data were imported from the network platform into SPSS for analysis. In descriptive statistics, frequency and percentage were used for enumeration data. Numerical variables were described using the mean and standard deviation (SD) or median and upper and lower quartiles when the data did not follow a normal distribution. Differences between groups were tested by one-way ANOVA, Kruskal–Wallis/Wilcoxon rank sum test, Kendall tau-b correlation coefficient, and simple linear regression. All the priori levels of significance and hypothesis tests were 2 sided.

Candidate variables were carefully chosen based on clinically relevant and significant univariate relationship factors. On univariate analysis, variables with a p value <0.25 were selected and entered a multivariable model. In the current study, the generalized linear models such as logistic regression and multiple regression were difficult to describe the nonlinear relationship between the independent and dependent variables. Restricted cubic spline (RCS) are popular way to flexibly model nonlinear relationships in regression models. RCS is based on the cubic spline which use cubic polynomials to obtain a smooth function, which add beyond boundary knots (before the first and after the last) to improving the behavior at the extremes [31]. Therefore, we conducted the RCS model to examine the optimum length of work in MNC, quality of nursing care, and nurse practice environment perception. In the models, all the categorical variables were classified into dummy variables and special secondary school, nurse, <2 years, and internal medicine ward were as the reference variables of the education level, profession-technical title, work seniority, and department, respectively.

We selected different cutoff points for working hours, according to the advice of Harrell in regression modeling strategies [32, 33]. We used the RCS with three knots at the 10th, 50th, and 90th (0.10, 0.50, and 0.90), four knots at the 5th, 35th, 65th, and 95th (0.05, 0.35, 0.65, and 0.95), five knots at the 5th, 27.5th, 72.5th, and 95th (0.05, 0.275, 0.50, 0.725, and 0.95), and six knots at the 5th, 23th, 41th, 59th, 77th, and 95th (0.05, 0.23, 0.41, 0.59, 0.77, 0.95) to flexibly model the association of working hours, MNC, QNC, and

NPE. The nonlinear associations were conducted using the Chi-square test. We calculated the ORs for quality associated with work hour. A two-sided *p* value <0.05 was considered significant. Statistical analyses were performed using IBM SPSS Statistics 23.0 and R software.

2.6. Ethical Considerations. The study was approved by the Ethics Committee of Tongji Hospital, Tongji Medical College, Huazhong University of Science and Technology (no. TJ-IRB20220454).

3. Results

3.1. General Characteristics of the Participants. In total, 13,052 of the nurses completed the survey and 349 questionnaires were excluded due to uncompleted answers. Finally, 97.33% questionnaire datasets of the study containing 12,703 nurses were included in analysis. On average, nurses worked 7.72 (SD = 1.16) hours and took care of $7(P_{25}-P_{75}, 4-10)$ patients on the day shift; 12.85%, 41.03%, 65.71%, and 28.57% patients with special-level care, first-level care, second-level care, and third-level care, respectively. On the night shift, work hours were 8.92 (SD = 2.20) hours and per nurse should took care of 13 $(P_{25}-P_{75}, 6-25)$ patients, which in 19.99% of special-level care, 23.33% of first-level care, 38.46% of second-level care, and 21.05% of third-level care. 82.47% nurses come from Level-III hospitals and 97.2% of them were female. The majority were from internal medicine (32.8%), with a bachelor's degree (84%). 46.6% of the nurses held a senior professional-technical title and the mean age was 32.07 years (SD = 6.79). Employment of 5–10 years was reported the most in terms of work seniority. During the nurses' last shift, 69.5% was on duty during the day and 30.33% nurses reported working overtime (Table 1).

3.2. Prevalence of MNC, NPE, and QNC. The most frequently MNC was changing sheets. The most significant causes of MNC were labor resources, management, communication, and material resources. 43.9% of the nurses rated their unit's QNC as "good." The average score of NPE was 3081.88 (SD = 739.37).

3.3. Association between RNs' Working Hours and MNC, NPE, and QNC. All the data on the RCS analysis were divided by shift (day and night). The variables of age, gender, overtime work, and patient-care grade ratio were significant in univariate analysis and showed a bias. We found that when the age, gender, overtime work, and patient-care grade ratio were not fed into the RCS models of night shift of MNC, NPE, and day shift of QNC, the RCS models had a good performance.

We conducted RCS to investigate the association between nurses' working hours and MNC (Tables2 and 3). The RCS with 6 knots and 3 knots were prioritized for the interpretation of the effect of working hours on MNC for the day and night shift, respectively. On the day shift, working hours, overtime work, education, professional-technical title, department, labor resources, and management were significantly correlated with MNC and explained 10.3% of the variation. We visualized the relationship in Figure 1. The shape of the curve showed a slight negative association when the duration was less than 7.5 hours and increased visibly from 7.5 hours to 15 hours, indicating a significant positive relationship. The curve presented a sharp drop, which revealed a negative correlation for working beyond 15 hours. In other words, working up to 7.5 hours showed minimal MNC but was greatest for shifts exceeding 15 hours. Overtime work, nurses' postgraduate education background, the professional-technical title of nurse in charge and assistant director nurse or above, labor resources, and management showed a positive relationship with MNC. The gynecology and obstetrics unit and NICU were negatively associated with MNC. For the night shift, working hours, professional-technical title (assistant director nurse or above), departments (surgery, pediatric, and specialist ICU), patient-care grades (special-level care and second-level care), labor resources, communication, and management explained the 9.7% variance in the model. Except departments which were negatively associated, the other independent variables showed a positive correlation with MNC. With a tipping point of 12 hours, the length of work was positively related to MNC when it was less than 12 hours. Conversely, it showed a negative relation. That is, nurses reported the highest MNC when they worked 12 hours on the night shift (Figure 2).

Tables 2 and 4 and Figures 3 and 4 describe the correlation between working hours and perceptions of NPE. For the day shift, overtime work, nurse-to-patient ratio, and special-level nursing were negatively correlated with NPE satisfaction. Meanwhile the surgery unit, others unit, NICU, PICU, specialist ICU, and first-level nursing had a positive relation. In terms of the night shift, work experience of 5–10 years and second-level nursing were negatively associated with NPE satisfaction; however, the surgery unit, NICU, and specialist ICU were positive. The significant variables explain 5.9% and 6% of NPE satisfaction on the day and night shift, respectively. The satisfaction on the day shift remained stable below 7 hours of working time but goes down at 15 hours (Figure 3). Nevertheless, on the night shift, the satisfaction increased gradually and followed an unnoticeable decline at 7–7.75 hours (Figure 4). Essentially, we observed the highest NPE satisfaction when nurses worked 7–7.5 hours on the day shift and the lowest was reported when nurses worked 7 hours on night shift.

The number of working hours as compared to QNC is shown in Tables 5 and 6. On the day shift, the findings revealed a significantly lower OR which trended to the poor quality of nursing care as follows: overtime working (OR 0.5 (95% CI 0.45–0.55)), working seniority of 2–5 years (OR 0.79 (95% CI 0.76–1.35)), 5–10 years (OR 0.74 (95% CI 0.60–0.90)), 10–20 years (OR 0.77 (95% CI 0.62–0.95)), >20 years (OR 0.65 (95% CI 0.51–0.84)), and nurse-to-patient ratio (OR 0.99 (95% CI 0.99-0.99)). The other units (OR 1.25 (95% CI 1.10–1.42)), NICU (OR 1.44 (95% CI 1.05–2.01)), and specialist ICU (OR 1.42 (95% CI 1.10–1.84))

TABLE 1: Characteristics of the study participants ($N = 12703$).

Characteristics		N (%)	Mean (SD)	Range
Hospital grade	Level-III	10476 (82.47)		
	Level-II	2227 (17.53)		
Departments	Internal medicine	4166 (32.80)		
	Surgery	3629 (28.57)		
	Gynecology and obstetrics	854 (6.72)		
	Pediatric	660 (5.20)		
	Neonatology	59 (0.46)		
	Others	1761 (13.86)		
	ICU	728 (5.73)		
	NICU	274 (2.15)		
	PICU	81 (0.64)		
	Specialist ICU	491 (3.87)		
Age (years)			32.07 (6.79)	20~60
≤25		1830 (14.41)		
26–34		7473 (58.83)		
35–44		2565 (20.19)		
≥45		835 (6.57)		
Gender	Male	361 (2.84)		
	Female	12342 (97.16)		
Educational background	Special secondary school	77 (0.61)		
	Junior college	1836 (14.45)		
	Undergraduate	10669 (83.99)		
	Postgraduate	121 (0.95)		
Overtime work	Yes	3853 (30.33)		
	No	8850 (69.67)		
Shift	Day	8831 (69.52)		
	Night	3872 (30.48)		
Work seniority (years)	<2	1372 (10.81)		
	2–5	2008 (15.80)		
	5–10	4088 (32.18)		
Work seniority (years)	10–20	3938 (31.00)		
	>20	1297 (10.21)		
Professional-technical title	Nurse	2066 (16.26)		
	Senior nurse	5917 (46.58)		
	Nurse in charge	4304 (33.88)		
	Assistant director nurse or above	416 (3.28)		
Missed nursing care (top3)[a]				0~4
Changing sheets		5627 (7.03)		
Emotional support to patient and/or family		5182 (6.47)		
Turning patient every 2 hours		4846 (6.05)		
Causes of missed nursing care[b]				0~18
Management		62740 (25.92)	4.94 (5.26)	
Communication		62464 (25.81)	4.92 (5.16)	
Labor resources		82455 (34.07)	6.49 (3.90)	
Material resources		34379 (14.2)	2.71 (2.81)	
Quality of nursing care	Poor	22 (0.17)		0~4
	Average	1317 (10.37)		
	Good	5577 (43.90)		
	Excellent	5787 (45.56)		
Satisfaction of the nursing practice environment			3081.88 (739.37)	0~3700

Note. [a]: N = rarely(1) + occasionally(2) + frequently(3) + always(4). [b]: N = significant reason(3) + moderate reason(2) + minor reason(1).

suggested better quality of nursing care. On the night shift, senior nurse (OR 0.04 (95% CI 0.00–0.27)) and 2–5 years (OR 0.79 (95% CI 0.62–0.99)) showed poorer quality of nursing care; yet, the OB-GNY unit (OR 1.36 (95% CI 1.04–1.79)), pediatric (OR 1.37 (95% CI 1.01–1.85)), second-level nursing (OR 1 (95% CI 1.00-1.00)), and third-level nursing (OR 1 (95% CI 1.00-1.00)) were observed as having better quality of nursing care.

Table 2: Comparison of MNC/NPE across groups ($N = 12703$).

