

Journal of EMERGENCY NURSING

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NETWORKING, EDUCATION, AND AN OPPORTUNITY FOR INNOVATION



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We have reached the time that the Emergency Nurses Association is hosting our Emergency Nursing 2022 conference, which is taking place this year from September 30th to October 3rd in Denver, Colorado. This annual event is one of great value to emergency nurses for expanding their knowledge, networking with colleagues, and being provided a general opportunity to recharge. This year, these reasons for attending are more important than ever as nurses continue to seek new ways to reconnect to our profession.

I have focused over this year on how to recharge as a way to support nurses in taking care of themselves so that they can better take care of others. I do not believe this effort should end with the close of the calendar year, but rather endure as a strong foundation for caregivers as they continue to balance their work and the impact of their profession. We remain in a dynamic time, not just within health care, but within the overall workforce. Many have named this the period of the “Great Resignation.” Nursing has experienced the impact and effects of this phenomenon in significant ways. Recruiting into health care is more challenging than ever and turnover continues to climb. I recently spoke with a physician, Dr Thom Mayer, who is committed to finding innovative solutions to our staffing crisis. He proposes that we change the work itself, not the people

performing the work, and believes that much current operating procedure is not working. This idea gives me pause; how would we change health care delivery today? Often in my day-to-day work it seems we are continuously seeking better ways to manage high volume and longer lengths of stay as well as various process-related improvements. Have we considered or focused on how to deliver our care differently? Dr Mayer’s idea is one all health care leaders should consider.

Emergency nurses are well positioned to help change how we deliver health care. We often see people at their initial point of care or entry into the health system. The emergency department remains one area where all patients arrive with an unplanned health-related crisis or concern. These arrivals are not scheduled, and often this visit is disruptive to the patient’s life. How can emergency nurses help to improve where care is delivered or become part of new care delivery models? Although the answers to these questions are not simple or straightforward, I believe they are a key piece to our forward motion as a specialty of the nursing profession.

The challenges the health care system faces are large and complex. Emergency nurses can be a powerful and influential factor in the steps to be taken to improve this system. I noted above the Emergency Nursing 2022 conference. With this in mind, networking, learning, and listening to other’s experiences are excellent platforms for idea generating to occur. Let us all remain optimistic and committed to improving care, providing services our communities need, and growing and expanding the emergency nursing specialty.

Author Disclosures

Conflicts of interest: none to report.

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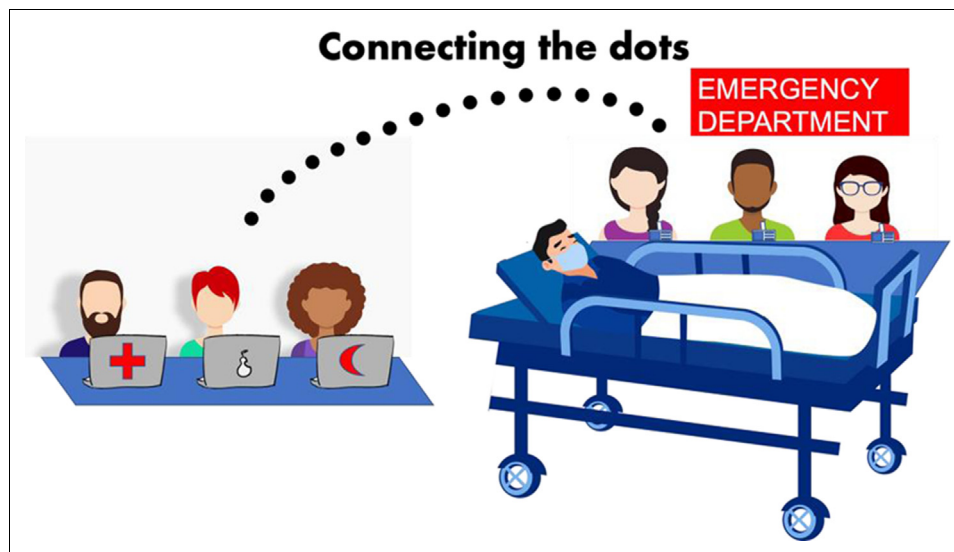
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CONNECTING THE DOTS! FROM BENCH TO STRETCHER SIDE



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The *Journal of Emergency Nursing* (JEN) strives to support emergency nurses in everyday practice. Owing to the competition in generating knowledge based on high-level evidence and obtaining elevated journal impact factors, journals strive to publish randomized controlled trials and research-focused articles to ensure a heightened number of citations. Although this practice can be justified, it has led to a gap or disconnect between

stretcher-side emergency nurses and the translation of knowledge. As we receive more feedback from JEN readers, we are deliberate about ensuring that our readership is listened to and provided with pragmatic knowledge ready to digest and apply. Given the need of stretcher-side emergency nurses to hit the ground running and gain access to peer-reviewed and evidence-based knowledge, JEN has decided to shift its focus to clinically relevant articles that

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provide an updated review of common topics in emergency nursing. To achieve this goal, JEN is extending the call for scholars and emergency nurses to submit papers and case studies that are relevant to their practice, which can inform and improve clinical practice. Owing to the nature of the publication process and built-in timelines, this transition of focus will not be immediately visible, but will be visible in future issues.

For nearly 50 years, JEN has served as a platform for emergency nurses as authors and readers to share vital instruction, knowledge, information, and experiences. JEN is a clinical nursing journal and is in a unique position to disseminate scholarship across the continuum of research, evidence-based practice, and quality improvement. In addition, JEN serves as a platform to disseminate practice-based emergency care solutions and innovations by publishing clinical papers, specialty section papers, clinical practice guidelines, and invited commentaries.

Over the past several years, since the onset of the COVID-19 pandemic, the world has witnessed the endurance, devotion, selflessness, and strength practiced by the health care community, emergency nurses in particular. This is in addition to the already enduring dedication and hard work that members of the emergency nursing specialty have steadfastly demonstrated as a matter of course in times less acutely challenging than these but as demanding.

In acknowledgment of JEN's longstanding respect for emergency nurses and the nursing profession, the JEN editorial team is using this opportunity to voice JEN's renewed statement of dedication to the support of these workers and to the continued provision of a platform for the advancement of the nursing profession and for each nurse's path.

JEN emergency nurse readers over the years have provided candid feedback regarding the articles they value in JEN and have communicated that they value articles by and for emergency nurses and articles directed toward the practitioner. While a new 2022 reader survey is currently in

the works and the JEN staff is anticipating receiving survey feedback from JEN readers, current informal routes of communication and feedback carry the strong message that JEN readers continue to value and rely on emergency nurse-authored and emergency nurse-directed clinical care articles.

As a dedicated source for the dissemination of professional expertise, hands-on experience, lessons learned, and practice development, JEN renews its encouragement of submissions from nurse authors to inform the practice of emergency nursing. This includes welcoming section articles focusing on relevant emergency nurse experiences, advice, narratives, and shared learning opportunities.

JEN readers and authors, we ask that you share your experiences in the field and emergency practice. Sharing your knowledge, expertise, and unique experiences in the fast-paced, high-intensity emergency setting, caring for patients on what may be the worst day of their lives, strengthens the JEN mission. As the flagship publication of the Emergency Nurses Association, it is an honor to have the means to support the publication of these works. We strongly encourage you to, along with our editorial team, be an active participant in advancing emergency nursing and being a part of JEN as the pre-eminent journal for emergency nursing. To review the author guidelines or submit a manuscript for consideration, go to <https://www.jenonline.org/>.

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IMPROVING TIMELINESS OF PEDIATRIC EMERGENCY DEPARTMENT ADMISSIONS



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NCPD Earn Up to 8.5 Hours. See page 616.

Contribution to Emergency Nursing Practice

- What is already known about this topic? Despite the importance of continuation of care following ED evaluation, there is sparsely documented information about timeliness for admission and no data exist to document ideal admission time frame.
- What does this paper add to the currently published literature? Outcome data regarding adult patients have been published. This paper is a novel approach to addressing movement from the ED to inpatient care for pediatric patients, thus ensuring appropriate continuity of care, especially for acute and critically ill children.
- What is the most important implication for clinical practice? A standardized practice for patients being admitted to inpatient units from the ED was initiated and improved timing from decision to admit by a mean of 24 minutes.

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Abstract

Introduction: The goal of this quality improvement project was to improve timing, communication, and continued care for pediatric patients who present to the emergency department at a Level I pediatric trauma center and require inpatient admission.

Methods: Using continuous improvement methodology, a patient flow process was created to improve the throughput of pediatric patients requiring inpatient admission from the emergency department, aimed at decreasing the time from decision to admit to actual admission. The new workflow included ED and inpatient nursing collaboration, with nursing leaders coordinating patient transfer.

Results: Baseline data indicated that, in 2019, patients admitted to a short-stay pediatric unit from the emergency department had an average time of 106.8 minutes from decision to admit to the actual admission. After the implementation of a new admission process, time from decision to admit to actual admission decreased from a mean of 106.8 minutes to 82.84 minutes for patients admitted to a short-stay unit. This illustrates an improvement from 59.75% to 68.75% of patients admitted within 60 minutes from ED admission to arrival on a short-stay unit. This model was then replicated throughout other units in the hospital.

Discussion: There are no known benchmark data to guide practice for rapid admission from the pediatric emergency department to inpatient units and continuing care. This quality improvement project demonstrates a model that has been successful admitting patients in an efficient, time-controlled manner. Additional research is needed to document benchmarks for admission timing and to demonstrate other measurable outcomes in patient care.

Key words: Emergency department; Hospital admission; Pediatric emergency department; Pediatric hospital; Trauma center

Background

Our hospital is a large pediatric hospital located in the mid-Atlantic area of the United States. It is part of a larger children's health system with primary and specialty services in the Northeast and in Florida. It includes the only Level I pediatric emergency department (ED) and Level I pediatric trauma center in the state, which typically provide services for more than 60,000 patients over the course of a year and offer care to the most vulnerable patients and families. Critical for patient care, the flow of patients through the emergency department is also vitally important for access to care, affecting the patient experience and the nursing practice environment.^{1,2} Organizational data indicated an increase in the number of patients being held in the emergency department as a barrier to patient disposition across the continuum of care. As noted in January 2019, 61.1% of our patients did not reach the inpatient units within 60 minutes of being ready for transfer. Between January and December of 2019, before implementation of improvement interventions, the mean time from patient readiness to arrival on the unit was 122.49 minutes. A lack of a standardized process was noted as the main barrier to meeting our target.

PROBLEM IDENTIFICATION

Patients at our pediatric hospital can access care at multiple locations, including the emergency department. Our department has prioritized flow within the department, as well as during patient disposition. Our ED flow consists of patient arrival, initial assessment, treatment, reassessment, and disposition. These processes contribute to satisfaction and overall successful patient care outcomes. When demand exceeds capacity, patients determined to need admission occupy ED space and flow is interrupted, leading to dissatisfaction and the inability to serve other patients requiring emergent care.^{1,3,4} Patients who are unable to progress through to the intended admission location are then held within the emergency department to continue care, which is not ideal for patients or their providers. An evidence-based process was needed to assure a seamless transition for patients admitted from the emergency department.

Review of current protocols and creation of best practices for ED flow were included in the consideration of the emergency department's ability to transfer patients for continued care. Communication and data documentation were extremely important starting points. During daily management huddle, emergency clinical nurses and other emergency care team members raised concerns regarding the ED front-end process and control over the patient

care they provide. With the emergency department being a high-volume, high-acuity, fast-paced care environment, multiple competing processes may cause poor patient flow. This results in the inability to consistently locate patients for "next steps" in care and for staff to have control over the environment where they provide care. Multiple patient arrivals at the same time caused bottlenecks resulting in unnecessary patient movement and potential obstruction to disposition decisions.⁵

In 2015, the ED team introduced the concept of immediate rooming when rooms are available and revamped the front-end process for when rooms are not available, with a goal to have patients in rooms and the bedside care team and support staff interacting with the patient within 15 minutes of arrival.^{4,6} Other goals, which were achieved, included reducing patient travel from a maximum of 9 stopping points to 6 when no rooms in the emergency department were available (Table 1), finding the correct patient in the ED waiting room 100% of the time, and limiting duplicative staff interaction with the primary care team. Achieving these goals streamlined communication, improving care for the patient/family while increasing efficiency of staff. The percentage of patients placed in rooms within 15 minutes increased from 59% to 85% overall and increased to 95% when a room was readily available.

Management of the internal ED patient flow led to the next challenge of improving flow to inpatient areas of the hospital, which was the emphasis for this quality improvement (QI) project. We considered acuity of illness, risk of deterioration in status, and opportunity to provide inpatient and specialty services. This important goal was incorporated in the Nursing Strategic Plan, with an initial goal of decreasing the length of stay (LOS) within the emergency

TABLE 1
Reduction in ED patient travel from a maximum of 9 stopping points to 6

Initial rooming process	Improved rooming process
1. Security screening	1. Security screening
2. Quick registration	2. Quick registration
3. PIVOT	3. PIVOT
4. Waiting room	4. Rapid assessment
5. Rapid assessment	5. Waiting room
6. Waiting room	6. Roomed in ED
7. Registration	
8. Waiting room	
9. Roomed in ED	

department but to then improve the overall satisfaction of patients and families across the continuum of care. A primary strategic goal alignment was for 65% of patients arriving on the inpatient units within 60 minutes from their baseline time of “patient ready” in the hospital electronic health record. Determining methods to succeed with this process was the problem identified and addressed through QI methodology.

AVAILABLE KNOWLEDGE

The Centers for Disease Control and Prevention reports a total of 130 million ED visits per year, with 12.4% of these resulting in hospital admission.⁷ In both adult and pediatric hospitals, approximately 70% of hospital admissions come from the emergency department. In pediatric hospitals, 10% of all ED visits result in admission.⁸ In 2018, the national median time interval from decision to admit to hospital admission across all EDs reporting was 116 minutes, but this represents only a small percentage of emergency departments and does not differentiate hospital type, patient characteristics, or geographical locations, especially urban versus rural.⁸

A substantial percentage of patients admitted to inpatient units come from the emergency department, which means patient flow within the emergency department and outside of the emergency department is extremely important, but there are no universal guidelines nor benchmarks available to gauge patient movement across hospital areas.^{2,9} Models to improve throughput in the emergency department itself, especially from the waiting room to initial care, and to streamline admission to critical care units across all populations have been published.⁹⁻¹³ Communication, as a critical part of handoff, and the ability of the ED staff to recognize and predict acute and critically ill patients are other aspects of study.¹⁴ However, we were unable to find data that present appropriate or recommended timing of ED patients admitted to inpatient areas. In most cases, this concept is measured by family satisfaction with ED care and access to care, specifically.¹⁵

Patient handoff is a comprehensive process associated with ED LOS and an important component to guarantee an efficient inpatient admission.^{9,14,16} Communication is key to smooth transfer from one unit to another, especially for ED patients who are admitted with various levels of complexity.¹⁷ One hospital used a conference call approach to disseminate information for pediatric patients who were moving from the emergency department.¹⁴ An electronic version of Situation, Background, Assessment, Recommendation was used by an emergency department for the inpatient nurse to view patient data and then call the emergency

department for additional details.¹⁸ Wolak et al⁹ published results of changing handoff processes, also using Situation, Background, Assessment, Recommendation, for patients admitted to inpatient areas. This adult-focused study noted an average LOS of 154 minutes from time to admit decision.

Prediction of ED patient risks for admission and for deterioration in status has been studied, but primarily focused on individual hospitals/organizations.^{10,11,19,20} Patient acuity on admission from the emergency department is another discussion point. Nadeau et al¹¹ conducted a retrospective review of pediatric patients admitted to 1 inpatient unit and then transferred to an intensive care unit (ICU) within 24 hours. Of 82,397 admitted patients, 1% were transferred to the ICU. Another study in a large Canadian hospital attempted to decrease the incidence of rapid response calls that required transfer to the ICU. The study focused on adult patients admitted to inpatient units from the emergency department within 24 hours. The authors used a Modified Early Warning Score along with other patient characteristics such as presence of a Foley catheter to predict risk at time of admission.¹³ These studies reinforce the need for patient risk identification and admission to an appropriate unit in a timely manner from the emergency department. Barak-Corren et al²¹ presented a multivariate prediction model that along with specific patient characteristics, including previous admissions, current medications, and ED risk acuity scoring, can predict the need for hospitalization of patients arriving to the emergency department as early as 10 minutes from check-in. This type of prediction assists in getting patients to the correct level and environment of care and is also helpful for the purpose of admission planning and decreasing the total LOS in the emergency department.²¹ Rowland et al²² described a similar predictive model for children admitted to nonspecialist hospitals in England, called the Pediatric Admission Guidance in the ED score, which assists in determining risk for admission. Similar to other published prediction models, this one also used a quantifying method to document potential for admission. An adult model focused on improving discharge times of inpatients to have available beds for ED admissions.¹² Obviously, providing health care in an efficient manner in any setting is important, but care in the emergency department is unique given that many patients presenting there are not previously known by providers or staff, acuity can change momentarily, and decisions for disposition can take extended periods of time.

Despite the availability of rapid access to care in the emergency department and accurate patient acuity evaluation, attention to timing of transfer to inpatient units has

not been a priority in research. However, it is essential to improve access for patients waiting in the emergency department for continuation of care, considering the lack of resources ED providers have to provide inpatient care. Streamlining admission from the emergency department to the ICU or a medical-surgical unit is critical.^{10,23}

Methods

To address the throughput in the emergency department and from the emergency department, a patient flow process improvement event was held using continuous improvement efforts. A continuous improvement event uses a QI structure that does not require institutional review board approval, given that it does not include development, testing, or evaluation involving human subjects. However, a query was submitted to the institutional review board at our institution, and they concluded that the project was not research. The data obtained for this project were de-identified and aggregate, and the results are not considered generalizable. This event emphasized the need to align with previous ED improvement efforts.

An interprofessional team with emergency clinical nurse participation completed an analysis of the flow of patients to the inpatient units, noting barriers within this environment, which included lack of a standard process, absence of visual indicators, and fragmented communication between teams. Process mapping was the tool used to outline results with the goal of disposition of patients within 60 minutes of the decision to admit, and an admission model (Table 2) was created to include specific steps to support improving patient flow on admission. Once the new process was implemented, barriers were discussed daily at the Patient Care Services huddle to improve communication, using daily visual data metrics and huddle discussion to monitor success and to escalate noted opportunities. High inpatient volume throughout the hospital limited the initial success of the admission model. Teams were encouraged to escalate barriers in real time. The most common barrier that was escalated was related to bed availability because of high inpatient census. Daily metrics were provided for nursing leadership and ED clinical teams to assess and measure success and to document trends in barriers. Trending issues allowed the team to identify ongoing issues, such as extended length of time for inpatient room turnover.

Once the potential new process was outlined, a unit known as 4 West, a fast-paced, short-stay unit, was chosen as the pilot unit to implement the new emergency department to inpatient model. The 4 West patient flow supervisor, a designated lead and expert nurse, had the task of

collaborating with the interdisciplinary team to coordinate patient flow and adjust resources to ensure optimal care delivery and continuum of care. The patient flow supervisor played a vital role in the process of admitting and discharging patients, ultimately guiding throughput of patients admitted from the emergency department. Direct communication between the emergency department and the receiving unit was instrumental in early identification and planning for patients. Given that our short-stay area is a fast-paced unit, with continuous admission and discharge expectations, it proved the best place to pilot the change with the end goal of rolling out the tested admission goal and admission process to the remainder of the medical-surgical inpatient units.

Efficiency added to the quality outcomes of this admission model; therefore, patients arriving from the emergency department were given a “reservation” or pull time when “ED ready to admit” was identified through the electronic health record. The emergency department and unit-based nurses determined a time when they would complete a handoff at the patient bedside in the emergency department to exchange this information. Although bedside handoff is a standard within our organization, completing the handoff in the emergency department was a new outcome as a result of this project. The nurses met in the ED patient room, and the medical-surgical nurse received a standardized report, performed a safety check with Pediatric Early Warning Score²⁴ assessment, and transported the patient back to the floor. The Pediatric Early Warning Score is a severity of illness score developed for hospitalized children, which provides objective patient criteria and allows for early identification of patients at risk for cardiopulmonary arrest.²⁴ Completing this assessment decreased the frequency of unnecessary rapid response team calls and transfer of newly admitted patients to an ICU within our organization.

Evaluation of the pilot for transition of pediatric ED patients revealed that, in 2019, 59.75% of patients were admitted within 60 minutes. Once we successfully and efficiently placed patients in ED rooms and demonstrated a decrease in inpatient admission timing, the QI group decided to introduce this model to other units within the hospital, with the intention of all units participating in the same admission process as ED patients.

Assumptions included the fact that streamlined inpatient care can decrease incidents, flawless communication ensures continuity of care, and shortened stays in the emergency department result in more efficient inpatient services. Evaluation of patient and family experience was linked to improving “likelihood to recommend” scores, supporting the enterprise’s vision, and assisting in maintaining patient location within the only children’s hospital in the state.

TABLE 2

Process for admission of ED patients to inpatient units

Step	Process step	Step number	Instructions
1	Decision to admit patient from ED (ED provider)	1.1	ED provider enters “ED Inpatient Bed Request” order into EHR (includes the patient’s name, age, MRN, diagnosis, service, and/or trach/vent and medically complex)
2	Bed assignment (nursing supervisor/unit PFS)	2.1	Nursing supervisor assigns patient to designated unit via Voalte text to the receiving unit PFS, using Voalte Quick Text for Admission
		2.2	Unit PFS assigns patient bed and nurse; Group Voalte sent to nursing supervisor, ED flow supervisor, ED RN, inpatient/CC RN, and unit clerk to communicate room, receiving nurse, and room readiness status
3	Patient is ready to be admitted	3.1	When the patient is ready to be admitted, the ED provider contacts (text/call) the admitting resident/service for physician-to-physician handoff
		3.2	Admitting resident/service contacts the nursing supervisor to review the patient and their admission, service/team, and unit
		3.3	Admitting service enters “Admit to Inpatient” order into EHR
		3.4	Nursing supervisor posts the unit, room number, and team to the bed board
		3.6	The inpatient/CC PFS uses the Admission Quick Text to update the team on the reservation time
4	RN to RN handoff report	4.1	ED RN monitors track board for patient to be admitted “green” status and initiation of the ALOS timer
		4.2	ED nurse completes all ED patient care orders and RN ready for admission checklist
		4.3	The inpatient/CC nurse prepares to receive the patient and pulls the patient at the set reservation time
5	Patient transport to accepting floor	5.1	MD, ED, and RN boxes will be checked when patient is ready to leave the ED
		5.2	Inpatient/CC RN will arrive at the ED and receive IPASS Report at the set reservation time
		5.3	Unit clerk will pull patient in EHR and alert accepting service of patient arrival to the floor via Web eXchange

EHR, electronic health record; MRN, medical record number; PFS, patient flow supervisor; RN, registered nurse; CC RN, critical care RN; ALOS, admit length of stay; CC PFS, critical care patient flow supervisor; IPASS, illness severity, patient summary, action list, situation awareness and contingency planning, synthesis by receiver.

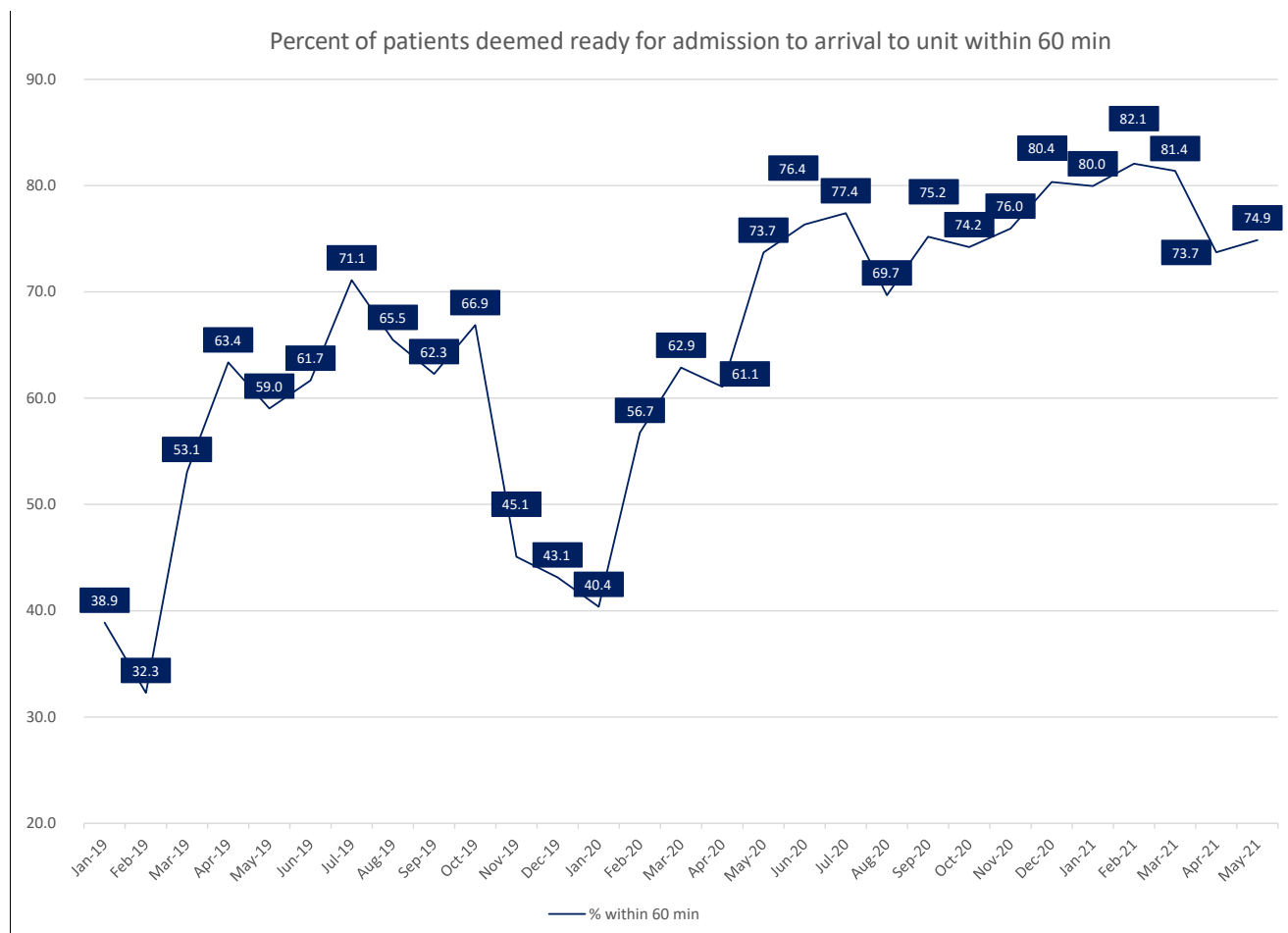
The nursing department strategic plan incorporated the goals of decreasing LOS within the emergency department and improving satisfaction of patients and families across the continuum of care. Real-time, daily metrics continued to provide nursing leadership and clinical teams success stories and the opportunity to address barriers and continue to improve processes.

Results

Aggregate data comprised a population of pediatric patients ranging from 0 to 21 years of age admitted from the emergency department to medical-surgical and critical care units. [Figure](#) indicates the percentage of patients deemed ready to admit and physically transferred to the inpatient unit within 60 minutes of this decision. The improvements in the

admission model, a registered nurse–initiated “pull process,” reservation time, and a coordinated handoff led to a significant decrease in overall admission time. Admission time is also illustrated in [Figure](#), documenting an improvement from 38.9% to 80.0% of patients who were ready for admission to arrival within unit within 60 minutes from January 2019 to January 2021. This represents an overall improvement of 41.1%.

Before the implementation of the improvements outlined in the article, the mean transfer time from the emergency department to the inpatient unit was 122.49 minutes (January to December 2019); postimplementation the mean time was 83.63 minutes (January to December 2020), a difference of 39 minutes. These data indicate overall improvement, but there is no information that supports what an “ideal” admission time frame is nor what patient outcomes improve as a result. A visual cue provided by



FIGURE

Percentage of patients deemed ready to admit and transferred within 60 minutes from admission order.

our electronic medical record created a signal that offered the largest improvement in visibility.

Discussion

The coronavirus disease 2019 (COVID-19) pandemic has wreaked havoc in the emergency department across both pediatric and adult patient populations. Early in the pandemic months, “lockdowns” resulted in an overall decrease in communicable diseases among children, so emergency departments in children’s hospitals were operating at a much slower pace and inpatient admissions were limited by several variables including suspension of nonurgent surgical procedures.^{25,26} Overall volume within our department decreased by 33% during this time frame. This project was started before the COVID-19 pandemic, so results obtained between

preproject and postproject may not fully represent the “typical” ED patient flow for this institution, which was described early in the article. An annual ED census of 60,000 patients does not normally mean 168 patients per day, given that fluctuations have always included “seasonal” pediatric problems. Although adult hospital emergency departments were overflowing, pediatric emergency departments were slower but quickly escalated to much higher daily census. At times, 1.5 times as many patients per day were seen in our hospital as previously at the same time of year, despite Centers for Disease Control and Prevention data that indicate that pediatric ED volumes did not increase over 2019.²⁷ In latter months of the pandemic, pediatric hospitals also experienced nursing shortages, with excessive turnover in staff, and these hospitals have different issues when hiring new staff than their adult counterparts. Nurses experienced in adult care can move between institutions and require

less orientation than adult-trained nurses who are moving to a pediatric hospital, which was sometimes the case at our institution, adding another barrier to ED patient flow during this past year.

As we continue to collect data on the average time to admit from the emergency department, many variables must be considered, some of which were not in place before January 2020. The members of the team who created this new model of care were successful, despite many variables beyond their control.

Limitations

As previously mentioned, the COVID-19 pandemic may have affected the design of this process and should be considered a potential limitation. An additional limitation of this study was the use of data from only 1 children's health care system, which could result in bias and impede applicability and reproducibility of the methods for other institutions. The QI methodology does not support the ability for the data to be generalized in any setting; it only provides a framework for the process. In addition, this study measured time frame only; it did not document other patient outcomes. Patient acuity data were also not collected, which could assist in determining if rapid, streamlined admission from the emergency department increases the opportunity to efficiently identify and address deterioration in status. Seasonal shifts in acuity and volume of ED patients are also factors that are not easy to control. In times of exceedingly high inpatient census, the emergency department can be used as an inpatient "hold" area, which philosophically eliminates aims to provide care in the best possible environment by the most qualified providers. Unfortunately, there are no benchmark data to compare results or ideal metrics to continue to aim to achieve. There also may be different perspectives between adult and pediatric patients, where decision to admit may be urgent for some and not for others. However, improving throughput in any ED setting can only result in overall improved patient access and patient/family satisfaction. The QI project implementation took place over the course of the pandemic, perhaps affecting the number of patients requiring admission in the pediatric ED setting.

Implications for Emergency Nurses

Emergency departments are tasked with providing care to many patients, often exceeding their capacity. Creating a streamlined process for patients admitted from the

emergency department to the inpatient setting improves efficiency of clinical care and patient access to services not available in the emergency department. Improving patient throughput in the department allows ED providers and nurses additional time to offer services to a larger volume of patients with varied acuity presentations.

Implementing a standard work process for patient admission, while also incorporating effective communication, provides a road map to efficiently move patients from the emergency department to the inpatient setting. This is a model that can be replicated for other hospital areas and benchmarks for comparison of results. In this model of care, collaboration between interdisciplinary teams representing the emergency department and various inpatient units is integral to facilitate the movement of patients through the system, ultimately allowing more available physical space/treatment rooms to care for patients arriving to the emergency department. Thus, by improving throughput and expediting admission to inpatient units, the providers, nurses, and support staff initiating care in the emergency department are encouraged to evaluate patient needs and predict disposition for inpatient acute and critical care in a timely manner, which can result in improved patient outcomes and patient/family satisfaction.

Conclusion

Improving the time from decision to admit to actual admission to an inpatient unit was the goal of this ED QI project, with secondary aims to increase patient and family satisfaction. Methods have been continuously evaluated and data collected to document the success or sometimes failure of this method to achieve the intended goal. Decreasing the time for patients to reach the inpatient unit was our ultimate measure of success. Additional factors that demonstrated success included the availability of inpatient beds, that is, clean or ready for admission based on discharge timing of previous patients or environmental services efficiency or both. Although our pilot improvement project was originally implemented on a short-stay unit, where turnover is imperative for unit success, we were able to replicate this process in all inpatient medical-surgical and critical care areas. We believe this methodology can be successfully replicated throughout our organization and plan to evaluate the results in the future.

Author Disclosures

Conflicts of interest: none to report.

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ASSOCIATION OF CANNABIS USE AND AT-RISK ALCOHOL USE WITH INTIMATE PARTNER VIOLENCE IN AN URBAN ED SAMPLE



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Contribution to Emergency Nursing Practice

- Urban ED patients have elevated rates of substance use and intimate partner violence.
- Among a sample of married/partnered ED patients seeking nonemergent/low-acuity care, rates of intimate partner violence perpetration and victimization differed significantly by substance use behaviors. Rates were highest among those engaging in cannabis use only and those reporting both at-risk drinking and cannabis use. In gender-stratified multivariate logistic regression analyses, the association between at-risk drinking only, cannabis use only, and both at-risk drinking and cannabis use and each intimate partner violence outcome remained significant for women but not men.
- Brief screening of substance use patterns may help identify those at greater risk for intimate partner violence. These patients can be prioritized to receive preventive counseling and referrals.

Abstract

Introduction: Urban ED patients have elevated rates of substance use and intimate partner violence. The purpose of this study is to describe the risk profiles for intimate partner violence among urban ED patients who report at-risk alcohol use only, cannabis use only, or both types of substance use.

Methods: Cross-sectional survey data were collected from study participants (N = 1037; 53% female; ages 18-50) following informed consent. We measured participants' past-year at-risk drinking (women/men who had 4+/5+ drinks in a day), cannabis use, psychosocial and demographic characteristics, and past-year physical intimate partner violence (assessed with the Revised Conflict Tactics Scale). We used bivariate analysis to assess whether rates of intimate partner violence perpetration and victimization differed by type of substance use behavior. Multivariate logistic regression models were estimated for each intimate partner violence outcome. All analyses were stratified by gender.

Results: Rates of intimate partner violence differed significantly by type of substance use behavior and were highest among those who reported both at-risk drinking and cannabis use. Multivariate analysis showed that women who reported at-risk drinking only, cannabis use only, or both types of substance use had increased odds for intimate partner violence perpetration and victimization compared with women who reported neither type of substance use. Men's at-risk drinking and cannabis use were not associated with elevated odds of intimate partner violence perpetration or victimization.

Discussion: Brief screening of patients' at-risk drinking and cannabis use behaviors may help identify those at greater risk for intimate partner violence and those in need of referral to treatment.

Key words: At-risk drinking; Cannabis; Emergency department; Gender; Intimate partner violence; Screening

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Introduction

Intimate partner violence (IPV) remains a significant public health problem that can result in physical and mental health morbidity.¹ While a complex array of factors is associated with risk for IPV, a large body of research links alcohol use with both its occurrence and severity.² For example, in an analysis of Wave II of the US National Epidemiological Survey of Alcohol and Related Conditions, usual quantity of drinks was associated with elevated risk for bidirectional (ie, perpetration and victimization) IPV and victimization only.³ A recent meta-analysis of substance use and IPV found that measures of problematic alcohol use (eg, abuse, dependence, and drinking problems) were stronger correlates than consumption measures (eg, alcohol use or frequency) for IPV victimization but were statistically similar for IPV perpetration.⁴ The alcohol myopia model proposes that acute alcohol consumption results in cognitive impairment, which creates a narrowing effect on attention (ie, alcohol myopia).⁵ Giancola et al⁶ expanded upon the model to propose 5 putative mechanisms (negative affect, angry affect, hostile cognitive rumination, self-awareness, and empathy) that link this theoretical framework with alcohol-related aggression, such as IPV.

In terms of the cannabis-IPV association, a review of 30 studies reported that distal cannabis use (eg, frequency of use in the past year) was modestly associated with distal reports of IPV (eg, frequency of IPV perpetration in the past year).⁷ On the basis of meta-analysis, Cafferky et al⁴ reported that the effect size between cannabis use and IPV perpetration and victimization was not substantially different from that of amphetamines or cocaine. Cognitive impairment resulting from cannabis use may inhibit conflict resolution and thereafter contribute to conflict and aggression.⁷

The role of cannabis vis-à-vis IPV is garnering increased research attention for several reasons. First, other than tobacco, cannabis is the most widely used drug among those who drink.⁸ Its prevalence is likely to increase, given trends toward legalization of medicinal and recreational cannabis use. Second, those who use alcohol and cannabis may be at greater risk for alcohol-related consequences compared with drinkers who do not use cannabis. For example, an analysis of a United States national sample found that those who used both substances in the past 12 months were more likely to report legal, health, work, fighting, and relationship problems compared with those who used alcohol only.⁹ To date, there has been limited research with ED-based samples that has analyzed how odds for intimate partner aggression may differ between those who only drink or use cannabis versus those who use both substances.^{10,11} In one study

among a sample of young adults recruited from an urban emergency department, dating abuse perpetration was more likely on days when males reported alcohol and cannabis use (odds ratio [OR] = 4.54) or alcohol use only (OR = 5.35) compared with those who use neither alcohol nor cannabis; no associations were seen for females.¹⁰ Understanding how odds for IPV may differ among patients who engage in problem drinking only, cannabis use only, or both behaviors could help identify those who may be in need of further screening. This is important because rates of IPV, substance use, and other social problems are elevated among underserved patients seeking medical care in urban safety-net ED settings.¹¹⁻¹⁵ These emergency departments are part of essential hospitals that provide a substantial volume of care to low-income patients, the uninsured, and others who face social and economic hardships.¹⁶ From a prevention standpoint, the ED visit presents an opportunity for staff to screen patients and discuss potential treatment or interventions for those reporting risky drinking and drug use.^{17,18}

Previous analyses of the data herein found that approximately 23% of the sample reported past-year IPV,¹² and that IPV is linked with problem drinking behaviors (eg, frequency of intoxication and at-risk drinking, defined as women/men who had 4+/5+ drinks in a day) and cannabis use.^{12,19,20} We extend these findings by describing the risk profiles of study participants who reported at-risk drinking only, cannabis use only, and both at-risk drinking and cannabis use in relation to past-year IPV victimization and IPV perpetration. We expected that each type of substance use behavior would be associated with both IPV outcomes, and that the magnitude of effect would be greatest among those who report at-risk drinking and cannabis use.