Characteristics	MNC			NPE		
	Mean (SD)/Media (P_{25}, P_{75})	F/t/Z	p	Mean (SD)/Media (P_{25}, P_{75})	F/t/Z	p
N-P ratio[1]		3.411	0.001		−4.749	<0.001
Departments[2]		6.03	0.001		7.41	0.001
Internal medicine	6.83 ± 10.58			3030.97 ± 759.15		
Surgery	6.35 ± 10.40			3112.28 ± 722.00		
Gynecology and obstetrics	4.65 ± 8.91			3118.84 ± 752.76		
Pediatric	6.07 ± 9.89			3011.01 ± 767.28		
Neonatology	2.78 ± 5.62			3150.34 ± 688.13		
Others	6.29 ± 11.37			3105.76 ± 735.90		
ICU	6.44 ± 10.29			3030.54 ± 754.73		
NICU	4.24 ± 8.29			3206.7 ± 666.497		
PICU	3.99 ± 9.09			3292.48 ± 660.604		
Specialist ICU	6.49 ± 10.60			3197.8 ± 644.661		
Age (years)[3]		10.688	0.014		36.522	<0.001
≤25	1 (0, 8)			3290.5 (2666.5, 3673)		
26–34	1 (0, 9)			3380 (2720, 3686)		
35–44	1 (0, 9)			3420 (2824, 3682)		
≥45	1 (0, 11)			3239 (2646.5, 3635.5)		
Gender[2]		1.114	0.265		−2.820	0.005
Male	6.91 ± 11.273			3297 (2506.5, 3681.5)		
Female	6.29 ± 10.410			3372 (2727.75, 3681)		
Education background[3]		13.80	0.003		81.881	<0.001
Special secondary school	0 (0, 8)			3281 (2850, 3649.5)		
Junior college	1 (0, 8)			3190 (2504.25, 3632)		
Undergraduate	1 (0, 9)			3394 (2755, 3686)		
Postgraduate	3 (0, 16)			3475 (2960.5, 3676)		
Overtime work[2]		−25.913	<0.001		−22.178	<0.001
Yes	4, (0, 16)			3099 (2382, 3594.5)		
No	0, (0, 6)			3467 (2880, 3694)		
Professional-technical title[3]		31.098	<0.001		19.224	<0.001
Nurse	1 (0, 7)			3288.5 (2645, 3670)		
Senior nurse	1 (0, 8)			3396 (2743.5, 3686)		
Nurse in charge	1 (0, 10)			3378 (2720, 3679)		
Assistant director nurse or above	1 (0, 12)			3322.5 (2810.75, 3658.75)		
Work seniority (years)[3]		18.109	0.001		20.758	<0.001
<2	0 (0, 7)			3345 (2671.75, 3676.75)		
2–5	1 (0, 9)			3304 (2696.75, 3678)		
5–10	1 (0, 8)			3389 (2714.25, 3685)		
10–20	1 (0, 9)			3399 (2757.5, 3687)		
>20	0 (0, 11)			3309 (2690, 3653.5)		
Shift[2]		−2.820	0.005		−2.786	0.005
Day	1 (0, 8)			3389 (2730, 3683)		
Night	1 (0, 9)			3331.5 (2705, 3674)		
Patient grade ratio[1]						
Special level		0.111	0.912		−4.163	<0.001
First level		2.107	0.045		2.780	0.005
Second level		−0.148	0.882		−3.884	<0.001
Third level		−0.592	0.554		0.747	0.455

Note. [1]linear regression; [2]one-way ANOVA; [3]Kruskal–Wallis rank sum test.

4. Discussion

The results found that about one third of the Chinese nurses worked overtime, an average of 7.72 hours on the day shift and 8.92 on the night shift. In 2018, a survey of 1449 nurses in Guangdong province, China, noted that 55% of the nurses reported working overtime [34]. However, we would like to attract attention to the way that nurses working overtime have evolved into a common phenomenon all over the world. A cohort study showed that 50.5% of the Denmark nurses were scheduled for long shifts (≥9 h–<12 h), 1–12 times in the past year [3]. Also, for Finland were 46.6% and averaged between 8.2 and 8.4 hours [35]. In Malaysia, most nurses reported working extended hours. At least 50% of the nurses had experienced doing a double shift and about 30% worked during their day off [36]. In the midwestern

TABLE 3: The association among working hours, covariates, and MNC.

		Day shift-6 knots[1]						Night shift-3 knots[2]					
		B	SD	Beta	t	CI	p	B	SD	Beta	t	CI	p
Intercept		−2.980	2.779	—	0.28	−8.43–2.46	0.283	1.070	4.862	—	0.220	−8.46–10.60	0.826
Working hours		0.470	0.357	0.056	1.30	−0.23–1.17	0.192	0.750	0.229	0.161	3.251	0.30–1.19	0.001
Working hours (spline1)		−26.500	8.806	−4.096	−3.01	−43.76−−9.23	0.003	−1.080	0.348	−0.153	−3.102	−1.76−−0.40	0.002
Working hours (spline2)		47.740	15.600	5.139	3.06	17.16–78.31	0.002						
Working hours (spline3)		−80.520	28.110	−1.101	−2.87	−135.62−−25.42	0.004						
Age (years)	26–34	−0.105	0.512	−0.005	−0.205	−1.11−−0.90	0.837	0.157	0.625	0.007	0.252	−1.07–1.38	0.801
	35–44	−0.015	0.623	−0.001	−0.023	−1.23–1.21	0.981	−0.333	0.841	−0.011	−0.396	−1.98–1.32	0.692
	≥45	0.277	0.860	0.008	0.322	−1.41–1.96	0.747	−2.284	2.327	−0.019	−0.981	−6.85–2.28	0.326
Overtime work	Yes	2.710	0.308	0.119	8.800	2.10–3.31	<0.001						
Education	Junior college	0.800	1.225	0.027	0.65	−1.60–3.20	0.516	−4.890	4.504	−0.163	−1.085	−13.72–3.94	0.278
	Undergraduate	1.050	1.211	0.037	0.86	−1.33–3.42	0.388	−5.170	4.493	−0.177	−1.150	−13.98–3.64	0.250
	Postgraduate	4.250	1.593	0.041	2.67	1.12–7.37	0.008	−3.770	4.861	−0.031	−0.776	−13.30–5.76	0.438
Professional-technical title	Senior nurse	0.690	0.425	0.033	1.62	−0.14–1.52	0.105	−0.030	0.554	−0.001	−0.055	−1.12–1.06	0.956
	Nurse in charge	1.650	0.498	0.076	3.32	0.68–2.63	0.001	−0.070	0.697	−0.003	−0.099	−1.44–1.30	0.921
	Assistant director nurse or above	2.190	0.757	0.044	2.89	0.70–3.67	0.004	10.830	5.064	0.034	2.138	0.90–20.76	0.033
Work seniority (years)	2–5	−0.360	0.508	−0.012	−0.72	−1.36−−0.63	0.473	−0.190	0.609	−0.007	−0.313	−1.39−−1.00	0.754
	5–10	−0.670	0.514	−0.030	−1.31	−1.68–0.34	0.191	0.120	0.647	0.005	0.181	−1.15–1.39	0.856
	10–20	−0.760	0.549	−0.034	−1.38	−1.83–0.32	0.169	−0.390	0.714	−0.017	−0.547	−1.79–1.01	0.584
	>20	−0.820	0.657	−0.027	−1.25	−2.11−−0.47	0.213	−1.140	1.382	−0.015	−0.823	−3.85–1.57	0.411
N-P ratio		0.010	0.009	0.018	1.39	−0.01−−0.03	0.163	0.010	0.013	0.022	0.948	−0.01−−0.04	0.343
Patient-care grade (%)	Special-level	−0.177	0.002	−0.001	−0.08	−0.00−−0.00	0.939	−0.010	0.005	−0.059	−3.001	−0.02−−0.00	0.003
	First-level	0.449	0.002	0.000	0.02	−0.00−−0.00	0.984	0.000	0.003	0.000	0.009	−0.01−−0.01	0.993
	Second-level	−0.001	0.001	−0.010	−0.97	−0.00−−0.00	0.331	0.010	0.003	0.037	2.269	0.00−−0.01	0.023
	Third-level	−0.001	0.003	−0.003	−0.33	−0.01−−0.00	0.745	0.010	0.008	0.027	1.687	−0.00−−0.03	0.092
Department units	Surgery	0.240	0.269	0.011	0.91	−0.28−−0.77	0.362	−1.000	0.423	−0.043	−2.369	−1.83−−0.17	0.018
	Gynecology and obstetrics	−1.570	0.448	−0.038	−3.50	−2.45−−0.69	<0.001	−0.970	0.699	−0.023	−1.388	−2.34−−0.40	0.165
	Pediatric	0.020	0.496	0.000	0.03	−0.96−−0.99	0.975	−2.020	0.764	−0.043	−2.642	−3.52−−0.52	0.008
	Neonatology	−1.910	1.671	−0.012	−1.14	−5.19–1.36	0.252	−3.200	2.113	−0.024	−1.516	−7.35−−0.94	0.130
	Others	−0.250	0.339	−0.008	−0.74	−0.91−−0.42	0.462	−0.230	0.561	−0.007	−0.405	−1.33−−0.87	0.685
	ICU	−0.480	0.565	−0.009	−0.85	−1.59−−0.63	0.398	0.760	0.679	0.020	1.116	−0.57−−2.09	0.265
	NICU	−1.740	0.834	−0.022	−2.09	−3.38−−0.11	0.037	0.270	1.032	0.004	0.260	−1.75−−2.29	0.795
	PICU	−0.330	1.489	−0.002	−0.22	−3.25−−2.59	0.823	−1.800	1.759	−0.016	−1.024	−5.25−−1.65	0.306
	Specialist ICU	−0.590	0.668	−0.009	−0.88	−1.89−−0.72	0.381	1.950	0.758	0.045	2.568	0.46−−3.43	0.010
Labor resource		0.380	0.036	0.142	10.52	0.31−−0.45	<0.001	0.520	0.053	0.190	9.706	0.41−−0.62	<0.001
Supplies		0.070	0.068	0.018	0.98	−0.07−−0.20	0.328	−0.020	0.103	−0.005	−0.200	−0.22−−0.18	0.842
Communication		−0.050	0.050	−0.027	−1.09	−0.15−−0.04	0.277	0.150	0.071	0.072	2.069	0.01−−0.29	0.039
Management		0.270	0.043	0.137	6.33	0.19−−0.35	<0.001	0.150	0.063	0.073	2.349	0.02−−0.27	0.019

Note. [1]: $F = 30.77$, $p < 0.001$, $R^2 = 0.106$, adjusted $R^2 = 0.103$; [2]: $F = 14.39$ $p < 0.001$, $R^2 = 0.104$, adjusted $R^2 = 0.097$.
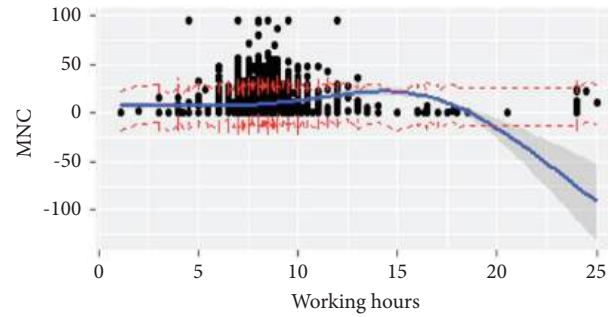
FIGURE 1: Working hours and MNC on the day shift. Figure legend: Relationship between working hours and missed nurse care on the day shift using a restricted cubic spline line regression model. The missed nurse care score is depicted by the black dot and ratios are indicated by solid lines and 95% CIs by shaded areas. The working hours at six knots of 5th, 23th, 41th, 59th, 77th, and 95th are 7 hours, 7.5 hours, 8 hours, 8 hours, 8.2 hours, and 9.25 hours.
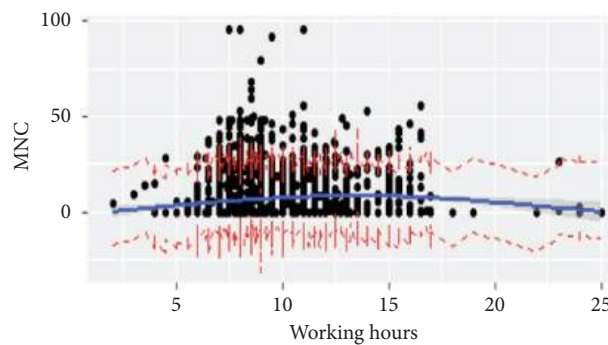

FIGURE 2: Working hours and MNC on the night shift. Figure legend: Relationship between working hours and missed nurse care on the night shift using a restricted cubic spline line regression model. The missed nurse care score is indicated by the black dot and ratios are indicated by solid lines and 95% CIs by shaded areas. The working hours at three knots of 10th, 50th, and 90th are 7 hours, 8.5 hours, and 12 hours.

United States, 97.7% of the NICU nurses worked greater than 10 hours [37]. The overtime observed in this investigation is better compared to those studies previously mentioned. This improvement may be due to the emphasis placed by the Chinese and Hubei provincial governments on health workers.

An agreement was reached that overtime was negatively correlated with the quality of nursing care and nurses' health whether or not it was mandatory or voluntary overtime [38]. Therefore, in 2014, the American Nurses Association advocated for nurse working time to be limited to 12 hours or less per day [39]. As the Chinese government focused more attention on nurse welfare and construction of nurse staff [40] and the Hubei provincial governments' concern for nurses' mental and physical health [41], the number of nurses working overtime decreased significantly. However, the length of work time for the day/night shift that was conducive to quality of nursing care was undefined, especially in Chinese samples. Thus, in this study, we explored the appropriate duration for the day/night shift to improve patient safety.

The results of MNC showed that 7–7.5 hours on the day shift and less than 12 hours on the night shift reported the minimum missed of nursing care. When it comes to 15 hours on the day shift, MNC were more likely to be reported. This was consistent with previous studies which

found that longer shifts were prone to missed care [16, 22]. It was probably related to the fact that the time setting was circadian rhythm [42]. In China, for the nurses working a full-time job in the hospital, it is more acceptable for nurses worked <8 hours on the day shift or 12 hours on the night shift. The nurses in our study may have preferred that night shifts not exceed 12 hours. The results of a survey of Wuhan, Hubei province, showed that 40.6% of the night nurses were willing to participate in public activities such as training during their breaks [43], it is because that almost hospital in Hubei province have set the "sleepy day" (it is on the day after night shift and only for sleeping) that nurses can get enough rest.

Moreover, a strong positive correlation can be seen in that overtime work led to a tripling incidence of missed care in both shifts. The results presumably associated to the insufficient nurse staffing. Although the nurse-to-patient ratio was not significant in the RCS model, the proportion of the patient-care grade and reason of labor resource which nurse reported was conspicuously to MNC. The results were in line with previous studies [44], which perceived staffing adequacy for nurse with a greater impact on missed care than the actual nurse-to-patient ratio. Regarding nurse characteristics, our study showed that nurses who held a postgraduate education degree and higher professional-technical title were more likely to have MNC.

TABLE 4: The association among working hours, covariates, and NPE.

		Day shift-4 knots[1]						Night shift-4 knots[2]					
		B	SD	Beta	t	CI	p	B	SD	Beta	t	CI	p
Intercept		3164.600	183.000	—	17.294	2805.91–3523.30	<0.001	3631.000	390.300	—	9.305	2866.21–4396.47	<0.001
Working hours		6.620	22.390	0.011	0.295	-37.27–50.50	0.768	-75.410	26.770	-0.225	-2.817	-127.89–-22.93	0.005
Working hours[1]		-310.820	126.000	-0.576	-2.467	-557.83–-63.81	0.014	1388.000	296.500	2.440	4.681	806.52–1969.02	<0.001
Working hours[2]		1699.770	690.000	0.508	2.463	347.23–3052.30	0.014	-3177.000	657.000	-2.214	-4.835	-4464.68–-1888.59	<0.001
Overtime work yes		-229.150	19.850	-0.143	-11.544	-268.06–-190.24	<0.001	-318.100	27.840	-0.196	-11.429	-372.71–-263.57	<0.001
Education	Junior school	-108.810	88.040	-0.052	-1.236	-281.38–-63.77	0.217	-122.400	332.100	-0.056	-0.369	-773.56–528.71	0.712
	Undergraduate	16.240	87.050	0.008	0.187	-154.39–186.88	0.852	82.290	331.400	0.039	0.248	-567.36–731.95	0.804
	Postgraduate	38.370	114.500	0.005	0.335	-186.09–262.83	0.738	148.000	358.800	0.017	0.412	-555.58–851.51	0.680
N-P ratio		-3.610	0.650	-0.073	-5.558	-4.88–-2.34	<0.001	1.452	0.938	0.037	1.548	-0.39–-3.29	0.122
Professional-technical-title	Senior nurse	38.790	30.560	0.026	1.269	-21.11–98.69	0.204	34.090	40.800	0.023	0.835	-45.91–114.09	0.404
	Nurse in charge	-9.300	35.760	-0.006	-0.260	-79.40–60.80	0.795	63.070	51.360	0.037	1.228	-37.62–163.76	0.219
	Assistant director nurse or above	58.570	54.390	0.017	1.077	-48.06–165.20	0.282	-395.700	373.300	-0.017	-1.060	-1127.70–336.24	0.289
Work seniority (years)	2–5	-13.920	36.510	-0.007	-0.381	-85.48–57.64	0.703	-83.870	44.920	-0.045	-1.867	-171.94–4.19	0.062
	5–10	10.980	36.910	0.007	0.298	-61.38–83.34	0.766	-121.300	47.700	-0.077	-2.542	-214.78–-27.73	0.011
	10–20	37.180	39.460	0.024	0.942	-40.16–114.53	0.346	-84.400	52.650	-0.051	-1.603	-187.62–18.82	0.109
	>20	-4.370	47.190	-0.002	-0.093	-96.88–88.14	0.926	9.107	101.900	0.002	0.089	-190.70–208.91	0.929
Department units	Surgery	47.930	19.300	0.030	2.484	10.10–85.76	0.013	74.150	31.150	0.044	2.380	13.08–135.22	0.017
	Gynecology and obstetrics	23.850	32.220	0.008	0.740	-39.30–87.00	0.459	49.560	51.680	0.016	0.959	-51.75–150.88	0.338
	Pediatric	-56.120	35.630	-0.017	-1.575	-125.96–13.71	0.115	18.630	56.390	0.005	0.330	-91.93–129.19	0.741
	Neonatology	30.780	120.100	0.003	0.256	-204.66–266.23	0.798	155.000	156.100	0.016	0.993	-151.06–461.07	0.321
	Others	52.170	24.360	0.025	2.142	4.42–99.92	0.032	76.760	41.420	0.033	1.853	-4.44–157.96	0.064
	ICU	69.940	40.520	0.020	1.726	-9.49–149.37	0.084	77.760	50.270	0.029	1.547	-20.80–176.31	0.122
	NICU	150.750	59.950	0.027	2.515	33.24–268.26	0.012	158.300	76.540	0.036	2.068	8.23–308.35	0.039
	PICU	345.750	106.900	0.034	3.235	136.23–555.26	0.001	146.300	129.900	0.018	1.126	-108.35–400.91	0.260
Department units	Specialist ICU	135.560	47.900	0.031	2.830	41.66–229.46	0.005	244.600	55.990	0.078	4.368	134.80–354.35	<0.001
Patient-care grade (%)	Special level	-0.710	0.167	-0.050	-4.228	-1.03–-0.38	<0.001	-0.455	0.337	-0.027	-1.349	-1.12–-0.21	0.177
	First level	0.840	0.164	0.054	5.087	0.51–1.16	<0.001	0.009	0.217	0.001	0.041	-0.42–0.44	0.967
	Second level	-0.140	0.107	-0.014	-1.309	-0.35–-0.07	0.191	-0.942	0.196	-0.080	-4.812	-1.33–-0.56	<0.001
	Third level	-0.090	0.188	-0.005	-0.485	-0.46–-0.28	0.627	0.623	0.580	0.017	1.074	-0.51–1.76	0.283

Note. [1]: $F = 17.9$, $p < 0.001$, $R^2 = 0.063$, adjusted $R^2 = 0.059$; [2]: $F = 9.55$, $p < 0.001$, $R^2 = 0.067$, adjusted $R^2 = 0.060$.
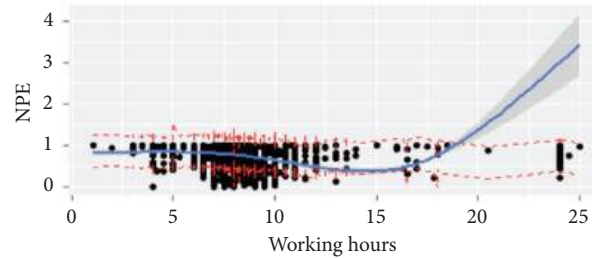
Figure 3: Working hours and NPE on the day shift. Figure legend: Relationship between working hours and nurses' practice environment satisfaction on the day shift using a restricted cubic spline line regression model. The missed nurse care score is shown by the black dot and ratios are indicated by solid lines and 95% CIs by shaded areas. The working hours at four knots of 5th, 35th, 65th, and 95th are 7 hours, 7.75 hours, 8 hours, and 9.25 hours.
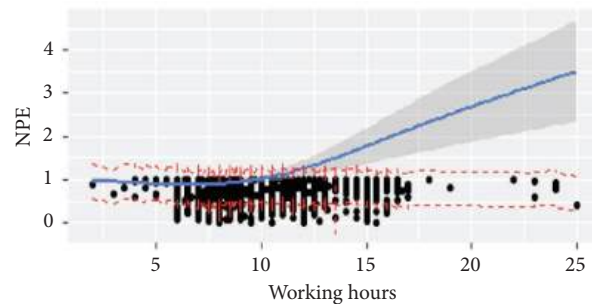

Figure 4: Working hours and NPE on the night shift. Figure legend: Relationship between working hours and nurse's practice environment satisfaction on the night shift using a restricted cubic spline line regression model. The missed nurse care score is shown by the black dot and ratios are indicated by solid lines and 95% CIs by shaded areas. The working hours at four knots of 5th, 35th, 65th, and 95th are 7 hours, 7.75 hours, 8 hours, and 9.25 hours.