Methods

The project was approved by the Institutional Review Board of the hospital at which the study occurred. Participants provided informed consent and received a \$30 grocery store gift card for completing the survey.

SAMPLE AND DATA COLLECTION

This cross-sectional study was based on patients seeking nonemergent care (ie, not requiring immediate medical attention; low or nonemergent presentation) at the emergency department of an urban level I trauma center in Northern California. The hospital is part of a county-wide integrated public health care system. As such, it serves a

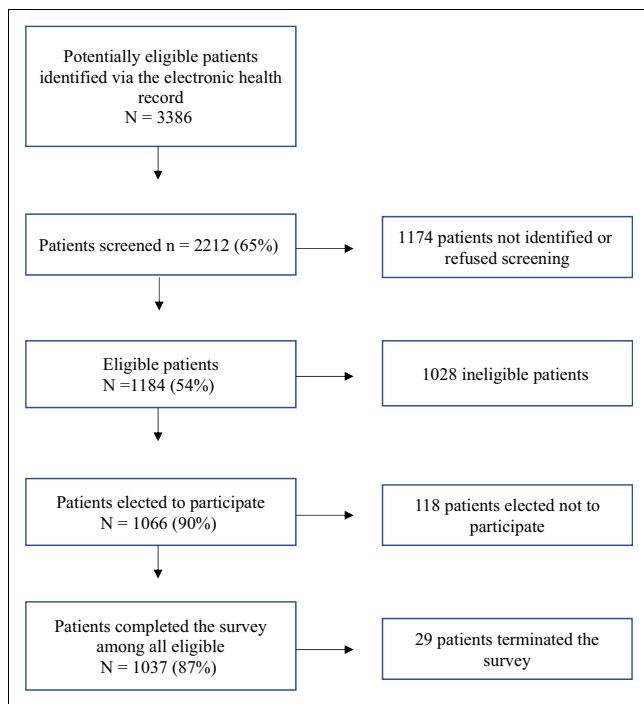


FIGURE
Study sample recruitment.

population with low socioeconomic status, many of whom are uninsured and rely on the hospital for routine medical care. Study eligibility criteria were the following: 18 to 50 years old; English or Spanish speaker; resident of the county in which the hospital is located; and married, cohabiting, or in a romantic (dating) relationship with the same person for the past 12 months. Patients who were intoxicated, experiencing acute psychosis or suicidal or homicidal ideation, were cognitively/psychologically impaired and unable to provide informed consent, in custody by law enforcement, or in need of immediate medical attention (Emergency Severity Index²¹ levels 1-2) were ineligible and excluded.

Survey data collection was conducted from February 27 to December 15, 2017. Owing to staffing constraints, we did not seek to proportionately recruit patients from all ED shifts. Instead, 2 trained, bilingual research assistants per shift staffed the emergency department during weekday peak volume hours (9 AM-9 PM) to recruit eligible patients to the study. Figure shows the recruitment sequence. The research assistants identified potentially eligible patients through a multistep process. First, they searched the emergency department's electronic patient information system for currently registered ED patients between ages 18 and 50 years (N = 3386) who had been triaged at Emergency Severity Index levels 3 to 5. Second, the research assistants

located and conducted face-to-face screening with patients in the ED waiting room or in a treatment cubicle (N = 2212). Third, the research assistants offered eligible patients the opportunity to participate in a confidential, face-to-face survey interview for which they would receive a \$30 grocery store gift card incentive (N = 1184). The research assistants obtained informed consent in a private area adjacent to the ED waiting room or in the patient's room without others present (N = 1066). Twenty-nine patients terminated the survey interview before completion. This was due primarily to interruption for medical services (eg, patient transported to ultrasound or X-ray). Thus, 1037 participants (53% female) completed the survey. The research assistants conducted the screening and survey interview using computer assisted personal interview techniques with tablet computers running the Qualtrics platform. Average survey interview completion time was 37 minutes (SD = 20.7). Sample characteristics are shown in Table 1.

MEASUREMENTS

Main Outcome

IPV. Past 12-month physical IPV was measured with the 12-item physical assault subscale in the Revised Conflict Tactics Scale.²² Participants were asked about violent behaviors that they may have perpetrated against their spouse/partner, and that their spouse/partner may have perpetrated against them. This allows for identification of the participant as a perpetrator of violence and/or as a victim of violence. Cronbach's α for the scale was 0.85.

Independent Variables

At-Risk Drinking. Participants who drank alcohol in the past 4 weeks were asked, "What was the greatest number of drinks you had on any day in the past 4 weeks?" A "drink" was defined as a 12-ounce can of beer, a 5-ounce glass of wine, or a 1-ounce shot of liquor. Participants who drank alcohol in the past year (but not in the past 4 weeks) were asked about the greatest number of drinks they had on any day over the past 12 months. Women and men were considered at-risk drinkers if they had had 4 and 5 or more drinks, respectively, on any 1 day in the past 4 weeks (past 12 months for past-year drinkers). This is in accord with criteria on at-risk drinking as specified by the National Institute on Alcohol Abuse and Alcoholism.²³ Abstainers were coded "0."

Cannabis Use. We created a dichotomous cannabis use variable coded positively for participants who reported that they used marijuana or hashish in the previous 12 months.

TABLE 1

Sample characteristics

Variable	Men (n = 484) % or mean (SD)	Women (n = 550) % or mean (SD)	χ^2 or <i>t</i> <i>P</i> value*
Age	36.5 (8.2)	34.0 (8.5)	< .001
Missing = 0			
Race/ethnicity:			
Black/African American	26.2	31.3	ns
Hispanic	52.9	47.6	
Other	14.5	14.5	
White	6.4	6.5	
Missing = 0			
Relationship type			
Same-sex	2.3	5.1	< .05
Heterosexual	97.7	94.9	
Missing = 6			
Perceived neighborhood disorder	6.1 (5.4)	6.8 (5.6)	ns
Missing = 0			
Impulsivity	5.3 (2.5)	5.4 (2.6)	ns
Missing = 3			
Adverse childhood experiences	1.1 (1.4)	1.5 (1.6)	< .001
Missing = 2			
Food insufficiency	44.7	54.5	ns
Missing = 6			
PTSD positive screener	22.1	27.6	ns
Missing = 2			
Participant's drinking and cannabis			
At-risk drinking only	21.7	11.2	< .001
Cannabis use only	17.7	14.5	
Both at-risk drinking and cannabis use	12.7	9.4	
Neither	47.8	64.8	
Missing = 12			
Illicit drug use	17.0	8.1	< .001
Missing = 8			
Spouse's/partner's drinking and cannabis:			
Hazardous drinking only	11.3	12.9	ns
Cannabis use only	10.1	16.6	
Both hazardous drinking and cannabis use	8.0	9.6	
Neither	70.6	60.8	
Missing = 16			
Spouse's/partner's illicit drug use	4.6	6.9	ns
Missing = 17			

continued

TABLE 1
Continued

Variable	Men (n = 484) % or mean (SD)	Women (n = 550) % or mean (SD)	χ^2 or <i>t</i> <i>P</i> value*
IPV:			
IPV Perpetration	14.6	19.3	ns
Missing = 8			
IPV Victimization	22.2	17.3	ns
Missing = 8			

ns, not significant.

* Chi-square or *t* test for gender differences in sample characteristic.

Recreational cannabis use was legalized in California in November 2016.

Spouse/Partner Hazardous Drinking. We used the 3-item AUDIT-C (Alcohol Use Disorders Identification Test-Consumption) to measure the participant's assessment of his/her spouse/partner's drinking.^{24,25} The 3 questions cover how often the partner drinks, how many standard drinks the partner has on a typical day, and how often the partner has 6 or more drinks on 1 occasion. Male and female spouses/partners with a score above 4 and 3, respectively, were categorized as hazardous drinkers. Cronbach's α was 0.81.

Spouse/Partner Cannabis Use. Participants were asked whether their spouse/partner used marijuana or hashish in the previous 12 months. We created a dichotomous variable (spouse/partner cannabis use), coded positively based on participant report.

Other Covariates. Participants self-reported their gender and the gender of their spouse/partner. We used these reports to create a dichotomous variable for relationship type (same-sex or heterosexual). Self-reported race/ethnicity was recoded into 4 racial/ethnic categories: White; African American; Hispanic; and other (includes multi-ethnic/multiracial). Age was used as a continuous variable. Household food insufficiency over the past 12 months was measured with a 1-item screener.²⁶ We used a modified version of the Adverse Childhood Experiences (ACE) scale to measure exposure to 6 ACE: (1) mentally ill person in the home; (2) parent/caregiver alcoholism; (3) sexual abuse; (4) physical abuse; (5) psychological abuse; and (6) violence directed against the respondent's mother.²⁷ Cronbach's α was 0.74. Impulsivity was measured with a 3-item scale that has been used in previous IPV studies.²⁸⁻³⁰ Cronbach's α was 0.79. Perceived neighborhood disorder was measured with Hill and Angel's³¹ 10-item measure of neighborhood disorder. Cronbach's α was 0.88.

Post-traumatic stress disorder (PTSD) was assessed with 4 items from the Primary Care Screener for PTSD.³² A score of 3 or more is considered positive. Cronbach's α was 0.83. We created a dichotomous illicit drug use variable coded positively for participants who reported that they used amphetamines, cocaine, heroin, or pain relievers (eg, opioids) not prescribed for them in the previous 12 months. Participants were asked whether their spouse/partner used amphetamines, cocaine, heroin, or pain relievers (eg, opioids) not prescribed for them during the same timeframe. We created a dichotomous variable (spouse/partner illicit drug use), coded positively based on participant report.

STATISTICAL ANALYSIS

The study's initial sample size estimate called for the enrollment of 800 married, cohabiting, or dating adults (50% female). This was based on calculations that using linear regression analyses, power would be 80% to detect a small overall effect ($R^2 = 0.02$) with 20 predictors, $\alpha = 0.05$. Power would be 85% to detect small incremental changes of adding single variables to the regression equations ($\Delta R^2 = 0.01$) with 19 prior predictors, a prior R^2 of 0.10, and $\alpha = 0.05$.

Analyses were conducted with IBM SPSS Statistics v. 25 (IBM Corp, Armonk, NY). We calculated frequencies for categorical variables and means and standard deviations for continuous variables. We stratified analyses by gender because previous findings showed significant gender differences in substance use.^{33,34} We conducted chi-square tests of independence to assess the bivariate relationship between at-risk drinking/cannabis use patterns and IPV. We estimated adjusted ORs [aORs] and 95% CIs with gender-stratified multivariate logistic regression models for 2 outcomes: IPV perpetration and IPV victimization. We created a 4-level categorical variable for participants'

TABLE 2

Bivariate associations between substance use and IPV

Type of IPV by gender	At-risk drinking only	Cannabis use only	At-risk drinking and cannabis use	Neither at-risk drinking nor cannabis use
Men (N = 473)				
% IPV perpetration	10.9	23.5	36.1	7.5
$\chi^2 = 37.73, 3df, P < .001$				
% IPV victimization	20.8	37.6	39.3	12.8
$\chi^2 = 33.48, 3df, P < .001$				
Women (N = 542)				
% IPV perpetration	29.5	39.2	54.9	7.7
$\chi^2 = 96.54, 3df, P < .001$				
% IPV victimization	23.0	39.2	41.2	7.7
$\chi^2 = 71.36, 3df, P < .001$				

IPV, intimate partner violence.

drinking and cannabis use coded as at-risk drinking only, cannabis use only, both at-risk drinking and cannabis use, and neither at-risk drinking nor cannabis use (reference category). Because previous results showed that odds for IPV were elevated among participants whose spouses/partners were hazardous drinkers (ie, positive AUDIT-C screener),^{12,20} we created a similar 4-level variable for spouse's/partner's drinking behavior and cannabis use coded

as hazardous drinking only, cannabis use only, both hazardous drinking and cannabis use, and neither hazardous drinking nor cannabis use (reference category). Each multivariate model included both of these 4-level variables (ie, participants' alcohol and cannabis use; participants' description of their spouse's/partner's alcohol and cannabis use) and the following covariates previously shown to be related to IPV: demographic (age, race/ethnicity, food insufficiency)

TABLE 3

Women's at-risk drinking, cannabis use, and IPV

Type of substance use	IPV perpetration (Model 1)	IPV victimization (Model 2)
	aOR (95% CI)	aOR (95% CI)
Participant's drinking and cannabis:		
At-risk drinking only	4.04 (1.80-9.06)*	2.47 (1.06-5.77) [†]
Cannabis use only	3.45 (1.54-7.76)*	3.32 (1.46-7.59)*
Both at-risk drinking and cannabis use	8.45 (3.52-20.28) [‡]	3.81 (1.55-9.32)*
Neither (reference group)	1.00	1.00
Spouse's/partner's drinking and cannabis:		
Hazardous drinking only	1.12 (0.48, 2.61)	1.95 (0.85, 4.46)
Cannabis use only	1.02 (0.45, 2.31)	1.36 (0.59, 3.14)
Both hazardous drinking and cannabis use	0.77 (0.31, 1.90)	1.57 (0.63, 3.88)
Neither (reference group)	1.00	1.00

aOR, adjusted odds ratio; IPV, intimate partner violence.

Each model is adjusted for age, race/ethnicity, relationship type (same-sex or heterosexual), household food insufficiency, perceived neighborhood disorder, impulsivity, adverse childhood experiences, PTSD, illicit drug use and spouse/partner's illicit drug use.

* $P < .01$.† $P < .05$.‡ $P < .001$.

TABLE 4

Men's at-risk drinking, cannabis use, and IPV

Type of substance use	IPV perpetration (Model 1)	IPV victimization (Model 2)
	aOR (95% CI)	aOR (95% CI)
Participant's drinking and cannabis:		
At-risk drinking only	1.01 (0.39-2.63)	1.50 (0.71-3.14)
Cannabis use only	1.50 (0.58-3.84)	1.62 (0.74-3.57)
Both at-risk drinking and cannabis use	2.58 (1.00-6.61)	1.16 (0.49-2.74)
Neither (reference group)	1.00	1.00
Spouse's/partner's drinking and cannabis:		
Hazardous drinking only	2.69 (1.11-6.51)*	4.02 (1.92-8.45)†
Cannabis use only	2.40 (0.92-6.25)	2.80 (1.19-6.56)*
Both hazardous drinking and cannabis use	4.63 (1.67-12.86)‡	5.03 (1.93-13.07)‡
Neither (reference group)	1.00	1.00

Each model is adjusted for age, race/ethnicity, relationship type (same-sex or heterosexual), household food insufficiency, perceived neighborhood disorder, impulsivity, adverse childhood experiences, PTSD, illicit drug use, and spouse/partner's illicit drug use.

aOR, adjusted odds ratio; CI, confidence interval; IPV, intimate partner violence.

* $P < .05$.

† $P < .001$.

‡ $P < .01$.

and psychosocial factors (perceived neighborhood disorder, impulsivity, ACE, PTSD), illicit drug use, and spouse/partner's illicit drug use.^{12,19,20} We also included a covariate for relationship type (same-sex or heterosexual) in each multivariate model. Missing data ranged from 0% to 1.6% for the variables in the study and were dropped from the analysis through listwise deletion. The multivariate analysis is based on complete data from 464 men and 525 women.

Results

Sample characteristics by gender are shown in Table 1. There were significant gender differences in age, ACE, alcohol and cannabis use patterns, and illicit drug use. A greater proportion of women (5.1%) were in a same-sex relationship than men (2.3%). Bivariate analyses (Table 2) showed that rates of IPV perpetration and victimization differed significantly by substance use type for men and women.

The results of the multivariate models (Table 3) showed that women who reported at-risk drinking only, cannabis use only, or both substance use behaviors had elevated odds for IPV perpetration (Model 1) and IPV victimization (Model 2) compared with those who did not engage in at-risk drinking or cannabis use. For example, women who

engaged in at-risk drinking only had a 4-fold increased odds of IPV perpetration (aOR = 4.04; 95% CI 1.80-9.06) and a more than 2-fold increased odds of IPV victimization (aOR = 2.47; 95% CI 1.06-5.77). Women who reported cannabis use only had a 3-fold increased risk for IPV perpetration (aOR = 3.45; 95% CI 1.54-7.76) and IPV victimization (aOR = 3.32; 95% CI 1.46, 7.59). The magnitude of effect for both outcomes was greatest among women who reported both cannabis and at-risk drinking. Compared with women who reported neither substance use behavior, those who reported both cannabis and at-risk drinking had an 8-fold increased odds of IPV perpetration (aOR = 8.45; 95% CI 3.52-20.28), and nearly 4-fold increased odds of IPV victimization (aOR = 3.81; 95% CI 1.55-9.32). Spouses'/partners' hazardous drinking and cannabis use patterns were not related to increased likelihood of women's IPV perpetration or victimization.

In contrast to the results seen for women, men's at-risk drinking and cannabis use patterns (Table 4) were not associated with their IPV perpetration (Model 1) or IPV victimization (Model 2). There were significant associations, however, between spouse/partner cannabis use and hazardous drinking patterns, as reported by men, and both IPV outcomes. For example, men who reported that their spouse/partner engaged in hazardous drinking only had a more than 2-fold increased odds of IPV perpetration (aOR = 2.69; 95% CI 1.11-6.51) and a 4-fold increased

odds of IPV victimization (aOR = 4.02; 95% CI 1.92-8.45) compared with men who reported that their spouse/partner did not engage in either substance use behavior. Men who reported that their spouse/partner used cannabis only had a more than 2-fold increased odds of IPV victimization (aOR = 2.80; 95% CI 1.19, 6.56). Magnitude of effect for IPV perpetration (aOR = 4.63; 95% CI 1.67, 12.86) and IPV victimization (aOR = 5.03; 95% CI 1.93, 13.07) was greatest among men who reported that their spouse engaged in both hazardous drinking and cannabis use.

Discussion

This study highlights the risk profiles of at-risk drinking only, cannabis use only, and both at-risk drinking and cannabis use for physical IPV perpetration and victimization among a sample of underserved urban ED patients seeking nonemergent care. The results are especially relevant for identifying those who may be at risk for IPV involvement among ED patients with lower acuity presentations. Several findings are noteworthy. The bivariate analyses showed that rates of IPV perpetration and victimization differed significantly by type of substance use behavior for men and women. In most cases, IPV rates were highest among those who reported both at-risk drinking and cannabis use and lowest among those who reported neither type of substance use. Results of the multivariate analyses, however, revealed distinct gender differences regarding hypothesized associations. For example, our expectation that study participants who report at-risk drinking only, cannabis use only, or both substance use behaviors would have elevated odds for IPV perpetration and victimization compared with those who report neither substance use behavior was confirmed for women but not for men. Similarly, our expectation that the magnitude of effect for each IPV outcome would be greater among those who reported both at-risk drinking and cannabis use was confirmed only for women. These gender differences are unexpected insofar as they run counter to findings that typically link men's substance use with IPV in community-based studies³⁵⁻³⁸ and ED-based studies.^{10,39} Despite the significant bivariate results seen for men's substance use behaviors and each IPV outcome, the logistic regression results suggest that when these associations are considered within the context of a multivariate model that accounts for other correlated factors, the associations are diminished to a nonsignificant level. The lack of significance in the multivariate model may also indicate that categorical assessment of men's substance use is not a robust enough measure to adequately capture the

association. Previous analysis of the data herein, for example, found that men's frequency of intoxication was significantly associated with frequency of their past-year IPV involvement (perpetration and/or victimization).²⁰ Another explanation for the observed null associations between men's at-risk drinking and cannabis use and IPV in the multivariate models may be the result of underreporting of substance use behaviors, which would produce downwardly biased estimates. Alternatively, lack of heterogeneity among the sample may explain the null associations between men's IPV and their substance use.⁴⁰

Interestingly, although men's own substance use was not associated with either IPV outcome, the multivariate results showed that their spouse's/partner's hazardous drinking and cannabis use was associated with men's IPV perpetration and victimization. For example, the findings showed that compared with men who reported that their spouse/partner did not engage in hazardous drinking or cannabis use, men whose spouses/partners engaged in hazardous drinking only had a more than 2-fold increased odds of IPV perpetration and a 4-fold increased odds of IPV victimization. Odds for IPV perpetration and victimization were most elevated among men whose spouses/partners engaged in both hazardous drinking and cannabis use. One potential explanation for these results is that women's substance use may precipitate couple conflict and, thereafter, physical aggression. This may be due in part to stigma associated with women's substance use,⁴¹ especially heavier drinking (ie, drinking that exceeds the US dietary guidelines of 1 drink or less in a day for women, when alcohol is consumed).⁴²

Limitations

The findings should be evaluated in the context of the study's limitations. First, the cross-sectional design precludes making causal inferences regarding the study's observed associations. Second, the sample was obtained from a single urban emergency department, which may limit generalizability. Third, owing to survey time constraints, no data were collected concerning psychological abuse, injury, or sexual coercion among the participants. Fourth, a dichotomous measure of cannabis use was used in the analysis, which does not capture disordered use. The impact of this variable on IPV risk may therefore be underestimated in the analysis. Fifth, it is unknown whether participants or their spouse/partners who reported both problem drinking and cannabis use engaged in these behaviors simultaneously (ie, drank and used cannabis at the same time) and whether spouse/partners engaged in simultaneous alcohol and cannabis use. Those who engage in both

behaviors at the same time, for example, may have increased likelihood of alcohol-related problems and consequences compared with those who use both substances but not at the same time.⁹ Similarly, it is unknown whether participants and their spouses/partners engaged in these substance use behaviors together or independently of the other (or some combination thereof). Additional research using more granular longitudinal methods, such as ecological momentary assessment, will be needed to tease apart these effects. The participants' spouses and romantic partners weren't interviewed; absence of dyadic reports on the occurrence of IPV may result in an underestimation of IPV prevalence.⁴³ Finally, recall bias may have affected participants' estimation of events over the previous 12 months.

Implications for Emergency Nurses

This study has several implications for emergency clinical care. First, the results imply that a substantial proportion of married/partnered patients seeking nonemergent care in the emergency department may have experienced IPV in the past year. Although these patients may not be presenting with their chief complaint related to partner aggression, clinical staff should be aware that IPV is prevalent among urban ED patients, affects both men and women, and is often bidirectional (ie, each partner may experience perpetration and victimization).¹³ Training emergency department nurses to screen patients for IPV is an important first step toward increasing IPV case identification and providing patients with appropriate referrals and resources.⁴⁴

Second, using brief screeners to assess the patient's substance use patterns may help identify those in need of further counseling and/or referrals. For example, emergency clinical care staff can use the National Institute on Alcohol Abuse and Alcoholism–recommended single-question screener to inquire about past-year at-risk drinking: “How many times in the past year have you had X or more drinks in a day?” where X is 5 for men and 4 for women, and a response of ≥ 1 is considered positive.⁴⁵ Among those who screen positive, clinical care staff could use the 3-question AUDIT-C screener to further assess the patient's frequency of alcohol use and number of drinks per occasion.^{24,25}

Third, cannabis use is becoming increasingly prevalent, and this trend is likely to continue as more states enact medical and recreational cannabis legalization. Clinical staff should consider asking patients about their cannabis use and should be aware that those who screen positively for at-risk drinking and use cannabis may be at elevated risk for IPV involvement. Similarly, the 1-question screener,

“How many times in the past year have you used a drug or used a prescription medication for nonmedical reasons?” can be asked of patients.⁴⁶ A positive screen could be followed with asking the patient to relay the type of drug, quantity, frequency, and consequences of use.

Conclusions

Despite its limitations, this study contributes to our understanding of how at-risk drinking and cannabis use may be related to IPV perpetration and victimization among urban ED patients seeking nonemergent care. While the results varied by study participant gender, the findings indicate that at-risk drinking only, cannabis use only, and both types of substance use are linked with increased odds for each IPV outcome, with parallel findings seen for spouse/partner substance use patterns. The gender differences seen in the results warrant further investigation in future ED-based studies. The findings suggest that problem drinking and cannabis use behaviors of each member of the couple should be considered in relation to IPV. Meanwhile, ED staff can use brief screening questions to assess the patient's at-risk drinking and cannabis use when screening patients for IPV and formulating treatment and prevention strategies.

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ABILITY TO CARE IN ACUTE SITUATIONS—THE INFLUENCE OF SIMULATION-BASED EDUCATION ON NEW GRADUATE NURSES

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Contribution to Emergency Nursing Practice

- Acute care situations are known to be challenging for a novice nurse. Studies have reported simulation-based education to support new graduate nurses' clinical judgment, confidence, and clinical practice.
- This study adds knowledge about the influence of a simulation on perceived ability to provide care in acute situations. Using a scale specifically developed for new graduate nurses, a significant increase in perceived abilities to care in acute situations was found.
- Simulation-based education can influence newly graduated nurses' perceived ability to provide care in acute situations. Experiences from working in acute situations seem more important than length of work experience to facilitate perceived ability.

Abstract

Introduction: Simulation-based education is frequently used in transition programs for new graduate nurses. Simulation-

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based education is implemented as a measure to practice nursing skills, gain experience, and prepare nurses for caring in challenging situations, such as acute situations. However, concerns about the data supporting the use of simulation are obtained from small studies that do not use validated measurement scales.

Objective: This study aimed to explore the influence of simulation-based education on new graduate nurses' perceived ability to provide care in acute situations.

Methods: A total of 102 new graduate nurses participated in simulation-based education as a mandatory part of an introductory program. They completed a premeasurement and a postmeasurement using the Perception to Care in Acute Situations scale. The Wilcoxon signed-rank test and the paired samples *t* test were used to test the statistical significance of outcomes for the simulation-based education, with the alpha set at 0.05. Cohen's *d* formula was used to calculate the effect size.

Results: The Wilcoxon signed-rank test on the total scale score showed that simulation-based education resulted in a statistically significant change in the nurses' perceptions of their ability to care in acute situations ($N = 99$; $Z = 7877$; $P < .001$). The paired samples *t* test showed that the mean posteducation score was significantly higher ($P < .001$) in the total score. Cohen's *d* formula (-1.24) indicated a large effect size on the total score.

Discussion: Simulation-based education can provide an effective means of improving new graduate nurses' perceived ability to provide care in acute situations.

Key words: Simulation; Nursing; Transition; New graduate nurse

Introduction

Nurses play a crucial role in recognizing and responding to acute situations.¹ This issue is further complicated by the fact that patient acuity is expected to increase in hospital wards as patients get older and have more complex care needs.² In a

review, Hawkins et al³ found that the experiences of new graduate nurses (NGNs) transitioning to acute care settings are dominated by fear. This was illustrated as fear of the acuity of patients, making mistakes, harming patients, the unknown after orientation, and not meeting expectations. Critically ill patients and limited resources have been reported to influence NGNs' feelings of being overwhelmed.⁴ The reason for this overwhelming feeling can be related to their limited clinical experience, with limited ability to recognize and sort out what to focus on in acute situations.⁵ Specific areas that NGNs find challenging and important aspects of caring in acute situations are confidence in the provision of care, communication, and including the patient perspective.⁶

To facilitate the challenging transition process from being a nursing student to being a registered but novice nurse, different interventions and transition programs have been developed.^{7,8} As one of several learning activities, simulation-based education is often incorporated into these programs to support NGNs in developing their readiness for action.⁹ Simulation in health care settings creates a situation or environment that allows participants to experience a representation of a real event for practice, learning, evaluation, testing, or gaining an understanding of systems or human actions.¹⁰ Advantages of simulation-based education are the ability to include repetition, specific diseases and scenarios and, most critically, allow participants to make mistakes in a safe atmosphere without fear of causing harm to patients.¹¹ A review from the specific context of transition program studies indicated that the use of simulation-based education improved NGNs' perceptions of their skills, confidence, competence, and readiness for practice.¹² Elsewhere, simulations have been reported to enhance NGNs' ongoing development of clinical judgment and their ability to notice patient issues and reflect on care experiences.¹³

Despite literature indicating that simulation-based education is beneficial, there is no consensus regarding the types and timing of simulations.^{14,15} There are also concerns that data for simulation-based education in NGN transition programs are often obtained from small sample sizes with low statistical significance that fail to use valid, reliable, and psychometric-tested scales.¹² Hence, we need to better understand whether and how simulation-based education can improve NGNs' perceived ability to provide care in acute situations using a scale specifically developed for measuring NGNs' ability in acute situations.

AIM

This study aims to explore the influence of simulation-based education on NGNs' perceived ability to provide care in acute situations.

Methods

The reporting of this study was guided by the Cheng et al¹⁶ guidelines for health care simulation research: extensions to the Consolidated Standards of Reporting Trials and Strengthening the Reporting of Observational Studies in Epidemiology statements.¹⁶

STUDY DESIGN

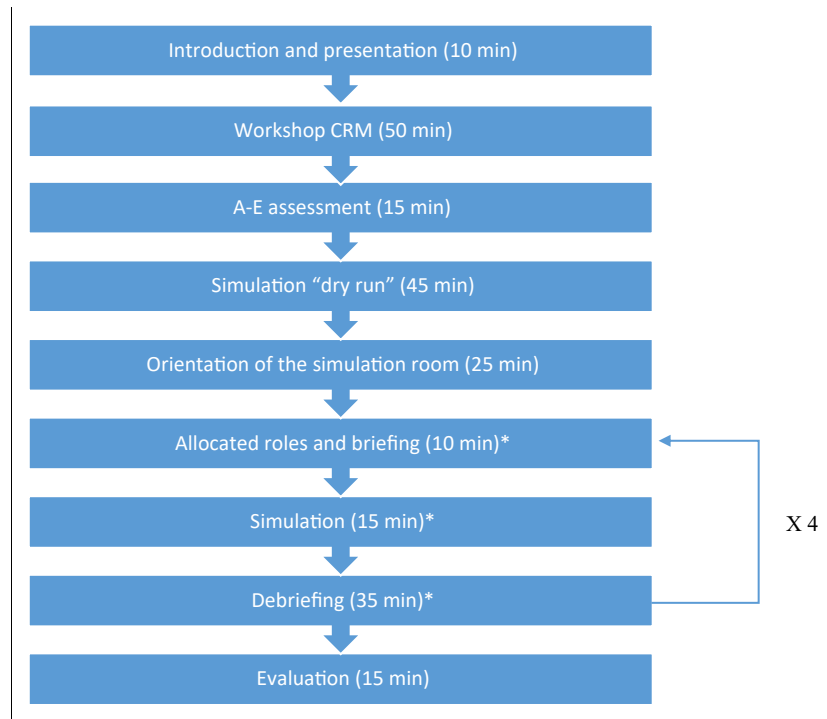
The study used a quantitative method with a pretest and post-test design.

SETTING

The study was conducted at a regional simulation center in the southwest region of Sweden. The simulation center is located at a university hospital, where the participants also work; thus, the medical equipment, devices, and procedures are well known to most of the participants. The center provides high-fidelity simulation that creates a high degree of realism through the careful selection of equipment (such as advanced patient simulators) and scenarios. All simulation facilitators and operators/technicians have completed a course to be medical simulation instructors or operators. Facilitators also have vast clinical experience working as nurses/physicians in various wards. The 1-day simulation-based education studied has been part of the regional transition program for several years. The overall design and components of the program (eg, introducing workshop, practical work, observation, and debriefing) have been similar over the years, although scenarios and facilitators/operators have varied and refinements in equipment have been made.

SIMULATION-BASED EDUCATION

The simulation-based education was developed by representatives from the introduction program and the simulation and education center at the university hospital. The first activity was a workshop building Lego. The activity focused on attempting to provide clear instructions, cooperation, and communication given that participants may have been new to one another. This activity led to the introduction of a set of principles in crisis resource management.¹⁷ Thereafter, a movie covering the Airway, Breathing, Circulation, Disability, Exposure assessment¹⁸ was shown. The next step was a simulation without a patient simulator. Participants received a patient case and cards with a range of actions described. A facilitator then led the simulation exercise orally, with 2 participants in each group. The next part was



FIGURE

The process of the simulation-based education. CRM, crisis resource management. *Small groups.

an orientation of the simulation room, including the equipment, available medicines, patient simulator, and environment.

The group was then divided into smaller groups with a maximum of 8 participants. Four patient scenarios were simulated, one at a time and with debriefing sessions in between. The simulated scenarios were a patient with chest pain, a patient with an altered level of consciousness, a patient with sepsis, and a patient with chronic obstructive pulmonary disease who was intoxicated with opioids. The sex of the patient simulator varied depending on the sex of the simulation operator/technician (ie, if the operator was a female, the patient was a female). The scenarios started with one primary nurse entering the room. The others in the allocated group either waited in the adjacent corridor ready to participate in the scenario when they were called upon or were allocated the role of an observer. The observers observed the scenarios in a room that was fully equipped with audio and video from the simulation room. The observers were given a specific task in each scenario, such as monitoring the use of the crisis resource management criteria, re-evaluation, closed loops, or speak up. These observations were later discussed in the debriefing session,

accompanied by feedback from the facilitator after each scenario. Between each of the 4 scenarios, nurses were assigned a new role to allow the participants to alternate between active participation in a scenario and the role of an observer. This means that all participants were actively engaged in both scenario work and observation during the education day. Once all scenarios were performed and debriefed, the whole group gathered and evaluated the day verbally and in writing. Figure illustrates the process of the simulation-based education.

MEASUREMENT OF OUTCOMES

The outcome of the simulation-based education was measured using the Perception to Care in Acute Situations (PCAS) scale. The PCAS scale was developed and validated as a measure of novice nurses' ability to care in acute situations.⁶ The scale consists of 17 items grouped into 3 factors: confidence in the provision of care (10 items), communication (4 items), and patient perspective (3 items). The items used a 4-point scale ranging from 1 to 4. High scores indicate an inclination toward the perception of the ability to

care in acute situations. The PCAS scale has been suggested for both reflection and evaluation of novice nurses' training interventions, such as simulation. A brief statement in the introduction of the scale describes these acute situations as sudden changes in care situations (eg, in patient status) or the perception that there is insufficient time in relation to actions that must be performed. A common illustration of an acute situation is when a patient experiences a sudden illness.⁶

PARTICIPANTS AND DATA COLLECTION

The foci of this study were NGNs who participated in a simulation-based education activity in a mandatory part of a regional NGN transition program. NGNs were defined as having fewer than 2 years of work experience after graduation.

Representatives of the introduction program distributed an information letter to all NGNs in the transition program during the autumn of 2021. The letter contained initial information about the study and included contact information for the research group. When attending the simulation-based education, the participants received both written and oral information about the study and the opportunity to ask questions. A written informed consent was obtained when the participants completed the PCAS scale before the start of the first activity as a baseline measurement (pre-education data). Subsequently, after completing the education day, the participants completed the PCAS scale for a second time (posteducation data). Data were collected from 17 simulation education days. The number of participants varied from 3 to 12 per education day.

ANALYSIS

Data were analyzed using SPSS 27 for Windows (IBM Corp, Armonk, NY).¹⁹ Descriptive statistics and frequency statistics were used to analyze missing data, errors, and demographics. Owing to the ordinal nature of the scale, the nonparametric Wilcoxon signed-rank test was applied to observe differences in repeated measurements. The Wilcoxon signed-rank test was designed for analyzing paired ordinal data.^{20,21} Calculations were made on both items, factor and total score on pre-education and posteducation data. For comparative purposes, paired samples *t* tests^{20,21} were also calculated. Differences in demographic variables (experience) and score between participants on both pretest and post-test were analyzed using independent sample *t* tests (2-tailed).^{20,21} Before this analysis, the normality of the score distribution was assessed using the Kolmogorov-Smirnov and

TABLE 1
Participant demographics

Variable	Value
Participants	102
Sex, N (%)	
Female	91 (89)
Male	9 (9)
Other/unknown	2 (2)
Median age (range)	27 (22-50)
Median months working experience (range)	12 (6-22)
No. of universities nurses graduated from	13
Work experience in health care before nursing education, n (%)	64 (63)
Education in another health care related profession before nursing education, n (%)	24 (24)
Work experience in health care during nursing education, n (%)	89 (88)
Experience of acute situations during nursing education, n (%)	59 (58)
Experience of acute situations posteducation, n (%)	
Few	72 (71)
Many	30 (29)
Acute care/in patient wards represented, N	22
Nurses in each specialization, n	
Medicine	44
Surgery	38
Emergency department	9
Psychiatric	3
Combinations/missing	8

Shapiro-Wilk tests.²² A significance level (alpha) was defined as $P < .05$ (2-tailed). The effect size for the tests was calculated using Cohen's *d* formula: small ($d \geq 0.20$), medium ($d \geq 0.50$), and large ($d \geq 0.80$).²³ Internal consistency as a degree of reliability of the scale was assessed both in pre-/post-education using Cronbach's alpha.²⁴

ETHICAL CONSIDERATIONES

This study followed the principles stated in the Declaration of Helsinki.²⁵ To accomplish this, information was given both verbally and in writing. A written informed consent

TABLE 2

PCAS-scale item and factors

Factor 1 “Confidence in provision of care”

1. I worry about providing care in acute situations
2. I trust my ability to provide care in acute situations
3. I have sufficient knowledge to provide care in acute situations
4. I estimate my general ability to provide care in acute situations
5. I estimate my ability to manage the demands that I place upon myself in acute situations
6. I estimate my ability to manage demands from my colleagues in acute situations
7. I estimate my ability to independently determine necessary actions in acute situations
8. I estimate my ability to independently prioritise between actions in acute situations
9. I estimate my ability to independently lead bedside care in acute situations
10. I estimate my ability to understand the individual patient’s medical needs in acute situations

Factor 2 “Communication”

11. I estimate my ability to take instructions over the telephone in acute situations
12. I estimate my ability to carry out instructions that I have received over the phone in acute situations
13. I estimate my ability to receive instructions from an attending doctor in acute situations
14. I estimate my ability to report a patient’s condition to a nurse in an acute situation

Factor 3 “Patient perspective”

15. I estimate my ability to make patients participate in acute situations
16. I estimate my ability to understand the individual patient’s care needs in acute situations
17. I estimate my ability to provide information adapted to the needs of the individual in acute situations

Pre-education Cronbach alpha: Total scale 0.877

Posteducation Cronbach alpha: Total scale 0.886

PCAS, Perception to Care in Acute Situations.

was obtained, ensuring that participation in this study was voluntary and that responses were treated anonymously. Participants were informed of their right to withdraw at any time without giving a reason. Ethical approval was waived by the Swedish Ethical Review Authority (DNR: 2019-06329) because this type of study is exempt from ethical approval according to the Swedish Ethical Review Act.²⁶

Results

A total of 109 NGNs were asked to participate in the study at the start of simulation-based education. One nurse declined to participate. Six participants were excluded from the study owing to missing data > 20% on one scale. Of the remaining 102 NGNs, 3 participants each had one missing value on the PCAS scale: 2 nurses in the pretest and 1 in the post-test. Owing to the ordinal nature of the scale and the sample size in this study, we chose not to impute any data. Accordingly, the analysis

was performed based on data from between 99 and 102 NGNs.