Our explanation for these results was that both kinds of nurses may take more indirect nursing work such as management and scientific research. Bragadóttir's et al.'s study corresponded with our study in that age and role (practice nurse or retested nurse) were significantly related to MNC [45]. However, at present, two systematical reviews indicated that there was not a consistent influence or effect of nurses' characteristics on MNC [46–48]. Thus, to affirm these findings, future research will require a large sample, more rigorous design, and expansive scope.

A good practice environment was important for talent engagement and retention, especially influencing the quality of nursing care and patient safety [49].

In this study, we investigated working hours and its impact on nurses' evaluation of the practice environment. Day staff reporting a better work environment than night staff was supported by previous studies [50]. Nurses gave the highest rating to the practice environment when they worked 7–7.5 hours and lowest when they worked more than 15 hours on the day shift. On the one hand, the appropriate working hours reflected a more comprehensive hospital management and nursing workflow. On the other hand, the avoidance of fatigue allowed nurses to have a more positive work experience [37], which is consistent with a study in Malaysia. Nurses working extended hours had more negative perceptions to the practice environment. In addition, nurses who were not working during their day off had a more positive association with the practice environment

[51]. On night shift, nurses who worked 7 hours reported the most negative perceptions of the practice environment. The probable reason may be that the shorter the length of night shift work, the more frequent the night shift work for nurse. Plenty of studies have indicated that abnormal emotions were usually showed up on nurses who were on duty of continual night shifts [37, 52]. Shift work may function as an occupational stressor that impacts nurses' perceptions of the practice environment and increase nurses' intention to leave [53].

The present study found that appropriate work time benefited the quality of nursing care. Similar to NPE, the working hours for the day and night shift were recommended to be 7–7.5 and 15 hours, respectively. Day staff showed better quality of nursing care than night staff, possibly due to nurses' sustained attention and predicted cognitive efficiency under long shifts [10]. To short shift, nurses were preferred on the day shift. In regards to long shifts, there is substantial evidence between the working hours and quality of nursing care. The long shift was harmful to nurses' sleep which led to lower quality of nursing care [54]. However, studies showed that the long shift contributed to the continuous patient care [21]. In contrast, it has been reported that there is no statistically significant difference in the quality of nursing care and shift length in a recent study [55].

Although evidence showed that schedule night shift of no longer than 8 hours [56], long shift (over 8 hours but no

TABLE 5: Comparison of QNC across groups ($N = 12703$).

Characteristics	N (%)				$F/\tau b/Z$	p
	Poor	Average	Good	Excellent		
N-P ratio[1]					52.77	<0.001
Departments[2]					0.065	<0.001
Internal medicine	7 (0.17)	486 (11.67)	1908 (45.80)	1765 (42.37)		
Surgery	4 (0.11)	367 (10.11)	1595 (43.95)	1663 (45.83)		
Gynecology and obstetrics	2 (0.23)	67 (7.85)	361 (42.27)	424 (49.65)		
Pediatric	1 (0.15)	85 (12.88)	276 (41.82)	298 (45.15)		
Neonatology	0 (0.00)	2 (3.39)	27 (45.76)	30 (50.85)		
Others	4 (0.23)	166 (9.43)	756 (42.93)	835 (47.42)		
ICU	3 (0.41)	79 (10.85)	330 (45.33)	31 (43.41)		
NICU	0 (0.00)	19 (6.93)	96 (35.04))	159 (58.03)		
PICU	1 (0.15)	4 (4.94)	28 (34.57)	48 (59.26)		
Specialist ICU	0 (0.00)	42 (8.55)	200 (40.73)	249 (50.71)		
Age (years)[2]					−0.032	0.200
≤25	3 (0.16)	170 (9.29)	765 (41.80)	892 (48.74)		
26–34	11 (0.15)	777 (10.39)	3328 (44.52)	3360 (44.94)		
35–44	4 (0.16)	280 (10.92)	1102 (42.96)	1179 (45.96)		
≥45	4 (0.48)	90 (10.82)	382 (45.91)	356 (42.79)		
Gender[3]					−0.611	0.541
Male	3 (1.64)	36 (2.73)	150 (2.69)	172 (2.97)		
Female	19 (86.36)	1281 (97.27)	5427 (97.31))	5615 (97.03)		
Education background					0.014	0.015
Special secondary school	0 (0.00)	6 (7.79)	31 (40.26)	40 (51.95)		
Junior college	4 (0.22)	204 (11.11)	853 (46.46)	775 (42.21)		
Undergraduate	18 (0.17)	1091 (10.23)	4641 (43.50)	4919 (46.11)		
Postgraduate	0 (0.00)	16 (13.22)	52 (42.98)	53 (43.80)		
Overtime work[3]					−23.719	<0.001
Yes	16 (72.73)	688 (52.24)	1930 (34.61)	1219 (21.06)		
No	6 (27.27)	629 (47.76)	3647 (65.39)	4568 (78.94)		
Professional-technical title[2]					−0.036	0.006
Nurse	4 (0.19)	190 (9.20)	872 (42.41)	1000 (48.40)		
Senior nurse	8 (0.14)	617 (10.43)	2616 (44.21)	2676 (45.23)		
Nurse in charge	9 (0.21)	471 (10.94)	1882 (43.73)	1942 (45.12)		
Assistant director nurse or above	1 (0.24)	39 (9.38)	207 (49.76)	169 (40.63)		
Work seniority (years)[2]					−0.022	0.012
<2	2 (0.15)	122 (8.89)	540 (39.36)	708 (51.60)		
2–5	1 (0.05)	203 (10.11)	919 (45.77)	885 (44.07)		
5–10	9 (0.22)	427 (10.45)	1833 (44.84)	1819 (44.50)		
10–20	5 (0.13)	42110.69)	1692 (42.97)	1820 (46.22)		
>20	5 (0.39)	14411.10)	593 (45.72)	555 (42.79)		
Shift[3]					−4.425	<0.001
Day	18 (0.20)	879 (9.95)	3797 (43.00)	4137 (46.85)		
Night	4 (0.10)	438 (11.31)	1780 (45.97)	1650 (42.61)		
Patient grade ratio[1]						
Special level					6.237	<0.001
First level					2.878	0.035
Second level					3.186	0.023
Third level					1.779	0.149

Note. [1]one-way ANOVA; [2]Kendall tau-b correlation coefficient; [3]Wilcoxon rank sum test.

more than 15 hours) on night shift was suggested in this study, particularly combined with the high nurse-to-patient ratio. It was noted that nurse staffing was an important factor to the quality of nursing care. In the general inpatient units, nurses usually cared for more patients on the night shift than the day shift, whereas nursing work of the night shift was less than day time. In another words, patient-care hours was increased under a long shift [21]. In intensive care units, all the patients were with high dependence, so they were rated a higher patient-care grade. There was not much difference

Table 6: The association among working hours, covariates, and QNC.

		Day shift-4 knots						Night shift-4 knots					
		B	SD	t	OR	CI	p	B	SD	t	OR	CI	p
Poor|average		-7.12	0.51	-14.10	0.000	0.00–0.00	<0.001	-8.249	1.151	-7.166	0.000	0.00–0.00	<0.001
Average|good		-3.07	0.45	-6.84	0.050	0.02–0.11	<0.001	-3.371	1.037	-3.250	0.020	0.01–0.06	<0.001
Good|excellent		-0.63	0.45	-1.42	0.530	0.22–1.28	0.157	-0.905	1.036	-0.874	0.240	0.08–0.68	0.008
Working hours		0.00	0.06	-0.03	1.000	0.88–1.13	0.977	-0.163	0.072	-2.280	0.850	0.74–0.98	0.023
Working hours (spline1)		-0.77	0.34	-2.23	0.460	0.24–0.91	0.026	3.110	0.795	3.914	22.430	4.75–107.20	<0.001
Working hours (spline2)		4.42	1.88	2.35	83.510	2.07–3350.34	0.019	-7.080	1.762	-4.017	0.000	0.00–0.03	<0.001
Overtime work-yes		-0.70	0.05	-13.08	0.500	0.45–0.55	<0.001	-0.893	0.075	-11.883	0.410	0.35–0.47	<0.001
Professional-technical title	Senior nurse	0.01	0.08	0.17	1.010	0.86–1.19	0.862	-0.173	0.104	-1.659	0.840	0.69–1.03	0.097
	Nurse in charge	0.00	0.10	-0.04	1.000	0.83–1.20	0.971	-0.181	0.132	-1.374	0.830	0.64–1.08	0.170
	Assistant director nurse or above	0.02	0.15	0.11	1.020	0.76–1.35	0.916	-3.248	1.094	-2.970	0.040	0.00–0.27	0.003
Work seniority (years)	2–5	-0.24	0.10	-2.37	0.790	0.65–0.96	0.018	-0.239	0.118	-2.019	0.790	0.62–0.99	0.044
	5–10	-0.30	0.10	-2.95	0.740	0.60–0.90	0.003	-0.121	0.126	-0.956	0.890	0.69–1.13	0.339
	10–20	-0.27	0.11	-2.44	0.770	0.62–0.95	0.015	-0.018	0.139	-0.130	0.980	0.75–1.29	0.897
	>20	-0.43	0.13	-3.35	0.650	0.51–0.84	0.001	0.007	0.269	0.026	1.010	0.60–1.71	0.980
N-P ratio		-0.01	0.00	-5.38	0.990	0.99–0.99	<0.001	-0.003	0.003	-1.111	1.000	0.99–1.00	0.267
Department units	Surgery	0.09	0.05	1.66	1.090	0.98–1.21	0.096	0.106	0.082	1.289	1.110	0.95–1.31	0.198
	Gynecology and obstetrics	0.12	0.09	1.33	1.120	0.95–1.33	0.184	0.311	0.139	2.238	1.360	1.04–1.79	0.025
	Pediatric	-0.03	0.10	-0.31	0.970	0.80–1.17	0.754	0.314	0.154	2.039	1.370	1.01–1.85	0.042
	Neonatology	0.35	0.33	1.05	1.420	0.75–2.77	0.296	-0.200	0.404	-0.496	0.820	0.37–1.83	0.620
	Others	0.22	0.07	3.36	1.250	1.10–1.42	0.001	-0.087	0.110	-0.790	0.920	0.74–1.14	0.430
	ICU	0.08	0.11	0.80	1.090	0.88–1.34	0.425	-0.103	0.132	-0.779	0.900	0.70–1.17	0.436
	NICU	0.37	0.17	2.21	1.440	1.05–2.01	0.027	0.379	0.207	1.830	1.460	0.98–2.20	0.067
	PICU	0.47	0.30	1.57	1.600	0.90–2.93	0.116	0.310	0.365	0.849	1.360	0.67–2.84	0.396
	Specialist ICU	0.35	0.13	2.70	1.420	1.10–1.84	0.007	0.076	0.149	0.511	1.080	0.81–1.45	0.610
Patient-care grade (%)	Special level							0.001	0.001	1.312	1.000	1.00–1.00	0.190
	First level							-0.001	0.001	-1.616	1.000	1.00–1.00	0.106
	Second level							-0.001	0.001	-2.088	1.000	1.00–1.00	0.037
	Third level							0.004	0.002	2.301	1.000	1.00–1.01	0.021

of nursing work between the day and night shifts. Therefore, the short shift in the ICU is still to be considered for the impact of nurse staffing and the patient-care grade on the quality of nursing care.

5. Conclusion

This study identified a better work duration using the perspective of nurse-reported outcomes. Working hours of 7–7.75 on the day shift and 12 hours (no more than 15 hours) on the night shift were recommended from the comprehensive of MNC, nurse-reported quality of nursing care, and perceptions of NPE. This study also highlighted the diverse roles of units, important positive impact of less overtime, and better work experience (included the work seniority and professional-technical title) in the outcomes. However, the mechanisms are still under discussion. Thus, there is an urgent need for researchers to explore how a long duration of overtime work or rotation impacts the quality of nursing care. However, despite the strength of our large sample size and representation of the study, there were several limitations. We surveyed nurses' schedules who only reviewed one shift. Studies have provided that continuous shift working/overtime working was different from occasional shift working/overworking [57]. In addition, although we controlled for department units as a confounding variable, we did not delve into the relationship between work time and nursing outcome under the difference units.

Data Availability

The data used to support the findings of this study are available from the corresponding author upon reasonable request.

Additional Points

What is already known. (i) Nurses usually work overtime and keep rationing to ensure the continuous nursing care. (ii) Frequent night shifts and working overtime were harmful to the quality of care and nurses' perceptions of the practice environment, resulting in turnover of nurses. (iii) Guidelines by governments and institutions were made to limit the length of work time per shift for nurses. What this paper adds. (i) This analysis provides evidence of a nonliner relationship between work hours and missed nursing care, quality of care, and perception of the nursing practice environment. (ii) This paper proved that working overtime of nurses had a detrimental effect on quality of care and perception of nursing's practice environment whether on the day shift or night shift. (iii) These findings indicated that beneficial working hours are 7–7.75 on the day shift and 12 hours (but no more than 15 hours) on the night shift based on the nurse-reported outcomes.

Disclosure

Miqi Li and Ying Wang are co-first authors.

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Authors' Contributions

Miqi Li and Ying Wang contributed equally to this work.

Acknowledgments

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Research Article

Workplace Social Support as a Mediating Factor in the Association between Occupational Stressors and Job Burnout: A Study in the Taiwanese Nursing Context

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Aims and Objectives. The purpose of this study was to investigate the prevalence of job burnout among Taiwanese nurses, specifically exploring the mediating role of workplace social support in the association between nurses' stressors and this burnout. *Background*. Nurses confront high-stress, high-stakes work environments due to evolving disease patterns and growing healthcare needs. The nurse-patient ratio in Taiwan is higher than in other countries, necessitating effective strategies to mitigate nurse burnout and enhance the quality of patient care. *Design*. A cross-sectional study design was employed. *Methods*. From January to April 2019, 500 nurses were recruited from a medical center in Kaohsiung City, southern Taiwan. Participants completed a questionnaire addressing workplace social support, stressors faced by nurses, and job burnout. Data were analyzed using descriptive statistics, one-way analysis of variance, *t*-test evaluations, Pearson's correlation analyses, and a structural equation model with maximum likelihood estimation. *Results*. The findings revealed that a portion of nurses experienced high rates of personal burnout (7.20%), work-related burnout (5.00%), and client-related burnout (4.80%). The relationships among workplace social support, nurses' stressors, and job burnout were all substantial, exhibiting correlation coefficients ranging from −0.318 to 0.828. The direct effect of nurse stress on job burnout was 0.551, comprising 90.7% of the cumulative effect. In contrast, the indirect effect of nurse stress on job burnout, considering workplace social support, amounted to 9.3% of the total effect, with a value of 0.056. *Conclusions*. The study underscored the importance of addressing job burnout among nurses in Taiwan. Workplace social support may function as a mediating factor in the relationship between nurses' stressors and job burnout. *Implications for Nursing Management*. The results suggest that healthcare administrators should prioritize workplace social support initiatives. These efforts could help identify and address nurses' stressors, promote work-life balance, and reduce nurse-patient ratios and work overload.

1. Introduction

Nurse burnout is a prevailing global concern within the healthcare sector, presenting significant implications for patient care and the well-being of nurses. Despite growing awareness and research in this area, a knowledge gap persists regarding the complex factors contributing to this phenomenon, particularly in diverse cultural and socioeconomic contexts. This study explores a unique aspect of the nursing field by investigating the relationship between

workplace social support (WSS), job stress, and nurse burnout, specifically in the Taiwanese healthcare setting. Although nurse burnout is a widely researched topic, the distinct emphasis on the role of WSS in this context provides new and unique information. The unique aspects of the Taiwanese healthcare environment, including its rapidly aging population and changing disease trends, further underscore the distinctiveness of this research.

From a theoretical perspective, there is a recognized need to deepen our understanding of how different elements

interact to exacerbate or mitigate nurse burnout. While previous studies have illuminated the individual impacts of job stress and social support on nurse burnout [1], the interplay between these factors, especially the mediating role of WSS, remains relatively underexplored. This gap in the existing literature suggests a missed opportunity to develop a comprehensive theoretical framework that could more accurately depict the factors contributing to nurse burnout. On a practical level, the high rates of nurse burnout are indicative of significant challenges within the nursing profession and healthcare institutions. Despite various attempts to address this issue, we still lack comprehensive strategies that take into account all aspects of nurse burnout, including the role of social support in the workplace. This suggests a crucial gap between current practice and potential strategies to mitigate nurse burnout.

This study aims to bridge these theoretical and practical gaps. By using structural equation modelling (SEM) to investigate the mediating role of WSS in the relationship between job stress and nurse burnout, we seek to enrich the theoretical understanding of these constructs. Simultaneously, the findings of this research aim to provide practical insights that can assist healthcare administrators and nurse managers in developing effective strategies to mitigate nurse burnout, thereby improving the quality of patient care and nurses' well-being.

2. Background

Research in Taiwan suggests that nurses experience higher rates of work-related stress than other medical professionals [2, 3]. Healthcare professionals play a crucial role in delivering high-quality healthcare. Unfortunately, job burnout has emerged as a significant concern in recent years, adversely affecting personal health and job satisfaction [4]. Occupational stress is a major contributor to job burnout among nurses and other populations [5]. Increased levels of work stress have been found to contribute to job burnout among healthcare professionals, including nurses [6]. The impact of stressful events on individuals is determined by their perception of stress [7]. Consequently, effective management of work stress is critical for preventing negative work attitudes and maintaining high-quality nursing care.

The intensity of occupational stress has been proposed as a factor contributing to job burnout in various populations [5], including healthcare workers who are prone to job burnout due to their high-stress work environments [6]. A shortage of nursing professionals and long-term care personnel in Taiwan has led to a higher nurse-patient ratio significantly higher than that in other countries [8–10]. According to data published by Taiwan's Ministry of Health and Welfare, the global average nurse-to-patient ratio in medical centers is 1 : 7.7, while in Taiwan, it is 1 : 8.6 [10, 11]. Various factors influence the nursing workforce shortage, including ineffective policies, inadequate planning and recruitment, and a lack of leadership management [12]. Nursing turnover is a complex issue impacted by numerous factors, including insufficient professional recognition of nurses, inadequate social support, heavy workloads, and low

job satisfaction. An increased patient load can reduce nurses' perception of social support in the workplace, thereby negatively affecting their job satisfaction and performance. Furthermore, recent studies have demonstrated that occupational stress can directly lead to job burnout and indirectly influence it through other factors, such as social support, as suggested by some researchers [13].

In light of these concerns, nurse burnout, exacerbated by high work-related stress and occupational hazards, has become a critical issue in Taiwan's healthcare sector. This problem not only affects the well-being of nurses but can also lower job satisfaction, increase turnover rates, and potentially compromise the quality of patient care.

The relationship between job stress, WSS, and job burnout can be explained by both the job demands-resources (JD-R) model [14, 15] and the buffering effect model of social support [16, 17]. Researchers have also proposed that social support can serve as a buffer against the detrimental effects of stressful events on individuals' physical and mental health [18]. Yeh et al. [19] discovered that emotional exhaustion and work-family conflict (WFC) mediate the relationship between nurse burnout and relevant outcomes. These findings offer valuable theoretical and practical implications for organizations aiming to implement interventions to reduce burnout among nursing personnel [19]. According to the JD-R model, WSS can decrease perceived stress and prevent burnout in nursing professionals. Job demands, such as work overload and occupational hazards, can contribute to job burnout. However, social support can offer emotional and informational assistance, reduce isolation, and enhance control over the work environment. The buffering effect model suggests that social support can serve as a safeguard against the adverse effects of stress. Workplace stressors, such as work overload and occupational hazards, can cause perceived stress, but high levels of WSS, including support from supervisors, coworkers, and the organization, can counteract these stressors by providing emotional and informational support, fostering a sense of belonging, and bolstering self-esteem. This, in turn, can lead to lower levels of perceived stress.