The demographics of the 102 participants are presented in detail in [Table 1](#). For the total sample, the median age was 27 years. Most participants were female (89%). Their median working experience as nurses was 12 months. Of the participants, 58% had experience with acute situations during their nursing education (eg, from clinical training); they were educated at 13 universities and represented 22 different wards or departments.

The PCAS scale items and factors are presented in [Table 2](#). Internal consistency as a measure of reliability on the PCAS scale was assessed using Cronbach’s alpha. The PCAS scale pre-education test demonstrated an alpha coefficient of .877 and a posteducation coefficient of .886, indicating that the PCAS scale was sufficient for research.²⁷

The Wilcoxon signed-rank test ([Table 3](#)) indicates that participation in simulation-based education had a statistically significant increase in the NGNs’ perception of their ability to care in acute situations ($N = 99$;

TABLE 3

Wilcoxon signed-rank test before and after education

Items pre-post	Total	Negative	Positive	Ties	Z	Significant(2-tailed), <i>P</i> value
1	102	6	37	59	4425	< .001
2	102	8	51	43	5574	< .001
3	102	7	48	47	5504	< .001
4	100	5	36	59	4824	< .001
5	102	4	36	62	5009	< .001
6	102	4	30	68	4459	< .001
7	102	13	30	59	2595	< .010
8	102	6	31	65	4111	< .001
9	102	3	49	50	6299	< .001
10	102	4	43	55	5689	< .001
11	101	8	26	67	3124	< .002
12	102	3	34	65	5096	< .001
13	102	6	28	68	3781	< .001
14	102	5	31	66	4317	< .001
15	102	4	45	53	5456	< .001
16	102	4	27	71	3768	< .001
17	102	4	35	63	4584	< .001
F1	100	8	86	6	7617	< .001
F2	101	9	49	43	5220	< .001
F3	102	4	56	42	5670	< .001
TS	99	9	86	4	7877	< .001

F, factor; TS, total scale.

$Z = 7877$; $P < .001$). The total score results were 86 positive, 9 negative, and 4 ties (no change). The Wilcoxon signed-rank test of each factor also indicated a statistically significant increase in the NGNs' perception of factor 1 (confidence in provision of care [$N = 100$; $Z = 7617$; $P < .001$]), factor 2 (communication [$N = 101$; $Z = 5220$; $P < .001$]), and factor 3 (patient perspective [$N = 102$; $Z = 5670$; $P < .001$]).

The normality test of score distribution was calculated on the pretest total score using the Kolmogorov-Smirnov test ($P = .107$) and the Shapiro-Wilk test ($P = .756$). Given that data indicated normality, mean scores were calculated for each factor and the total score and were compared between pre-education and posteducation; details are presented in Table 4. The paired sample t test indicated the mean posteducation score was significantly higher ($P < .001$) for all 3 factors, as was the total score, indicating that participation in simulation-based education had a statistically significant change on nurses' perception of their

ability to care in acute situations. The effect size of the mean scores between pre-education and posteducation data was calculated using Cohen's d effect size -1.24 , indicating a large effect size on the total score.

Independent t tests (Table 5) on mean score before and after education were significant ($P < .05$) for experience in acute situations during nursing education and experiences of acute situations postnursing education. Work experience was not significant ($P > .05$) in mean score before and after education.

Discussion

The results of this pretest and post-test study found that simulation-based education can increase NGNs' perceptions of their ability to provide care in acute situations. An increased perception of ability was found to be statistically significant using the Wilcoxon signed-rank test for total score and the 3 PCAS scale factors: confidence in the

TABLE 4
Paired sample *t* test and Cohen's *d* effect size

	n	Mean	SD	SE mean	Paired <i>t</i> test			Cohen's <i>d</i>
					t value	df	Significant (2-tailed) <i>P</i> value	
Factor 1 "Confidence in provision of care"								
Pretest	100	25.59	4.02	.402	-11.346	99	< .001	-1.13
Post-test		28.98	3.60	.360				
Factor 2 "Communication"								
Pretest	101	11.95	1.59	.158	-5.973	100	< .001	-0.59
Post-test		12.93	1.90	.189				
Factor 3 "Patient perspective"								
Pretest	102	8.49	1.49	.147	-6.478	101	< .001	-0.64
Post-test		9.47	1.27	.125				
Total score								
Pretest	99	46.04	5.68	.571	-12.357	98	< .001	-1.24
Post-test		51.47	5.56	.559				

F, factor; TS, total scale.

provision of care, communication, and patient perspective.⁶ Based on paired sample *t* tests, the mean posteducation score was significantly higher for the total score and all 3 factors. Cohen's *d* effect size indicates a large effect size on the total score and "confidence in the provision of care" and medium effect sizes on the factors "communication" and "patient perspective." Subsequently, the increase in "confidence in the provision of care" was specifically evident, whereas more ties were reported regarding "communication" and "patient perspective." The differences between the factors can be explained by the NGN's skill levels. In this simulation, the NGNs were trained to use an algorithm (Airway, Breathing, Circulation, Disability, Exposure), a procedure that could provide nurses with the confidence to care safely and adequately in acute situations. Access to procedures is necessary for the novice/advanced beginner in managing clinical situations.⁵ However, in nurse's practice and "know how," a great deal of knowledge is tacit, knowledge that cannot be fully developed unless it is made visible. Simulation-based education can also facilitate reflection and consequently the development toward a deeper practical understanding.⁵ Thus, simulations may improve self-confidence in dealing with acute situations by increasing the NGN's practical and tacit understanding.

The incorporation of simulation-based education into transition programs is a widespread and effective strategy

to improve nurses' skills, improve quality in health care, and reduce errors.²⁸ The effect size in the present study suggests the greatest improvement of the factor "confidence in the provision of care," which may be an indicator of an increase in NGNs' skills. A review by Connell et al²⁹ of the effectiveness of education on the recognition and management of deteriorating patients also found that simulation-based education improved overall techniques and skills. NGNs' improvement in confidence using simulation-based education, including in acute situations, has also been reported previously.^{30,31}

The results on 1 specific item, number 7, "I estimate my ability to independently determine necessary actions in acute situations," were not in line with the rest of the items. The Wilcoxon signed-rank test showed that 13 participants perceived a decrease in their ability on this item. A possible explanation for this decrease could be that some participants became aware of their lack of knowledge and experience related to the medical problems presented during the simulation. Such an understanding may be the basis for not feeling able to independently determine what actions are needed.

Crowe et al³⁰ demonstrated the importance of confidence to independently determine necessary actions in acute situations. They found that low confidence contributes to delays and an inability to perform appropriate care in acute situations. Therefore, the overall strong effect on the factor

TABLE 5

Difference in PCAS scores between participant groups

	Pre-education (mean)	Significant (2-tailed) <i>P</i> value	Posteducation (mean)	Significant (2-tailed) <i>P</i> value
Experience of acute situations during nursing education				
No	44.22	.010	49.90	.019
Yes	47.22		52.51	.019
Work experience as a nurse				
< 12 mo	45.74	.636	52.30	.114
> 12 mo	46.28		50.54	
Experience of acute situations posteducation				
Few	44.97	.004	50.59	.020
Many	48.55		53.36	

PCAS, Perception to Care in Acute Situations.

“confidence in the provision of care” could be seen as crucial for facilitating appropriate care in acute situations.

The comparison of scores using independent sample *t* test revealed a significant difference both before and after the simulation-based education based upon participation in acute situations during nursing education and acute situation experiences after nursing education. The result of this finding corresponds to those of Sterner et al³² who indicated that participation in acute situations during nursing education and posteducation had a significant effect on perceived ability to provide care in acute situations.

An interesting finding in this study was that working experience as a nurse was not significant in perceived ability to provide care. Working length as a nurse and higher self-assessed competence have been found in several other studies.³³ However, our results indicate that in providing care in acute situations there is an importance of a contextual experience of acute situations and not mere working experience. This also corresponds to Benner⁵ who means that acquisition and development of skills are the use of concrete experience and not mere passage of time.

This study continues to build on evidence for simulation-based education as a measure to increase nursing competence in different forms. The findings of this study can be used as a basis for further investigation of whether and how modifications to simulated scenarios or educational components (eg, debriefing, progression in practical moments) can provide strong support for the development of communication and patient perspectives in acute situations. Future studies could also explore how NGNs translate their knowledge into clinical practice and the possible long-term effects of simulation-based interventions for NGNs.

Implications for Emergency Nurses

Simulation-based education can influence the perceived ability to provide care in acute situations. This study also confirms the importance of providing experiences of acute situations during nursing education and posteducation to develop this ability in early working life. This reinforces the importance clinical placements on wards and clinics with a high ratio of acute situations during nursing education, but also the value of including simulations focusing acute situations in transition programs for further developing this ability.

LIMITATIONS

The use of a pretest and post-test study methodology is not as rigorous as a study with randomization or a control group. The choice of a validated and psychometric-tested instrument for the measurement of the ability to care in acute situations should, however, be considered a methodological strength.¹² Furthermore, the data in this study were self-reported. However, the use of self-reported data is frequently used in simulation-based studies,³⁴ owing to a lack of objective measures. NGNs in this study were defined as having fewer than 2 years of work experience after graduation. The reason for the inclusion of participants with working experience up to 22 months was that they still were subject to the transition program.

Conclusion

The transition from NGN to competent, confident, and independent nurse is challenging, calling for meaningful and effective learning opportunities for NGNs to support

practice needs and expectations. Acute situations are described as specifically challenging for NGNs; thus, it is important to highlight initiatives in transition programs that influence the perceived ability to provide care in these situations. This study supports previous findings that simulation-based education for NGNs can provide an effective means of improving perceived ability to provide care. A contribution from this study is the significant findings and strong effect on perceived ability to provide care in the specific context of acute situations. More specifically, aspects of confidence, communication, and patient involvement were found to be positively influenced.

Author Disclosures

Conflicts of interest: none to report.

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CRITICAL CLINICAL EVENTS AND RESILIENCE AMONG EMERGENCY NURSES IN 3 TRAUMA HOSPITAL-BASED EMERGENCY DEPARTMENTS: A CROSS-SECTIONAL STUDY



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Contribution to Emergency Nursing Practice

- Emergency nurses are exposed to numerous critical (stressful) clinical events in the workplace.
- Providing care to a sexually abused child, experiencing the death of a coworker, and lack of responsiveness by a colleague during a serious situation were considered the most stressful critical clinical events by emergency nurses, while the least stress-provoking event was incidents with excessive media coverage.
- Emergency nurses should be educated on work-related stress, its impact on their health, sentinel events and tipping points in relation to stress symptoms, and effective strategies to promote resilience.

Abstract

Introduction: Emergency nurses experience occupational stressors resulting from exposures to critical clinical events. The purpose of this study was to identify the critical clinical events for emergency nurses serving 3 patient populations

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(general, adult, pediatric) and whether the resilience of these nurses differed by the patient population served.

Methods: This study used a cross-sectional survey design. A total of 48 emergency nurses were recruited from 3 trauma hospital-based emergency departments (general, adult, pediatric). Clinical Events Questionnaire, Connor-Davidson Resilience scale, and an investigator-developed demographic questionnaire were used to collect data from respondents.

Results: All respondents were female ($n = 48$, 100%), and most were White ($n = 46$, 96%). The average age of participants was 39.6 years, the average number of years as a registered nurse was 12.7 years, and the average number of years as an emergency nurse was 8.8 years. Clinical events considered most critical were providing care to a sexually abused child, experiencing the death of a coworker, and lack of responsiveness by a colleague during a serious situation. The least stress-provoking event was incidents with excessive media coverage. Nurses were less affected by the critical events they experienced more frequently at work. Nurses in the 3 trauma settings had high level of resilience, with no statistically significant differences between groups.

Discussion: The occupational stress from exposure to significant clinical events varied with the patient population served by emergency nurses. It is important that interventions be adopted to alleviate the effect of work-related stressors and promote the psychological health of emergency nurses.

Key words: Critical clinical event; Emergency department; Emergency nurse; Resilience; Stress

Introduction

Emergency nurses are exposed to a steady stream of critical clinical events as part of their normal nursing practice. Critical clinical events are those patient care situations that

evoke extreme distress in nurses.¹ Examples of critical clinical events include witnessing a death, seeing the impact of physical or sexual abuse of a child, simultaneous treatment of severely injured patients, and being physically assaulted during the course of patient care.^{2,3}

BACKGROUND

The National Institute for Occupational Safety and Health⁴ defines work-related stress as any adverse physical or psychological reaction to overwhelming job requirements that exceeds the capabilities of the worker to adapt. Nursing is a highly demanding profession, and nurses are subject to a wide variety of work-related stressors. Emergency nurses, in particular, experience high levels of work-related stress as they face numerous critical clinical events during their daily work. In previous studies on occupational stress in emergency departments, emergency nurses reported exposure to different types of clinical stressors during their work. Heavy workload, sexual abuse or death of a child, workplace violence, providing critical care for a family member or friend, and inability to provide quality care were rated as the most stressful events in the workplace by emergency nurses.^{2,3,5}

According to the American Psychological Association,⁶ chronic exposure to work-related stress has negative effects on individuals' mental and physical well-being and can contribute to health conditions such as heart disease, immune problems, anxiety, and depression. Maladaptive strategies to occupational stress such as overeating or drinking alcohol can complicate stress effects further.⁶ Work-related stress also decreases workers' productivity and job performance and affects job satisfaction. The findings of research with emergency nurse samples showed that stress at work is related to decreased job performance,⁷ burnout,⁸ intention to leave,⁹ and compassion fatigue.¹⁰

Work-related stress cannot be totally avoided for nurses working in emergency departments. Therefore, it is crucial for emergency nurses to develop resilience through adopting effective coping strategies. Examples of effective coping strategies adopted by emergency nurses are using self-control of emotions and responses to stressors, positive reappraisal,¹¹ asking for advice from others, and focusing on the benefits of a negative or challenging situation.¹² Despite the use of effective coping strategies to promote resilience in emergency nurses, several personal and work-related factors were found to influence resilience in ED health care workers. Being married, having more years of professional experience, and working night shift are associated with greater resilience.¹³

CONCEPTUAL FRAMEWORK

The framework for this study was the Cognitive Activation Theory of Stress developed by Ursin and Eriksen.¹⁴ This theory describes the relationships between life stressors, an individual's responses to stressors, and the consequences on the individual's health. There are 4 key assumptions for the Cognitive Activation Theory of Stress: (1) there must be an event or situation with the potential to cause someone stress, (2) the stressor must be experienced, (3) the person will experience a state of heightened arousal, and (4) the person will experience a reaction to the stressor.¹⁴ The following background is organized based on the 4 assumptions.

STRESS SITUATIONS

Several events or situations are linked to stress in nurses. Specific nursing situations include providing disaster management and relief,¹⁵ experiencing workplace violence,^{2,3} seeing patients die,³ and providing trauma care.¹⁶ In addition, specific personal events (eg, illness of a loved one) are stress provoking factors for nurses.¹⁷

STRESS EXPERIENCE AND AROUSAL

Duffy et al¹⁸ measured the prevalence of secondary traumatic stress among a sample of emergency nurses. The authors evaluated the participants based on the frequency of symptoms related to secondary traumatic stress (intrusion, avoidance, and arousal). They found that most (64%) respondents met the diagnostic criteria for secondary traumatic stress based on the symptoms reported.

STRESS REACTION

Richardson explained that effective coping strategies promote resilience,¹⁹ which is the ability of a person to thrive during stressful situations.²⁰ Several demographic, personal, and lifestyle factors influence an individual's resilience.^{21,22} Studies with emergency nurses show that nurses use different types of coping mechanisms to manage workplace stress and promote resilience.^{11,12}

SCIENTIFIC GAP

The literature reflects that there are likely multiple clinical events perceived as "critical." Due to the nature of the ED environment, several critical clinical events are not totally avoidable such as experiencing sudden patient death or

dealing with multiple clinical events at the same time. Therefore, one of the logical next steps in reducing the potential negative impact of critical clinical events on emergency nurses is to identify those clinical events perceived as most critical (or distressing). It is not known whether critical clinical events experienced by emergency nurses vary by patient population served; therefore, research needs to be conducted exploring this difference.

Resilience is an important indicator of an individual's ability to cope with stressors. Several studies addressed the effect of emergency nurses' demographic characteristics on their resilience. However, there is a need for studies that investigate the effects of different work-related factors such as the type of patient population served on emergency nurse resilience. The purpose of this study was to identify critical clinical events for emergency nurses serving 3 patient populations (general, adult, pediatric) and whether the resilience of these emergency nurses differs by the patient population served.

Methods

STUDY DESIGN

This study was conducted using a secondary data analysis of cross-sectional data collected in a previous study. Based on the scientific gap, the following research questions were answered:

1. What are the prevailing critical clinical events in a sample of emergency nurses based on the patient population served?
2. Does emergency nurse resilience differ by the patient population served?

The reporting of this study adhered to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines tailored for cross-sectional studies.²³

SETTINGS AND SAMPLE

A total of 48 participants in the original study were recruited from 3 trauma hospital-based emergency departments: urban general teaching hospital providing care to both adults and pediatric patients, suburban adult teaching hospital, and urban pediatric teaching hospital. From each site, 16 emergency nurses participated in the study; respondents worked in only 1 study site (no overlap with employment). In the year preceding the original study, the numbers of trauma team activations were 2900 in the general trauma

center, 456 in the adult trauma center, and 306 in the pediatric trauma center. Each site had an interprofessional trauma team that responded when activated. Trauma team members were composed of emergency nurses, emergency physician, trauma resident, trauma surgeon, and support personnel such as paramedic, radiology technician, and laboratory technician.

Participant recruitment occurred between December 2009 and April 2010. The original study used a qualitative design with focus group interviews with emergency nurses on the stressors they experienced in the work environment. The respondents were asked to complete cross-sectional surveys before starting the focus group interviews to stimulate their thoughts regarding the stressors they encounter in the workplace. A total of 48 participants responded to the study invitation. Inclusion criteria were being employed full or part time, having an unrestricted registered nurse licensure, and providing emergency care. Exclusion criteria were managers or other direct supervisors who evaluate the performance of the potential respondents. Convenience sampling was used to recruit respondents.

A post hoc power analysis was computed based on the parameters of the variable with the most significant difference between groups (violence, including verbal abuse, threats, and physical abuse by one member of staff toward another). Based on effect size 0.251, alpha 0.05, sample size of 48, and 4 covariates, achieved power was 30.3%. In order to achieve an optimal minimum power of 80% with effect size 0.251 with 3 groups and 4 covariates, a minimum sample size of 157 is recommended for a future replication study within a population similar to this study.

HUMAN SUBJECTS PROTECTIONS

Approval was granted by the university and 3 hospital Institutional Review Boards. Respondents were informed that participation was voluntary and not a condition of their employment. Signed written consent was obtained from all participants.

VARIABLES AND INSTRUMENTS

Clinical Events

Clinical events were measured using the Clinical Events Questionnaire (CEQ).¹ The CEQ is a 29-item instrument used to measure perceived stress of different clinical events using a 5-point Likert scale ranging from 0 to 4. Higher scores reflect greater negative perception of the clinical events. Using factor analysis, O'Connor and Jeavons¹

determined that the questionnaire's 3 subscales accounted for 51.5% of the variance. Internal consistency reliability for the subscales was 0.90 (grief), 0.92 (emergency), and 0.81 (risk).

Resilience

Resilience was measured using the Connor-Davidson Resilience scale (CD-RISC).²⁴ Responses were provided using a 5-point Likert scale ranging from 0 to 4. The total score ranges between 0 and 100, where higher scores indicate greater resilience. CD-RISC exhibited evidence of reliability through internal consistency reliability (Cronbach's alpha = 0.89) and test-retest reliability (intraclass correlation coefficient = 0.87). Moreover, the CD-RISC demonstrated validity using factor analysis, convergent validity, and discriminant validity.²⁴

Patient Population Served and Respondent Characteristics

Patient population served was determined by the site of the emergency department in which respondents completed their survey packet. Survey packets were color-coded to ensure that data were correctly attributed to their respective group (general, adult, pediatric). Respondents also completed an investigator-developed demographic and work characteristics questionnaire. Survey items solicited respondents about their personal demographic and work characteristics. Demographic characteristics were age, gender, race, ethnicity, educational attainment, years of experience as a registered nurse, and years of experience as an emergency nurse. Work characteristics were shift worked, average number hours worked per week, and whether formal training was received by current employer on how to cope with stressful patient situations.

PROCEDURES

Respondents were recruited through mailbox invitations and presentations at department meetings. Potential respondents communicated with a site facilitator to participate and came to a scheduled focus group session. At the start of each research session, respondents read and signed the study consent form and were given a paper copy of the survey packet used for the current report. All enrolled respondents (n = 48) completed the study procedures. Data were collected anonymously. Data then were entered into an electronic database by 2 graduate assistants. Data entry reliability was confirmed before data analysis.

DATA ANALYSIS

Descriptive statistics (eg, frequencies, percentages) were used to describe the characteristics of the study sample. Analysis of variance and Fisher exact test were used to test whether there were significant differences in the demographic and work characteristics between the 3 groups based on the patient population served (general, adult, pediatric). A mean score across participants was generated for each item in CEQ. Items were rank-ordered from highest mean score to lowest mean score. The total CD-RISC score for each respondent was calculated. Analysis of covariance (ANCOVA) was used to compare mean scores for leading critical clinical events and CD-RISC scores based on patient population served. Covariates were based on those demographic and work characteristic variables identified to have statistically significant differences between patient population served. Tukey post hoc analyses along with 95% confidence intervals were conducted for items demonstrating statistical analysis from ANCOVA. Alpha was set at 0.05. Analyses were completed using SPSS Statistics 27 (IBM Corp). Figures were created using RStudio.

Results

All participants were female (n = 48, 100%), and most were White (n = 46 of 48, 96%) and non-Hispanic (n = 40 of 41, 98%). The mean age of participants was 39.6 years (range 24-62 years). The mean number of years as a registered nurse was 12.7 (range 1-42 years), and the mean number of years as an emergency nurse was 8.8 (range 1-28 years). There were significant differences in age (F[2,45] = 8.929, $P < .001$), years of RN experience (F[2,45] = 9.076, $P < .001$), years of ED experience (F[2,45] = 7.830, $P = .001$), and shift worked (Fisher exact $P < .001$) between the sample groups based on patient population served (general, adult, pediatric). No significant differences were found for the remaining demographic characteristics when compared based on patient population served (see [Table 1](#)).

Clinical events that were perceived as most stressful were providing care to a sexually abused child (M = 3.50, SD = 0.68), observing the death of a coworker (M = 3.48, SD = 0.88), and the lack of responsiveness by a health care professional during a serious situation (M = 3.19, SD = 0.73) (see [Table 2](#)). The least stress provoking events were dealing with incidents with excessive media coverage (M = 1.48, SD = 1.07), unusual situations involving patients without death (M = 1.54, SD = 0.85), and emergency situations such as cardiac or respiratory arrest (M = 1.85, SD = 1.03) (see [Table 2](#)).

TABLE 1
Demographic and work characteristics of the study respondents (n = 48)

Characteristic	All respondents			Patient population served									F statistic	P value*
	Mean	N	%	General			Adult			Pediatric				
				Mean	N	%	Mean	N	%	Mean	N	%		
Age (y)	39.6			37.2			47.1			34.5			8.93	< .001
Years as registered nurse	12.7			9.7			20.3			8.2			9.08	< .001
Years as emergency nurse	8.8			7.2			13.4			5.8			7.83	.001
Hours worked per week	37.9			39.3			37.4			37.1			0.28	.76
Educational attainment														.62
Diploma		7	14.6		1	6.3		2	12.5		4	25.0		
Associate degree		18	37.5		6	37.5		7	43.8		5	31.3		
Bachelor's degree		19	39.6		7	43.8		5	31.3		7	43.8		
Master's degree		4	8.3		2	12.5		2	12.5		0	0		
Shift worked														< .001
Day shift		32	66.7		16	100		7	43.8		9	56.3		
Evening shift		6	12.5		0	0		1	6.3		5	31.3		
Night shift		10	20.8		0	0		8	50.0		2	12.5		
Received training to cope with stressful situations		31	64.6		11	68.8		11	68.8		9	56.3		.80

* ANOVA computed for ratio variables; Fisher exact test computed for categorical variables.

Several group comparisons reflected significant group differences based on patient population served; for example, violence, including verbal abuse, threats, and physical abuse by one member of staff toward another ($F[2,41] = 6.533$, $P = .003$), death of a patient after prolonged resuscitation ($F[2,41] = 5.707$, $P = .007$), multiple trauma with massive bleeding or dismemberment ($F[2,41] = 5.370$, $P = .008$), unexpected patient death ($F[2,41] = 5.344$, $P = .009$), emergency situation (eg, cardiac arrest or respiratory arrest) ($F[2,41] = 5.023$, $P = .011$), caring for severely burned patient ($F[2,41] = 4.226$, $P = .021$), and providing care to a coworker's family member who is dying or in a serious condition ($F[2,41] = 3.317$, $P = .046$). Figures 1-7 display boxplot graphs for stressors with significant differences between the 3 emergency nurse groups.

The results of post hoc analysis showed that emergency nurses who provide care for pediatric patients rated multiple stressors significantly higher than emergency nurses caring for general or adult populations. Emergency nurses who served pediatric patients perceived violence, including verbal abuse, threats, and physical abuse by one member of staff

toward another as a stressor ($M = 3.06$) significantly higher than emergency nurses who served adult patient population ($M = 2.19$, $P = .020$). Likewise, emergency nurses providing care to pediatric patients rated the death of a patient after prolonged resuscitation ($M = 3.00$) higher than emergency nurses who served adult patient population ($M = 1.75$, $P = .002$) and emergency nurses who served general patient population ($M = 1.94$, $P = .011$). Moreover, emergency nurses who served pediatric patients perceived multiple trauma with massive bleeding or dismemberment as a stressor ($M = 2.88$) significantly higher than emergency nurses who served adult patient populations ($M = 1.69$, $P = .002$) and emergency nurses providing care for general populations ($M = 2.00$, $P = .029$). The remaining significant differences between groups are presented in Table 3. Interestingly, despite ANCOVA results that indicated significant differences between the 3 groups for the stressor caring for severely injured patient, post hoc analysis results revealed no significant differences between the groups. Figure 6 displays a boxplot graph visualizing the responses to this critical clinical event.

TABLE 2

Clinical events ranked based on perceptions as being critical (most stressful) based on mean score and compared by patient population served while controlling for respondent age, years of registered nurse experience, years of emergency nursing experience, and shift worked

Clinical event (stressor)	All respondents		Patient population served							
	Mean	SD	G		A		P		F	P
			Mean	SD	Mean	SD	Mean	SD	statistic*	value
Sexual abuse of a child	3.50	0.68	3.56	0.63	3.56	0.63	3.38	0.81	0.058	.944
Death of a coworker	3.48	0.88	3.75	0.45	3.06	1.18	3.62	0.72	0.971	.387
Lack of responsiveness by health care professional during a serious situation	3.19	0.73	3.31	0.60	3.00	0.82	3.25	0.78	0.048	.953
Providing care to a coworker's family member who is dying or in a serious condition	3.13	0.89	3.13	0.96	2.69	0.87	3.56	0.63	3.317	.046 [†]
Death of a child	3.12	0.84	3.06	0.93	3.19	0.83	3.13	0.81	0.196	.823
Serious injury to emergency provider in the line of duty	3.02	0.86	3.31	0.70	2.63	1.03	3.13	0.72	0.756	.476
Unexpected patient death	2.98	0.84	2.69	0.79	2.69	0.87	3.56	0.51	5.344	.009 [‡]
Suicide of patient who is or has been in your care	2.90	0.97	2.94	1.00	2.44	0.96	3.31	0.79	1.591	.216
Serious injury of a colleague	2.90	0.99	3.19	0.91	2.63	1.09	2.88	0.96	0.124	.884
Death of a baby from SIDS	2.81	0.98	2.88	0.96	2.75	1.18	2.81	0.83	0.118	.889
Caring for a severely burned patient	2.79	0.92	2.50	0.97	2.88	0.96	3.00	0.82	4.226	.021 [§]
Violence, including verbal abuse, threats, and physical abuse by one member of staff toward another	2.56	0.94	2.44	0.73	2.19	1.11	3.06	0.77	6.533	.003 [†]
Actual/potential contact with infectious body fluids (eg, Hepatitis B, HIV, tuberculosis)	2.52	1.11	2.56	0.89	1.94	1.00	3.06	1.18	2.217	.122
Moral distress	2.35	0.96	2.56	0.96	2.06	0.85	2.44	1.03	1.309	.281
Death of a patient after prolonged resuscitation	2.23	1.11	1.94	0.93	1.75	1.00	3.00	1.03	5.707	.007 [†]
Multiple trauma with massive bleeding or dismemberment	2.19	1.05	2.00	0.97	1.69	0.87	2.88	0.96	5.370	.008 [†]
Dealing with multiple events in a short period	2.19	1.09	2.19	1.11	2.00	1.03	2.37	1.15	0.007	.993
Dealing with hysterical family members	2.10	1.08	1.94	0.85	2.13	1.26	2.25	1.13	0.730	.488
Emergency situation (eg, cardiac arrest or respiratory arrest)	1.85	1.03	1.81	0.75	1.25	0.78	2.50	1.16	5.023	.011 [†]
Unusual situations involving patients but with no deaths involved	1.54	0.85	1.63	0.72	1.50	0.89	1.50	0.97	0.561	.575
Incidents with excessive media coverage	1.48	1.07	1.50	1.21	1.50	1.03	1.69	1.01	1.004	.375

ANCOVA, analysis of covariance; G, general; A, adult; P, pediatric; HIV, human immunodeficiency virus; SIDS, sudden infant death syndrome.

* ANCOVA F statistic reported.

[†] P > G > A.

[‡] P > G = A.

[§] P > A > G.

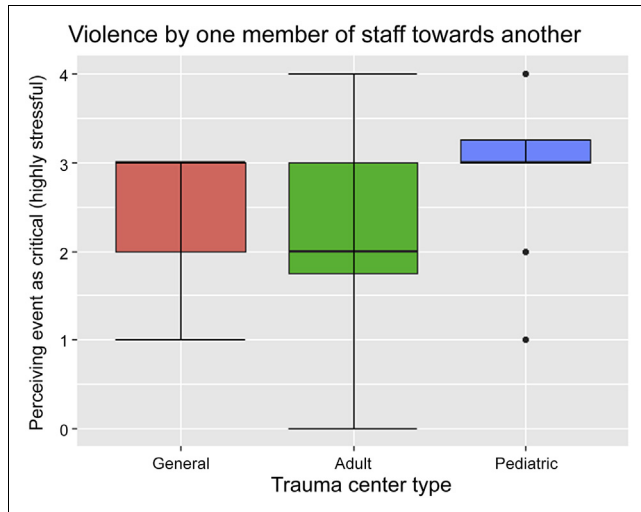


FIGURE 1
Violence, including verbal abuse, threats, and physical abuse by one member of staff toward another.

Resilience strategies overall were heavily used by study respondents (81.5 [8.3]). Comparison of overall resilience scores across the groups revealed no significant difference in the overall resilience among the 3 groups ($F[2,41] = 0.199, P = .820$): general emergency nurses (79.6 [7.4]), adult emergency nurses (82.9 [7.9]), and pediatric emergency nurses (81.5 [9.7]). Figure 8 displays a boxplot of resilience scores by patient population served.

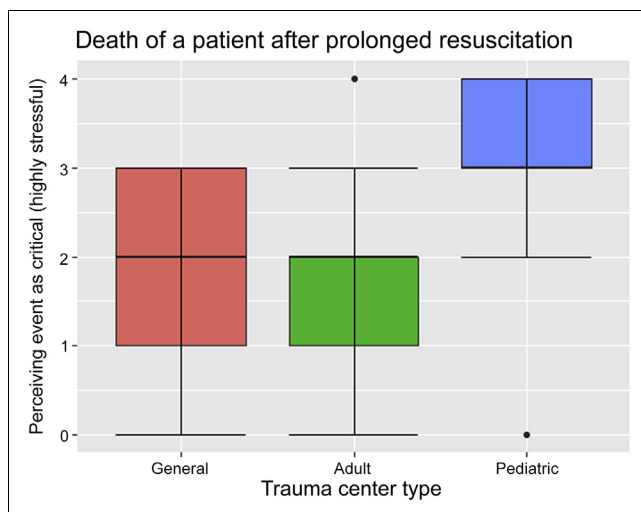


FIGURE 2
Death of a patient after prolonged resuscitation.

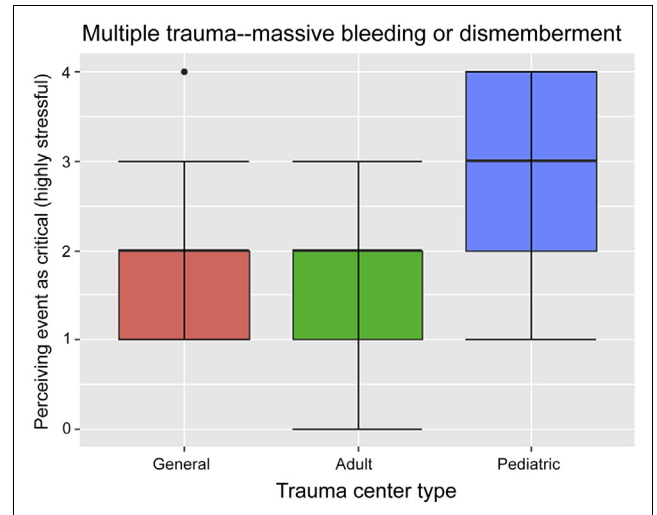


FIGURE 3
Multiple trauma with massive bleeding or dismemberment.

Discussion

There were 2 research questions addressed in this study; the first was to identify the most stressful clinical events experienced by emergency nurses and whether these events were perceived differently by nurses serving 3 patient population groups, and the second was to examine whether emergency nurse resilience is influenced by the patient population served. This study addressed the gap in the literature by investigating whether the most stressful critical clinical

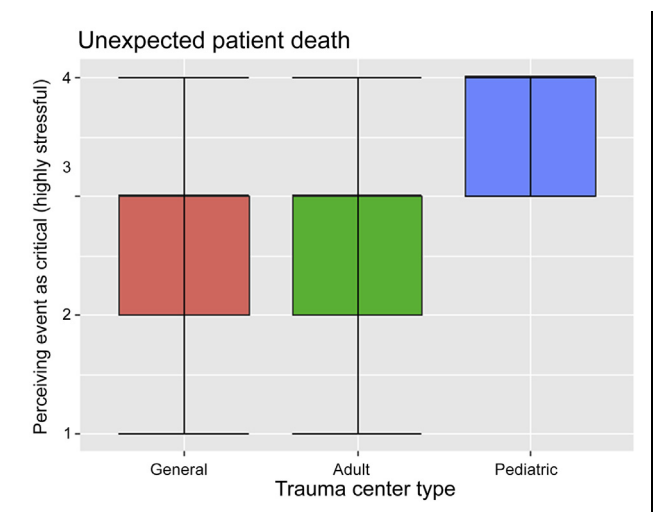


FIGURE 4
Unexpected patient death.

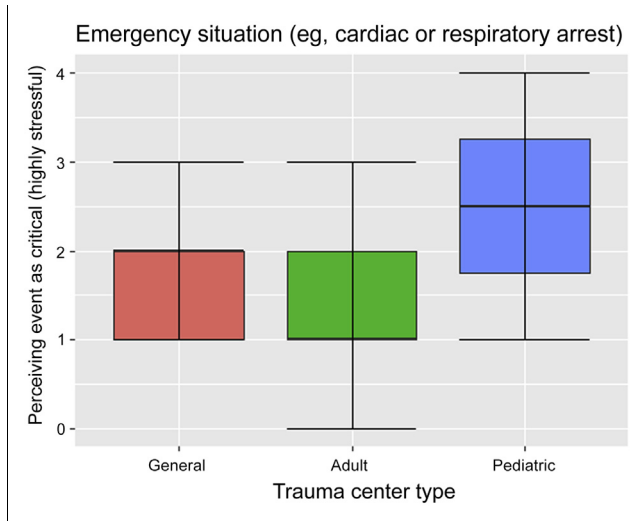


FIGURE 5
Emergency situation (eg, cardiac arrest or respiratory arrest).

events and resilience differed among emergency nurses based on the type of patient population served. In general, the results of this study indicated that emergency nurses experience several stressful clinical events at work, and several of these stressors are perceived differently by nurses based on the patient population served. Importantly, emergency nurses showed a high level of resilience regardless of the patient population served.

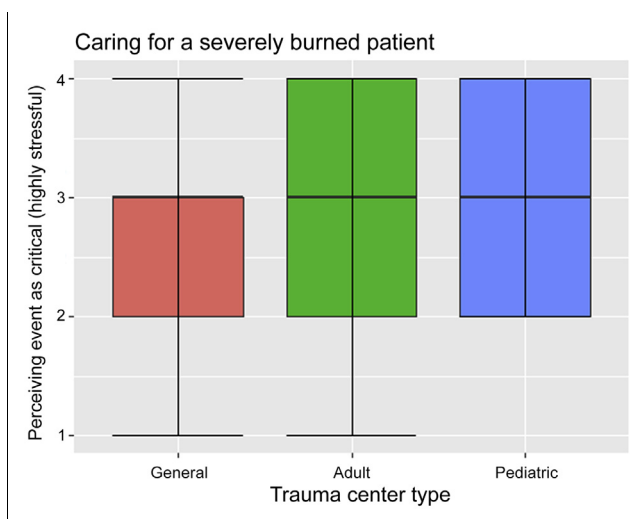


FIGURE 6
Caring for a severely burned patient.