Based on the JD-R model and the buffering effect model of social support, we aim to (a) determine the prevalence of job burnout among nursing professionals, (b) investigate the relationship between stress, WSS, and job burnout among nurses, and (c) examine the mediating role of WSS in the association between occupational stress and job burnout. Consequently, we propose the following hypotheses: (a) there will be a positive correlation between job burnout and occupational stress; (b) WSS will be negatively correlated with job burnout; and (c) WSS will moderate the positive relationship between occupational stress and job burnout. The formulated hypotheses serve as the foundation for the conceptual framework depicted in Figure 1. The figure presents three main variables: occupational stress (NOSS), WSS (C-JCQ), and job burnout (CBI). The arrows represent the hypothesized relationships between these variables. Specifically, NOSS is expected to have a positive relationship with CBI, while C-JCQ is anticipated to have
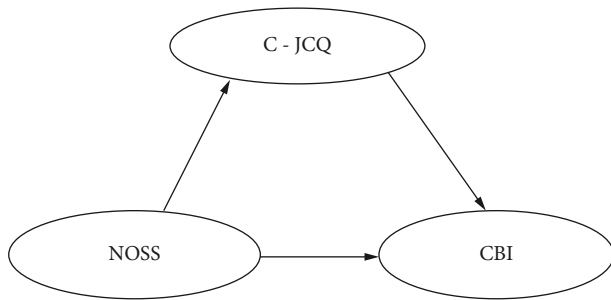
FIGURE 1: The proposed role of workplace social support (C-JCQ) as a mediator in the relationship between occupational stressors (NOSS) and job burnout (CBI).

a negative correlation with CBI. Furthermore, C-JCQ is hypothesized to mediate the relationship between NOSS and CBI.

3. Methods

3.1. Study Design. In this research, we adopted a cross-sectional design with the aim of answering the following research questions:

(1) What is the current prevalence of job burnout among nurses in Taiwan?

(2) Is there a significant relationship between occupational stress, WSS, and job burnout in the Taiwanese nursing context?

(3) Does WSS play a mediating role in the association between occupational stress and job burnout among the nursing workforce in Taiwan?

3.2. Setting and Participants. The research included nurses employed at a public medical center in Taiwan. The inclusion criteria for the participants were as follows: (1) they had to have been employed at the institution for at least three months, (2) they could not hold administrative positions, and (3) they need to willingly agree to participate and cooperate after receiving a detailed explanation from the research team. Conversely, the study excluded: (1) specialist nurses, (2) staff in management roles, (3) nurses from nonclinical units such as the physical examination center and the aesthetic medical center, (4) staff on unpaid leave, and (5) those who did not agree to participate in the study after the explanation by the researchers. In the context of SEM, the recommended sample size for a survey is typically 10 to 15 times the number of items in the questionnaire [20]. This study included a total of 46 items (15 related to nurses' stress, 15 to workplace social support, and 16 to nurse burnout). Accordingly, to fulfil the SEM analysis requirements and enhance the reliability and validity of our findings, we need to gather at least 460 completed and valid questionnaires. These questionnaires provided demographic information and captured details about the nurses' perceived stress levels, WSS, and levels of burnout.

For this study, we collected data using a structured questionnaire distributed among nurses at a public medical center in Taiwan. The questionnaire was administered between January and April 2019, employing convenience sampling with the support of trained research assistants. Out of the 560 questionnaires disseminated, 516 were returned, yielding a response rate of 92.1%. After discarding questionnaires that were not completely filled out, we obtained a final tally of 500 valid responses from participants who completed the entire questionnaire. This sample size helps safeguard the integrity of our results and facilitates a more accurate interpretation and generalization of the data.

3.3. Questionnaire and Measurements

3.3.1. Nurse Burnout. In this study, job burnout was measured using the Copenhagen Burnout Inventory (CBI) [21] and the Chinese version of the Occupational Burnout Inventory, which was developed based on the effort-reward imbalance model [22–24]. The self-administered questionnaire included three subscales: personal burnout (5 items), work-related burnout (5 items), and client-related burnout (6 items). Participants rated their responses on a 5-point Likert scale, ranging from 1 (never) to 5 (always). In this study, the scale's Cronbach's α coefficient was 0.942, with the coefficients for the three subscales being 0.904, 0.884, and 0.915, respectively. Each subscale score ranged from 0 to 100, with higher scores indicating higher levels of burnout. In this study, we defined high personal/work-related burnout as a personal/work-related burnout score of ≥80 points and high client-related burnout as a client-related burnout score of ≥65 points [25].

3.3.2. Social Support. We used the Chinese version of the Job Content Questionnaire (C-JCQ) [26, 27] to assess psychosocial work characteristics and understand job stress issues. The C-JCQ consists of three subscales with 15 items. In this study, the scale's Cronbach's α coefficient was 0.936, and the coefficients for each subscale were as follows: workplace justice (0.918, 7 items), supervisor support (0.923, 4 items), and coworker support (0.909, 4 items), indicating acceptable internal consistencies. Participants rated each item on a Likert scale of 1 to 4 (1 = strongly disagree; 2 = disagree; 3 = agree; and 4 = strongly agree). Each subscale score ranged from 0 to 100, with higher scores indicating better workplace justice, social support, and coworker support.

3.3.3. Perceived Stress. We used the Chinese version of the Nurses' Occupational Stressor Scale (NOSS) [25, 28] to measure the participants' occupational stressors. The NOSS consists of three subscales with 15 items. In this study, the scale's Cronbach's α coefficient was 0.942, and the coefficients for each subscale were as follows: occupational hazards (0.752, 5 items), work-life conflict (0.832, 5 items), and overload (0.772, 5 items). Participants rated each item

on a Likert scale ranging from 1 (strongly disagree) to 4 (strongly agree). Each subscale score ranged from 0 to 100, with higher scores in the three dimensions of occupational hazards, work-life conflict, and overload, indicating higher levels of nurses' stress.

3.4. Ethical Considerations. Throughout the study, we adhered to the bioethical principles outlined in the Declaration of Helsinki. The Institutional Review Board for Medical Research Ethics at Kaohsiung Veterans Hospital (VGHKS19-CT1-05) granted approval for this study. We ensured the inclusion of all participants and preserved the anonymity and confidentiality of the collected data to protect the individuals' privacy.

3.5. Data Analysis. The cross-sectional nature of our study inherently carries a potential risk of common method variance (CMV) bias [29, 30]. To evaluate the presence of this bias, we used Harman's single-factor test, a commonly accepted method for this purpose [29, 31]. According to this test, if common method bias is present, a significant part of the variance should be explained by the first factor, or a single factor should emerge from the analysis. For our analysis, we subjected 46 items (15 items each on nurses' stress and workplace social support, and 16 items on nurse burnout) to an exploratory factor analysis. This was carried out using principal component analysis with varimax rotation, while forcing the extraction of a single factor. The first factor accounted for 29.61% of the variance, which falls below the 50% cut-off point. Therefore, based on these results, our study did not detect the existence of a CMV bias.

We used descriptive statistical methods to examine the demographic characteristics of the participants, including aspects such as gender, age, marital status, education level, working unit, and length of professional experience. One-way analysis of variance (ANOVA) was employed to contrast the research variables across age, unit, and work experience groups, while *t*-tests were conducted to investigate differences between groups based on gender, marital status, and educational qualifications. We also employed Pearson's correlation analyses to scrutinize the bivariate associations among the three variables: nurses' stress, WSS, and nurse burnout.

In the structural equation model (SEM) analysis, we employed the maximum likelihood estimation method by using the IBM SPSS software and AMOS 23.0. This method provides unbiased, consistent, and efficient estimates when the data are normally distributed. Before conducting the SEM analysis, we ensured that the data met the necessary assumptions, including linearity, multivariate normality, and the absence of multicollinearity. We checked for linearity by examining scatterplots, assessed multivariate normality by checking skewness and kurtosis values, and checked for multicollinearity by examining the variance inflation factor (VIF).

We evaluated the SEM using various goodness-of-fit indices. These indices included the chi-square/degrees of freedom ratio (χ^2/df), the standardized root-mean-square residual (SRMR), the root mean square error of approximation (RMSEA), the goodness of fit index (GFI), the comparative fit index (CFI), and the Tucker–Lewis index (TLI). The χ^2/df ratio, which measures how well the data fits the model, indicates a good fit with values under 5.0. The SRMR represents the average discrepancy between the data and the model; values up to 0.08 are acceptable. The RMSEA measures the approximation error, with values under 0.08 considered reasonable. The GFI measures how much of the variance is explained by the model, with values over 0.90 indicating a good fit. The CFI compares the fit of our model to a basic model, with values over 0.90 considered good. Lastly, the TLI, also known as the Non-Normed Fit Index, measures relative fit, with values over 0.90 indicating a good fit.

4. Results

Table 1 presents the demographic characteristics of the 500 participating individuals and the distribution of job burnout dimensions across categorical factors. The study population primarily consisted of female nurses (96.2%) aged between 20 and 58 years, with a mean age of 34.66 and a standard deviation of 9.85. There were no significant differences in the mean scores of personal burnout, work-related burnout, and client-related burnout across gender, age, and education groups. Approximately 35% of the participants were married, while 90% had earned a university degree or higher. Approximately 25.6% of the nurses worked in the medical ward, while 22.4% were from the surgical ward. Table 2 expands on the demographic details, emphasizing the range of professional experience among the study participants, with a majority (53.4%) having up to 5 years of experience, 14.2% having worked between 6 and 10 years, and 32.4% boasting over 11 years of experience. Concurrently, the study highlighted the notable presence of job stress, which was observed to be at an upper-middle level. Moreover, the study revealed the prevalence of burnout to be around a mild to moderate level, with some nurses experiencing extreme burnout. Specifically, 7.20% reported high levels of personal burnout, 5.00% experienced high levels of work-related burnout, and 4.80% suffered from high levels of client-related burnout, indicating a widespread presence of severe burnout among the nurses.

Table 3 presents the results of Pearson's correlation analyses (employing a two-tailed method) among the NOSS subscales (occupational hazards, work/life conflict, overload), the C-JCQ subscales (workplace justice, supervisor support, coworker support), and the CBI subscales (personal burnout, work-related burnout, and client-related burnout). All correlations among variables were statistically significant, with coefficients ranging from −0.318 to 0.828 ($p < 0.001$). The C-JCQ was negatively related to each of the CBI subscales, including personal burnout, work-related burnout, and client-related burnout ($p < 0.001$).