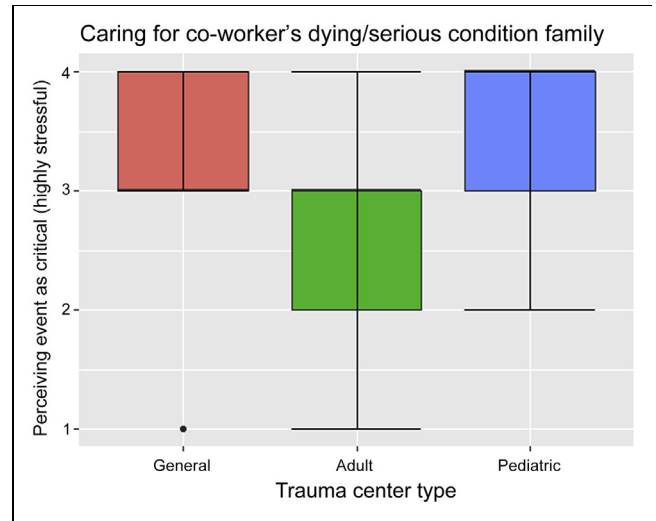


FIGURE 7
Providing care to a coworker's family member who is dying or in a serious condition.

Sexual abuse of a child was ranked as the most stressful event experienced by nurses in this study. This finding is similar to the findings of research by Elder et al³ and Green-slade et al.⁵ Compared with the findings of previous studies, the current study found different highly stressful events for emergency nurses (ie, the death of a coworker and the lack of responsiveness by a colleague during a serious situation). However, this could be due to different assessment methods used to identify these stressors across the studies.

Regarding the stressors with the least impact on emergency nurses, the current study found that dealing with media was rated as the lowest stress-provoking event in the workplace, which is consistent with findings of previous studies.^{3,5} Because of the nature of the role of the nurse, emergency nurses are more concerned with providing care to patients during serious events than dealing with media coverage on these events. Other least stress-provoking events reported by the emergency nurses were experiencing emergency situations and witnessing unusual events involving patients without death. This is not surprising, given that these events are common in the ED environment, and emergency nurses are used to managing these situations.

The present study shows that the stress from critical clinical events perceived by emergency nurses varied based on the patient population served. Across the 3 patient populations served, emergency nurses working in adult-based trauma centers were less affected by most of the other stressful critical clinical events. In contrast, compared with other emergency nurses, emergency nurses who served pediatric patient populations were found significantly more

TABLE 3

Post hoc analysis of the stressors perceived significantly different by nurse participants at the 3 types of trauma centers

Clinical event (stressor)	Trauma center population (I)	Trauma center population (J)	Mean difference (I-J)	95% confidence interval	P value
Violence, including verbal abuse, threats, and physical abuse by one member of staff toward another	Pediatric	Adult	0.88	0.12-1.63	.020
Death of a patient after prolonged resuscitation	Pediatric	Adult	1.25	0.40-2.10	.002
	Pediatric	General	1.06	0.22-1.91	.011
Multiple trauma with massive bleeding or dismemberment	Pediatric	Adult	1.19	0.39-1.99	.002
	Pediatric	General	0.88	0.08-1.67	.029
Unexpected patient death	Pediatric	Adult	0.88	0.24-1.51	.005
	Pediatric	General	0.88	0.24-1.51	.005
Emergency situation (eg, cardiac or respiratory arrest)	Pediatric	Adult	1.25	0.47-2.03	< .001
Providing care to a coworker's family member who is dying or in a serious condition	Pediatric	Adult	0.88	0.16-1.59	.013

vulnerable to stressors such as violence including verbal abuse, threats, and physical abuse by one member of staff toward another, unexpected death of a patient after prolonged resuscitation, multiple trauma with massive bleeding or dismemberment, unexpected patient death; being involved in emergency situations (eg, cardiac or respiratory arrest), and providing care to a coworker's family member who is dying or in a serious condition. Evidence shows that stressful

clinical events (ie, patient death after resuscitation) are more likely to occur in adult emergency departments than in pediatric emergency departments.²⁵ Generally speaking, desensitization against stressful events results from the increased exposure to these events²⁶; therefore, emergency nurses might become less vulnerable to the stressors they experience frequently when providing care to their patients. Alternatively, emergency nurses could develop strong coping mechanisms to the stressful situations they encounter at high rates in the work environment, which would help them better deal with these situations. The high resilience in the study population supports this assertion.

In terms of resilience, emergency nurses in this study showed high resilience regardless of the patient population served. Emergency nurses in the present study mainly used coping strategies such as adaptation and positive thinking to promote resilience. These coping strategies were reported by nurses in studies by Gholamzadeh et al¹¹ and Lu et al.¹² This stresses the importance of adopting positive coping strategies to promote emergency nurse resilience against occupational stressors. However, having high resilience could be a barrier for emergency nurses to seek help from Employee Assistance Programs or other psychological counseling services, as these nurses could rely more on self-initiated strategies to cope with psychological stressors than seeking outside help.

As the majority of the current study respondents were White, findings on resilience should be interpreted with

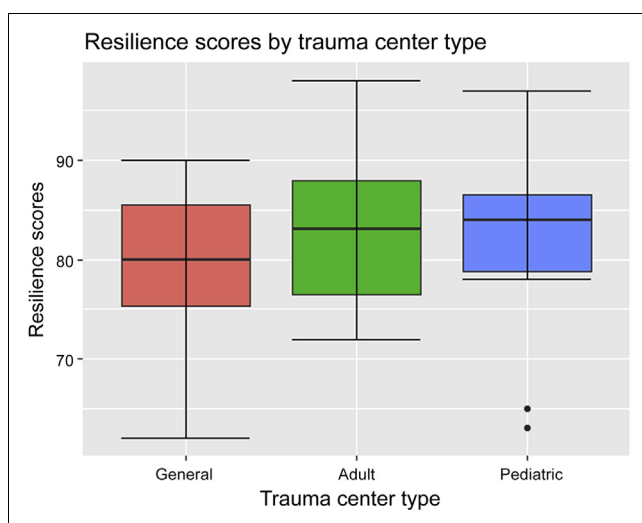


FIGURE 8

Resilience score by type of trauma center.

caution. Evidence from literature shows that racism-related stress experienced by nurses from minority racial groups could negatively impact those nurses' resilience. Therefore, one's self-identified race could affect responses to perceived occupational and personal stressors.²⁷

Demographic characteristics have an impact on an individual's perceived stress as well as resilience.^{13,28} Participants in this study were all female and predominantly non-Hispanic (98%) and White (96%); the demographic characteristics of the sample in this study are quite homogeneous and dissimilar to the demographic characteristics for the registered nursing workforce. The 2020 National Nursing Workforce Survey shows that 90.5% of registered nurses in the United States are female, 80.6% are White, and 94.4% are non-Hispanic.²⁹ These differences limit the transferability of the study findings to a general nurse population.

The original study, from which the data for this secondary analysis were derived, was conducted before the COVID-19 pandemic. Recent stressors experienced by emergency health care workers due to the COVID-19 pandemic were inadequate personal protective equipment, insufficient guidance on disease management, frequently changing work practices, uncertainty surrounding the decision-making process, concerns of acquiring the disease and transmitting it to others, and increased workload.³⁰⁻³² These stressors led to high levels of traumatic stress, anxiety, and burnout among emergency health care workers.³² However, studies showed that high resilience by adopting positive coping behaviors has enhanced emergency nurses' hardiness against stressors experienced during the pandemic.³³

Limitations

There are some limitations for the present study. The first limitation is the cross-sectional survey study design, which limits the ability to depict cause-effect relationships. The second limitation is related to the sampling method and size; a total of 48 emergency nurses were recruited through convenience sampling in this study. Recruiting a larger and random sample would increase generalizability. Moreover, there was no verification that nurse participants who rated the critical clinical events in this study experienced these events previously. However, these events are very common in emergency departments, and the majority of events were discussed by nurses in the qualitative focus group interviews conducted in the previous study. In addition, social-desirability bias could impact the reliability of study results; collecting data through self-administered questionnaires increases the risk for this bias, as participants might provide responses that are socially acceptable rather than what they believe.

Implications for Emergency Nurses

Stressors in the workplace for emergency nurses can never be totally eliminated. Therefore, strategies should be adopted to alleviate the impact of these stressors on emergency nurses. Initially, before starting to work in an emergency department, nurses can perform self-assessments for pre-existing stressors, symptoms of anxiety and post-traumatic stress, and use of coping behaviors. In addition, all nurses can be given information for obtaining third-party psychological counseling based on the results from their self-assessment. Nurses' positive coping behaviors should be reinforced, and maladapted behaviors (eg, polysubstance abuse) should be discouraged.

At the primary prevention level, emergency nurses should be educated on work-related stress, its impact on their health, sentinel events and tipping points in relation to stress symptoms, and most importantly, effective strategies to promote resilience. Equally important, the education can include means to identify when an event becomes significant (critical) for them and manage personal stressors. Moreover, emergency nurse managers can conduct anonymous assessments to identify situations perceived as most stressful to their staff as well as the resilience strategies used by the nurses to deal with these stressors. Additional resources can be directed to the emergency department after these events to allow emergency nurses time to mentally recover before returning to their "normal" workflow. Emergency nurses can be coached on using proactive coping strategies to promote their resilience.

At the secondary prevention level, strategies should be adopted to mitigate the effects of highly stressful situations. An example of a world-wide used strategy that is relevant to emergency nurses' experience is The Pause.³⁴ The Pause is a brief intervention that was suggested by an emergency nurse in 2009. It is a small break for the health care team after the death of a patient to honor the life that ended and to acknowledge the efforts by the members of the health care team.³⁴ Evidence suggests that The Pause is an effective tool to reduce stress experienced by health care workers who provided care for critically ill patients.³⁴ Furthermore, emergency nurses who experienced a highly stressful critical clinical event should be offered an informal defusing or formal critical incident stress debriefing session by trained professionals. Debriefing sessions allow for facilitated discussions between emergency nurses to provide reflections on an experience and suggest strategies to promote future behaviors and responses.³⁵ Because evidence in the literature relative to the effectiveness of immediate debriefing is mixed,³⁶ participating in these sessions should be voluntary to prevent further psychological distress. In addition, social

networking with colleagues away from the workplace is an opportunity to vent stress and provide mutual support through discussing stressful situations encountered at work.³⁷ However, work restrictions during the ongoing COVID-19 pandemic may limit this activity. Emergency nurses can still socialize with family members or others within their network who are willing to listen empathetically to their experiences.

At the tertiary prevention level, emergency nurse managers can monitor their staff for signs of acute stress or post-traumatic stress. Appropriate referral to Employee Assistance Programs or other counseling services should be arranged as needed. Such counseling services should be available for emergency nurses at no cost and be optional depending on the impact of the employee's ability to provide safe care.

Future research can investigate other events potentially considered stressful by emergency nurses as well as work-related factors that influence emergency nurse resilience (eg, care of patients during a major infection outbreak, working with insufficient staff and resources). In addition, intervention studies need to be conducted to test the effectiveness of strategies to mitigate the effect of occupational stress on emergency nurses.

Conclusion

Emergency nurses in the present study reported similarities in their leading critical clinical events. Those events that significantly differed by patient population served tended to reflect volume of exposure. The greater volume and commonality of the event were reflected as less critical. While resilience was strong in the study sample, targeted strategies to bolster and protect resilience can be considered for critical clinical events based on patient population served.

Author Disclosures

Conflicts of interest: none to report.

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EMERGENCY NURSE CONSENSUS ON MOST EFFECTIVE AND ACCESSIBLE SUPPORT STRATEGIES DURING COVID-19: A DELPHI STUDY



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Contribution to Emergency Nursing Practice

- The prevalence of burnout, stress, and similar conditions in health care workers is well studied. Although there is a wealth of evidence relating to strategies to prevent and reduce these conditions, evidence to identify which strategies are most effective for emergency nurses is sparse. There is no consensus on how to best support staff.
- The main finding of this paper is that emergency nurses perceive social and emotional well-being support as most effective and engaging; employer-led supports are not favored, and they prefer in-person support.
- Recommendations for translating the findings of this paper into emergency clinical practice include encouraging tailored support strategies for emergency nurses based on their perceptions and preferences.

Abstract

Introduction: Emergency nurses face significant risk for stress-related complications while working during the COVID-

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19 pandemic. However, there is limited empirical evidence on the effectiveness and accessibility of support strategies for nurses in this novel situation. Expert consensus may help fill this knowledge gap. Therefore, the study objective was to gain expert consensus from emergency nurses on the most effective and accessible strategies during the COVID-19 pandemic.

Methods: This 2-round Delphi study recruited an online expert panel from emergency nurses practicing during the COVID-19 pandemic within a single Mountain West health system spanning 9 urban and rural emergency departments. Over 10 weeks in the summer of 2021, participants completed 2 sequential surveys to rate and rank employee-led and employer-led support strategies collated from a literature review.

Results: Of 327 recruitment emails sent, 28 nurses joined the expert panel. Emergency nurses reached a consensus on preference for employee-led self-care activities, including enhancing social well-being and strengthening emotional well-being. None of the employer-led strategies reached group consensus regarding high effectiveness, accessibility, and the likelihood of participation. Additionally, emergency nurses favored in-person support strategies over other delivery methods.

Discussion: Numerous studies have explored the impact of the COVID-19 pandemic on health care workers. Although experts and researchers seek to determine the best support strategies, this study highlights how emergency nurses wish to be supported. Employers can tailor support strategies for maximum effect by understanding health care worker perceptions and preferences.

Key words: Emergency nursing; COVID-19; Hospital administrators; Nurse administrators; Occupational health; Occupational stress

Introduction

On March 11, 2020, the World Health Organization declared a global pandemic from the novel COVID-19 virus.¹ The pandemic has affected all corners of the world

and has placed a tremendous burden on health care workers. Early in the pandemic, numerous professional organizations warned of impending adverse sequelae for these workers owing to their heightened level of physical, emotional, and moral distress stemming from traumatic experiences while working during the pandemic.² Since the pandemic began, thousands of nurses reported feeling stress, frustration, exhaustion, anxiety, undervalued, and unsupported.³ In addition, a prepandemic survey revealed that nurses reported having suicidal ideation more than other types of United States health care workers and were less likely to seek professional help.⁴ The effects of the pandemic have almost certainly intensified this dire situation. Organizations including the American Psychiatric Nurses Association,⁵ American Nurses Foundation,⁶ World Health Organization,⁷ The Joint Commission,⁸ and the National Academy of Medicine⁹ are among the dozens of groups aware of the need for immediate attention and are seeking various ways to support health care workers. The health care workforce must be protected, given that the full extent of the pandemic's impact on health care workers remains unknown.

The prevalence of burnout, stress, anxiety, and other similar occupation-associated conditions in health care workers is well studied; there is a wealth of evidence relating to support resources and strategies to prevent and reduce these conditions. A literature review revealed various support strategies to reduce these conditions and stressors, many of which fit categorical themes. There appears to be a predominance of strategies targeted to the individual, such as self-care activities, and less attention on organization-driven or employer-led strategies, such as providing formal support programs and employee counseling.¹⁰ However, systematic reviews on coping strategies for health care workers during disease outbreaks revealed that both individual and institutional support are helpful.¹¹

The current knowledge has various limitations. To begin, the evidence concerning emergency nurses is sparse.¹² As frontline health care workers, emergency nurses are distinctively affected by the nature of their work given that they spend more time in direct patient care than other types of emergency health care workers. Emergency nurses also report higher levels of burnout from the pandemic than other emergency department (ED) health care workers.¹³ In addition, coping strategies vary among health care workers,¹⁴ and few comparative studies identify which types of staff well-being support interventions are most effective.¹⁰

Consequently, there is no consensus on how to best support staff involved in traumatic or disaster-like situations.^{15,16}

Although the unprecedented pandemic has sparked a barrage of new evidence related to supporting health care workers, most new evidence appears to be limited to expert opinion or "lessons learned" rather than research. To our knowledge, no published evidence explores how to best support emergency nurses in their working environment during a global pandemic. The purpose of this Delphi study is to identify consensus among emergency nurses about the most effective and accessible employer-led and employee-led support strategies during the COVID-19 pandemic. This study may augment the process of tailoring resources for emergency nurses to prevent stress-related complications and enhance overall well-being and will contribute relevant data to the general knowledge base to help shape future research.

Methods

Delphi methodology is a rigorous survey process, first defined by the Research and Development Corporation in the 1950s, that aims to measure consensus among a group of experts through a series of questionnaires with controlled opinion feedback.¹⁷ The technique has gained popularity across various industries, including nursing research,¹⁸⁻²⁰ and it can be adapted to suit a particular study.¹⁸⁻²¹ Moreover, a 2021 systematic review found that, in emergency nursing research, rigorous Delphi studies are versatile, appropriate, and effective for measuring group consensus.¹⁹ For this study, researchers used a 2-round, modified Delphi study aimed to establish consensus among emergency nurses on the most effective and accessible support strategies during the pandemic. Although the classic Delphi technique typically includes 3 to 4 survey rounds and begins with an open-ended questionnaire, a modified approach may include using a literature review to pregenerate items for the first round,^{20,21} conducting the study online,¹⁹ and using variations in total survey rounds.¹⁸⁻²⁰ Owing to the unique challenges experienced by emergency nurses during the pandemic, modifications for this study included conducting the study online to align with physical distancing safety measures and both reducing the survey rounds and pregenerating a list of evidence-informed support strategies to reduce attrition among time-constrained participants.

To collate a list of support strategies, researchers performed a literature review using the patient/population/problem, intervention, comparison, outcome question, "What are the most effective and accessible resources to ED nurses during a pandemic to decrease burnout?" Concurrent manual and librarian-assisted literature searches included combinations of the terms "health

BOX 1

List of support strategies

Employee-led strategies

- Self-care activities that enhance your own physical well-being, such as healthy eating, exercise, sleep hygiene, and lifestyle changes
- Self-care activities that enhance your emotional well-being, such as practicing stress management, relaxation, mindfulness, and reflective writing/journaling
- Self-care activities that enhance your spiritual well-being, such as gratitude, acceptance, prayer, and meditation
- Self-care activities that enhance your social well-being, such as establishing new and enhancing existing relationships with peers, friends, and family
- Self-care activities that enhance your financial well-being, such as seeking information on emergency grants, funds, or other financial support for nurses
- Seeking education and training on work-related skills, such as conflict management, communication, and how to work in a team
- Seeking counseling offered or sponsored by your employer
- Performing self-assessments, such as for burnout, stress, or compassion fatigue

Employer-led strategies

- Formal debriefings led by a chaplain, social worker, or other peer
- Formal education or training on self-care strategies for your physical well-being, such as healthy eating, exercise, sleep hygiene, and lifestyle changes
- Formal education or training on self-care strategies for your emotional well-being, such as practicing stress management, relaxation, mindfulness, and reflective writing/journaling
- Formal education or training on self-care strategies for your spiritual well-being, such as gratitude, acceptance, prayer, and meditation
- Formal education or training on self-care strategies for your social well-being, such as establishing new and enhancing existing relationships with peers, friends, and family
- Formal education or training on work-related skills, such as conflict management, communication, and team-building exercises
- Leadership rounding, huddles, check-ins with staff, and access to experts for consultation
- Formal recognition from leadership and staff, such as a “kudos” board and “thank you” cards, and verbal support
- Ensuring a safe work environment, such as providing adequate PPE
- Establishing formal and anonymous processes for listening to staff feedback, such as staff forums and suggestion boxes
- Offering individual (1:1) support for employees, such as mentorship or counseling
- Offering financial support, such as subsidizing hotel rooms for staff
- Supporting social gatherings, such as book clubs, journal clubs, coffee talks
- Supporting spiritual health, such as holding moments of silence, ethics rounds or consultations
- Establishing support groups, such as peer support groups and psychological first aid responders

PPE, personal protective equipment.

care workers,” “health care providers,” “nurses,” “frontline nurses,” “emergency department,” “ED,” “burnout,” “occupational stress,” “compassion fatigue,” “psychological distress,” “support system,” “support program,” “support resources,” “COVID-19,” “pandemic,” and “public health emergency.” The search was limited to articles published since 2015 in the English language. Queried

sources included the CINAHL, MEDLINE, PubMed and ProQuest databases, Google Scholar, and gray literature. A total of 50 articles were found, 23 of which did not meet patient/population/problem, intervention, comparison, outcome criteria, resulting in 27 articles included in the review. The authors reviewed the articles to identify recommended support strategies, and each

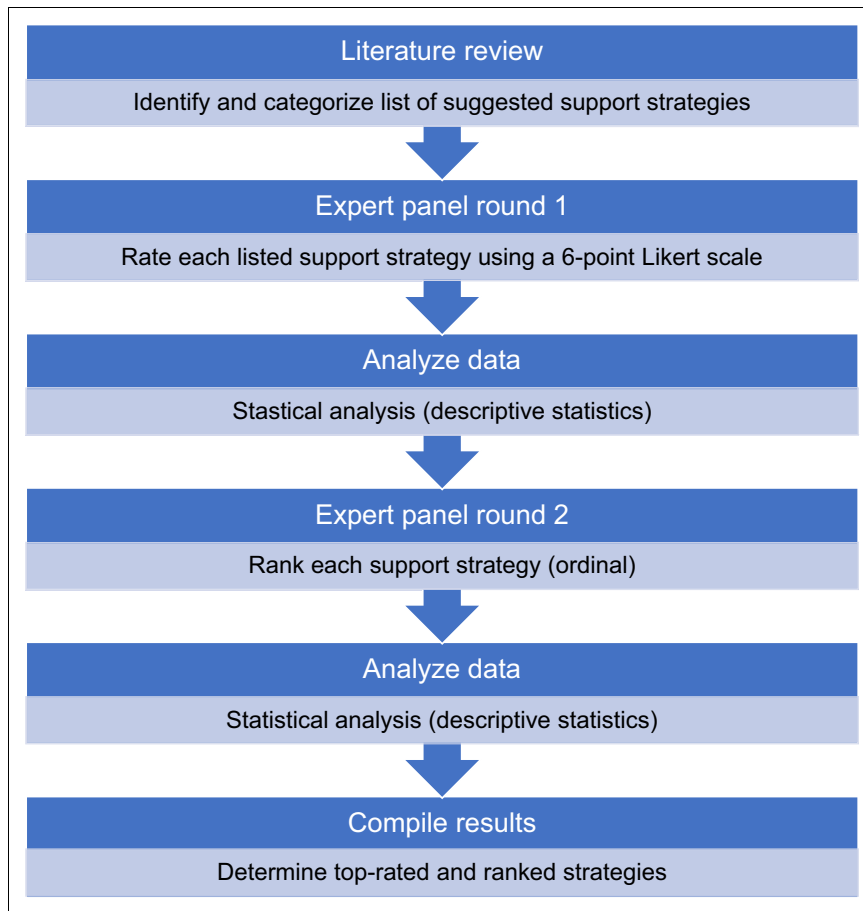


FIGURE
Delphi study schematic.

strategy was then categorized into various themes that were either employee led or employer led (Box 1).

The results of the literature synthesis informed the creation of 2 sequential surveys administered to eligible emergency nurses over 10 weeks (Figure). The surveys queried opinions regarding listed support strategies (Box 1). Given that Delphi studies do not require a specific number of participants,^{18,19,21,22} investigators pragmatically aimed to recruit at least 30 participants across 9 study sites within a single health care system. All employed emergency nurses (registered nurses and licensed practical nurses) who provided direct patient care during the COVID-19 pandemic were eligible for participation, regardless of their employment status (full time, part time, per diem/flex time). In addition, float pool nurses who self-reported working at least 75% or more of typical shifts in the emergency department met eligibility criteria. Nurses not considered employees of the organization, those working outside the ED setting, and nurses not engaged

in direct patient care, such as emergency nurse managers or directors, were excluded from participation. The study received institutional review board approval and final authorization on January 28, 2021.

Recruitment occurred over approximately 3 weeks in May 2021 and included various web-based and direct, in-person communication methods. Recruitment included sharing recruitment flyers via organizational communication platforms and posting flyers in ED staff work areas. In addition, all employed emergency nurses received private emailed survey invitations and, if needed owing to no response, a maximum of 2 weekly reminders via REDCap (Vanderbilt University), a secure electronic database platform, to mitigate associated risks with loss of confidentiality.^{23,24} Owing to the nature of the study, all participants were employees and considered a vulnerable population. During the study, one investigator served in a supervisory role for potential participants at 1 study site. Safeguards to protect participants and

BOX 2

Sample survey questions for employee-led support strategies

Initial survey

On a scale of 1-6, with 6 being highest, rate your perception of the effectiveness of the following employee-led support strategies for emergency nurses working during the COVID-19 pandemic. Effectiveness is defined as perceived positive impact to employee well-being.

On a scale of 1-6, with 6 being highest, rate your perception of the accessibility of the following employee-led support strategies for emergency nurses working during the COVID-19 pandemic. Accessibility refers to perceived ease of activating, accessing, understanding, or using a specific support strategy.

On a scale of 1-6, with 6 being highest, rate how likely you are to participate in the following employee-led support strategies for emergency nurses working during the COVID-19 pandemic.

On a scale of 1-6, with 6 being highest, rate how likely you are to participate in the following support strategies for emergency nurses working during the COVID-19 pandemic that are accessed or delivered in the following manner

- In person
- Online, at a website or via a webinar
- By telephone or calling a hotline
- An application on a mobile device, such as a cellphone or tablet
- By wearing smart technology, such as a smartwatch, sensors, or virtual reality headsets

Final survey

Based on an initial survey of emergency nurses, the following employee-led support strategies scored at least an average score of 4 of 6 on the 6-point Likert scale in terms of how likely you are to participate in the strategy. Now, rank each item from 1 to 2, in order of most likely to participate to least likely to participate.

Overall, which strategies would you most recommend for supporting emergency nurses working during the COVID-19 pandemic? Rank each item from 1 to 2, in order of most recommended to least recommended

COVID-19, coronavirus disease 2019.

reduce bias included a statement in all study materials, including the informed consent form, that participation was voluntary and the choice to participate or not would have no effect on employment. Participants were allowed to withdraw at any time, without penalty, for any reason without requiring disclosure.

Two sequential surveys were developed in REDCap and emailed to the group. The initial survey asked the panel to use a 6-point Likert scale (1, lowest; 6, highest) to rate their preference for employee-led and employer-led support strategies on 3 dimensions: effectiveness, accessibility, and likelihood of participation (Box 2). Effectiveness was defined as perceived positive impact on well-being, and accessibility referred to perceived ease of activating, accessing, understanding, or using a specific support strategy. Employee-led strategies refer to those initiated and acted upon by employees, whereas employer-led strategies refer to those initiated and acted upon by employers. Additionally, the initial survey included a question on the likelihood of participation in strategies accessed or delivered in the following manner: in-person, online (visiting a website or via webinar), by telephone, via an application on a mobile device, and by wearing smart technology. Of note, participants were not required to have used or participated in a specific strategy to offer opinions on perceived potential effectiveness, accessibility, or likelihood of participation.

There are no strict requirements for conducting Delphi studies, and there is no agreement on the best way to conceptualize consensus.^{18-22,25} For this study, participants independently rated various support strategies using a 6-point Likert scale to avoid potential pitfalls with a midpoint option.²¹ A priori, researchers agreed that only strategies averaging at least a 4 of 6 on the Likert scale would be considered for inclusion in the final survey. A biostatistician used SAS (SAS Institute Inc) version 9.4 to calculate descriptive statistics, specifically central tendency and dispersion measures. To account for outliers in the data set, the study team focused on the interpolated median (IM) and interquartile range (IQR).²¹ After consulting with the biostatistician, researchers defined consensus for top-rated strategies as those with an $IM \geq 4$ on a 6-point Likert scale and $IQR \leq 2$. The second (final) survey included only top-rated first-survey strategies, and participants then ranked the strategies from most to least preferred in each category (employer led and employee led) and overall. Because there were so few favorably-rated strategies from which to choose in round two, the final survey provided only 2 options from which to select—"most preferred" and "least preferred." Incomplete responses from either survey were retained in the data set (ie, not eliminated).

Results

A total of 327 emergency and float pool nurses received targeted recruitment emails. Of those, a total of 52 employees responded to the initial recruitment email, and 28 of those met the inclusion criteria. Twenty-eight completed the initial survey (100% response rate), and 19 of the 28 (68% response rate) also completed the final survey. Of all respondents, 61% identified as female, 39% identified as male, and most were between 35 and 44 years (36%). Two float pool nurses (7%) participated. In terms of years of emergency nursing experience, most of the panel had 1 to 5 years (36%) or >10 years of experience (39%). The bulk of respondents worked full time (82%) and day shift (54%) and practiced in an urban or suburban emergency department (64%) (Table 1).

Round 1 results show emergency nurses perceived employee-led self-care activities to enhance social well-being, such as establishing new and enhancing existing relationships with peers, friends, and family, as most effective (IM = 4.1, IQR = 2). Conversely, emergency nurses did not perceive employer-led strategies as effective. There were no top-rated strategies in terms of accessibility for either employee-led or employer-led supports. Only 2 strategies were top rated for likelihood of participation: those for employee-led self-care strategies to enhance social (IM = 4.4, IQR = 2) and emotional well-being (IM = 4.1, IQR = 2). These 2 strategies met the criteria for inclusion in the final survey. Finally, emergency nurses strongly preferred to participate in strategies accessed or delivered inperson compared with other means (IM = 5, IQR = 2) (Table 2).

For the final round, participants ranked 2 strategies in terms of likelihood of participation and overall recommended. For both, employee-led self-care strategies to enhance social well-being outranked employee-led activities to enhance emotional well-being.

Discussion

To the best of our knowledge, this is the first study to systematically query emergency nurses about various types of support strategies by looking comprehensively at strategies suggested in the published literature. The purpose of this study was to identify emergency nurse consensus on the most effective and accessible support strategies during the COVID-19 pandemic. Overall, the data suggest emergency nurses perceive employee-led strategies to support social well-being as the most effective support strategy, followed by strategies to enhance emotional well-being. These findings

TABLE 1
Expert panel characteristics

Characteristic	n (%) of respondents
Survey	
Round 1	28 (100)
Round 2	19 (68)
Sex	
Female	17 (61)
Male	11 (39)
Age*	
< 25	1 (4)
25-34	8 (29)
35-44	10 (36)
45-54	6 (21)
55-64	3 (11)
≥ 65	0 (0)
Years of experience	
< 1 y	3 (11)
1-5 y	10 (36)
5-10 y	4 (14)
≥ 10 y	11 (39)
Employment status [†]	
Full time	23 (82)
Part time	3 (11)
Flex/per diem	2 (7)
Worksite	
Urban or suburban emergency department	18 (64)
Rural, critical access, or free-standing emergency department	10 (36)
Work shift*	
Day shift	15 (54)
Mid shift	8 (29)
Night shift	5 (18)

* Percentages may not total 100 owing to rounding.

[†] Includes 2 float pool nurses.

align with a multicenter study showing emergency nurses preferred to cope by spending time with friends and family.¹³ Another survey showed that, for health care workers, relying on emotion-focused coping mechanisms may improve symptoms of anxiety and depression.²⁶ Furthermore, a 2020 scoping review on ameliorating interventions to reduce occupational stressors among ED staff indicated strategies such as mindfulness and relaxation aimed at ED health care workers reduced burnout, stress, and anxiety.²⁷

TABLE 2

Initial survey responses indicating top-rated strategies

Topic	Employee-led strategy	Employer-led strategy
Perceived effectiveness	Self-care activities that enhance social well-being, such as establishing new and enhancing existing relationships with peers, friends, and family	None
Perceived accessibility	None	None
Likelihood of participation	Self-care activities that enhance your social well-being, such as establishing new and enhancing existing relationships with peers, friends, and family. Self-care activities that enhance your emotional well-being, such as practicing stress management, relaxation, mindfulness, and reflective writing/journaling	None

For this study, emergency nurses did not rate any employer-led strategies favorably. Congruently, a recent study conducted in the same health system evaluated nurse responses to both self-initiated and leader-led resilience activities and found that nurses do not engage in leader-led activities.²⁸ These findings warrant further exploration of why employees do not engage with employer-led support activities or resources. Engaging employees is critical when designing, implementing, and evaluating support systems. Moreover, Fitzpatrick and Valentine²⁹ explicitly call for nursing organizations to assist health care leaders in building upon organizational practice research to identify effective interventions. Otherwise, organizations risk wasting resources on interventions not rooted in empirical evidence.

Despite physical distancing limitations implemented during the pandemic and the availability of various technological tools to support staff, emergency nurses preferred in-person support. This particular finding may reflect the reality of the day-to-day work life for emergency nurses, where there is minimal, if any, downtime to view a webinar, call a hotline, or log in to an application. However, a cross-sectional study of nearly 1000 doctors and nurses showed that more than 50% of participants accessed psychological support resources through online media during the pandemic.³⁰ Although using technology to deliver mental health interventions may be low cost and highly scalable, more research is needed to evaluate effectiveness.³¹

Limitations

Limitations to the study include focusing solely on emergency nurses working in a single health care system in the Mountain West area. Results may not be and were not

intended to be generalizable to other types of health care professionals, such as intensive care nurses, physicians, and nonfrontline health care professionals affected by the COVID-19 pandemic. Although there is no requirement for a minimum sample for Delphi studies, participation by emergency nurses in both the initial and final surveys was limited, and this may have introduced nonresponse and attrition biases. The limited participation may be attributed to the unique challenges posed by the peaks and dips of COVID-19 activity at the time of the study and the potential lack of motivation or available time to respond. It is reasonable to assume the dynamic nature of the pandemic may influence support preferences at any given time. In addition, the reported support preferences may be unique to long-term situations with chronic stress compared with short-term events, such as mass casualty incidents. The body of evidence related to COVID-19 has dramatically changed and expanded since the conceptualization phase of this study in early 2020. Thus, there may be new empirical evidence that helps us better understand effective ways to support emergency nurses. Finally, the study measured perceptions of effectiveness and accessibility but did not directly measure those outcomes; thus, researchers recommend caution when equating consensus results with “best” interventions.²¹

Implications for Emergency Nurses

The National Academies of Sciences, Engineering, and Medicine’ report, *The Future of Nursing 2020-2030: Charting a Path to Achieve Health Equity*, highlights the critical importance of continually supporting the well-being of nurses responding to disaster and public health

emergencies through the actions of various organizations within and outside health care, as well as nurses themselves.³² This study highlights strategies nurses and their employers can take to support nurse well-being through the course of the COVID-19 pandemic and to prepare for future crises.

Conclusion

As we better understand the depth and breadth of pandemic's impact on the well-being of frontline health care workers, a multifaceted approach may be most effective in addressing short- and long-term support needs. Not all nurses cope with stress the same way. Therefore, support strategies should be dynamic, adapted to local cultures and contexts,^{15,27,33} and holistic to include personalized strategies and supportive work environments.^{11,27,33} Opportunity exists for future, large-scale research comparing long-term effectiveness and accessibility of support strategies, both for emergency nurses and other health care professionals affected by the pandemic.

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Author Disclosures

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THE EFFECTS OF MOTIVATIONAL MESSAGES SENT TO EMERGENCY NURSES DURING THE COVID-19 PANDEMIC ON JOB SATISFACTION, COMPASSION FATIGUE, AND COMMUNICATION SKILLS: A RANDOMIZED CONTROLLED TRIAL

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Contribution to Emergency Nursing Practice

- What is already known about this topic? Lack of motivation in emergency nurses can cause a decrease in job satisfaction and compassion fatigue. Low motivation can also negatively affect the communication skills of emergency nurses.
- What does this paper add to the currently published literature? This study showed that motivational messages increase emergency nurses' job satisfaction and improve communication skills while reducing their compassion fatigue.
- What is the most important implication for clinical practice? It is seen that motivational messages have positive effects on job satisfaction, communication skills, and compassion fatigue of emergency nurses.

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Abstract

Introduction: During the COVID-19 pandemic, emergency nurses have been adversely affected physically, socially, and psychologically by factors such as increased workload, longer working hours, isolation from family, and limited resources. This study aimed to investigate the effect of motivational messages sent to emergency nurses during the COVID-19 pandemic on their job satisfaction, compassion fatigue, and communication skills.

Methods: This was a randomized controlled experimental study. The study was conducted with 60 emergency nurses in 2 training and research hospitals in Istanbul between July 31 and August 31, 2021. The participants were randomly assigned to the intervention and control groups. Participants in the intervention group ($n = 30$) received daily motivational messages to their mobile phones by short message service for 21 days; those in the control group ($n = 30$) received no motivational messages. The Job Satisfaction Scale, Compassion Fatigue Scale, and Communication Skills Scale were administered before and after the intervention.

Results: The mean age was 29.8 (SD = 7.5) and 28.7 years (SD = 6.9) in the intervention and control groups, respectively. Before the intervention, there were no significant differences in the groups' scores for job satisfaction ($P = .561$), compassion fatigue ($P = .687$), or communication skills ($P = .355$). After the intervention, the intervention group had significantly higher scores for job satisfaction ($P < .001$) and communication skills ($P < .001$) and significantly lower compassion fatigue scores than the control group ($P < .001$).

Discussion: Our results suggest that motivational messages sent to emergency nurses during the COVID-19 pandemic

increase job satisfaction and improve communication skills while reducing compassion fatigue.

Key words: Emergency; Nursing; Motivation; Job satisfaction; Compassion fatigue; Communication skills

Introduction

The COVID-19 pandemic has become one of the most important health problems in the world today.¹ During the pandemic, there was a marked increase in ED admissions of both walk-in and ambulance-conveyed patients. In many countries, a separate triage system and separate physical areas were established for COVID-19 patients.² In Turkey, pretriage areas staffed by one of the doctors and nurses on shift were established outside many emergency departments to identify suspected COVID-19 cases. Suspected cases were directed to isolated areas of the emergency department, whereas nonsuspect patients were referred to clean areas based on their severity.³ As a result, emergency teams in these departments provided care for both emergency patients and COVID-19 patients simultaneously. This has led to an increase in the workload of emergency staff, especially nurses.⁴ In addition to the increased workload, other problems faced by emergency personnel during the pandemic include the management of limited resources, the added difficulty of working in personal protective equipment, fear of COVID-19 transmission, being separated from family, and negative interactions with patients' relatives. These issues have adversely affected nurses physically, and the stress, anxiety, and uncertainty have lowered their motivation levels.⁵

Improving nurses' job satisfaction and motivation levels is necessary to increase the effectiveness of nursing services, which are a key component of health services.⁶ Job satisfaction, which is an emotional response to the appraisal of one's job and work life, is generally addressed together with the concept of motivation. This is because motivation has the power to influence not only the behaviors and performance of nurses responsible for patient care but also their professional job satisfaction.⁷ Nurses' job satisfaction can be enhanced by feelings that they are successful and are well suited to the profession as well as factors such as effective communication and being respected, appreciated, and rewarded.⁸ For patients to receive appropriate and effective care, nurses must derive satisfaction from the care services they provide and the unit in which they work.⁹ Emergency nurses in particular experience the negative impact on their emotional well-being and ability to provide compassionate care, resulting in compassion fatigue in some nurses.¹⁰

Compassion fatigue was first described by nurse Joinson¹¹ as the emotional effect of indirect trauma while helping people who experience direct traumatic stress. Researchers later described compassion fatigue as a natural consequence

of the care relationship between 2 people and defined it as a gradual decrease in compassion toward patients over time.¹¹ Unlike compassion fatigue, burnout is a long-term condition associated with the work environment and can be seen in every profession. Studies have revealed that compassion fatigue is common among workers in intensive care, surgery, and emergency units because these units serve patients experiencing significant emotional pain and physical stress, which can readily lead to physical, emotional, and mental burnout in their caregivers.¹²⁻¹⁴ Hegney et al¹⁵ determined in their study that emergency nurses had high levels of compassion fatigue, which was associated with anxiety, depression, and shift-based work conditions. Peters¹⁶ also reported that nurses were at risk of compassion fatigue. Figley¹⁷ reported that compassion fatigue is the cost of nursing care because the basis of compassion fatigue is both the individual needing care and the individual providing care. Job dissatisfaction may increase if measures to counter compassion fatigue are not taken or support is not provided, and the care relationship between nurse and patient may be adversely affected. This can result in poor communication with both colleagues and patients.¹⁸ Strategies to prevent compassion fatigue should be developed so that nurses do not lose their selfless approach toward patients, especially in this period of intense physical and mental fatigue during the COVID-19 pandemic. One study indicated that the increased workload owing to the pandemic and the resulting stress, compassion fatigue, and burnout were inversely associated with happiness and perceived organizational justice. Therefore, the authors concluded that interventions to improve employees' work and social life are urgently needed.¹⁹ One such intervention may consist of easy-to-send, inexpensive, effective motivational messages (appreciation, gratitude, etc) to promote well-being. Another possibility is social support-based approaches (colleagues, managers, etc) to strengthen professional interpersonal relationships and enable communication.²⁰

Nursing is a profession based on human relations, and communication is essential in terms of the quality and effectiveness of patient care because nurses use communication techniques when identifying and solving problems, coping with stress, and providing health education. Communication skills help ensure that messages are understood correctly and promote the development of interpersonal relationships. Inadequate and ineffective communication skills are associated with negative patient outcomes and medical errors and also have a negative effect on pandemic

management.²¹ Supporting health care professionals psychologically during the pandemic may help them adapt better to this period. A qualitative study conducted in China by Khoo et al²² revealed that appreciation from colleagues and patients reduced health care professionals' stress and increased their morale. This was reported to positively affect teamwork and communication with patients. A different study showed that motivation made individuals happy and happiness was directly associated with communication.²³ Kandemir et al²⁴ observed that positive informal communication increased happiness in the workplace and positively affected employee motivation.

Emergency nurses have arguably borne the greatest burden during the pandemic, with long working hours and high care loads, and this high level of performance has adversely affected their mental health. Therefore, this study aimed to examine the effect of motivational messages sent to emergency nurses during the COVID-19 pandemic on their levels of job satisfaction, compassion fatigue, and communication skills. We hypothesized that motivational messages would enhance nurses' job satisfaction, decrease their compassion fatigue, and favorably affect their communication skills.

Methods

TRIAL DESIGN

This study was a randomized controlled trial. The study protocol was preregistered publicly (NCT05158504) to ClinicalTrials.gov.tr, which is managed by the National Institutes of Health, National Library of Medicine, Office of Management and Budget, and Department of Health and Human Services for the evaluation and approval of research studies at an international level.

STUDY SAMPLE

The population of the study comprised 89 nurses working in the emergency departments of 2 training and research hospitals (both designated as pandemic hospitals) affiliated with the Ministry of Health in Istanbul, Turkey, between July 31, 2021, and August 31, 2021. Power analysis was performed to determine the necessary sample size using G*Power version 3.1 (Franz Faul, Universität Kiel, Germany). In a similar study by Shin et al,²⁵ the effect size for compassion fatigue was calculated as 0.617. In the power analysis, we determined that a total of 60 people, 30 in each group, were necessary for a study power greater than 95% at a significance level of 5% and effect size of 0.617 ($df = 116, t = 1.658$).

Inclusion criteria were working in the emergency department, working only the day shift on weekdays, having a

mobile phone, and volunteering to participate in the study. In the hospitals where the study was conducted, nurses follow an alternating monthly work schedule with 1 month of night shift and 1 month of day shift. Exclusion criteria for the study included being on leave for any reason (maternity, annual, medical) during the study dates, not completely filling in the data collection forms, or withdrawing from the study. In addition, during the online one-on-one interview with all participants before the study, the participants were asked about their psychiatric history or psychiatric drug use. Individuals with a psychiatric diagnosis or a history of using psychiatric drugs were excluded from the study.

After excluding nurses that did not meet the study selection criteria ($n = 24$), we decided to include all 65 eligible nurses in the study sample (33 in the intervention group and 32 in the control group) to account for potential losses (73% of the population). As 3 nurses in the intervention group and 2 nurses in the control group did not respond at post-test, the study was completed with a total of 60 nurses, 30 in each group (Figure).

RANDOMIZATION

Randomization was performed using a computer-based random number generator.²⁶ The random allocation sequence and assignment of the participants to the control and intervention groups were performed by the researchers. Participants who agreed to participate in the study were numbered in the order in which they were enrolled and were assigned to the intervention or control group according to the random number sequence on the randomization list. Owing to the study design, blinding was not possible because the participants knew about the intervention.

OUTCOMES MEASURES

Data were collected in face-to-face interviews using a personal information form, the Job Satisfaction Scale, Compassion Fatigue Scale, and Communication Skills Scale. Owing to the COVID-19 pandemic, the first interview with the participants was conducted online and the participants were informed about the study. Data were collected using the personal information form before the intervention (day 1 of the study), and the participants completed the Job Satisfaction Scale, Compassion Fatigue Scale, and Communication Skills Scale once before the intervention (pretest) and again after the intervention (post-test). The primary outcomes of the study were changes in the participants' job satisfaction, compassion fatigue, and communication skills scores after the intervention.

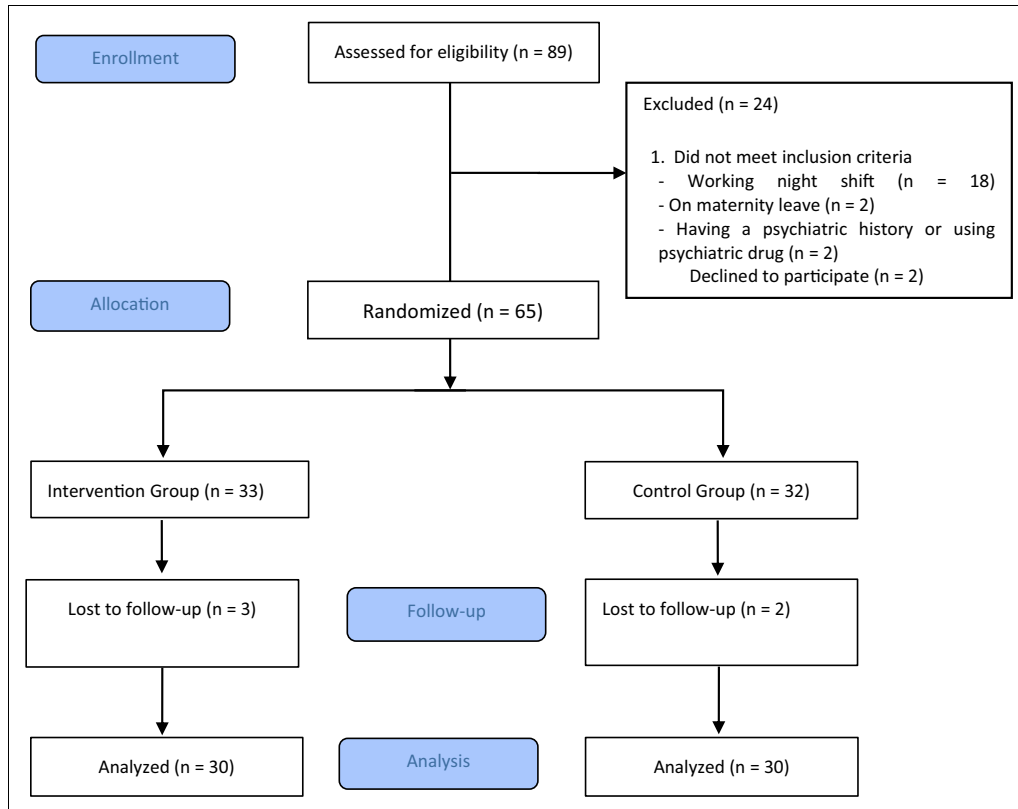


FIGURE
CONSORT flow diagram. CONSORT, Consolidated Standards of Reporting Trials.

Personal Information Form

Based on the relevant literature, this form contained a total of 8 questions including descriptive characteristics such as the participant's age, sex, education level, professional experience, time working in current unit, weekly working hours, whether they feel the nursing profession suits them, and whether they intend to continue working.^{27,28}

Job Satisfaction Scale

This 5-item scale was adapted by Judge, Locke, Durham, and Kluger in 1998 from a longer measure of job satisfaction developed by Brayfield and Rothe in 1951. The Turkish validity and reliability of the scale were conducted by Keser and Bilir²⁹ in 2019. The items are rated on a 5-point Likert scale from strongly disagree (1) to strongly agree (5), and the average score is obtained. A higher average score indicates greater job satisfaction. The Cronbach alpha value of the scale was previously reported to be 0.85 and was calculated as 0.91 in this study.

Compassion Fatigue Scale

This instrument was developed as a 13-item short form by Adams et al in 2006, and the Turkish validity and reliability study was conducted by Dinç and Ekinci³⁰ in 2019. The scale aims to measure secondary trauma and occupational burnout. Items are rated on a 10-point Likert-type scale from rarely/never (1) to very often (10). The total score that can be obtained ranges from 13 to 130, with higher scores representing a higher level of compassion fatigue. The Cronbach alpha value of the scale was reported as 0.87 in the validity study and was calculated as 0.96 in this study.

Communication Skills Scale

This scale was developed in Turkish by Korkut³¹ in 1996 to determine how people evaluate their own communication skills. The 25 items are rated on a 5-point Likert-type scale from always (1) to never (5), yielding a total score ranging from 25 to 125. The scale consists of 5 subscales: basic skills and self-expression, following communication principles,

TABLE 1
Motivational message intervention program

Time	Message purpose and example
7 AM	A good morning message to start the day with good energy - Example 1: Radiate your energy all around you, because you have wonderful energy. Good morning...
12 PM	Health-promoting message - Example 1: Breathing exercises stimulate the vagus nerve, the longest nerve in our body. This puts the body into rest, repair, and calm mode. Come on, it's time to stimulate those nerves. Take a deep breath...!
4 PM	"Me time" message - Example: It's time to do something you enjoy that you haven't done in a long time. Life is too short, don't put anything off!

attention to communication, willingness to communicate, and effective listening and nonverbal communication. Higher scores reflect a positive perception of one's communication skills. The developer later conducted the validity and reliability study for the scale and reported a Cronbach's alpha of 0.88. In this study, the Cronbach alpha value was 0.96.

STUDY PROCEDURE

Intervention Group

Before the study, the motivational messages were reviewed by an expert panel consisting of 4 nurse academicians and 2 psychologists. The expert panel's evaluation was based on the Davis technique.³² They scored each statement as irrelevant (1), needs major revision (2), relevant but needs minor modification (3), or very relevant (4). Necessary changes were made to the messages according to the panel's feedback. The resulting 61 messages were determined to have a content validity index of 96%. The pretest was performed before the intervention on the first day of the study. For the next 21 days, participants in the intervention group were sent motivational messages via short message service to their mobile phones 3 times a day (7 AM, 12 PM, and 4 PM). The head nurse allowed participants to take a short break (5-10 minutes) to access the messages when they heard the delivery notification sound. The participants received a different set of motivational messages each day. The post-test was performed at the end of the intervention.

Examples of the daily motivational messages are presented in Table 1 and Supplementary Material.

Control Group

Participants in the control group underwent the same pretest and post-test assessments as the intervention group, but did not receive motivational messages during the intervention period.

STATISTICAL ANALYSIS

The study data were analyzed using SPSS for Windows version 22.0 (IBM Corp, Armonk, NY). Number, percentage, mean, and SD were used as descriptive statistical methods. Normal distribution was evaluated with kurtosis and skewness. The distribution of descriptive variables by group was evaluated using chi-square analysis. Continuous quantitative data were compared between independent groups using the *t* test, and within-group changes were analyzed using analysis of variance (ANOVA) with repeated measurement. The statement: "Mauchly's test of Sphericity was used to decide whether prerequisite of sphericity is provided or not. As it was decided that prerequisite of sphericity was not provided, the difference between the repeated measures was decided by applying Greenhouse-Geise test." was added to this section. A *P* value of < .05 was considered statistically significant.

ETHICAL CONSIDERATIONS

Permission to conduct this study was obtained from the COVID-19 Scientific Research Evaluation Commission within the Ministry of Health, General Directorate of Health Services (application date: March 18, 2021; approval number: T07_43_13). In addition, written permission to conduct the study was obtained from the participating hospitals (24.04.2021), and institutional ethics committee approval was obtained on May 6, 2021 (decision number: E-46418926-050.99). Written permission to use the scales used in this study was obtained from their owners. The study was conducted in compliance with the principles of the Declaration of Helsinki.

Results

The mean ages of the participants in the intervention and control groups were 29.8 (SD = 7.5) and 28.7 years (SD = 6.9), respectively. Females accounted for 53.3% of

TABLE 2
Sociodemographic characteristics of the nurses ($N = 60$)

Variable	Intervention group ($n = 30$)		Control group ($n = 30$)		Total		Chi-square test	P value
	n	%	n	%	n	%		
Age (y), mean (SD)	29.86 (7.56)		28.70 (6.95)				0.60	.895
Sex								
Female	16	53.3	13	43.3	29	48.3	0.60	.303
Male	14	46.7	17	56.7	31	51.7		
Education level								
High school	6	20.0	4	13.3	10	16.7	4.72	.193
Associate degree	5	16.7	4	13.3	9	15.0		
Undergraduate	10	33.3	18	60.0	28	46.7		
Postgraduate	9	30.0	4	13.3	13	21.7		
Professional experience								
<1 y	2	6.7	7	23.3	9	15.0	4.36	.224
1-5 y	8	26.7	7	23.3	15	25.0		
6-10 y	9	30.0	10	33.3	19	31.7		
≥ 10 y	11	36.7	6	20.0	17	28.3		
Time working in current unit								
<1 y	3	10.0	8	26.7	11	18.3	3.86	.276
1-5 y	12	40.0	13	43.3	25	41.7		
6-10 y	11	36.7	7	23.3	18	30.0		
≥ 10 y	4	13.3	2	6.7	6	10.0		
Weekly working hours								
<40 h	5	16.7	2	6.7	7	11.7	1.45	.212
>40 h	25	83.3	28	93.3	53	88.3		
Feels the profession suits them								
Yes	22	73.3	20	66.7	42	70.0	0.31	.389
No	8	26.7	10	33.3	18	30.0		
Intends to continue working								
Yes	10	33.3	16	53.3	26	43.3	2.44	.096
No	20	66.7	14	46.7	34	56.7		

the nurses in the intervention group and 43.3% of those in the control group. In terms of education level, most nurses in both groups held bachelor's degrees. Although 36.7% of participants in the intervention group had at least 10 years of professional experience, this rate was 20% in the control group. When their time working in the current unit was evaluated, 40% of the participants in the intervention group and 43.3% of those in the control group had 1 to 5 years of experience in the emergency department. Nearly all of the nurses in both groups worked over 40 hours per week. When asked if they consider the profession a good fit for them, 73.3% of

participants in the intervention group and 66.7% of those in the control group said yes. Two-thirds of participants in the intervention group and 46.7% of participants in the control group stated they did not want to continue working in the emergency department. There were no significant differences between the intervention and control groups in terms of sociodemographic characteristics ($P > .05$) (Table 2).

Comparison of mean job satisfaction scores between the groups showed no statistical difference in the pretest ($t = -0.585$, $P > .05$), whereas the intervention group had a significantly higher scores in the post-test ($t = 3.7$,

TABLE 3
Comparison of mean job satisfaction scores between the groups ($N = 60$)

Variable	Intervention group ($n = 30$)			Control group ($n = 30$)			Test value	P value
	Mean	SD	Min-Max	Mean	SD	Min-Max		
Job satisfaction—pretest	2.86	0.86	1-4.6	3.00	0.90	1.6-4.4	-0.585*	.561
Job satisfaction—post-test	3.54	0.65	2.2-5	2.82	0.81	1.6-4.4	3.775*	< .001
Measurement	F = 29.138 [†] ; $P < .001$							
Measurement \times group	F = 81.181 [†] ; $P < .001$							

Min-Max, minimum-maximum.

* Independent groups t test.

[†] Repeated measures analysis of variance.

$P < .05$). The job satisfaction measurement \times group interaction was found to be significant ($F = 81.181$, $P < .05$). Job satisfaction scores in the intervention group increased significantly in the post-test compared with the pretest, whereas those in the control group decreased in the post-test compared with the pretest ($P < .05$) (Table 3).

Similarly, the groups showed no significant differences in Compassion Fatigue Scale total or subscale scores in the pretest ($t = -0.405$, -1.886 , 0.364 , respectively $P > .05$) but significant differences in mean total score and scores in the secondary trauma subscale and occupational burnout subscale appeared in the post-test ($t = -4.35$, -3.37 , respectively $P < .05$). Score measurement \times group interactions were significant for compassion fatigue, secondary trauma, and occupational burnout ($P < .05$). In the intervention group, compassion fatigue, secondary trauma, and occupational burnout scores decreased significantly from the pretest to the post-test, whereas scores in the control group increased significantly between the pretest and post-test, significantly for compassion fatigue and occupational burnout ($P < .001$) (Table 4).

In the pretest, there was no statistically significant difference between the groups in mean Communication Skills Scale total score or scores in the subscales of basic skills and self-expression, attention to communication, willingness to communicate, effective listening and nonverbal communication, and following communication principles ($t = -0.93$, -1.115 , -1.659 , -0.595 , -0.043 , -0.703 , respectively $P > .05$). However, in the post-test, there were significant differences between the groups in all communication skills scores ($t = 3.83$, $P < .05$). There were significant changes in communication skills total and subscale scores between the pretest and post-test ($P < .05$). Score measurement \times group interactions were significant for the Communication Skills Scale and its subscales ($F = 131.714$, $P < .05$). Total and subscale scores on the

Communication Skills Scale increased significantly in the post-test in the motivational group but decreased in the control group compared with pretest scores ($P < .05$) (Table 5).

Discussion

Emergency nurses are frontline workers facing serious risk, and factors such as growing patient numbers and extended working hours during the pandemic have taken a physical and psychological toll on this group. Nurses are showing negative psychological reactions such as stress-related anxiety and depression, and burnout; lower job satisfaction; and compassion fatigue owing to the increased workload. This demonstrates that nurses need physical, mental, and social support to reduce their psychological burden and enhance the response capacity of the health system.³³

Maintaining high job satisfaction is strongly associated with organizational success, professional commitment, and quality care.³⁴ In a cross-sectional study by Yu et al,³⁵ health workers' job satisfaction scores were found to be higher before the COVID-19 pandemic than during the pandemic. Nia et al³⁶ also reported that the nurses in their study had reduced job satisfaction owing to the higher workload and stated that, to improve job satisfaction levels, nurses must be given adequate time for sleep and rest, and their social lives should be supported. Other authors have also recommended psychosocial interventions to increase levels of job satisfaction in nurses and other health care professionals.^{37,38} A randomized controlled study by Hersch et al³⁹ indicated that a stress-oriented multidisciplinary education program improved job satisfaction among nurses caring for a tiring and challenging patient group. In addition, Choi et al⁴⁰ reported that hospitals' motivational plans and practices had positive effects on

TABLE 4
Comparison of mean compassion fatigue scores between the groups ($N = 60$)

Variable	Intervention group ($n = 30$)			Control group ($n = 30$)			Test value	P value
	Mean	SD	Min-Max	Mean	SD	Min-Max		
Compassion fatigue—pretest	48.76	16.72	18-86	50.90	23.48	15-92	-0.405*	.687
Compassion fatigue—post-test	36.73	12.43	16-61	54.53	21.78	16-92	-3.887*	< .001
Measurement	F = 37.296 [†] ; $P < .001$							
Measurement \times group	F = 129.736 [†] ; $P < .001$							
Secondary trauma—pretest	12.00	5.73	5-30	15.50	8.39	5-31	-1.886*	.065
Secondary trauma—post-test	9.56	4.04	5-20	16.13	7.19	5-30	-4.359*	< .001
Measurement	F = 5.918 [†] ; $P < .05$							
Measurement \times group	F = 17.177 [†] ; $P < .001$							
Occupational burnout—pretest	36.76	12.33	12-56	35.40	16.45	10-62	0.364*	.717
Occupational burnout—post-test	27.16	9.40	11-42	38.40	15.63	11-63	-3.371*	< .001
Measurement	F = 56.971 [†] ; $P < .001$							
Measurement \times group	F = 207.639 [†] ; $P < .001$							

Min-Max, minimum-maximum.

* Independent groups t test.

[†] Repeated measures analysis of variance.

employees' job satisfaction. In this study, we determined that emergency nurses who received motivational messages during the COVID-19 pandemic had significantly increased job satisfaction levels, whereas those who did not receive the messages showed a decline in job satisfaction. This suggests that motivation levels must be enhanced to promote high job satisfaction among health workers.

Compassion fatigue is an important issue in the nursing profession, which is based on the need for nurses who will be compassionate and caring toward patients. Preventing compassion fatigue is essential to ensure safe, quality patient care and increase patient and employee satisfaction.⁴¹ It has been reported that most emergency nurses experience compassion fatigue and nurses working in surgical units experience moderate burnout and secondary traumatic stress.^{42,43} Barmawi et al⁴⁴ determined that intensive care nurses experienced compassion fatigue and use both mental and physical avoidance at and outside of work as a coping mechanism and that they needed counseling or motivation to address this. In a study conducted in the current pandemic, health workers in COVID-19 units and emergency departments were found to have higher levels of compassion fatigue than those in other units.⁴⁵ In our study, we observed significantly lower compassion fatigue levels in emergency nurses who received motivational messages than those who did not. Although compassion fatigue was

reported in the literature to be moderately positively associated with positive affect and other personal and social factors, the results of a randomized controlled study indicated that an awareness and training program reduced health workers' occupational burnout and compassion fatigue.⁴⁶ Therefore, we believe that in nursing, which is an emotionally and physically challenging profession, nurses must be adequately supported in their professional and social lives, especially during the pandemic, to enable them to work efficiently and avoid a negative impact on the quality of patient care.

Nurses are in direct and continuous contact with patients, and effective communication is both the way nurses provide holistic care to patients and a way to reduce nurses' burnout and increase their job satisfaction.⁴⁷ Norful et al⁴⁸ observed that nurses' communication and empathy skills declined as their workload increased and that good communication skills were associated with better performance. In another ED study, Rodrigues et al⁴⁹ reported that after trainings and meetings to improve nursing care activities and restructure communication among the staff, ED dynamics improved significantly and the health care team demonstrated better cooperation and harmony. In a quasi-experimental study conducted with nursing students and aiming to enhance emergency response capability, quality communication and having up-to-date information improved the students' professional development and had

TABLE 5
Comparison of mean communication skills scores between the groups ($N = 60$)

Variable	Intervention group ($n = 30$)			Control group ($n = 30$)			Test value	P value
	Mean	SD	Min-Max	Mean	SD	Min-Max		
Total score—pretest	89.40	11.46	72-113	92.83	16.56	59-118	-0.933*	.355
Total score—post-test	100.9	9.31	86-125	88.36	15.37	63-123	3.830*	< .001
Measurement	F = 25.693 [†] ; $P < .001$							
Measurement \times group	F = 131.714 [†] ; $P < .001$							
Basic skills and self-expression—pretest	31.83	4.12	24-41	33.20	5.30	22-41	-1.115*	.270
Basic skills and self-expression—post-test	36.33	3.13	32-45	31.86	5.09	23-44	4.093*	< .001
Measurement	F = 26.424 [†] ; $P < .001$							
Measurement \times group	F = 89.664 [†] ; $P < .001$							
Attention to communication—pretest	17.53	2.22	14-22	18.76	3.41	9-24	-1.659*	.103
Attention to communication—post-test	19.66	1.98	16-25	17.56	3.08	9-24	3.136*	.003
Measurement	F = 5.818 [†] ; $P < .05$							
Measurement \times group	F = 74.207 [†] ; $P < .001$							
Willingness to communicate—pretest	10.76	2.06	8-15	11.13	2.67	6-15	-0.595*	.554
Willingness to communicate—post-test	11.96	1.77	9-15	10.50	2.40	6-15	2.691*	.009
Measurement	F = 4.836 [†] ; $P < .05$							
Measurement \times group	F = 50.620 [†] ; $P < .001$							
Effective listening and nonverbal-communication—pretest	18.66	2.57	14-25	18.70	3.37	12-23	-0.043*	.966
Effective listening and nonverbal-communication—post-test	20.53	2.24	16-25	18.13	3.46	12-25	3.188*	.002
Measurement	F = 10.294 [†] ; $P < .01$							
Measurement \times group	F = 36.066 [†] ; $P < .001$							
Following principles of communication—pretest	10.60	2.14	7-15	11.03	2.60	6-15	-0.703*	.484
Following principles of communication—post-test	12.43	1.61	10-15	10.30	2.35	6-15	4.099*	< .001
Measurement	F = 14.219 [†] ; $P < .001$							
Measurement \times group	F = 77.416 [†] ; $P < .001$							

Min-Max, minimum-maximum.

* Independent groups t test.

[†] Repeated measures analysis of variance.

a favorable impact on their practitioner roles.⁵⁰ In the present study, we observed that participants who received motivational messages had higher scores on the Communication Skills Scale and all of its subscales than those who did not. In line with these studies, it is seen that emergency nurses' motivation is essential in terms of maintaining their psychosocial well-being. Methods such as asynchronous messaging, digital approaches, and in-person messaging can be used in motivational interventions to reach a wider audience. These are organizational communication methods commonly used to convey motivational interventions.⁴⁹

Limitations

This study has several limitations. First, our results are limited to the participants in this study and cannot be generalized to all nurses working in emergency units during the COVID-19 pandemic. One reason for this is that shift systems and break times differ among institutions. Second, there may be a possibility of biased sampling. Randomization did not occur to achieve what was intended in equipoise between groups. Third, there may be deviations from the intended intervention (participant forgetting her phone,

unable to read messages owing to unmeasurable/unknown clinical priorities, permission was obtained from the head nurse only once for the nurses to read the messages, and permission was not obtained each time). Fourth, the participants could not be blinded owing to the study design. This may cause demoralization in the control group and limit the validity of the results. In addition, the changes in nurses after the intervention could not be evaluated owing to self-report. Therefore, it is recommended to design a blinded study in the future. The fifth limitation is that the demographic characteristics of the nurses differ. Another limitation is that personal protective equipment negatively affects break times. Finally, the study included only day shift nurses. For this reason, it does not provide information about the effects of the intervention on compassion fatigue, job satisfaction, and communication skills among nurses working the night shift. Moreover, overall such messages have a short-term effect.

Implications for Emergency Nurses

Although the increased workload in the emergency services during the pandemic decreased nurses' job satisfaction, it increased their compassion fatigue.⁴ Motivation has positive effects on employees.⁶ In this randomized controlled study, motivational messages were sent to the participants in the intervention group via SMS 3 times a day, and an increase in job satisfaction and communication skills and a decrease in compassion fatigue were found in emergency nurses. Motivation is important and should be provided to increase patient care quality and employee satisfaction. For this purpose, the use of different methods including professional support such as providing motivational interventions specific to workers' needs and social support consisting of colleagues or head nurses' solidarity can be considered.

Conclusion

The results of this study suggest that motivational messages sent to emergency nurses during the COVID-19 pandemic increase job satisfaction and improve communication skills while reducing compassion fatigue. Motivational techniques can have a major impact on the mental health of emergency nurses during the pandemic. For this reason, promoting and maintaining high motivation among nurses, especially those with a high work load and those in charge of the care and treatment of critical patient groups, are necessary to avoid psychosocial problems. It is considered that

providing psychosocial support via SMS is simple and effective. Studies that provide professional support that is helpful in increasing nurses' motivation are highly suggested. It is also strongly suggested to conduct studies that provide social support in the form of cooperation among colleagues and head nurses. Large-scale studies with longer follow-up and larger sample groups including night-shift workers are needed to determine the long-term and larger effects of motivational messages.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author, (S.G. sonay.goktas@sbu.edu.tr) upon reasonable request.

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Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jen.2022.06.001>.

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COMPARISON OF DEATH ANXIETY, DEATH OBSESSION, AND HUMOR IN NURSES AND MEDICAL EMERGENCY PERSONNEL IN COVID-19 PANDEMIC

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Contribution to Emergency Nursing Practice

- What is already known about [death anxiety, death obsession, and humor in nurses and medical emergency personnel]: Work place stress has been reported by emergency nurses and emergency medical personnel.
- What does this paper add to the currently published literature? This study specifically examined death anxiety and obsession among emergency nurses and emergency nursing personnel during the period of the COVID-19 pandemic. Contributes to show the current knowledge and application of the science on COVID-19.
- What is the most important implication for clinical practice? Given the report of death anxiety and death obsession by emergency caregivers, further strategies are needed to support coping with workplace stressors.

Abstract

Introduction: COVID-19 has created numerous challenges for the health system. Nurses and medical emergency personnel are at the forefront of fighting COVID-19 and exposed to psychological disorders such as death anxiety and death obsession. Humor is a defense and coping mechanism against the anxiety

and obsession associated with death. This study aimed to compare death anxiety, death obsession, and humor among nurses and medical emergency personnel during the COVID-19 pandemic.

Methods: This descriptive cross-sectional study was conducted with 230 nurses and medical emergency personnel. To collect data, the Templer death anxiety scale, death obsession scale, and humor styles questionnaire were used. SPSS 19 was used for data analysis. The significance level was considered at $P < .05$.

Results: Mean and standard deviation of death anxiety in the nurses and medical emergency personnel were 6.86 (4.04) and 5.68 (3.57), respectively; these values for death obsession were 29.82 (12.30) and 25.30 (12.66) and for humor 116.75 (30.87) and 118.48 (24.66), respectively. The nurses had significantly higher death anxiety ($t = 2.33, P = .02$) and death obsession ($t = -2.68, P = .008$) than the medical emergency personnel; moreover, there was no significant relationship among humor, death anxiety ($r = .11, P = .10$), and death obsession ($r = .07, P = .31$) in nurses and emergency personnel.

Discussion: The results of this study showed that the levels of death anxiety and death obsession were higher in the nurses

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than the medical emergency personnel. There was no significant difference between the hospital nurses and medical emergency personnel in terms of humor.

Introduction

In December 2019, a novel infectious disease called COVID-19 emerged; scientists identified that it was caused by a new type of coronavirus called SARS-CoV-2. The virus was first identified in Wuhan, China, and then turned into a pandemic in February 2020.¹ COVID-19 is acutely contagious and its symptoms usually include fever, dry cough, fatigue, gastrointestinal symptoms, and, in severe cases, acute respiratory syndrome, multiple organ dysfunction, and high mortality.² By August 7, 2021, more than 200 million people were infected, and more than 4 million people have died of this disease worldwide. In addition, the numbers of the infected and the dead are still increasing in Iran, and 93,086 deaths have been recorded until this time.³

The COVID-19 pandemic has created challenges for people in various professions; however, the emotional stress the health care staff has been facing is remarkably higher and may remain with them permanently.⁴ Nurses and medical emergency personnel play a key role in providing care for patients during the COVID-19 pandemic^{5,6}; they are also exposed to various psychological disorders owing to several stressors such as increased workload, an increase in the number of patients in need of critical care, frequent encounters with patients' death, and fear of being infected and transmitting the disease to their friends, family, and relatives; these stressors may impose psychological effects on them.⁷ A wide range of psychological disorders such as stress, depression, and anxiety have been reported in health care staff during COVID-19.^{8,9}

One psychological disorder health care staff may face is death anxiety.¹⁰ Death anxiety is a multidimensional concept with emotional, cognitive, and experimental features and is defined as the feeling of anxiety or fear regarding the thought of death.¹⁰ Death anxiety is the most crucial concern of human life and the core of all anxiety disorders. It is considered to be one of the most important factors of mental health.¹¹ Health care staff may experience death anxiety owing to frequent encounters with patients' death during COVID-19.¹² Furthermore, nurses and medical emergency personnel are at the highest risk of contracting COVID-19. Since the beginning of the disease, a large number of them have contracted the disease or passed away, thereby creating and increasing death anxiety among health care staff.^{13,14} Ignoring death anxiety in medical staff

Key words: Anxiety, Work related stress, Behavior coping

may lead to unexpected and undesirable complications such as disorders in their performance, anxiety, depression, and suicidal thoughts.¹⁰ In a study conducted by Yusefzade et al¹⁵ in Iran, a significant relationship was observed between death anxiety and occupational burnout in medical emergency personnel. Death anxiety, a negative affective state that is incited by mortality salience, may be experienced by nurses and other health care workers who are exposed to sickness, trauma, and violence.¹⁶

Death obsession can be a symptom of severe death anxiety and lead to excessive mental efforts to control death, and this attitude toward death can be problematic.¹⁷ Death anxiety can have negative effects on health care staff's performance and disrupt their relationship with patients.¹⁸

Different types of coping models and defense mechanisms are used against different types of death; one of these coping models is humor. Humor is a critical skill for coping with difficulties and refers to the quality of actions, speech, and writing.¹⁹ Humor has a positive relationship with positive emotional states such as hopefulness, self-esteem, optimism, happiness, and joy, and a negative relationship with negative emotional states such as stress, depression, worry, hopelessness, compulsive obsession, phobia, and anxiety.²⁰ Humor improves the relationship between nurses and patients by creating a feeling of happiness and well-being.²¹ Canestrari et al,²² in their study in Italy during the COVID-19 outbreak, referred to humor as a potential factor in reducing perceived stress. In this study, health care workers who used more coping strategies based on humor experienced lower levels of stress and anxiety.

During COVID-19, health care staff are at risk of death anxiety and obsession owing to their frequent encounters with patients' and their coworkers' death, which can affect the quality of services they provide. Moreover, different medical environments affect the levels of death anxiety and obsession in health care workers. The emergency department is a community-based health management system that is connected to all health care systems, and its personnel are the most important assets of the system; their spiritual and mental peace significantly affects patients' improvement and service quality. Moreover, nurses play a salient role in providing health care for patients with COVID-19 at the forefront of fighting this disease, so analyzing death anxiety and obsession in those working in these environments during COVID-19 and assessing

strategies for reducing this anxiety, such as humor, are subjects of great importance. No study has been done in this regard so far; accordingly, the present study aimed to analyze death anxiety, death obsession, and humor in nurses and medical emergency personnel during COVID-19 in Iran.

Methods

STUDY TYPE AND SETTING

This study was a descriptive cross-sectional study. The study population included the nurses working in Imam Reza Hospital and the medical emergency personnel working in the prehospital emergency ward of Sirjan University of Medical Sciences in 2020. Sirjan is the second most populated county of Kerman in the southeast of Iran. The aforementioned hospital has general and specialty wards, and the prehospital emergency ward provides emergency care to patients by ambulance and air emergency.

SAMPLE SIZE AND SAMPLING

The number of nurses in Imam Reza Hospital and the prehospital emergency ward was 242 and 139, respectively, and a total of 381 participants were enrolled in the study through a census with a response rate of 60%. Of 230 completed questionnaires, 91 questionnaires were from Imam Reza Hospital and 139 from the prehospital emergency ward. The inclusion criteria were having a minimum of 6 months of work experience and giving consent to participate in the study.

DATA GATHERING TOOLS

Data-gathering tools included demographic information, death anxiety, death obsession, and humor styles questionnaires.

Templer Death Anxiety

The death-anxiety scale was designed by Templer in 1970. It includes 15 yes/no questions, of which 9 have a positive direction and the other 6 have a negative direction. Scores of 1 (presence of anxiety) and 0 (absence of anxiety) are attributed to "yes" and "no," respectively. The total score ranges from 0 to 15; 0 indicates the absence of death anxiety and 15 shows high death anxiety. A score from 1 to 6, 7 to 9, and 10 to 15 indicates none, moderate, and severe anxiety, respectively.²³ The questionnaire has acceptable validity and reliability. The reliability of this tool has been measured to

be 0.83 and 0.76 based on test-retest (3 weeks interval) and internal consistency, respectively.²⁴ In Iran, Nia et al²⁵ confirmed the validity of this scale using convergent and divergent methods, and the reliability of the scale was 0.88 based on the Cronbach alpha.

Death Obsession Scale

The death obsession scale was introduced by Abdel Khalek in Egypt in 1998. This tool has 15 items and 3 subscales of death rumination (8 questions), death dominance (4 questions), and death idea repetition (worry) (3 questions). A total of 5 choices are attributed to each item ranging from 1 (never) to 5 (very high) in the form of a Likert scale; the lowest score is 15 and the highest 75.²⁶ This scale has high reliability based on test-retest (1-week interval) (0.91) and high internal consistency (Cronbach's $\alpha = 0.90$).¹⁶ In Iran, Mohammadzadeh and Najafi²⁷ confirmed this scale's validity using factor analysis and its reliability using test-retest, split-half, and internal consistency coefficient.