The SEM was employed to analyze the connections among the research variables and evaluate the proposed hypotheses. Utilizing the maximum likelihood method, we adjusted the data and refined the theoretical model based on

TABLE 1: Distribution of demographic data and nursing burnout across categorical elements ($N = 500$).

Variables	N (%)	Personal burnout mean (SD)	Work-related burnout mean (SD)	Client-related burnout mean (SD)
Age (years)				
20–29	235 (47.0)	50.32 (16.80)	48.51 (17.04)	36.13 (17.44)
30–39	121 (24.2)	54.59 (17.50)	50.37 (17.30)	38.29 (15.54)
40–49	90 (18.0)	55.06 (18.35)	48.72 (15.52)	36.53 (13.94)
≥50	54 (10.8)	50.74 (21.24)	45.56 (20.85)	35.26 (17.43)
t/F		2.50	0.98	0.61
p		0.059	0.400	0.608
Gender				
Male	19 (3.8)	53.42 (18.71)	51.84 (17.97)	41.67 (17.62)
Female	481 (96.2)	52.20 (17.84)	48.56 (17.27)	36.43 (16.32)
t/F		0.09	0.66	1.87
p		0.771	0.417	0.172
Education level				
College	50 (10.0)	49.60 (16.84)	46.90 (17.55)	34.58 (15.55)
University	431 (86.2)	52.69 (17.65)	49.26 (17.04)	37.19 (16.54)
Masters or above	19 (3.8)	49.21 (24.17)	40.26 (20.44)	29.39 (13.21)
t/F		0.96	2.78	2.51
p		0.384	0.063	0.082
Marital status				
Single	326 (65.2)	51.67 (18.39)	49.48 (17.56)	37.32 (16.91)
Married	174 (34.8)	53.33 (16.79)	47.18 (16.71)	35.34 (15.32)
t/F		0.98	2.00	1.65
p		0.332	0.158	0.199
Working unit				
(1) Medical unit	128 (25.6)	49.73 (15.48)	47.50 (15.41)	37.79 (14.54)
(2) Surgical unit	112 (22.4)	51.92 (17.09)	47.59 (16.58)	35.75 (16.75)
(3) Gynecology and pediatrics	40 (8.0)	49.13 (19.74)	44.50 (16.82)	30.63 (13.98)
(4) General department ward	74 (14.8)	50.20 (18.50)	47.50 (18.38)	33.61 (17.60)
(5) ICU	101 (20.2)	57.92 (17.14)	52.82 (16.96)	37.42 (14.65)
(6) ER	31 (6.2)	55.48 (24.13)	55.32 (21.41)	49.46 (21.35)
(7) Dialysis room	14 (2.8)	49.64 (17.59)	41.79 (20.44)	32.14 (14.75)
t/F		2.78	2.78	5.10
p		0.012*	0.011*	0.000***
Scheffe		—	—	1, 2, 3, 4, 5, 7 < 6

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE 2: Distribution of demographic data and descriptive results of variables.

Variables	N (%)	Mean (SD)	Range
Age		34.65 (9.85)	20–58
Working years		9.11 (8.71)	0.25–31.67
<1 year	32 (6.40)		
1–5 years	235 (47.00)		
6–10 years	71 (14.20)		
11–20 years	85 (17.00)		
≥21 years	77 (15.40)		
Job stress		68.86 (9.92)	32–99
Workplace social support			
Workplace justice		63.30 (14.14)	0–100
Supervisor social support		11.97 (1.83)	4–16
Coworker social support		12.51 (1.74)	4–16
Job burnout			
Personal burnout		52.25 (17.85)	0–100
<80 points	464 (92.80)		
≥80 points	36 (7.20)		
Work-related burnout		48.68 (17.29)	0–100
<80 points	475 (95.00)		
≥80 points	25 (5.00)		

Variables	N (%)	Mean (SD)	Range
Client-related burnout		36.63 (16.39)	0–100
<65 points	476 (95.20)		
≥65 points	24 (4.80)		

Note. Personal burnout ≥80 points: severe; work-related burnout ≥80 points: severe; client related burnout ≥65 points: severe.

TABLE 3: Correlations among the continuous variables.

	WJ	SS	CS	OH	WLC	Overload	PB	WRB	CRB
WJ	1								
SS	0.669**	1							
CS	0.456**	0.543**	1						
OH	−0.231**	−0.192**	−0.110**	1					
WLC	−0.283**	−0.239**	−0.162**	0.632**	1				
Overload	−0.318**	−0.297**	−0.198**	0.610**	0.644**	1			
PB	−0.251**	−0.246**	−0.198**	0.430**	0.532**	0.429**	1		
WRB	−0.286**	−0.297**	−0.182**	0.437**	0.482**	0.428**	0.828**	1	
CRB	−0.215**	−0.202**	−0.153**	0.344**	0.344**	0.302**	0.505**	0.634**	1

Note. All correlations in this matrix were found to be statistically significant with a significance level of $p < 0.01$ (**). WJ, workplace justice; CS, coworker support; SS, supervisor support; OH, occupational hazards; WLC, work-life conflict; PB, personal burnout; WRB, work-related burnout; CRB, client-related burnout.

model fit indices, considering factors such as gender, age, education level, and length of work experience. The goodness of fit results for this model were as follows: $\chi^2/df = 2.628$ (less than 5.0), SRMR = 0.031 (less than or equal to 0.08), RMSEA = 0.057 (less than 0.08), GFI = 0.974 (greater than 0.90), CFI = 0.982 (greater than 0.90), and TLI = 0.973 (greater than 0.90). All these indices met their respective reference criteria, indicating that the model provided a good fit for the data [32]. Figure 2 presents the final model, which incorporates the correlations and impact pathways of the research variables, thereby confirming the study's hypotheses.

Table 4 shows the path coefficient results of the SEM. We found that the NOSS was positively related to the CBI ($\beta = 0.55$, $p < 0.001$) but negatively correlated with the C-JCQ of WSS ($\beta = -0.38$, $p < 0.001$). The C-JCQ was negatively related to the CBI ($\beta = -0.15$, $p < 0.001$). Among all the dimensions of NOSS, C-JCQ, and CBI, the highest absolute values were found for supervisor support (0.87), work-life conflict (0.83), and work-related burnout (0.97), respectively.

Table 5 demonstrates the direct and indirect connections between the C-JCQ and the CBI. None of the confidence intervals for each pathway include zero, indicating the significance of these relationships. The NOSS exhibited total and direct effects of 0.61 and 0.55 on the CBI, respectively. The proportion of the direct effect to the total effect of NOSS on CBI was 90.7%. The C-JCQ demonstrated an indirect effect of 0.06, which accounted for 9.3% of the total effect.

In summary, the results showed significant relationships among the variables in the study, with the C-JCQ, representing WSS, negatively correlated with both NOSS and CBI. The SEM analysis substantiated the hypothesized mediation

role of WSS in the relationship between nurses' stress and job burnout. The strongest relationships were observed between supervisor support, work-life conflict, and work-related burnout.

5. Discussion

This study, which explores the connection between WSS and nurse burnout in Taiwan, revealed three important findings. Firstly, job burnout among Taiwanese nurses requires special attention. Second, the stressors nurses face and the social support they receive at work are related to job burnout. Lastly, WSS could potentially serve as a mediator in the association between nurses' stressors and job burnout. The study discovered that WSS positively impacts the reduction of nurses' stressors and job burnout, consistent with prior research [33]. Good organizational support, positive manager relationships, and effective care can improve the practice of nurse practitioners [34]. In addition, research indicates that higher levels of organizational support are linked to greater job satisfaction among nurses, and positive manager relationships correlate with increased job satisfaction for nurses, contributing to the overall strengthening of nurse practitioner practice.

As Taiwan undergoes rapid progress, nurses are faced with high-intensity, demanding work environments, driven by an aging population and changes in disease trends. The increase in healthcare needs and patient numbers requires nurses to develop advanced skills and dedicate more time to their clinical responsibilities. This increased workload can lead to emotional exhaustion and a decrease in personal satisfaction. Given that job burnout within healthcare settings can adversely impact the quality of patient care,
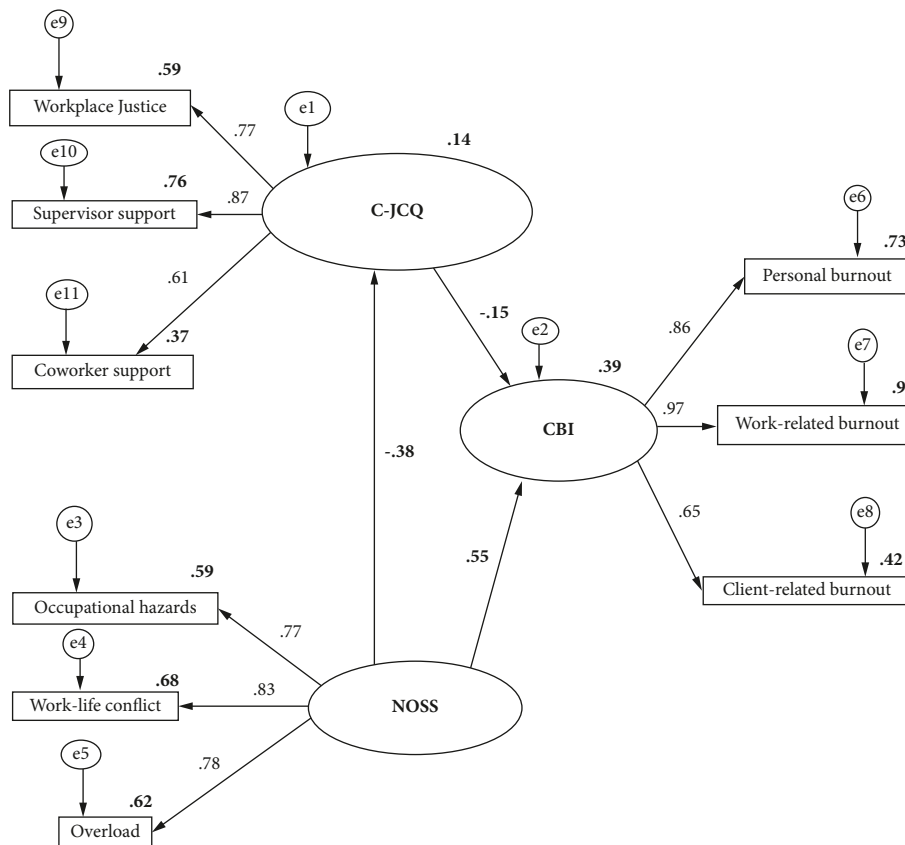
FIGURE 2: The final model and the standardized path model displayed standardized path coefficients, all of which were significant at $p < 0.01$. The C-JCQ, NOSS, and CBI were used to measure workplace social support, occupational stressors, and job burnout, respectively. C-JCQ: workplace social support, NOSS: nurses' stresses, CBI: nurse burnout, WJ: workplace justice, CS: coworker support, SS: supervisor support, OH: occupational hazards, WLC: work-life conflict, PB: personal burnout, WRB: work-related burnout, and CRB: client-related burnout.