Humor Styles Questionnaire

To measure humor, the humor styles questionnaire was used. The sense of humor questionnaire was developed by Khoshooi et al.²⁸ This questionnaire has 25 questions based on a 7-point scale (totally agree, agree, agree to some extent, no comment, disagree to some extent, disagree, and totally disagree) and 5 subscales including enjoyment of humor, laughter, verbal humor, sense of humor in social relations, and sense of humor in stressful conditions; each response ranges from 1 (totally disagree) to 7 (totally agree). The reliability of the questionnaire, based on internal consistency (Cronbach's alpha), was 0.74, 0.80, 0.77, 0.74, and 0.79 for the subscales, respectively, and 0.92 for the questionnaire, which proves desirable reliability coefficients for the questionnaire and its subscales. The total score ranges from 25 to 175. A higher score in each subscale denotes a higher level of humor.²⁸

DATA COLLECTION AND ANALYSIS

Data were collected from July 10 to September 10, 2020. Data collection was completed in person in Imam Reza Hospital and online in the emergency ward (contacting the medical emergency personnel in person was not feasible). After obtaining the ethical code from the ethics committee of Sirjan University of Medical Sciences and approval from the head of Imam Reza Hospital, the researcher visited the center; then the researcher invited the nurses to participate in the study after explaining the

TABLE 1
Demographic and contextual information of nurses

Variable	Hospital nurses (n = 91)		Medical emergency personnel (n = 139)	
	Frequency	%	Frequency	%
Age (y)				
20-30	40	44	62	44.6
30-40	38	41.8	51	36.7
> 40	13	14.2	26	18.7
Sex				
Female	51	56	17	12.2
Male	40	44	122	87.8
Marital status				
Single	25	27.5	49	35.5
Married	66	72.5	90	64.7
Education				
Associate degree	11	12.1	58	41.7
Bachelor's degree	77	84.6	70	50.4
Master's degree	3	3.3	11	7.9
Work experience, y				
1-5	48	52.7	66	47.5
6-10	7	7.7	35	25.2
>10	36	39.6	38	27.3
Neuropsychiatric disease				
Yes	9	9.9	17	12.2
No	82	90.1	122	87.8
Death of a close relative during the last 6 mo				
Yes	0	0	13	9.4
No	91	100	126	90.6
Workplace				
Urban base	-	-	74	53.2
Prehospital	-	-	47	33.8
Headquarters	-	-	18	12.9
Part				
Intensive care	35	38.5	-	-
Emergency	24	26.4	-	-
Medical surgical	13	14.3	-	-
Other	19	20.9	-	-

objectives, significance, and procedure of the study. The participants were informed of the confidentiality of the information and of the fact that participating in the study was optional. After receiving an informed consent from the participants, the questionnaires were given to them, and they were asked to complete them and return them to the researcher. To adhere to the ethics codes, name and last name were not requested in the questionnaires.

STATISTICAL ANALYSIS

Data were analyzed using SPSS 21 (SPSS Inc., Chicago, IL). To analyze the collected data, descriptive statistics (frequency, percentage, mean, and standard deviation), t-test, Pearson coefficient, ANOVA, Kruskal Wallis, and Mann Whitney tests were used; significance level was considered at $< .05$.

TABLE 2
Mean (SD) scores of death anxiety, death obsession, and humor of nurses

Variable group	Hospital nurses		Medical emergency personnel		Independent <i>t</i> test	<i>P</i> value
	Mean	SD	Mean	SD		
Death anxiety	6.86	4.04	5.68	3.57	-2.33	.02
Death obsession	29.82	12.30	25.30	12.66	-2.68	.008
Humor	116.75	30.87	118.48	24.66	0.47	.64

ETHICAL CONSIDERATIONS

This study was confirmed by the Ethics Committee of Sirjan School of Medicine with code IR.SIRUMS.-REC.1399.015. Permission to collect data was obtained from the Research Committee of Sirjan University of Medical Sciences and handed over to the management of Imam Reza Hospitals and the prehospital emergency center. Participants' consent was obtained from the participants in the study, and they were assured that the information was confidential.

Results

Most nurses were 20 to 30 years old (44%), female (56%), married (72.5%), had a bachelor's degree (84.6%), and 1 to 5 years of work experience (52.7%). Moreover, most of them had no history of neurological disorders or the death of relatives. Most medical emergency personnel were 20 to 30 years old, male, married, had a bachelor's degree, and 1 to 5 years of work experience. Additionally, most of them had no history of mental disease or the death of relatives. The differences in the proportion of females in both groups were 76% males ($n = 174$) in the study compared to 24% females ($n = 56$) (Table 1).

The mean of death anxiety, death obsession, and humor scores are presented in Table 2. The nurses had significantly higher levels of death anxiety and death obsession than medical emergency personnel; in terms of humor, there was no significant difference between the hospital nurses and medical emergency personnel.

In the hospital nurses, medical emergency personnel, and all participants in total, humor did not have a significant relationship with death anxiety and death obsession (Table 3).

The means of death anxiety in the nurses did not have any significant difference based on demographic information; however, in the medical emergency personnel, the mean of death anxiety was significantly higher in those older than 40 years. Moreover, in the medical emergency personnel, women had significantly higher levels of death anxiety. Death anxiety levels were not significantly different based on other demographic variables in this group (Table 4).

In the nurses, the mean of death obsession was significantly higher in women. In addition, the mean of death obsession was higher in the nurses with a bachelor's degree. In the medical emergency personnel, the mean of death obsession was higher in the personnel with a bachelor's degree. Death obsession levels were not significantly different based on the other demographic variables in the nurses and medical emergency personnel (Table 5).

TABLE 3
Relationship between death anxiety and death obsession with humor in nurses and emergency medical personnel

Variable	Humor					
	Hospital nurses		Medical emergency personnel		Total samples	
	<i>r</i> *	<i>P</i> value	<i>r</i> *	<i>P</i> value	<i>r</i> *	<i>P</i> value
Death anxiety	-0.20	.06	-0.02	.85	-0.11	.10
Death obsession	-0.05	.64	-0.08	.38	-0.07	.31

* Pearson's correlation coefficient.

TABLE 4
Comparison of death anxiety in nurses and emergency medical personnel in terms of demographic characteristics

Variable	Death anxiety							
	Hospital nurses				Medical emergency personnel			
	Mean	SD	Test statistics	P value	Mean	SD	Test statistics	P value
Age (y)								
20-30	6.82	4.12	F = 0.10*	.91	5.80	3.82	F = 3.40*	.04
30-40	7.02	4.21			4.84	3.0		
> 40	6.46	3.45			7.04	3.74		
Sex								
Female	7.29	4.0	t = 1.17 [†]	.25	7.41	4.11	t = 2.17 [†]	.03
Male	6.30	4.08			5.43	3.44		
Marital status								
Single	6.36	4.26	t = -0.72 [†]	.47	5.14	3.23	t = -1.30 [†]	.20
Married	7.04	3.97			5.97	3.73		
Education								
Associate degree	4.64	2.80	F = 2.76*	.07	5.64	3.16	F = 0.39*	.68
Bachelor's degree	7.27	4.13			5.84	3.96		
Master's degree	4.33	1.53			4.82	3.19		
Work experience								
1-5	6.67	4.08	F = 0.40*	.67	5.67	3.57	F = 0.21*	.81
6-10	6.0	3.56			5.4	3.45		
>10	7.28	4.12			5.95	3.77		
Neuropsychiatric disease								
Yes	4.44	4.67	t = -1.92 [†]	.06	6.06	3.44	t = 0.47 [†]	.64
No	7.12	3.91			5.62	3.60		
Death of a close relative during the last 6 mo								
Yes	-	-	-		6.69	3.90	t = 1.08 [†]	.28
No	-	-	-		5.57	3.54		
Workplace								
Urban base	-	-	-		5.23	2.94	H = 1.30 [‡]	.52
Road base	-	-	-		5.94	4.08		
Headquarters	-	-	-		6.83	4.36		
Part								
Intensive care	6.31	3.96	F = 1.05*	.38	-	-	-	
Emergency	7.71	4.79			-	-	-	
Medical surgical	7.85	3.60			-	-	-	
Other	6.10	3.35			-	-	-	

* Analysis of variance.

[†] Independent t test.

[‡] Kruskal-Wallis test.

The means of humor did not show any significant difference based on demographic variables in the nurses; however, in the medical emergency personnel, the mean of humor was significantly higher in men,

and it was higher in the urban center personnel. Humor did not show any significant difference based on the other demographic variables in this group (Table 6).

TABLE 5
Comparison of death obsession in nurses and emergency medical personnel based on demographic characteristics

Variable	Death obsession							
	Hospital nurses				Medical emergency personnel			
	Mean	SD	Test statistics	P value	Mean	SD	Test statistics	P value
Age (y)								
20-30	31.0	14.33	F = 0.34*	.72	27.47	14.13	H = 5.60 [†]	.06
30-40	29.08	10.66			21.65	6.91		
> 40	28.38	10.44			27.31	16.36		
Sex								
Female	32.80	13.19	t = 2.70 [‡]	.008	29.18	14.05	t = 1.35 [‡]	.18
Male	26.02	9.98			24.75	12.42		
Marital status								
Single	30.0	14.21	t = 0.08 [‡]	.93	22.16	7.36	Z = -1.22 [§]	.22
Married	29.76	11.62			27.0	14.53		
Education								
Associate degree	19.73	5.14	F = 5.77*	.004	23.67	10.35	H = 8.44 [†]	.02
Bachelor's degree	31.60	12.37			27.77	14.65		
Master's degree	21.33	8.39			18.09	2.66		
Work experience, y								
1-5	30.04	13.70	F = 0.56*	.58	25.50	13.38	F = 0.85*	.43
6-10	25.14	9.34			23.11	7.84		
>10	30.44	10.38			26.95	14.82		
Neuropsychiatric disease								
Yes	24.44	10.05	t = -1.39 [‡]	.17	28.24	14.49	t = 1.02 [‡]	.31
No	30.41	12.43			24.88	12.40		
Death of a close relative during the last 6 mo								
Yes	-	-	-		28.85	14.60	t = 1.06 [‡]	.29
No	-	-	-		24.93	12.46		
Workplace								
Urban base	-	-	-		24.42	10.8	F = 0.39*	.68
Road base	-	-	-		26.15	13.30		
Headquarters	-	-	-		26.67	17.75		
Part								
Intensive care	29.48	12.18	F = 1.16*	.33	-	-	-	
Emergency	29.38	13.96			-	-	-	
Medical surgical	35.31	12.51			-	-	-	
Other	27.26	9.69			-	-	-	

* Analysis of variance.

[†] Kruskal-Wallis test.

[‡] Independent t test.

[§] Mann-Whitney test.

TABLE 6
Comparison of humor in nurses with emergency medical personnel based on demographic characteristics

Variable	Humor							
	Hospital nurses				Medical emergency personnel			
	Mean	SD	Test statistics	P value	Mean	SD	Test statistics	P value
Age (y)								
20-30	117.38	35.25	F = 0.08*	.92	118.21	21.36	F = 0.01*	.99
30-40	117.21	29.04			118.53	26.12		
> 40	113.46	22.27			119.04	29.64		
Sex								
Female	114.59	35.39	$t = -0.75^\dagger$	.45	104.24	16.10	$t = -2.60^\dagger$	.01
Male	119.50	24.08			120.47	25.04		
Marital status								
Single	113.92	27.71	$t = -0.54^\dagger$	.59	113.61	22.40	$t = -1.73^\dagger$	.09
Married	117.82	32.13			121.13	25.54		
Education								
Associate degree	124.82	32.85	F = 0.46*	.63	117.93	26.77	F = 0.88*	.42
Bachelor's degree	115.83	31.10			120.30	23.02		
Master's degree	110.67	17.62			109.82	23.37		
Work experience, y								
1-5	116.71	34.49	F = 0.02*	.98	116.05	23.71	F = 0.61*	.54
6-10	119.14	31.53			120.60	25.64		
> 10	116.33	26.12			120.76	25.64		
Neuropsychiatric disease								
Yes	114.33	15.04	$t = -0.25^\dagger$	.81	121.29	23.81	$t = 0.50^\dagger$	.62
No	117.01	32.19			118.09	24.85		
Death of a close relative during the last 6 mo								
Yes	-	-	-	-	117.31	25.34	$t = -0.18^\dagger$	.86
No	-	-	-	-	118.60	24.69		
Workplace								
Urban base	-	-	-	-	123.61	23.60	F = 3.56*	.03
Road base	-	-	-	-	112.96	25.17		
Headquarters	-	-	-	-	111.83	24.22		
Part								
Intensive care	116.51	27.73	F = 0.05*	.99	-	-	-	-
Emergency	118.54	27.68			-	-		
Medical surgical	116.69	52.23			-	-		
Other	114.95	22.55			-	-		

* Analysis of variance.

† Independent *t* test.

Discussion

COVID-19 has created a myriad of challenges for health care personnel. This study aimed to compare death anxiety, death obsession, and humor in nurses and medical

emergency personnel during COVID-19. According to the results, death anxiety and death obsession levels were higher in the nurses than the medical emergency personnel. The results also showed that there was no significant

difference between the nurses and medical emergency personnel in terms of humor.

Frequent encounters with patients' death in the hospital are probably one of the reasons for the high mean score of death anxiety in the nurses.^{10,29} Sanadgol et al³⁰ state that nurses experience most of the various psychological symptoms, including death anxiety, owing to their daily interactions with patients with COVID-19, especially because of the lack of protective equipment. In the study conducted by Onchonga et al,³¹ findings indicated that most health care workers had mild anxiety and depression because of the COVID-19 pandemic. Nurses are the first frontline health care workers to interact with patients testing positive, which makes them more vulnerable. This poses a danger not only to them but also to their peers, family members, and relatives with whom they interact and live.³¹ Generally, nurses have more encounters with critically ill and near-to-death patients and their families owing to the nature of their job, and caring, comforting, and consoling these patients and their families are among the most demanding nursing cares exposing nurses to death anxiety.³²

In this study, the mean score of death obsession was significantly higher in the nurses than medical emergency personnel. No similar study was found in this regard; however, death anxiety and obsession increases in nurses, especially special care nurses, who have numerous contacts with patients unable to effectively make contact with them for reasons such as having an artificial airway, a decreased level of consciousness, dependence on life support devices, and constant nursing care.^{19,25} Furthermore, numerous studies have reported that nurses working in important wards, such as operating rooms, emergency rooms, and special care units such as the intensive care unit and cardiac care unit, experience more mental disorders and higher death anxiety levels owing to high mental pressures.^{10,33} This might be the reason for higher death obsession levels in nurses than medical emergency personnel. As Galehdar et al³⁴ stated in their study, nurses experienced psychological distress, including death anxiety and obsessive thoughts, while caring for patients with COVID-19, so through proper planning by authorities, it is possible to manage the risk factors of mental health distress in nurses and improve their mental health status.

In this study, humor did not have any significant relationship with death anxiety and death obsession in the nurses and medical emergency personnel. Contrary to the present study, Arab et al¹⁹ conducted a study in Iran and reported a significant relationship between humor and death anxiety among special care unit nurses. The authors of this study reported that because nurses play a central role

in the health care system, they need to improve their knowledge of the death process and strategies for coping with it and recommended humor as a strategy for overcoming death anxiety.¹⁹ Given that death is an inevitable phenomenon, increasing awareness and strengthening insights about it and extracting positive patterns of facing death can lead to reducing anxiety and to optimal exposure to death. As the author concluded in his study, it reduces negative attitudes toward death and death anxiety.³⁵

Moreover, in contrast to the results of the present study, in the study conducted by Curşeu et al⁹ on patients with COVID-19 in Romania during the pandemic and the study by Latipun et al³⁶ on patients with chronic disease, a significant relationship was reported between humor and death anxiety. The authors mentioned humor as a necessary defense mechanism against stressful and difficult situations to reduce perceived negative experiences and death anxiety. People who use humor experience less distress and anxiety and have fewer negative feelings owing to a decrease in fear of death.³⁷ Fang et al³⁸ stated that providing training courses for stress management, improving flexibility, and nurturing the sense of humor in nurses are among the crucial duties of hospital managers. Cheng et al³⁹ concluded that improving death education is essential to increasing the cognition of death and guiding nursing students to actively face death to reduce their level of death anxiety. The results of the study by Ghadampour et al⁴⁰ suggest that the mindfulness-based cognitive therapy is effective in reducing death anxiety.

In the present study, death anxiety had a significant relationship with age and gender in medical emergency personnel, and death anxiety was higher in those older than 40 years and women. In terms of age, the results of the present study were in line with those of the studies by Latha et al⁴¹ and Thabet and Abdalla.⁴² However, in contrast to the results of the present study, in the study by Roodbandi et al⁴³ conducted on medical emergency personnel in Iran, death anxiety decreased with age. Regarding gender, the results of the study conducted by Thabet and Abdalla⁴² were in line with the results of the present study. Because in the medical emergency ward of Sirjan female personnel only work in the dispatch center, one reason for high death anxiety levels in them might be frequent stressors they face, such as answering to a large number of calls asking for emergency services and the sensitive matter of time in sending ambulances. In this regard, Kindermann et al⁴⁴ stated that stressful work conditions and encounters with traumatic experiences of the callers are the causes of spiritual and mental problems, depression, anxiety, and secondary traumatic stress in dispatch personnel. Moreover, Smith et al⁴⁵ reported that working in high-pressure environments, insufficient rest between

stressful calls, dealing with traumatic calls, inadequate training for coping with the stress resulting from emergency calls, dealing with verbal violence, and lack of support are the causes of stress in emergency call takers and dispatchers. As COVID-19 has progressed, there has been a global phenomenon of exponential increases in emergency medical services calls, which is expected to impose a great pressure on emergency medical services dispatch centers.⁴⁶

Other results of this study included significant relationships between death obsession and gender in nurses and between death obsession and education level in nurses and medical emergency staff. Regarding gender, the mean of death obsession was significantly higher in female nurses, which was in line with the results of the studies conducted by Thabet and Abdalla⁴² and AlAteeq et al⁴⁷ during COVID-19. However, these results were in contrast to those of the study by Shakil et al,⁴⁸ in which the authors stated that the gendered social norms that result in more men leaving home, and therefore, their frequent contacts with threatening factors, are the reasons for the higher death anxiety score in them. In contrast, Onchonga et al³¹ claimed that the higher anxiety women experienced is due to their level of interaction and role in the society, like working in medical centers, as well as their mental characteristics such as fear of themselves and their families being infected. For example, they claimed that the higher anxiety women experience is associated with social caretaking norms linked to fear of their families being infected.³¹ No similar study was found regarding the higher mean score of death obsession among those with a bachelor's degree, which could have been caused by the high number of participants with a bachelor's degree in this study.

The results of this study also indicated that the mean of humor is significantly higher in men among medical emergency personnel. Hofmann et al⁴⁹ in a systematic review found that men generally acquire higher humor scores, and this is caused by personality differences such as an ability to use and understand humor.

Limitations

One of the limitations of this study was the personality traits of the personnel, which were not evaluated. Another limitation was that the study was conducted on a small sample from the country in Sirjan; therefore, generalization of the data should be done with caution.

Implications for Emergency Nurses

This study was conducted during the COVID-19 pandemic. Both emergency nurses and medical emergency personnel reported experiencing mild-moderate death

anxiety and obsession. Working in the pre-hospital and hospital emergency settings are often associated with anxiety. Opportunities to implement behavioral coping interventions are warranted to mitigate work related stress.

Conclusion

Death is a reality that health care staff frequently face. The results of this study revealed that the levels of death anxiety and death obsession were higher in the nurses than medical emergency personnel, and this can significantly affect their performance. Owing to the crucial role of nurses in the health system and medical care for patients with COVID-19, coping strategies for reducing death anxiety and obsession in nurses and providing mental support for nurses, who work at the forefront of providing health care for patients in pandemics, are recommended. Moreover, nurses should have a holistic outlook on life and know death as an inevitable reality.

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EFFECTIVENESS OF 2 PRETREATMENT METHODS IN ANTIFOGGING OF GOGGLES IN A COVID-19 ISOLATION WARD: A RANDOMIZED CONTROLLED TRIAL

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NCPD Earn Up to 8.5 Hours. See page 616.

Contribution to Emergency Nursing Practice

- Fogging of goggles can seriously affect the quality of medical work of health care staff and pose an unnecessary threat to the lives of patients.
- There is a lack of simple, effective and readily available methods to minimize and prevent the issue of goggle fogging.
- This study's findings can facilitate the prevention of fogging of medical goggles and streamline the work of nursing staff worldwide in the fight against COVID-19.

Abstract

Introduction: This study aimed to compare the effectiveness of the pretreatment of goggles with iodophor solution and antibacterial hand sanitizer to reduce the fogging of goggles.

Methods: A total of 90 health care workers were divided into a control group ($n = 30$), an iodophor solution group ($n = 30$), and an antibacterial hand sanitizer group ($n = 30$). This study

evaluated the degree of fogging of goggles and the light transmission, comfort, eye irritation, and the impact of goggles on the medical work of staff.

Results: The antibacterial hand sanitizer group had the lowest amount of goggle fogging and the most transparent view. Participants in the control group reported the worst light transmission and comfort level, followed by the iodophor solution group. In contrast, the goggles in the antibacterial hand sanitizer group had the best light transmission and comfort level. The iodophor solution group participants reported more eye irritation. Participants in the control group reported that the goggles severely impacted their medical work, with a less severe impact reported by the iodophor solution group. The antibacterial hand sanitizer group did not report any impact on their medical work.

Discussion: When the goggles were internally coated with antibacterial hand sanitizer solution (diluted 1:1 with distilled water), the antifog effect was significant. Moreover, the goggles treated with antibacterial hand sanitizer had a clearer field of vision, were reported as non-irritating to the eyes,

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and significantly improved the efficiency of COVID-19 health care workers, including emergency nurses and providers.

Introduction

COVID-19 is highly contagious and has spread worldwide.¹ The main transmission routes that have been identified include respiratory droplets and contact transmission. Aerosolized transmission can occur in relatively closed environments; prolonged exposure to high aerosol concentrations and general population susceptibility can increase the risk of transmission.^{2,3} Viruses can be transmitted by droplets in special working environments, such as in emergency departments among emergency clinicians treating patients with COVID-19. This exposes frontline emergency care staff to severe occupational hazards. Therefore, health care workers must take strict personal protective measures to prevent COVID-19 transmission during treatment.

Typically used personal protective equipment (PPE) in China includes surgical masks, double gloves, long-sleeved overalls, and goggles.⁴ Goggles are made of plastic material and play an essential role in protecting medical workers from COVID-19. They help prevent eye contact with aerosolized pathogens and are a critical barrier to break the chain of viral infection.⁵ The importance of professional medical goggles for health care workers involved in the management of COVID-19 has also been highlighted in published literature.^{6,7}

However, in practice, exhaled gases from health care workers can easily fog up goggles, resulting in reduced light transmission and obstructed vision. This can seriously reduce the comfort of health care workers wearing them. Further, large amounts of fogging could potentially put emergency care clinicians at a risk of making errors during emergency procedures that require the clinician to have clear and unobstructed vision. The success of procedures like endotracheal intubation, cardiopulmonary resuscitation, or the insertion of peripheral intravenous catheters depend on clinicians' ability to see clearly. Obstructed vision during these procedures could significantly affect the quality of medical care delivered and pose an unnecessary threat to patient safety.⁸ The effective use of goggles is also very important for emergency nurses and providers, as they are often required to take the lead in performing life-saving medical procedures.

Unfortunately, there is a lack of simple and effective solutions to prevent the fogging of goggles. To the best of our knowledge, only a few studies with small samples ($n < 10$),⁹ short reports,¹⁰ or letters^{11,12} have been published to date, and there is a lack of randomized controlled trials comparing

Key words: Goggles; Anti-fogging; COVID-19; Antibacterial hand sanitizer; Iodophor solution

the effectiveness of various methods of antifogging. Therefore, a randomized controlled trial was designed to innovatively compare the effectiveness of 2 pretreatment methods in reducing goggle fogging for health care workers in isolation wards. This study aimed to determine a feasible and straightforward method to prevent goggle fogging for frontline health care workers in the fight against COVID-19.

Materials and Methods

STUDY DESIGN

This randomized, single-blind controlled study was approved by the Ethics Committee of the 900th Hospital of the United Nations Security Forces (2021-008) and performed per the revised Declaration of Helsinki principles. Written informed consent was obtained from all participants before the study. The trial was registered in Clinical [Trials.gov](https://www.clinicaltrials.gov) (registration number ChiCTR2100054392).

SETTING AND PARTICIPANTS

A total of 98 health care workers working on the frontline of the isolation ward of Wuhan Taikang Tongji COVID-19 Specialist Hospital in December 2021 were selected as study participants. As per the inclusion criteria, participants included those aged 20 to 60 years, of either sex, medical and nursing staff, and those working in the COVID-19 isolation ward and skilled in wearing protective gear and providing daily medical care for patients in isolation. Health care workers who could not wear PPE for prolonged periods (> 3 hours) were excluded.

MATERIALS

We used 90 pairs of 3M brand (1621AF, Xuzhou Chuquan Electromechanical Technology Co, LTD, China) goggles made of polycarbonate. The iodophor solution (item number: 29924671903, Shanghai Likang Disinfection Hi-tech Co, LTD, China) and antibacterial hand sanitizer (item number: Q/ALX42, Shandong Likang Medical Technology Co, LTD, China) used in this study were both products of Lilcom Medical Technology. The iodophor solution is a

disinfectant solution with polyvinylpyrrolidone iodine as the main active ingredient, with an effective iodine content of 0.20% to 0.22% (Weight/Volume, W/V). Antibacterial hand sanitizer contains chlorhexidine gluconate [0.2% \pm 0.02% (W/V)] as the main active ingredient.

RANDOMIZATION AND INTERVENTIONS

This was a parallel-group randomized controlled trial in which all participants were enrolled in the same period and randomly allocated to 3 different groups at the same time for the same duration of follow-up. Using computer-generated randomization codes provided by laboratory biostatisticians, a simple randomization procedure was used to assign participants to 3 single-blind (participants were blinded) treatment groups in a ratio of 1:1:1. The 90 codes corresponded to 90 participants who were randomly sorted into 3 groups of 30 participants. The code was kept by the researcher involved in the evaluation of the effects of the trial, who provided the pretreated goggles to participants, with each goggle package consecutively numbered and prepared according to the randomization scheme.^{13,14}

A total of 90 health care workers were divided into 3 groups. These were the control group (goggles were coated with distilled water, $n = 30$), iodophor solution group (goggles were coated with iodophor solution, $n = 30$), and antibacterial hand sanitizer group (goggles were coated with antibacterial hand sanitizer and distilled water, mixed at a 1:1 ratio, $n = 30$).⁹⁻¹²

The pretreatment of the goggles was conducted by a dedicated group who were trained in advance to ensure uniform coating for each pair of goggles. The training covered ratios, volumes and drying methods for pretreating goggles. The 3 standard sets of pretreatments for goggles were derived from the results of several pretests and clinical experience. For the control group, 2 mL of distilled water was used to coat the inner side of the goggles and a hairdryer was used (Philips, power 1000 Watts, low speed, 30 seconds) to dry them. For the iodophor solution group, an iodophor solution was used to coat the inner side of the goggles. A dry cotton ball with 1 to 2 mL of iodophor solution was used to apply a thin layer. Further, the inner surface of the goggles was coated evenly at various locations, taking care not to apply it too thickly so as to prevent any impact on vision and staining of the goggles. A hairdryer was used to dry the goggles after applying the solution. For the hand sanitizer group, antibacterial hand sanitizer solution was diluted with 1 mL of distilled water at a ratio of 1:1 to coat the goggles.¹⁵ Dry cotton balls were used to apply an appropriate amount of antibacterial hand sanitizer, creating a thin layer. Application of the solutions with dry cotton

balls ensured even coverage across the entire surface of goggles and that the line of sight was not affected by excess solution in the form of droplets. Following application, the goggles were also dried with a hairdryer and then considered ready to use.

Group participants did not know which group they would be assigned to or which antifog treatment method would be more effective. The 3 groups of participants used goggles with 3 different pretreatments on the same working day and wore the goggles for 4 hours per shift. Goggles were not to be removed until the end of the trial, which was the end of the participants' 4-hour shifts. There were no significant differences in the temperature and humidity of the working environment among the 3 groups during the day of trial (the temperature in the isolation ward was maintained at 22 °C-24 °C and the humidity at 40%-60%). All participants wore their goggles following the COVID-19 protocols for donning and doffing PPE.¹⁶

ASSESSMENTS

Goggle Fogging Level

The primary outcome measure of this study was the degree of fogging of goggles. The degree of fogging of the goggles was divided into 4 grades (Figure 1): fog that covered < 30% of the goggle area, fog that covered 30% to 50% of the goggle area, fog that covered 50% to 80% of the goggle area, and fog that covered > 80% of the goggle area. At the end of the 4 hours of medical work, the goggle fogging grading of the 3 groups of health care workers involved in the study was judged, photographed, and recorded. The locations were photographed with consistent light levels and the same brand of camera (D750; Nikon camera, Japan). Photographs were taken within 2 minutes of participants removing their goggles. Nine assessors were trained to score the fogging immediately after taking the photographs. At the end, one dedicated inspector checked the scores against the goggle fogging photos.

Questionnaire

A questionnaire (see Appendix) was orally administered to all 3 groups of health care professionals immediately after the trial by one dedicated person (after wearing the goggles for 4 hours). This researcher-designed questionnaire was pretested with nurses working in isolation wards (these nurses were not involved in the formal trial) and revised accordingly before implementation. The survey included participant-reported light transmission of the goggles,

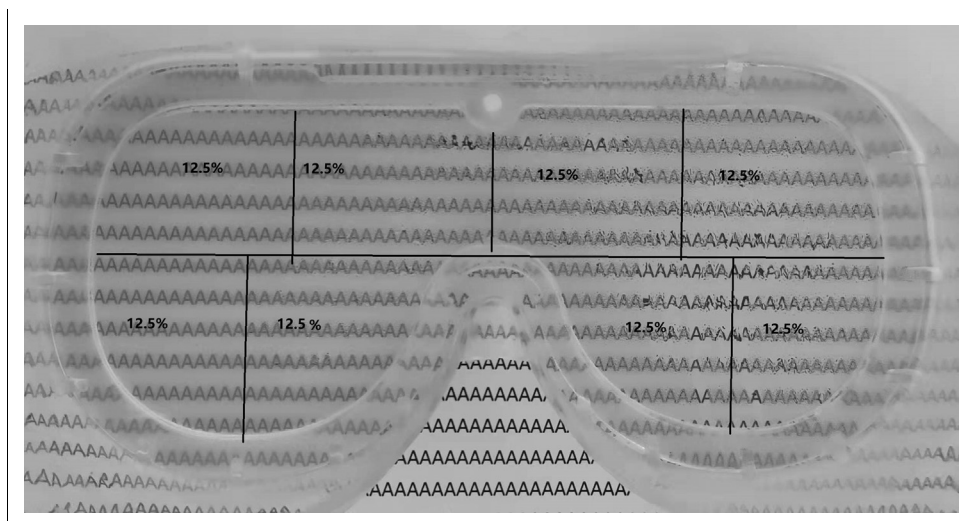


FIGURE 1
The uniform criteria for measuring the percentage of fogging of goggles.

comfort of wearing the goggles, goggle irritation to the eyes, and whether the goggles had any impact on medical practice (also participant-reported). The 3 groups of health care professionals rated the above 4 measures according to their perception: 10 = very good light transmission, very comfortable, no irritation to the eyes, and no impact on any medical work/patient care; 7 to 9 = good light transmission, comfortable to wear, less irritation to the eyes, and no effect on general medical work/patient care work; 4 to 6 = poor light transmission, average comfort, significant irritation to the eyes, and a small-scale impact on medical work/patient care; and 0 to 3 = very poor light transmission, incredibly uncomfortable to wear, severe irritation to the eyes, and profound implications for medical work/patient care. Eye irritation scores are inversely proportional (lower numbers indicate higher levels of irritation). The highest score possible for the 4 items is 40, with higher scores representing better overall results and satisfaction.

STATISTICAL ANALYSES

The sample size was calculated using A'Hern's single-group phase 2 method. With a deviation estimate of 7% obtained from a preliminary experimental result, we estimated that 28 patients in each group would be required, for a total of 84 participants ($\alpha = 0.05$, $\beta = 0.1$). To account for a potential dropout rate of 10%, we aimed to enroll more than 90 participants. All experimental data were statistically

analyzed using SPSS Windows software version 25.0 (Chicago, IL). For baseline characteristics of participants, the mean and SD were used to describe the degree of sample variation among the groups. The chi-square test for experimental normally distributed measures was performed using Levene's test (0.05). One-way analysis of variance and Fisher's least significant difference tests were used for the sample mean in each group that met the requirements of the chi-square test. The Kruskal-Wallis H tests measured data that did not meet the requirements of the chi-square test. The experimental data were expressed as mean (SD), and $P < .05$ indicated that the difference was statistically significant.

Results

STUDY POPULATION

Initially, 96 health care workers working in the frontline of the isolation ward were included. Six of them were later excluded based on the inclusion criteria (self-reported inability to wear goggles and strict PPE for more than 4 hours, possible discomforts such as vomiting and vertigo). Finally, 90 participants were randomly allocated to 3 groups: control (distilled water, $n = 30$), iodophor solution ($n = 30$), and antibacterial hand sanitizer ($n = 30$). Health care professionals in all 3 study groups completed the trial successfully (Figure 2). Baseline characteristics of participants were similar in the 3 groups (Table 1).

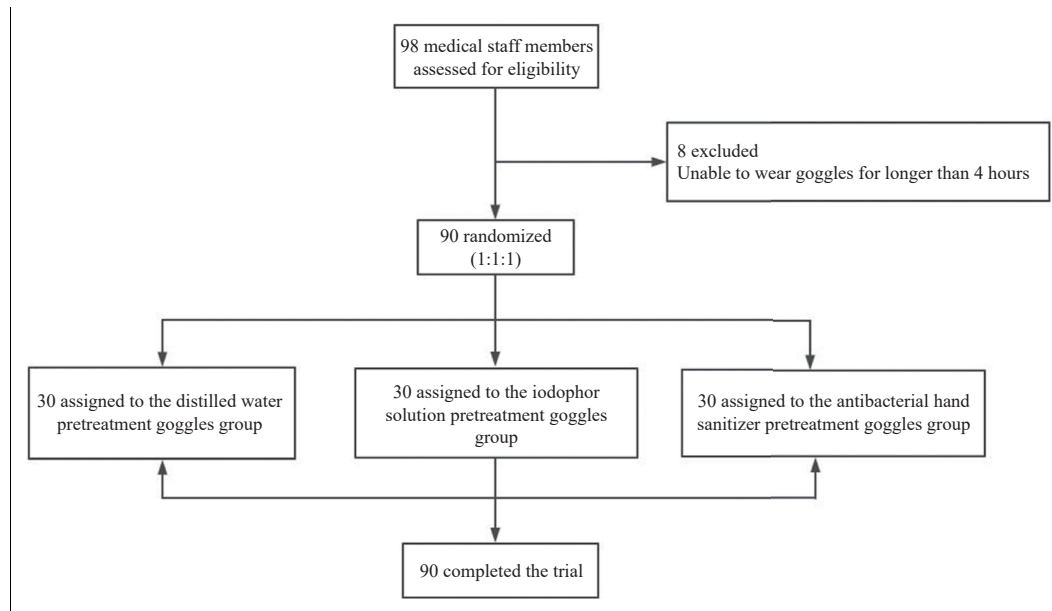


FIGURE 2
Trial profile.

COMPARISON OF THE DEGREE OF FOGGING OF GOGGLES AMONG THE 3 GROUPS OF HEALTH CARE WORKERS

The fogging levels of goggles were measured by a trained researcher and compared among the 3 groups of participants after 4 hours of wear. The photographed comparison chart (Figure 3) shows that the degree of fogging of the goggles differed significantly among the 3 groups. The goggles worn by participants in the control group were tinted with distilled water, almost entirely fogged and severely impeded participants' visual field (Figure 3A). In the iodophor solution group, the fogging was reduced compared with the control group (Figure 3B), but the visual field was still affected. The goggles in the antibacterial hand sanitizer group showed almost no fogging and the visual field was bright and clear (Figure 3C).

The degree of fogging of the goggles among the 3 groups was further quantified and analyzed, as shown in Table 2. There was an increase in the number of cases where the proportion of goggles fogged < 30% (barely fogged) in the iodophor solution group compared with the control group ($\chi^2 = 17.917$, $P < .001$). On comparing the number of goggles with 30% to 50% fog coverage (light fogging) among the 3 groups, the antibacterial hand sanitizer group showed the most significant increase in the number of lightly fogged goggles, with a statistically significant difference ($\chi^2 = 9.144$, $P = .003$). When comparing the number

of goggles covering 50% to 80% of the area (moderate fogging) in the 3 groups, the number of cases was similar and not statistically different ($\chi^2 = 3.621$, $P = .164$). The number of goggles with > 80% fog coverage (heavy fogging) was significantly lower in the antibacterial hand sanitizer group than in the control group ($\chi^2 = 26.667$, $P < .001$). In contrast, the amount of fogging in the iodophor group fell between that of the control group and the antibacterial hand sanitizer group.

QUESTIONNAIRE RESULTS

A researcher-designed questionnaire was orally administered to each of the 3 groups of health care workers at the end of the trial. The results of the questionnaire are shown in Figure 4. When comparing the light transmission and comfort level of the goggles among the 3 groups, the control group reported the worst light transmission and the lowest comfort level. The iodophor solution group reported improved light transmission ($F = 3.379$, $P < .01$; Figure 4A) and comfort compared with the control group ($F = 1.483$, $P < .01$; Figure 4B). The antibacterial hand sanitizer group reported the best light transmission (vs control, $F = 6.103$, $P < .01$; vs iodophor solution, $F = 2.724$, $P < .01$; Figure 4A) and the best comfort level (vs control, $F = 5.448$, $P < .01$; vs iodophor solution, $F = 3.966$, $P < .01$; Figure 4B) of the goggles, with statistically

TABLE 1
The baseline characteristics of participants

Characteristics	Control group, <i>n</i> (%) / mean (SD)	Iodophor solution group, <i>n</i> (%) / mean (SD)	Antibacterial hand sanitizer group, <i>n</i> (%) / mean (SD)
Male sex, <i>n</i> (%)	12 (40)	9 (30)	13 (43)
Age (y)	37.3 (4.2)	35.2 (4.7)	35.9 (3.7)
Professional category			
Nurse	9 (30)	8 (27)	11 (37)
Nurse practitioner	2 (7)	2 (7)	3 (10)
Charge nurse	3 (10)	4 (13)	4 (13)
Associate chief nurse	3 (10)	2 (7)	3 (10)
Chief nurse	1 (3)	0 (0)	1 (3)
Doctor	21 (70)	22 (73)	19 (63)
Resident doctor	2 (7)	2 (7)	3 (10)
Attending doctor	8 (26)	9 (30)	8 (26)
Associate chief doctor	6 (20)	8 (26)	5 (17)
Chief doctor	5 (17)	3 (10)	3 (10)
Years of working experience			
< 10 y	11 (37)	10 (33)	13 (43)
≥ 10 y	19 (63)	20 (67)	17 (57)

significant differences compared with the other 2 groups. On comparing reported levels of eye irritation among the 3 groups, participants who wore the goggles treated with distilled water and antibacterial hand sanitizer reported little to no eye irritation (control vs antibacterial hand sanitizer, $F = 0.517$, $P > .05$; Figure 4C). The iodophor solution group reported more irritation to the eyes than the other 2 groups (vs control, $F = -5.069$, $P < .01$; vs antibacterial hand sanitizer, $F = -4.552$, $P < .01$; Figure 4C).

Finally, the 3 groups of clinical staff rated whether the different treatments of goggles interfered with medical care. Lower rating levels indicated higher interference. The control group reported the lowest rating and reported the highest interference with medical care related to fogging, indicating

severe interference with medical care. The iodophor group reported a better rating than the control group ($F = 4.464$, $P < .01$; Figure 4D). The antibacterial hand sanitizer group reported the highest rating compared with the other 2 groups. The antibacterial hand sanitizer did not interfere with medical care (vs control, $F = 6.500$, $P < .01$, vs iodophor solution, $F = 2.036$, $P < .01$; Figure 4D). Our dedicated statistician summed the 4 scores above, which revealed that the control group had the lowest overall score and the iodophor solution group had a better overall score than the control group ($F = 4.1786$, $P < .01$; Figure 4E). However, the antibacterial hand sanitizer group had the highest overall score, significantly better than the other 2 groups (vs control, $F = 17.4643$, $P < .01$, vs iodophor solution, $F = 13.2857$, $P < .01$; Figure 4E).

Discussion

Our innovative study was designed as a randomized, single-blind controlled study. Frontline clinicians caring for COVID-19 patients wore goggles pretreated with 3 solutions (distilled water, iodophor solution, and antibacterial hand sanitizer) to measure the fogging of the goggles. The results of our study suggest that goggles pretreated with the antibacterial hand sanitizer (diluted with distilled water at a 1:1 ratio) were the most effective at preventing fogging after 4 hours.

Numerous reports claim that the eyes may be the gateway for COVID-19 to invade the body and that the virus can cause infection through the conjunctiva.^{17,18} One of the current requirements of the Chinese government for medical staff caring for patients infected with COVID-19 is to maintain eye protection. In China, wearing goggles is an integral part of the daily routine of health care workers in the COVID-19 ward. In addition, the more acutely ill and infectious patients are admitted to isolation wards, so clinical staff working in isolation wards are required by the government to use goggles rather than face shields. Adequate safety measures to avoid exposing the eyes to hazardous environments can effectively interrupt the spread of COVID-19 and protect emergency clinicians on the front lines performing endotracheal intubation, cardiopulmonary resuscitation, and other life-saving medical procedures.⁵

However, the goggles currently used can easily fog, creating issues for staff during their clinical work. Owing to temperature differences between the inner and outer surfaces of the goggles, moist, warm air emitted from staff during respiration can condense into tiny droplets on the inner surface, which obscures the clarity and visibility of the

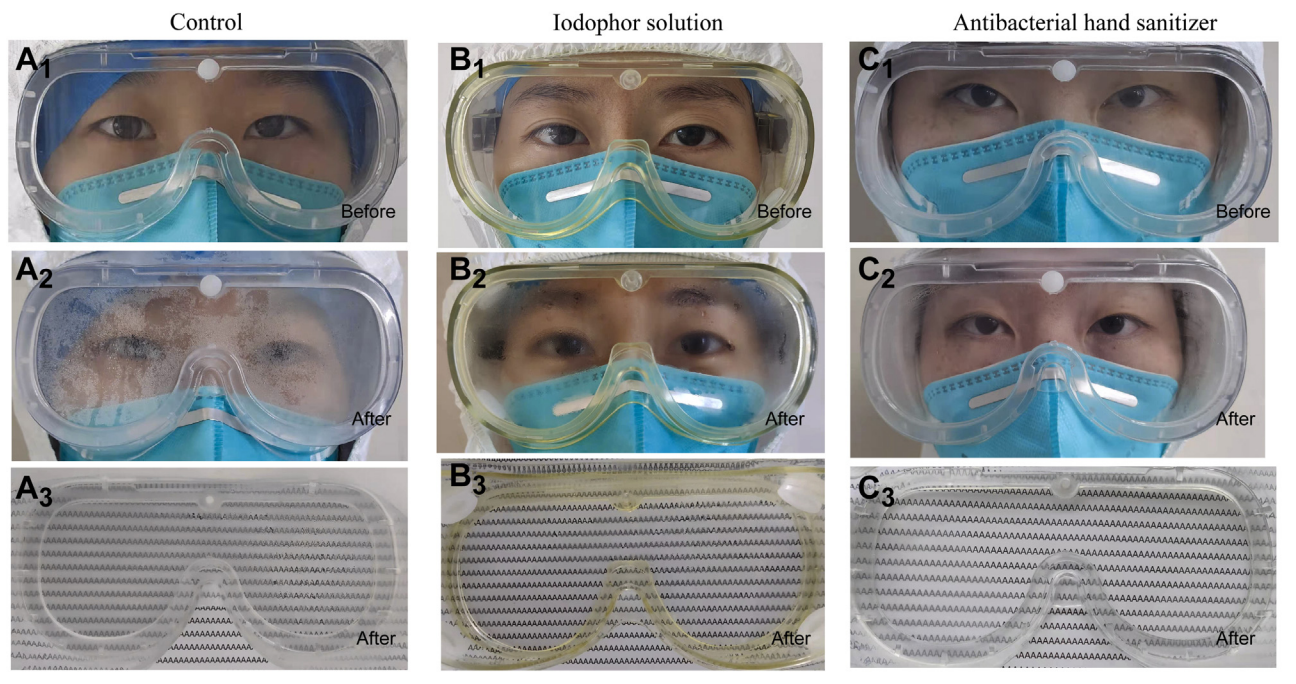


FIGURE 3

Comparison of the degree of fogging of goggles among the 3 groups of health care workers. (A) Comparison of the control group before and after 4 hours of goggle wear (1-3). (B) Comparison of the iodophor solution group before and after 4 hours of goggle wear (1-3). (C) Comparison of the antibacterial hand sanitizer group before and after 4 hours of goggle wear (1-3).

goggles and can seriously compromise the safety of patient care.¹⁹ In addition, the fogging of goggles can blur the vision of the clinician.²⁰ Some health care workers may also experience eye strain, dizziness, nausea, and vomiting, which directly affect the efficiency and safety of health care workers.¹³ Effectively preventing fogging of goggles can enhance the protection of health care workers caring for patients acutely infected with COVID-19.

Few studies have been conducted on antifogging measures for goggles worn during COVID-19. Provided that COVID-19 is still widespread worldwide,²¹ there is an urgent need for effective antifogging measures of goggles. One study, which interviewed health care workers and searched databases, concluded that using washing-up liquid or hand sanitizer is the most effective method for preventing goggles from fogging.¹² However, the above findings are empirical attempts,⁹⁻¹¹ and there are no randomized controlled trials on the effectiveness of several pretreatment methods to reduce goggle fogging. Antifogging agents and detergents used for swimming goggles may also be effective for medical goggles.^{10,22} However, these antifog sprays need to be purchased separately, may be cost prohibitive,¹⁰ and may not be readily available or feasible to purchase in rural or under-resourced settings.

In the hospital/unit of study, antifog sprays were not commonly available or in stock and were not easily accessible. Therefore, iodophor solution and antibacterial hand sanitizer were compared in this study, as both items were easily accessible in the COVID-19 wards.

In our study, both iodophor solution and antibacterial hand sanitizer showed more effective antifogging than the control group (distilled water). The main component of the iodophor solution is polyvinylpyrrolidone iodine, which is smooth. It can form a protective film on the surface to provide an antifogging effect and is more commonly used in laparoscopic lens antifogging.²³ However, in the application of iodine for laparoscopic antifogging, it was found that there may be several problems after iodophor solution application: (1) this method is effective for antifogging for the first 30 minutes after application, but the effect is poor after 30 minutes; (2) iodophor solution is a colored liquid, which may affect the operator's judgment of the color of intra-abdominal organs when providing clinical care; (3) this method is not suitable for people who are allergic to iodine. Our study confirmed the above problems when using iodine-treated goggles. In this study, pretreatment of the goggles with iodophor solution prevented fogging of the goggles for a brief period.

TABLE 2

Comparison of the degree of fogging of goggles among the 3 groups of health care workers

Area	Control group, (n = 30), n (%)	Iodophor solution group, (n = 30), n (%)	Antibacterial hand sanitizer group, (n = 30), n (%)	χ^2	P value
Dense fog covers < 30% of the goggle area	0 (0)	5 (17)*	13 (43) ^{†‡}	17.917	.000
Dense fog covers 30%-50% of the goggle area	2 (7)	8 (27)*	12 (40)*	9.144	.003
Dense fog covers 50%-80% of the goggle area	9 (30)	10 (33)	4 (14)	3.621	.164
Dense fog covers > 80% of the goggle area	19 (63)	7 (23)*	1 (3) ^{†‡}	26.667	.000

* $P < .05$ vs control group.

† $P < .01$ vs control group.

‡ $P < .05$ vs iodophor solution group.

However, as the working time increased (generally after 2 hours), participants reported the iodophor solution coated goggles gradually fogged up. The reason for this may be that the active ingredients of the iodophor solution evaporate, resulting in poor light transmission and visual field loss. Our study also found that the goggles had a teal color after the application of iodine vapor, which affected the vision of the medical staff. Notably, the goggles were found to irritate the eyes after the application of iodine vapor, further aggravating the discomfort of the health care staff and thus affecting their medical work. Contrastingly, the main ingredient of antibacterial hand sanitizer is chlorhexidine gluconate. It is a surfactant that reduces the surface tension of water droplets, provides an antifog effect when applied to goggles, and has non-volatile properties.²⁴ In our study, the antifog effect and antifogging time of goggles which were internally coated with antibacterial hand sanitizer were significantly better than that in the iodine voltage-coated group. It is also relatively inexpensive and simple to use, and the treated goggles have good transparency, less impact on vision, and were reported to be gentle and non-irritating by the participants. Notably, one of the non-negligible advantages of pretreating goggles with antibacterial hand sanitizer diluted with distilled water is that the material is readily available in the hospital environment and easily accepted and used by health care workers.

STRENGTHS

It is worth mentioning that our study tested a solution that is readily available in most health care facilities that may allow clinical staff to wear goggles continuously for a 4-hour work

period. Test intervals of various time lengths have been implemented in existing studies to assess the effect of different pretreatment methods on fogging of goggles.¹⁵ The reason we designed the goggles to be worn for 4 hours is based on the shifts (4 hours in the morning and 4 hours in the afternoon) that Chinese hospital staff work in isolation wards. We designed this trial to investigate a more suitable method of preventing goggle fogging for our specific working hours. In the future, we will consider further modifying the study protocol to consider the effects of time intervals and different roles and workloads on goggle fogging.

Limitations

There are some limitations to this study. For example, this was a single-center clinical study with a small sample size ($n = 90$). Therefore, a multi-center, large sample clinical study is needed to further validate the antifog effect of antibacterial hand sanitizer on goggles. We designed the trial with the intention of enrolling an all-nurse sample, but during recruitment, we were unable to recruit sufficient numbers of eligible nurses. In order to further investigate the antifog effect of different solutions in different roles and divisions of work, the target group was modified to include providers in addition to nurses. This study is part of a larger research project, which will be followed by a study on the development and application of functional protective gear specifically for nurses. It is notable that our sample contained primarily emergency nurses and providers (Figure 5). Moreover, since this study was performed to determine the single-time use of different agents, the effect on glasses with regular use needs to

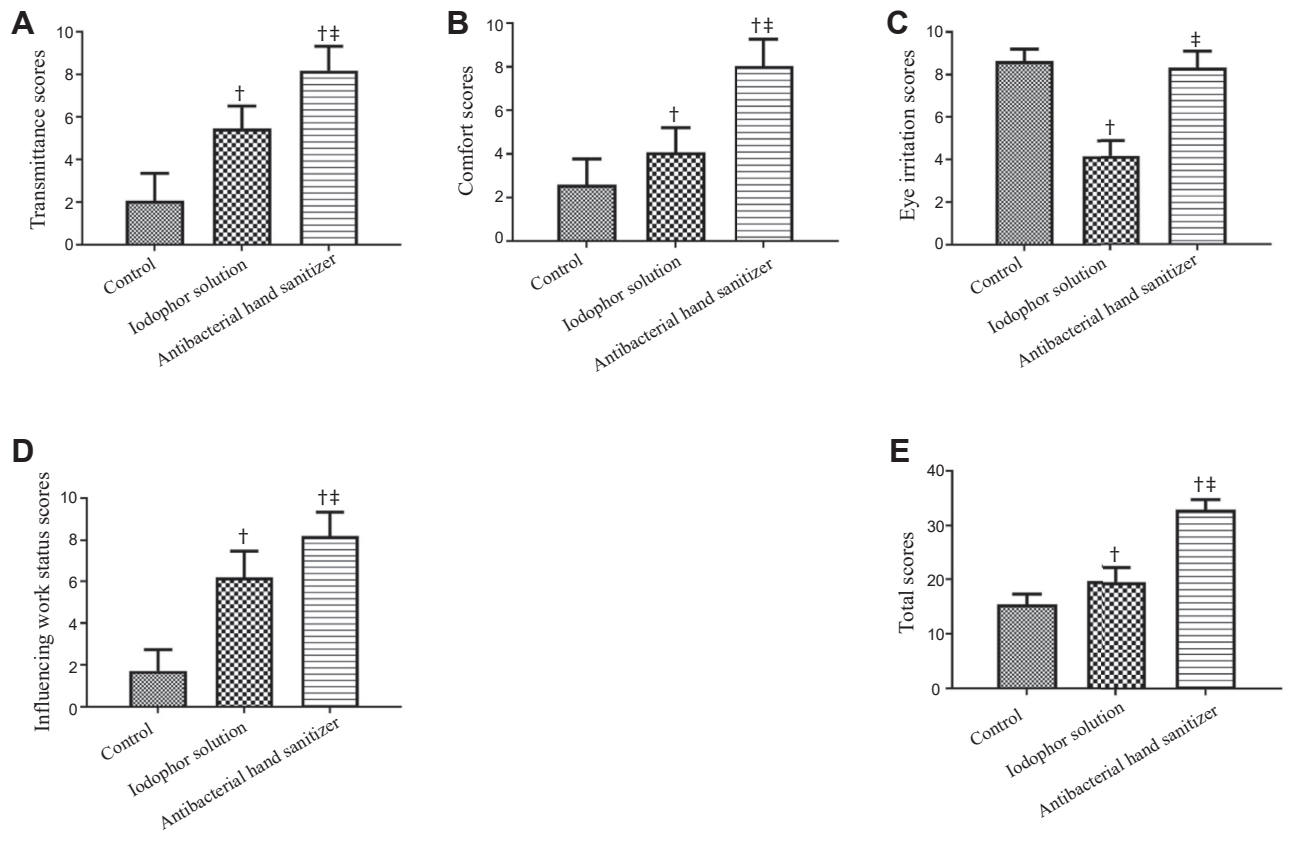


FIGURE 4

Results of the questionnaire for the 3 groups of health care workers. (A) Comparison of the transmittance scores of the 3 groups of goggles. (B) Comparison of goggle comfort scores among the 3 groups of health care workers. (C) Comparison of the eye irritation scores in 3 groups of health care workers (lower score indicates higher levels of irritation). (D) Comparison of the 3 groups of health care workers' self-perception of whether wearing goggles would interfere with their medical work (lower score indicates higher levels of interference). (E) Comparison of the total scores of the 3 groups. Data are presented as means (SD). * $P < .05$ vs control group. † $P < .01$ vs control group. ‡ $P < .01$ vs iodophor solution group.

be studied with longer follow-up. The fogging degree can also be impacted by perspiration from the participants. Strenuous or high workloads in the isolation ward may have influenced our results. Although we have tried to ensure consistency in the nature of work of the participants (all work in the COVID-19 isolation ward), a participant's workload is likely to be affected by their role (Figure 5).

Implications for Emergency Nurses

Our study has important implications in an emergency clinical practice setting. In the context of the current global epidemic of COVID-19, the number of seriously ill patients continues to increase worldwide. Health care professionals, especially emergency nursing staff, need to be able to safely and efficiently practice on the front lines. The fogging of goggles

significantly impedes patient care. This finding of our study can help prevent the fogging of medical goggles and facilitate the work of health care workers worldwide in the fight against COVID-19, especially for emergency nurses and providers who need to wear goggles for extended periods of time.

Conclusion

In summary, in the practical application of COVID-19 medical work, the use of antibacterial hand sanitizer (with chlorhexidine gluconate as the main active ingredient) diluted at a ratio of 1:1 with distilled water and internally applied to goggles was effective in preventing fogging compared with iodine and distilled water alone. Frontline clinical staff reported a clearer view through their goggles after using goggles treated

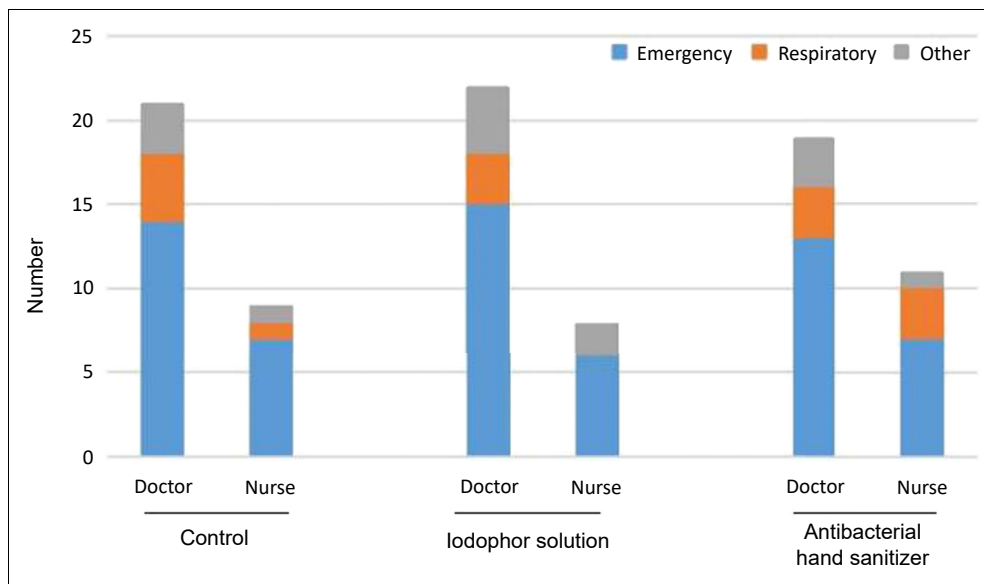


FIGURE 5

Descriptive visualization of roles of participants. Emergency, emergency department nurses, and providers; Respiratory, respiratory department nurses and providers; Other, nurses and doctors from other departments, including cardiology, gastroenterology, etc.

with antibacterial hand sanitizer diluted with distilled water. In addition, because of easy access to the materials involved, this method is easily accessible to clinical staff and could be easily reproduced in other clinical settings.

Data Availability Statement

All data generated or analyzed during this study can be made available. Further enquiries can be directed to the corresponding author.

Statement of Ethics

This study was approved by the Ethics Committee of the 900 Hospital of the Joint Logistics Team (2021-008) and performed per the revised Declaration of Helsinki principles. The trial has been registered in [ClinicalTrials.gov](https://www.clinicaltrials.gov) (registration number ChiCTR2100054392).

Author Disclosure

Conflicts of interest: none to report.

This study protocol was approved by the Military Biosecurity Research Special Program (20SWAQK48).

Hubei Wuhan Anti-epidemic Special (TKTJKY2020050). 900th Hospital Clinical Application Research Special (2020L041).

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Appendix

Questionnaire on fogging of 3 goggle pretreatment methods in isolation area

1. What is your gender
A. Male B. Female
2. What is your professional role
A. Doctor B. Nurse
3. Your age
4. Your length of time employed
5. What is your highest educational background
A. Master degree or above
B. Undergraduate degree
C. Junior college
D. High school / technical secondary school and below
6. How long do you wear goggles at one time (hour)
A. 1-2 hours B. 3-4 hours C. 5-6 hours D. more than 6 hours

7. Is there fog when wearing goggles?
A. Yes B. No

8. When does fogging start while wearing goggles?
A. 0-1 hour B. 1-2 hours C. 2-3 hours D. 3-4 hours
E. more than 4 hours

9. Is wearing goggles irritating to the eyes?
A. Yes B. No

10. What is your comfort score when wearing goggles?
(10 points: very comfortable without affecting any medical care work;

7-9 is relatively comfortable, and the general medical care work is not affected;

4-6 moderate comfort, affecting a small part of medical care work,

1-3 uncomfortable, seriously affecting medical care;

0 is very uncomfortable, which completely affects the medical and nursing work)

Comfort level

10 9 8 7 6 5 4 3 2 1 0

11. What is your professional title?

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WHAT A RAT RACE: A CASE STUDY OF RAT BITE FEVER IN AN EMERGENCY DEPARTMENT



Authors: Kelly Bedner, MSNEd, BSN, RN, CEN, and Elizabeth Crago, PhD, RN, Greensburg, and Mount Pleasant, PA

NCPD Earn Up to 8.5 Hours. See page 616.

Contribution to Emergency Nursing Practice

- In 2020, the CDC reported an increase in rodent activity.
- Rat bite fever is an acute illness caused by bacteria from rodents.
- This potentially debilitating or lethal syndrome requires astute assessment skills by ED clinicians to diagnose and provide timely interventions that reverse or limit the long-term consequences of this rodent-based infection.

Abstract

Rat bite fever is an acute illness caused by bacteria from rodents. In the United States, rat bite fever is considered rare; however, actual incidence is unknown because of lack of mandatory disease reporting requirements. Risk of development of rat bite fever after being bitten by a rat is approximately 10%. Early treatment is imperative as death is a potential complication. The following case study demonstrates the gravity of the syndrome.

Key words: Rat bite; Infectious disease; Rodent bite

Case Report

A 59-year-old man arrived in the emergency department with a chief complaint of a rat bite to the second and third fingers of his right hand. The patient stated that he was bitten 10 days before his arrival while attempting to kill a rat in his kitchen. The patient described the onset of profound weakness that began 5 days after the bite. He was so weak that he could not get up out of his chair and was consequently stuck in his chair for 5 days. He had attempted to summon assistance by yelling, but no one heard him. On the day of his ED visit, he had garnered enough strength to get out of the chair onto the floor, crawl to the phone, and call 911.

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Upon physical examination of the bite area, it was noted that the skin was healed with no visible redness or swelling. The patient was awake and alert; however, he was intermittently hallucinating, stating that he had been “seeing people walk through walls.” There was no vomiting, lymphadenopathy, chest pain, shortness of breath, or joint pain; however, while in the emergency department, he started complaining of back pain. His bilateral lower extremities were cool, clammy, and mottled. The palms of his hands were peeling and red. The patient had a medical history of hypertension, atherosclerotic heart disease, and obesity.

Initial vital signs were as follows: oral temperature 38°C, heart rate 103 beats per minute, respiratory rate 22 breaths per minute, blood pressure 187/93 mm Hg, oxygen saturation 99% on room air, and a bedside blood glucose of 121 mg/dL. The patient had been incontinent of both stool and urine before arrival. His abdomen was soft, nontender, and nondistended. His electrocardiogram showed nonspecific ST-T wave abnormalities.

A septic workup was initiated as part of the ED nursing protocol. Blood samples were drawn and sent to the laboratory for testing including a complete blood count (CBC), coagulations studies, metabolic panel, C-reactive protein, lactate and 2 sets of blood cultures. The patient’s CBC showed a white blood cell count of 16.2 k/uL with 90% neutrophils. Hemoglobin was 12.9, hematocrit 36.6%, and sed rate was greater than 130 mm/h. Coagulation studies reported a prothrombin time of 12.7 seconds,

international normalized ratio 1.2 seconds, and partial thromboplastin time 26.9 seconds. Metabolic panel reported a sodium of 134 mEq/L, potassium 4.6 mEq/L, blood urea nitrogen of 48 mg/dL, creatinine 1.5 mg/dL, glucose 147 mg/dL, and total creatine kinase 469 units/L. The patient's C-reactive protein was 32.3 mg/dL and lactic level was 1.8 mmol/L. The patient tested negative for influenza A and B. This patient was seen pre-COVID; therefore, no COVID testing was performed. The patient received acetaminophen for his fever and an intravenous 0.9 normal saline bolus of 30 mL/kg. The patient also received intravenous Unasyn 4.5 grams and vancomycin for antibiotic coverage.

A CT of the chest, pelvis, and abdomen was completed to rule out differential causes. There were no acute findings on the chest CT, and the pelvis/abdomen CT showed nonobstructive renal calculi. A magnetic resonance imaging of the brain was negative for any acute abnormalities. A lumbar puncture was completed and showed an elevation in the white blood cells at 54 and a protein count of 400. The cerebrospinal fluid cultures were negative.

At the conclusion of all assessments and diagnostic testing and in conjunction with his history, presenting illness, and signs and symptoms, the patient was diagnosed with sepsis secondary to rat bite fever.

Rat bite fever occurs when a person is bitten or scratched by a rodent. This syndrome may result from contact with rats, mice, squirrels, weasels, gerbils, and rat-eating carnivores such as dogs, cats, and pigs.¹

Signs and symptoms of rat bite fever include chills, fever, vomiting, headache, back and joint pain, a red rash to the hands and feet, and polyarthralgia. Symptom onset is 1 to 2 days after contact.² The bite itself usually heals very quickly.

Rat bite fever is most commonly diagnosed by history, symptoms, and blood culture results. The blood cultures will show the causative organism, usually *Streptobacillus moniliformis*, a Gram-negative bacillus commonly colonized in the nasopharyngeal passages of rats.^{1,3} The white blood cells are generally elevated up to 30,000/mm³ with an increase in the number of immature cell types in the blood sample. The CBC will also show a mild to moderate anemia.¹ The patient may have a significantly prolonged sed rate. The sed rate, or erythrocyte sedimentation rate, reveals inflammatory activity in the body. A syphilis test can also aid in the diagnosis of rat bite fever, as it will result in a false positive test in 25% to 50% of cases.¹

Complications of rat bite fever include endocarditis, myocarditis, meningitis, pneumonia, and abscesses of body

organs.¹ Other complications include nephritis, chronic anemia, and severe diarrhea with a resultant weight loss.

If not treated, the mortality rate of rat bite fever can be 7% to 13%.⁴

The primary treatment of rat bite fever is antibiotics, commonly amoxicillin, penicillin, erythromycin, or doxycycline.¹ If the patient develops endocarditis, ceftriaxone, gentamycin, and streptomycin may be used.¹ Remaining treatment is symptomatic and includes completing the sepsis bundles as applicable.

In this case study, the patient was hospitalized for a significant period of time. This is frequently observed in patients with rat bite fever. Patients are dehydrated and deconditioned because of the extreme weakness and often require intravenous hydration and antibiotics for an extended time.

This patient was admitted from the emergency department to a telemetry bed. He continued to receive intravenous fluids and antibiotics as well as daily laboratory work to monitor white blood cell counts, blood urea nitrogen, and creatinine. Owing to the weakness, subcutaneous heparin was administered every 12 hours to prevent deep venous thrombosis, and the patient received physical and occupational therapy throughout his hospitalization. He remained hospitalized for 3 weeks. Upon hospital discharge, it was recommended that he receive 4 more weeks of intravenous ceftriaxone 2 grams daily with home health; therefore, the patient had a peripherally inserted central catheter line placed before his return home. Upon discharge to his home environment, he was told to follow up with infectious disease, neurology, and his primary care provider to ensure a full recovery.

As with many rare but potentially debilitating or lethal syndromes, rat bite fever requires astute assessment skills by ED clinicians to diagnose and provide timely interventions that reverse or limit the long-term consequences of this rodent-based infection.

Author Disclosures

Conflicts of interest: none to report.

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EMERGENCY NURSING REVIEW QUESTIONS:

SEPTEMBER 2022



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These review questions are based on the Emergency Nursing Core Curriculum and other pertinent resources to emergency nursing practice. They offer emergency nurses an opportunity to test their knowledge about their practice.

QUESTIONS

1. A patient is being seen in the emergency department for general malaise. Which of the following laboratory values would cause you the most concern?
 - A. Sodium level of 144 mmol/L
 - B. Calcium level of 8.8 mg/dL
 - C. Aspartate aminotransferase (AST) level of 96 U/L
 - D. Serum troponin I level of 0.03 ng/mL
2. An elderly patient is diagnosed as having peripheral vascular disease upon discharge from the emergency department. Which of the following would further enhance the disease and cause the patient further complications?
 - A. Smoking
 - B. Alcohol
 - C. Calcium channel blockers
 - D. Narcotics
3. A cardiac arrest patient is noted to be in ventricular fibrillation. Cardiopulmonary resuscitation is in progress and the patient has an implantable cardioverter defibrillator (ICD) per family's history. You should:
 - A. await the defibrillator to function when it recognizes the fibrillation.
 - B. perform synchronized cardioversion as soon as possible.
 - C. defibrillate immediately with standard equipment.
 - D. await a magnet to turn off the implantable defibrillator.
4. In performing an ear irrigation on an adult patient with a visualized cerumen impaction, you should:
 - A. pull ear superiorly and posteriorly.
 - B. pull ear posteriorly and down.
 - C. irrigate using warm soapy water.
 - D. use cool saline with a drip method.
5. A cardiac monitor displays the following rhythm for a patient complaining of dizziness and shortness of breath. The patient does not describe any history of cardiac disease. How would you document this rhythm?

 - A. Sinus rhythm with second degree Mobitz I block
 - B. Sinus dysrhythmia
 - C. Sinus rhythm with P mitrale
 - D. Sinus rhythm with P pulmonale

ANSWERS

1. Correct answer: C

The AST is markedly elevated (C). This test evaluates liver function. AST is an enzyme found mostly in the liver, and the level rises as the liver is inflamed or injured. AST is also called serum glutamic-oxaloacetic transaminase. A

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sodium level of 144 mmol/L is within normal range (134-143mmol/L) (A). The calcium level is within normal limits (8.6-10.3 mg/dL) (B). A normal troponin I level is 0.0 to 0.4 mg/mL. The listed value is within normal range (D).¹

2. Correct answer: A

Smoking has been proven to enhance peripheral vascular disease owing to the vasoconstrictive effect of nicotine. If a patient continues to smoke, the peripheral vascular disease may worsen (A). Although alcohol use may cause confusion and increased tendencies for falling, it has not been associated with peripheral vascular disease (B). Calcium channel blockers may be used as a therapy for peripheral vascular disease to decrease vasospasms (C). Narcotics may be used to treat pain caused by decreased blood flow or vasospasms (D).²

3. Correct answer: C

If a patient remains in ventricular fibrillation with an ICD and the defibrillator does not function, the rescuer should proceed with standard defibrillation and cardiopulmonary resuscitation (C). ICDs can malfunction and may reach the full complement or therapy. A standard defibrillation should be used immediately (A). Synchronized cardioversion should be used for terminating an unstable organized rhythm, sending the shock on a defined R wave in the cardiac cycle (B). Although a magnet can be utilized to turn off an ICD, there is no need for a delay with treatment of the patient. All ICDs have a magnet sensitive switch that responds to a bar (or clinical ring) magnet. A bar (or clinical

ring) magnet that is placed directly over the ICD device will temporarily deactivate the defibrillator function (the magnet may be taped in place) (D).³

4. Correct answer: A

The dreaded ear irrigation is not a favorite procedure for the emergency nurse. Visualization of the canal should occur before the irrigation. The ear should be pulled superiorly, upward and posteriorly, back for an adult ear irrigation to facilitate the irrigation solution to enter the canal (A). Pulling the ear posteriorly and downward would occlude the canal (B). Saline or water would be an appropriate solution for irrigation, not containing soap, given that the bubbling of the soap would be difficult to remove from the ear canal (C). The irrigation should be room temperature or slightly warm. Cold substances should not be used for the purpose of irrigation, and the solution should be flushed gently in the canal as opposed to dripped (D).⁴

5. Correct answer: C

P mitrale is an atrial abnormality of the cardiac cycle, displaying a biphasic or bifid P wave. A characteristic M pattern is seen. A first degree heart block frequently accompanies a P mitrale pattern owing to the widening of the P wave. This is seen with left atrial enlargement or left atrial abnormality (C). A sinus rhythm with second degree Mobitz I block would display a progressive widening of the PR segment (A). A sinus dysrhythmia would display an irregular R-R interval (B). P pulmonale or right atrial abnormality would display a tall or peaked P wave. (D).⁵

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I AM SO TIRED AND WE PRETEND



Author: Jacqueline Rodricks, RN, BSN, Mississauga, Ontario, Canada

I am So Tired

Awake lying in bed

Thinking

What will my day be like today? Not good. I am so tired.

Driving to work

Thinking

Will I be able to make a difference today? No, because I am so tired.

Arriving at work and opening emails

Thinking

How am I going to make it through another day? I am so tired.

Trying to make a difference

Thinking

How many more resignations will come today? Everyone is so tired.

Asking everyone “How are you doing today?”

Thinking

I am not doing well, but I will keep on smiling even though I am so tired.

Participating in what I have to

Thinking

Do I actually have anything to contribute? No. I am so tired.

Taking everything personally

Thinking

Are the staff tired because of me? No, but I am so tired I don't accept that.

Working 11-12 hour days

Thinking

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Do the staff really think I have no idea? Yes, and I am so tired I can't care.

Driving home after a long day

Thinking

And crying . . . the day is over and I am so tired.

We Pretend

Fear and frustration

The pandemic was here

Fear and frustration

Rules changed through the year

Fear and frustration

People sick and dying

Fear and frustration

It was not for a lack of trying

Fear and frustration

Resignations keep coming

Fear and frustration

Staff were succumbing

Fear and frustration

Staff showing their ability

Fear and frustration

Trying to create stability

Fear and frustration

When will it end

Fear and frustration

We are good, we pretend

Author Disclosures Conflicts of interest: none to report.

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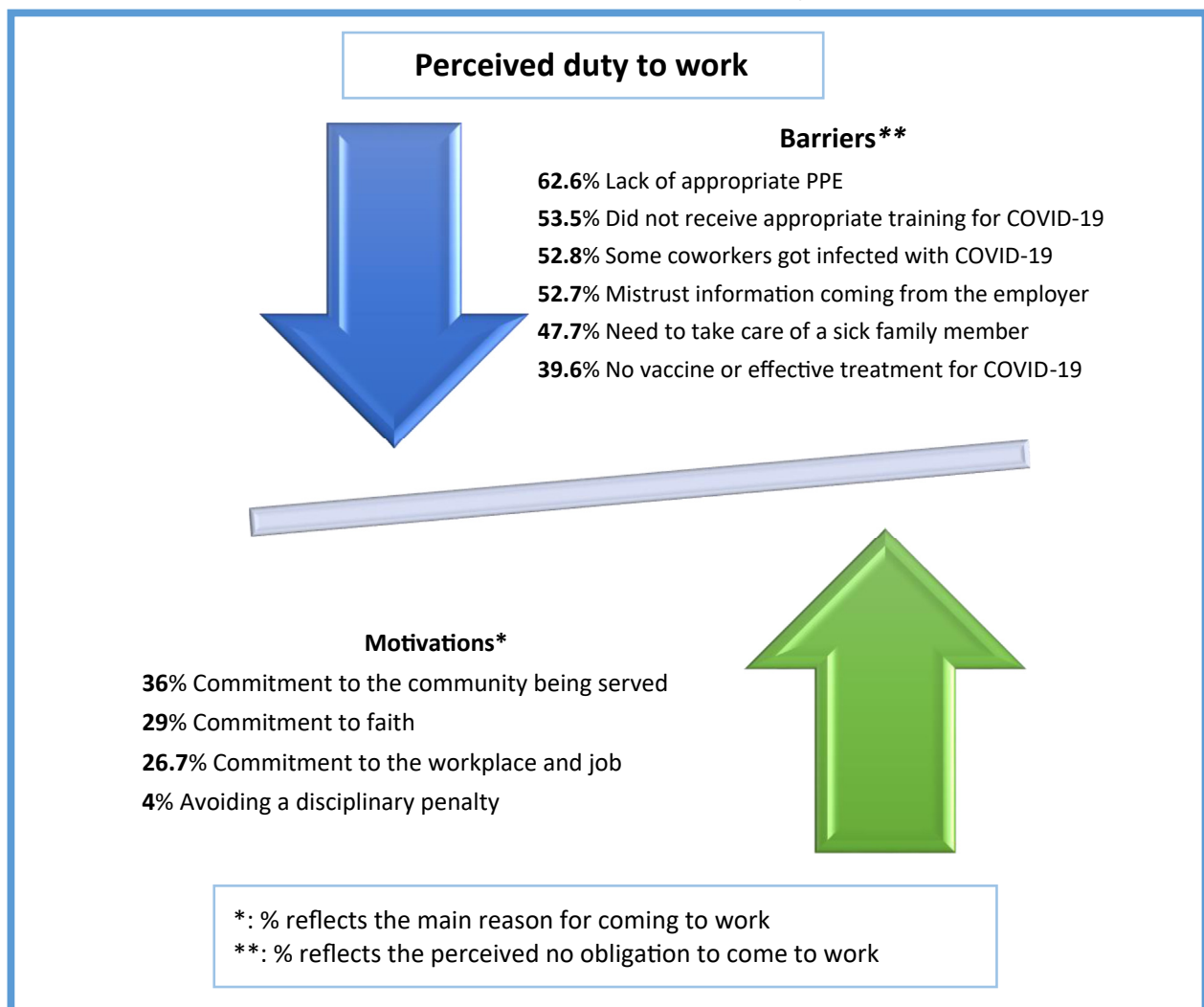
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DUTY TO WORK DURING THE COVID-19 PANDEMIC: A CROSS-SECTIONAL STUDY OF PERCEPTIONS OF HEALTH CARE PROVIDERS IN JORDAN



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DUTY TO WORK DURING THE COVID-19 PANDEMIC: A CROSS-SECTIONAL STUDY OF PERCEPTIONS OF HEALTH CARE PROVIDERS IN JORDAN



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NCPD Earn Up to 8.5 Hours. See page 616.