TABLE 4: Results of the unstandardized and standardized regression weights in the SEM.

Model pathways	Estimate[a]	S. E	C. R	p	Estimate[b] (β)
NOSS ⟶ C-JCQ	−0.46	0.07	−6.80	<0.001	−0.38
C-JCQ ⟶ CBI	−0.20	0.06	−3.16	<0.001	−0.15
NOSS ⟶ CBI	0.89	0.09	10.16	<0.001	0.55
C-JCQ ⟶ WJ	1				0.77
C-JCQ ⟶ SS	0.70	0.05	14.81	<0.001	0.87
C-JCQ ⟶ CS	0.47	0.04	12.76	<0.001	0.61
NOSS ⟶ OH	1				0.77
NOSS ⟶ WLC	1.14	0.07	17.18	<0.001	0.83
NOSS ⟶ overload	1.07	0.06	16.61	<0.001	0.78
CBI ⟶ PB	1				0.86
CBI ⟶ WRB	1.09	0.04	25.40	<0.001	0.97
CBI ⟶ CRB	0.83	0.05	16.32	<0.001	0.65

Note. Outcomes were calibrated, taking into account factors such as age, gender, marital status, educational level, and unit. Estimate[a], unstandardized regression weights, and Estimate[b], standardized regression weights. C-JCQ, workplace social support; NOSS, nurses' stresses; CBI, nurse burnout; WJ, workplace justice; CS, coworker support; SS, supervisor support; OH, occupational hazards; WLC, work-life conflict; PB, personal burnout; WRB, work-related burnout; CRB, client-related burnout.

TABLE 5: Direct and indirect effects of NOSS on CBI.

	Path	Effect	Percentage of the total effect
Direct effects	NOSS ⟶ CBI	0.55	90.7
Indirect effects	NOSS ⟶ C-JCQ ⟶ CBI	−0.378 × (−0.149) = 0.06	9.3
Total effect		0.61	

Note. NOSS, nurses' stresses; CBI, nurse burnout; C-JCQ, workplace social support.

examining the burnout levels among this group can enhance awareness of the challenges encountered by caregiving professionals.

The major stressors for nurses include workload, the nature of nursing work, family responsibilities, personal expectations, interpersonal relationships, and patient contact [33]. Previous studies [35, 36] have found that WSS has a positive effect on reducing nurses' stressors and a negative impact on job burnout. WSS can serve as a mediating factor in reducing perceived stress and subsequently decreasing the risk of job burnout in nursing. By enhancing social support and reducing occupational stress, healthcare managers can create a positive and supportive work environment for medical staff. This could result in decreased stress levels and burnout prevention, as perceived stress has both a direct and an indirect effect on job burnout, with the latter being mediated by social support [18].

This research examines the interconnections between nurses' stress, job burnout, and WSS, focusing on WSS's mediating role. The SEM findings revealed that nurses' stress had both direct and indirect effects on job burnout, with WSS acting as a mediator. As a mutable, state-like positive psychological resource, WSS was investigated as a mediating variable in this study. The findings suggested that nurses experiencing higher stress levels were more likely to endure physical and psychological fatigue, which could ultimately lead to an increase in their job burnout levels. Results from a previous study suggest that supervisors can help control potential stressors and mitigate burnout among nurses by supporting work-family balance. Hospitals can provide family health measures, while supervisors can facilitate a suitable working environment and promote team-building activities to enhance staff rapport [19].

Nurses often encounter workplace bullying, which can negatively affect their health, safety, and job performance. A recent study found that workplace bullying partially mediates the relationship between occupational burnout and nurses' intentions to leave their jobs [37]. Moreover, work-life conflict contributes to job dissatisfaction, which in turn increases the likelihood of nurses leaving their jobs. In contrast, WSS can reduce job dissatisfaction and turnover intentions by alleviating feelings of stress and burnout [38]. Occupational hazards encompass physical, chemical, biological, and psychosocial risks present in the workplace. With higher nurse-patient ratios, there is an increase in workload and longer working hours, leading to both physical and emotional exhaustion and a higher risk of occupational hazards. Work-life conflict arises from the mismatch between work demands and personal responsibilities. Higher nurse-patient ratios can cause longer working hours and an increased workload, leading to an imbalance between work and personal life and heightened stress levels. Work overload refers to excessive workload, responsibilities, and time pressure. With higher nurse-patient ratios, there is an increase in workload and longer working hours, resulting in feelings of being overwhelmed and stressed.

A recent study conducted in Taiwan found that work-related burnout and patient-related burnout negatively impacted job satisfaction [39]. Personal burnout may stem from various factors, including a lack of control over work, low job satisfaction, and an imbalance between work and personal life. The increase in nurse-patient ratios leads to a heightened workload and added responsibilities, resulting in a sense of being overwhelmed and increased stress. Work-related burnout can result from repetitive work, limited autonomy, and uncertain job security. The heavier workload and longer working hours brought on by higher nurse-patient ratios can cause feelings of overwork and exhaustion. Client-related burnout can stem from feelings of emotional exhaustion and disconnection from clients. Higher nurse-patient ratios can lead to an imbalance in work-life balance, work overload, and occupational hazards, all of which can result in personal, work-related, and client-related burnout.

Higher nurse-patient ratios can lead to an imbalance between work and personal life, work overload, and occupational hazards, all of which can contribute to personal, work-related, and client-related burnout. WSS, including workplace justice [40], supervisor support, and coworker support, can mitigate the effects of high nurse-patient ratios on burnout. A supportive work environment can provide a sense of belonging, recognition, and validation, leading to a lower likelihood of burnout. Taiwan is facing a shortage of healthcare workers due to an aging population, despite the implementation of the Long-Term Care Ten-Year Plan 2.0 [41]. Nurses are in short supply, and the nurse-patient ratio is higher than in other countries. Managers can reduce nursing burnout by investing in medical equipment and improving nurse-to-patient ratios [13].

In conclusion, to address nursing job burnout and improve patient care, healthcare managers should prioritize the implementation of WSS programs. These programs can help identify and address nurses' stressors, promote a positive working environment, encourage work-life balance, and mitigate job burnout. In addition, addressing the shortage of nurses through investment in medical equipment and an increase in nursing staff can help alleviate some of the burdens placed on nurses and improve the quality of patient care.

5.1. Limitations.

Despite providing valuable insights into the connection between WSS, job stress, and nurse burnout, this study has several limitations that must be considered. First, the research was conducted at a single medical center in Taiwan, which may restrict the applicability of the findings to other healthcare environments. Additionally, the study's participants were limited to nurses working in a public medical center, excluding managers and those on unpaid leave, which could affect the representativeness of the sample. Lastly, the study relied on self-reported data, which might be influenced by response bias or the desire to present oneself in a socially desirable manner. Furthermore, as a cross-sectional study, it offers only a snapshot of a specific population at a given point in time, making the sequencing of events or establishment of causality problematic. The ambiguity regarding whether the exposure or outcome

occurred first introduces an element of uncertainty. Consequently, one should proceed with caution when interpreting the study's results for inference purposes.

6. Conclusions

This research has provided a deeper understanding of the relationship between WSS, job stress, and burnout among nurses in Taiwan, focusing on the mediating role of WSS. The study significantly contributes to the existing body of knowledge and bridges both theoretical and practical gaps in the field of nursing burnout.

From a theoretical standpoint, this study contributes a new dimension to our understanding of WSS in the context of job stress and nurse burnout. The research findings highlight the crucial intermediary role of WSS in mitigating the impact of job stress on burnout. Before this research, such insights, especially within the Taiwanese healthcare setting, were limited. By exploring and highlighting the mediating role of WSS, this study addresses a theoretical gap in the existing literature. From a practical perspective, the study presents valuable implications for nursing management. It provides a clear roadmap for implementing strategies to alleviate nurse burnout and enhance the quality of patient care. The research suggests that enhancing WSS, promoting a positive work environment, facilitating work-life balance, and addressing nursing staff shortages could significantly reduce burnout levels. This practical insight allows healthcare administrators and nurse managers to devise effective strategies to mitigate burnout among their nursing personnel, thus addressing a crucial practical gap in the field.

This study enriches the theoretical understanding of the relationship between WSS, job stress, and nurse burnout and offers practical strategies for mitigating nurse burnout. It bridges the gap between what we previously understood about the subject and what we now understand, providing a solid foundation for future research and practical applications in this area.

7. Implications for Nursing Management

The results of this study offer numerous considerations for nursing management regarding the mitigation of nurse burnout and the enhancement of the quality of patient care. By identifying the elements contributing to job burnout and the crucial function of WSS, nurse managers and hospital administrators can devise and apply effective tactics to decrease burnout among nursing personnel. The following suggestions may direct nursing management in establishing a supportive work setting and improving the welfare of nursing professionals. First, nurse managers must endeavour to offer emotional, informational, and instrumental support to their nursing staff. This includes conducting routine evaluations of nurses' well-being, providing resources for stress management, and maintaining an adequate nursing workforce to avoid work overload. Furthermore, nursing management should promote and enable supportive connections between nurses and other

healthcare practitioners. Second, nursing managers need to acknowledge the significance of work-life balance in averting burnout and fostering nurses' welfare. Managers can provide caregivers with work-life balance measures such as arranging a suitable workplace, providing for family resource needs (e.g., childcare), and fostering a culture that values personal time and self-care. Third, hospitals must provide sufficient nursing staff to address high nurse-patient ratios and workload overload. This entails investing in the recruitment and retention of skilled nursing personnel and offering training and development opportunities. Lastly, hospitals should consistently evaluate the efficacy of the strategies employed to alleviate job burnout. This can be achieved through surveys, feedback sessions, and the examination of key performance indicators related to staff welfare, job satisfaction, and turnover rates. In conclusion, nursing supervisors play an important role in decreasing nurses' burnout and promoting a positive practice environment in nursing, thereby improving healthcare quality and patient safety.

Data Availability

The data used in this study are present within the article.

Conflicts of Interest

The authors declare that there are no conflicts of interest.

Acknowledgments

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