Abstract

Introduction: This study aimed to assess perceptions of duty to work among health care providers during the coronavirus disease 2019 response and to identify factors that may influence their perceptions.

Methods: This was a cross-sectional study conducted from April 1, 2020, to April 20, 2020, using an online survey distributed to health care providers in Jordan. Descriptive statistics were used, as well as chi-square test for independence to assess relationships between variables.

Results: A total of 302 questionnaires were included. Commitment to serve the community was the primary reason for coming

to work (36%), followed by commitment to faith (29.6%). The major perceived barriers for coming to work were lack of appropriate personal protective equipment and appropriate training (62.6% and 53.5%, respectively). Males perceived higher work obligations than females in all potential barriers ($P < .05$), except for the lack of appropriate training. Nurses perceived higher work obligations than other health care providers despite the lack of appropriate training ($\chi^2 = 11.83, P = .005$), lack of effective vaccine or treatment ($\chi^2 = 21.76, P < .001$), or reported infection among coworkers ($\chi^2 = 10.18, P = .03$).

Discussion: While the majority of health care providers perceive an obligation to work during the coronavirus disease 2019 pandemic, specific conditions, mainly lack of protective gear and training, may significantly alter their perception of work obligation. Providing training and proper personal protective equipment are among the vital measures that could improve the work environment and work obligation during pandemic conditions.

Key words: COVID-19; Health personnel; Health workforce; Ethics-medical

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Introduction

Countries around the world struggled to respond to the surge of patients with COVID-19 caused by the SARS-CoV-2, which overwhelmed many well-developed health care systems. During disasters and public health emergencies, health care providers (HCPs) were on the front lines, risking their lives to provide care for patients in need. Here, we define HCPs as health professionals who provide direct or indirect care to patients in hospital or prehospital settings. It is expected that HCPs have a clear work obligation during

pandemics and health disasters, which is based on the code of conduct that governs their practice.¹ While HCPs recognize an obligation to work, they also expect to maintain their own health and well-being in order to provide care for patients.²

During pandemic disasters, while the need for HCPs is exacerbated because of the dramatic increase in work volume, a significant proportion of HCPs become infected themselves and are unable to provide care, leading to a staff shortage.³⁻⁸ This shortage in staff, along with increasing demand, puts HCPs at a higher risk of infection, making matters worse.⁹ As a result, some HCPs may become unwilling to report to work because of the risk of infection to themselves or their families. This can dramatically overwhelm hospitals and stretch staff resources thin, rendering them unable to provide the services that are needed the most during such situations.

The willingness of HCPs to report to work is one of the most important factors in the face of surge capacity limitations in response to the COVID-19 pandemic. HCPs are less willing to report for duty during disease outbreaks.^{10,11} There are 2 positions with respect to the ethical obligation to work during disasters.¹ On one hand, some argue that HCPs are obligated to maintain their health in order to be able to care for others and not to be victims. In addition, they believe that it is not reasonable that HCPs threaten their own lives and the lives of their families to care for others.¹ A study performed by Damery et al¹ found that about 30% of nurses, 25% of hospital doctors, and 18% of general practitioners believe that they do not have to report for duty if doing so would risk themselves and/or their families. In contrast, others believe that HCPs should have limited self-regard and should accept potential harm in performing their job.¹² For instance, a study performed by Koh et al¹² assessed the impact of SARS on HCPs in Singapore. While the majority (76%) of participants felt at great risk of exposure to SARS, more than two-thirds (69.5%) accepted the risk of potentially contracting the disease as part of their job.

The COVID-19 pandemic has reintroduced the issue of role conflict and role abandonment among HCPs. The risk of infection to oneself and family has led some workers to abstain from their work. For instance, in an elderly-care home in Australia, after cases of COVID-19 among residents were reported, most of the workers did not report to work as scheduled because they felt in danger of infecting their family members.¹³ Another case of role abandonment occurred in a residential home in Spain that resulted in mortality for elderly people amid the COVID-19 response.¹⁴ It is, therefore, of primary importance to understand the perceived duty to work among HCPs during pandemic disasters. This is crucial to maintain staffing, maintain good quality patient care, and keep the health care system functional in such situations.

Disaster preparedness of health care facilities is paramount to ensure effective and efficient response to public health emergencies such as the COVID-19 pandemic. To achieve optimal disaster preparedness, the training of HCPs should adopt an all-hazards approach that utilizes generic basic principles for disaster scenarios.¹⁵ The work of McCabe et al¹⁶ provides a framework for evaluating the disaster preparedness of health care systems. The “ready, willing, and able” (RWA) framework can be applied to health care delivery systems at the individual, organizational, and governmental levels. Based on the RWA framework, the maximum overlap between the 3 domains, ‘ready,’ ‘willing,’ and ‘able,’ provides the maximum quality preparedness and response to public health emergencies. In this context, “ability” refers to the “actual operational power of an individual to perform a task”; “willingness” refers to the “state of being favorably predisposed in mind toward specific responses”; and “readiness” to respond means that an individual is “available for prompt reaction, service, or duty.”¹⁶ Therefore, the perceived duty to work can be explored within the context of the RWA framework.

In Jordan, the government has implemented 1 of the strictest lockdown policies in the world.¹⁷ This resulted in keeping the number of cases of COVID-19 under control and within the managing capacity of the Jordanian health care system. However, early in June 2020, Jordan, along with many other countries, started to relax the strict measures of social distancing to support its struggling economy. This resulted in a spike of cases of COVID-19, which put HCPs at high risk of contracting the disease and spreading it to their families. During the period from January 2021 until the end of March 2021, the spread of the pandemic was among the highest in the world, stressing the already limited health care resources.¹⁸ In this climate of uncertainty, the following questions are highlighted: (1) Are HCPs obligated to work in conditions that put them and their families at higher risk than day-to-day conditions? (2) Are there conditions where HCPs become no longer obligated to provide care for the sick? This study, therefore, aimed to assess the perceptions of duty to work among HCPs during the COVID-19 response and to explore factors that may influence their perceptions.

Methods

DESIGN

This was a cross-sectional descriptive study using an online questionnaire using a convenience sampling method with HCPs in Jordan.

MEASURES

The questionnaire was developed by an expert panel of HCPs and researchers (4 PhD holders in the fields of nursing and paramedicine) (Supplementary Appendix). The questionnaire items were also based on previous pandemic-related research,^{1,19,20} as no standardized tool was found to assess the perception of duty to work during a pandemic. The questionnaire included 14 items addressing 3 domains: demographics (7 items), 1 major reason for coming to work, and potential barriers for coming to work (6 items). The potential barrier statements take into consideration the RWA framework.¹⁶

The first section included information about sex, age, marital status, presence of children, education, job, and work experience. In the second section, participants were asked about the main reason for reporting to work during the COVID-19 response. Options that participants could select included: commitment to the community being served, commitment to faith, commitment to workplace and job, avoidance of penalties, and choice not to work in such situations. These options assumed that the participant was able to work. The third section included questions using a 6-point Likert-type scale to determine their barriers to work during COVID-19. Participants were asked to choose from 1 (not at all obligated) to 6 (strongly obligated). The questionnaire was pilot tested for readability and understanding of all terminologies by 10 participants and then modified according to participants' feedback. The final version of the questionnaire was then approved by the expert panel. The internal consistency using the Cronbach alpha coefficient was 0.84 for the barrier to work items, indicating good reliability. Google forms (Web application, Google) were used to develop the online questionnaire and the disseminated link.

SETTING

The survey took place in the country of Jordan. The majority of the health care workforce in Jordanian hospitals are nurses (44%) and physicians (25%).²¹ The majority of nurses are females whereas the majority of physicians are males.²² In the prehospital setting, emergency medical service (EMS) providers number approximately 2000, with males being the majority.²³ During the time of data collection, the number of cases of COVID-19 increased incrementally, as patients were in hospital isolation, and exposed people were quarantined. On the last day of data collection, there was a cumulative total of 425 cases and 7 deaths,¹⁸ and the health care system in the country was

not overwhelmed with patients with COVID-19 (Figure 1). However, there were reported cases of infection among HCPs working at the 3 hospitals in Jordan that were designated as primary inpatient centers for patients with COVID-19. These hospitals were excluded from sampling. The Raosoft online software (Raosoft, Inc., 2004) was used to estimate the required sample size with a confidence level of 95% and 5% margin of error. This requires 323 participants to carry out this study, given that the targeted HCPs are about 2000.²⁴

PARTICIPANTS

HCPs in Jordan were invited to voluntarily participate in the study. Potential participants included physicians, nurses, and allied health professionals (ie, laboratory and radiology technicians). EMS providers encompassing emergency medical technicians, intermediates, and paramedics from the prehospital setting were also invited to be part of the study.

DATA COLLECTION PROCESS

The online questionnaire link was shared with potential participants over social media, mainly through closed WhatsApp groups of HCPs. Responses were collected from April 1, 2020, to April 20, 2020. On April 10, 2020, the questionnaire link was reshared with the groups as a reminder for potential participants. No internet protocol (IP) addresses were collected.

DATA ANALYSIS

The online data were exported into the Statistical Package for the Social Sciences (SPSS), version 25, (Chicago, IL) for analysis. Continuous variables were reported as means and SDs, whereas categorical variables were reported as frequencies and percentages. Missing data were excluded, and valid percentages were used. The 6-point Likert-type questions were dichotomized for simplicity and ease of interpretation.²⁵ To score the responses, the first 3 choices were merged and labeled as "not obligated," whereas the last 3 choices were labeled as "obligated." A chi-square test for independence was used to assess relationships between demographics and potential barriers for duty to work with a P value $< .05$ to determine statistical significance. Bonferroni correction was used to adjust P value. An adjusted standardized residuals test was performed to identify between-group differences with 1.96 as a cut point for significance.

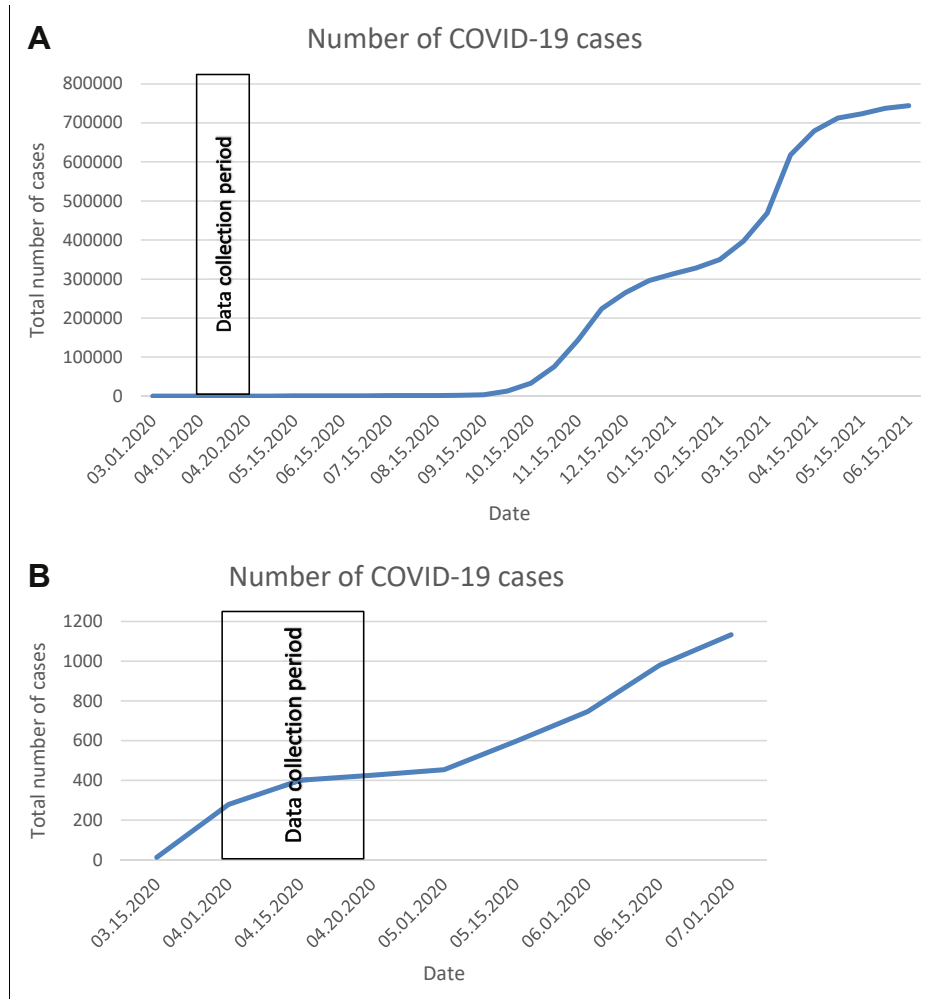


FIGURE 1

A: Total number of cases reported in Jordan, B: Total number of cases reported during the lockdown period.

ETHICAL APPROVAL

This study was approved by the Institutional Review Board at Jordan University of Science and Technology (204/2020).

Results

DEMOGRAPHICS

Of the 306 questionnaires received online, 302 (98.6%) were complete and eligible for further analyses. [Table 1](#) shows that the majority of participants are males (55.0%), married (69.8%), have children (65.3%), have a bachelor's degree or higher (74.8%), and work

as nurses (51.9%). Participants have a mean age of 34.3 (SD = 8.1) years and a mean experience of 11.1 (SD = 7.9) years.

MAIN REASONS FOR REPORTING TO WORK

Participants were asked about the main reasons they reported to work during the COVID-19 pandemic. [Table 2](#) demonstrates that 'commitment to the community being served' was the main factor for reporting to work (36.0%), whereas 'commitment to faith' was the second, and 'commitment to the workplace and job' was the third (29.7% and 26.7%, respectively). The least important reason for reporting to work was 'avoiding a disciplinary penalty,' which was represented by only 4.0% of

TABLE 1
Demographics of the study participants (N = 302)

Variable	n*	%
Sex		
Male	164	55.0
Female	134	45.0
Age		
Mean (SD)	34.3	8.1
Median	33	
25% and 75% quartile	28-40	
Marital status		
Single	78	26.2
Married	208	69.8
Others (not specified)	12	4.0
Have children		
Yes	194	65.3
No	103	34.7
Education		
High school	7	2.3
Diploma	68	22.8
Bachelors or higher	223	74.8
Job title		
Physician	28	9.4
Nurse	154	51.9
EMS providers	51	17.2
Other allied (not specified)	64	21.5
Work experience		
Mean (SD)	11.1	7.9
Median	10	
25% and 75% quartile	4-17	

EMS, emergency medical services.

* Missing participants were not included, and valid percentages were used.

participants. Only 3.7% of participants indicated that they 'would not report to work under such conditions.' The Table also demonstrates that commitment to the served community was selected most frequently for all types of jobs, whereas avoiding penalty and not reporting to work were selected most frequently by the other allied health group (9.5% and 11.1%, respectively, $\chi^2 = 28.68, P = .004$)

WORK OBLIGATION BARRIERS

Participants were asked about their perceived work obligation during the COVID-19 crisis under certain conditions as potential barriers for reporting to work. Table 3 demonstrates

the dichotomized responses to perceived work obligation under such conditions. The lack of availability of appropriate personal protective equipment (PPE) is the greatest barrier for the obligation to report to work (62.6%), followed by the lack of appropriate training (53.5%). While the lack of vaccine or treatment for the COVID-19 infection was the weakest barrier for the obligation to work, it was selected by more than one-third (39.6%) of participants. In a situation where coworkers become infected with COVID-19, just under half of the study sample (47.2%) perceived an obligation to report to work. Similarly, if the participant mistrusted information supplied by the employer, just under half of the participants (47.3%) perceived a work obligation. However, if there was a need to take care of a sick family member, over half of the participants (52.3%) still perceived an obligation to report to work.

Table 3 also shows the comparisons between participants' perceived work obligation based on their sex differences. As shown in the Table, except for the lack of appropriate COVID-19 training, male participants showed significantly higher perceived work obligation than female participants in all potential barriers including lack of appropriate PPE (males 47.6% and females 24.6%, $\chi^2 = 16.59, P < .001$); presence of COVID-19 infection among coworkers (males 54.6% and females 39.6%, $\chi^2 = 6.67, P = .02$); mistrust of information from employer (males 54.3% and females 40.2%, $\chi^2 = 5.83, P = .03$); lack of vaccine or effective treatment (males 67.3% and females 52.3%, $\chi^2 = 6.86, P = .02$); and a need to take care of a sick family member (males 59.5% and females 43.5%, $\chi^2 = 7.45, P = .01$).

Table 4 shows the relationships between participants' perceived work obligation and their profession. Chi-square test with an adjusted standardized residuals test was performed to identify between-group differences. If some coworkers become infected, nurses are more likely to perceive an obligation to work, whereas other allied HCPs are less likely to perceive an obligation to work (physician 51.9%, nurses 54.5%, EMS providers 39.2%, and others 32.8%, $\chi^2 = 10.18, P = .03$). In addition, if there is a lack of an effective vaccine or treatment for COVID-19, nurses are more likely to perceive an obligation to work, whereas other allied HCPs are less likely to perceive an obligation to work (physician 57.1%, nurses 71.7%, EMS providers 56.0%, and others 38.1%, $\chi^2 = 21.76, P < .001$). In the case of a lack of appropriate training on COVID-19, nurses are more likely to perceive an obligation to work, whereas EMS providers are less likely to perceive an obligation to work (physician 42.9%, nurses 55.6%, EMS providers 30.0%, and others 39.7%, $\chi^2 = 11.83, P = .005$). There was no significant relationship between job type

TABLE 2
Participant responses regarding main reason for coming to work

Participant response	All groups		Physician		Nurse		EMS provider		Other allied	
	n	%*	n	%	n	%	n	%	n	%
Commitment to served community	106	36.0	14	50.0	56	36.4	16	31.4	21	33.3
Commitment to faith	89	29.7	7	25.0	54	35.1	15	29.4	12	19.0
Commitment to workplace and job	80	26.7	6	21.4	40	26.0	16	31.4	17	27.0
Avoid penalty	12	4.0	1	3.6	3	1.9	2	3.9	6	9.5
Will not report to work in such situations	11	3.7	0	0.0	1	0.6	2	3.9	7	11.1

EMS, emergency medical services.

* Missing participants were not included, and valid percentages were used.

and other potential barriers, including lack of appropriate PPE, mistrusting information from the employer, and the need to take care of a sick family member. We found no

significant relationship between perceived work obligation and marital status or between perceived work obligation and having children.

TABLE 3
Participants' responses for work obligation variables with comparison by male versus female sex

Potential barrier	Total		Male		Female		Chi-square	df	Adjusted P value [†]
	n	%*	n	%	n	%			
Lack of appropriate PPE									
Not obligated	189	62.6	86	52.4	101	75.4	16.59	1	< .001
Obligated	113	37.4	78	47.6	33	24.6			
Some coworkers became infected with COVID-19									
Not obligated	159	52.8	74	45.4	81	60.4	6.67	1	.02
Obligated	142	47.2	89	54.6	53	39.6			
Mistrust information coming from the employer									
Not obligated	158	52.7	75	45.7	79	59.8	5.83	1	.03
Obligated	142	47.3	89	54.3	53	40.2			
Did not receive appropriate training for COVID-19									
Not obligated	160	53.5	77	47.2	79	59.8	4.65	1	.06
Obligated	139	46.5	86	52.8	53	40.2			
No vaccine or effective treatment for COVID-19									
Not obligated	118	39.6	53	32.7	63	47.7	6.86	1	.02
Obligated	180	60.4	109	67.3	69	52.3			
Need to take care of a sick family member									
Not obligated	142	47.7	66	40.5	74	56.5	7.45	1	.01
Obligated	156	52.3	97	59.5	57	43.5			

PPE, personal protective equipment.

* Missing participants were not included, and valid percentages were used.

† Chi-square test was used with Bonferroni correction to adjust *P*-value.

TABLE 4
Participants' responses to work obligation variables with type of job comparison

Potential barrier	Physician		Nurse		EMS provider		Other allied		Chi-square	df	Adjusted P value [†]
	n	%*	n	%	n	%	n	%			
Lack of appropriate PPE											
Not obligated	18	64.3	91	59.1	36	70.6	41	64.1	2.29	3	.76
Obligated	10	35.7	63	40.9	15	29.4	23	35.9			
Some coworkers became infected with COVID-19											
Not obligated	13	48.1	70	45.5	31	60.8	43	67.2	10.18	3	.03
Obligated	14	51.9	84	54.5	20	39.2	21	32.8			
Mistrust information coming from employer											
Not obligated	14	50.0	70	45.8	32	62.7	39	61.9	7.24	3	.06
Obligated	14	50.0	83	54.2	19	37.3	24	38.1			
Did not receive appropriate training for COVID-19											
Not obligated	16	57.1	68	44.4	35	70.0	38	60.3	11.83	3	.005
Obligated	12	42.9	85	55.6	15	30.0	25	39.7			
No vaccine or effective treatment for COVID-19											
Not obligated	12	42.9	43	28.3	22	44.0	39	61.9	21.76	3	< .001
Obligated	16	57.1	109	71.7	28	56.0	24	38.1			
Need to take care of a sick family member											
Not obligated	14	50.0	67	44.1	23	46.0	35	55.6	2.46	3	.57
Obligated	14	50.0	85	55.9	27	54.0	28	44.4			

EMS, emergency medical services; PPE, personal protective equipment.

* Missing participants were not included, and valid percentages were used.

† Chi-square test was used with Bonferroni correction to adjust *P*-value.

Discussion

Our study findings show that commitment to the served community was the main reason for reporting to work in the early phase of the COVID-19 pandemic in Jordan. The study also indicated that the lack of availability of appropriate PPE and the lack of appropriate training were the greatest barriers to the perceived obligation to report to work, whereas lack of vaccine or treatment for COVID-19 was found to be the weakest barrier. Males perceived higher work obligation than females, and nurses perceived a higher work obligation than other HCPs.

We found that commitment to the served community was the major stimulus for all types of HCPs to report to work despite the increased risk. To explain this, there is a need to put the findings in context. During the data collection period, the media was very active in highlighting the crucial role of the frontline HCPs in serving the community

and saving lives in the pandemic. This was clear when the country was on strict lockdown and under curfew except for those HCPs who could move freely through check-points with high respect. These situations may have helped make the commitment to serve the community the optimal reason for coming to work. In addition, the finding that those who were not willing to report to work or would report only to avoid penalties were mainly among the other allied health group of professionals, is in congruence with the previous studies indicating that physicians and nurses have a higher willingness to work than others.^{26,27} It should be noted here that HCPs in Jordanian hospitals are full-time workers. Those who do not report to work as scheduled are subject to some form of penalty. In the prehospital setting, EMS providers work in a quasi-military system (under the umbrella of the Civil Defense) and may therefore be subject to more severe forms of penalty in cases of work absenteeism.

The findings of our study also showed a high willingness of HCPs to work during the COVID-19 pandemic, which is in congruence with the recent studies in this field.^{26,28,29} Willingness of HCPs to work during influenza pandemics was examined in previous studies, and results were varied. A systematic review found that willingness to work during influenza pandemics ranged from 23.1% to 95.8%, depending on the context and scenario of the study.²⁷ The review also found that being male, a physician, or a nurse was associated with willingness to work. Recent studies on the COVID-19 pandemic found varied results as well. For instance, a recent study in Jordan found that while 96.4% of participants (physicians, nurses, and EMS providers) were willing to report to work during the pandemic, fewer than two-thirds (64.7%) were willing to provide direct care to patients with COVID-19.²⁸ Other studies found that the willingness of HCPs was 77.1% in China,³⁰ 69% in Bangladesh,²⁹ and 75% in Palestine.²⁶ Being male, working in the emergency department, having received appropriate training, and having low work-related stress levels and long experience were associated with willingness to work,^{26,28,29} whereas concern for family and lack of safety measures were the major barriers to willingness to work.^{28,29}

BARRIERS TOWARD PERCEIVED WORK OBLIGATION

The findings of our study highlight the importance of exploring and managing the main barriers that may influence the decision of HCPs to report for duty during pandemics. In this study, while the overwhelming majority of participants indicated a willingness to work during COVID-19, only about half of them perceived an obligation to report to work in the presence of any of the aforementioned barriers. Previous studies indicated that emergency responders face difficulties in balancing their safety and duty to work during disasters and public health emergencies, which could result in a significant shortage of HCPs.^{10,31} Previous studies also indicated that the perception of duty to work has a major influence on reporting for duty.^{1,32}

PPE are of prime importance to keep HCPs safe from contracting infections. During disease outbreaks, there might be a need for additional PPE and training to protect workers. In the United Kingdom, during the heat of the COVID-19 response in March 2020, HCPs threatened to quit their work if they were not provided with appropriate PPE, as they felt that working without enough PPE would have exposed them to unacceptable risks.²⁰ In addition, for the COVID-19 response, McConnell⁹ indicated that in the case of a PPE shortage, the risk of infection increases, and

the chance of fatal infection reaches approximately 1/200. In such a case, the author believes that HCPs are not obligated to work.⁹ Our findings are in congruence with these previous studies. That is, lack of proper PPE was found to be the major barrier to perceived work obligation, as about two-thirds of participants indicated that they did not feel obligated to report to work during the COVID-19 pandemic if there was a lack of PPE.

Our study indicated that in the case of inappropriate training, more than half of the participants perceived no obligation to work, making it the second major barrier to working during the COVID-19 response. Our findings were in congruence with previous studies, as knowledge and training on infectious diseases and infection control practices are among the most important contributing factors to motivating HCPs and enhancing their intention to work during public health emergencies.^{24,32-35} A study by Weingarten et al³⁶ found that HCPs and families of infected patients were at the highest risk of infection with COVID-19. In the middle of the COVID-19 response, a study in China found that 64.6% of participants received specific COVID-19 training at hospitals.³⁰ The study also showed that 77.1% of participants were willing to provide care for patients with COVID-19 infection.

Although vaccine availability is important in protecting responders, prompt availability of vaccination in the early stages of disease outbreaks is unlikely because of the long process of its development and distribution. However, research studies have indicated that vaccine availability might influence the decision on reporting to work.^{23,37} For instance, a study found that lack of effective PPE, along with the absence of self and family vaccination, were reported to dramatically decrease willingness to report for duty from 91% to 4%.³⁷ In our study, however, the availability of effective vaccines and treatments was least indicated by participants as a barrier for duty to treat. Their response can be explained by the observation that HCPs, in general, acknowledge that the development of a vaccine may require many months before it becomes available to responders, and that with proper PPE, they can be safe. In addition, the COVID-19 cases were under control during the period of data collection, which could have made HCPs less concerned about not being vaccinated.

SEX DIFFERENCES

Our study indicates that male participants perceive higher work obligation than female participants in the presence of all potential barriers. This might be due to the stereotypes concerning the role expectations of males and females in the

society of Jordan. In Jordan, females are generally assumed to be the primary caretakers of dependents in the households.³⁸ This unequally socially imposed role indicates that the exposure of female HCPs to the COVID-19 infection in the workplace could put their dependent family members at higher risk, which might be the main factor for their lower perception of work obligation compared with the males. In addition, a recent report on discrimination in Jordan found that women are still being viewed as mothers and wives, which may undermine their social status, economic status, and profession.³⁸ Our study findings are also in congruence with previous studies indicating that the male sex is a factor associated with willingness to work.^{27,32,39,40}

OCCUPATIONAL DIFFERENCES

There are occupational differences in perceptions of working during pandemics. According Malm et al⁴¹ and McConnell,⁹ the benefits one gains from their job, including social prestige, determine the level of duty to work. That is, HCPs such as physicians and nurses experience a stronger sense of duty to treat patients than social care workers owing to the greater benefits they acquire from the job.⁹ Although all HCPs are needed to keep health agencies functioning during normal times, some jobs are needed more than others during public health emergencies. For instance, nurses are most essential during pandemics, and they are at the highest risk of contracting infection due to frequent and long duration of contact with patients.⁴¹ While historical social and power dynamics have granted nurses fewer benefits and social prestige compared with physicians, our study found that nurses perceive higher work obligation than other HCPs, including physicians, in situations where they lack appropriate training, lack effective vaccine or treatment, or there is a reported infection among coworkers. Previous studies showed that physicians and nurses have a higher willingness to work than others,^{26,27} with physicians being the most likely to be willing to work.²⁷ Furthermore, after the Fukushima nuclear disaster in Japan in 2011, a study found that only 47% of HCPs reported to work in their hospitals (within the impacted zone).⁴² Second to the clerks (38% reported to work), only 48% of nurses reported to work. This fact was explained by suggesting that clerks and nurses were mostly women who had evacuated from the impacted area due to the concern of radiation exposure to their children. In our study, lower concerns about the impact to children from COVID-19

infection may explain the higher perceived work obligation among nurses than others.

EFFECT OF HAVING CHILDREN

The current study found no significant effect of having children on the perceived work obligation, which contradicts the findings of previous studies.^{42,43} The reason for the difference in our findings from other studies is unclear. A possible explanation is that early in the COVID-19 outbreak, children were the least affected group from COVID-19 infection. However, our study indicated that almost half of the participants perceived no obligation to report to work if they needed to take care of a sick family member (not necessarily children). This supports the findings of a previous study indicating that 28% of HCPs agree that it is professionally acceptable to abstain from work to protect the family during pandemics.⁴⁴ With regard to the COVID-19 response, McConnell⁹ indicated that it is morally permissible for HCPs to abstain from work when the risk and burden to self and family outweigh the duty to treat. This is the case in COVID-19, as the elderly are at a much higher risk of death from COVID-19 infection than the young.⁹ During pandemics, first responders are more concerned that they could transfer the contagious disease to their family members.⁴³ During the SARS outbreak, for instance, many HCPs contracted the disease from their work, and some of them transmitted the infection to their family members.² It was found that 21% of victims of the SARS outbreak were HCPs.⁴⁵ The feeling of uncertainty and the concern for family safety are reported to be the main sources of role conflict during disasters.⁴⁶ Another potential reason for the conflicting findings from our study, compared with previous studies, was that we did not measure whether the participant was the primary caretaker for their children; we only measured whether they had children.

RWA FRAMEWORK

This study assessed the perceived duty to work within the context of the RWA framework. In assessing the readiness domain, the readiness should be assessed at the individual, agency, and system levels. That is, at the agency or system levels, readiness includes “staff, structure, and stuff.” This means that the presence of barriers (in staff, structure, or stuff) for reporting for duty may influence the readiness domain of the framework.¹⁶ In our study, the lack of appropriate PPE (stuff) was the greatest barrier to the perceived

obligation to report to work. For the willingness domain, the willingness of an individual to respond appropriately is influenced by many factors. For instance, training experiences can provide confidence in the ability to respond, which in turn affects willingness to respond. Other factors may also influence the willingness to respond such as risk perception, trust relationships, and political imperatives.¹⁶ Our study found that the lack of appropriate training and mistrust with the employer were among the major barriers for perceived work obligation. For the ability domain, which is the actual ability of an individual to perform a task, included are knowledge, competencies, and proficiencies that come from education, training, and preparatory experiences.¹⁶ Our study found that lack of appropriate training influences the perceived duty to work, indicating that proper training can improve both the ability and willingness to respond. In addition, previous studies found that HCPs trained on disaster situations are more likely to perform better during actual disasters.¹⁵ Therefore, it is plausible that applying RWA constructs would improve the likelihood of coordinated, comprehensive, and competent responses to public health emergencies. Future study is needed to test this framework.

Limitations

The inherent nature of cross-sectional designs and the type of questions may have influenced the way participants answered the questions. Participants were enrolled mainly through closed WhatsApp groups of health care professionals, the most widely used social media tool in Jordan. Owing to the nature of the online survey, those who were not using these social media tools or were unavailable during the data collection period may not have had the chance to participate, which could limit the representativeness of the sample. We also could not exclude the possibility of response bias as the sample did not reflect the exact population demographics, given that more EMS providers and less physicians were represented in the study sample. In addition, the period of data collection occurred in an early phase of the pandemic, during lockdown, and with a relatively low number of COVID-19 cases in Jordan. Had the study been conducted in a later phase of the pandemic with more population deaths among coworkers and their families, the study may have produced different results. Finally, limits to generalizability include nonsystematic sampling and relatively small sample size. Health care specialty was not measured, nor were the age(s) of children and primary caretaker status of the participant.

Implications for Emergency Nurses

Individual clinicians and health care agencies in Jordan should be proactive in their disaster preparedness for infectious disease surges. Each organization and trained professional must assess factors to ensure they are ready, able, and willing to provide care for patients in pandemic surge conditions. These preparedness activities may include, but are not limited to, providing training, proper PPE, vaccinations, incentives, physiological and psychological support for staff and their families, and keeping them informed about the pandemic progress.

This study assessed the perceived work obligation of HCPs within the context of the RWA framework. Although the perceived work obligation can be influenced by the 'ready,' 'willing,' and 'able' domains, this study focused mainly on the 'willing' domain at the individual level. Future studies may use the RWA constructs as a framework to assess the preparedness of the health care system of Jordan for quality response to future disasters taking into consideration the 'ready,' 'willing,' and 'able' domains at system and organizational levels.

There is a plethora of resources that can be used for disaster preparedness at individual and organizational levels.⁴⁷⁻⁴⁹ For instance, the World Health Organization developed a strategic framework for emergency preparedness identifying the principles and elements applied in developing effective emergency preparedness at all levels.⁴⁷ In addition, the US Department of Health and Human Services developed the Kaiser Permanente Hazard Vulnerability Analysis as a tool that can be used by health care facilities to analyze hazards using a systematic approach.⁵⁰ At the individual and household levels, the Society for Academic Emergency Medicine and [Ready.gov](https://www.ready.gov) provide disaster preparedness plans and toolkits.^{48,49} At the local level, the health care system in Jordan is ill-prepared for disaster response and lacks the necessary resources to support professional and organizational readiness.⁵¹ However, health officials and decision-makers can adapt such resources within the context of Jordan to enhance the response preparedness of the country at the household, professional, and organizational levels.

Conclusions

During the COVID-19 pandemic, it was clear that the need for HCPs was never greater. This study assessed the perceived work obligation of HCPs within the context of the RWA framework. While the majority of HCPs were

willing to report to work during pandemics in our study, many barriers can significantly influence the perceived obligation to report to work. The lack of PPE, along with the lack of appropriate training, were the major perceived barriers. Males and nurses perceived more obligation to work than females and other HCPs, respectively. There is an urgent need to provide training, proper PPE, vaccinations, incentives, and physiological and psychological support for staff and their families to motivate HCPs to report to work during pandemics. Relying on the HCPs' sense of commitment to work may not be the best strategy to maintain staffing; other practical state, organizational, and individual preparedness interventions are recommended.

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Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jen.2022.04.004>.

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Please submit your manuscript or manuscript idea to Pat Clutter, MEd, BSN, RN, CEN, FAEN at: prclutter@gmail.com or Nancy Mannion, DNP, RN, CEN, FAEN at: NBonalumi@comcast.net.

Supplementary Appendix

Questionnaire

Dear health care providers,

We are hoping for your valued participation in our research by completing this survey entitled: **Duty to Work during the COVID-19 Pandemic: Perceptions of Health-care Providers in Jordan**. Your feedback is important. This survey designed to assess the perceived work obligation of the healthcare providers in Jordan during the COVID-19 pandemic, and the factors that may influence their perception. The survey should take less than 5 minutes to complete.

Your participation is strictly voluntary, and responses will be kept anonymous. You may withdraw your participation at any time. All information collected from this survey will be used for research purposes only and will be kept confidential.

If you have any questions about the research, please contact the principal investigator, Dr. XXXXXXXXXX via email at XXXXXXXXXXXXXXXX, or by phone at XXXXXXXXXX.

Demographic information

Sex

Male

Female

Age

Marital status

Single

Married

Others

Have children

Yes

No

Education

High school

Diploma

Bachelors or Higher

Job Title

Physician

Nurse

EMS providers

Other Allied (not specified)

Work Experience _____ year.

Reason for coming to work

The main reason for coming to work during the COVID-19 response

- Commitment to the community being served
- Commitment to faith
- Commitment to workplace and job
- Avoiding penalties
- Will not come to work in such situations.

Obligation to come to work

Based on the previous scenario, please rate your obligation to come to work from 1 to 5, with 1=Not obligated and 5=Obligated:

1. There is a lack of the availability of the appropriate PPE.
1 2 3 4
2. I mistrust the information coming from my employer regarding the progress of the disease outbreak.
1 2 3 4
3. I did not receive appropriate training specific to COVID-19.
1 2 3 4
4. There is no vaccine or effective treatment for COVID-19.
1 2 3 4
5. I need to take care of a sick family member.
1 2 3 4
6. Some co-workers got infected with COVID-19.
1 2 3 4

Thank you for participating. You may now return the completed survey to the research assistant.

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ENHANCING HOSPITAL-WIDE PATIENT FLOW TO REDUCE EMERGENCY DEPARTMENT CROWDING AND BOARDING



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Abstract

Introduction: ED overcrowding and boarding is a global phenomenon that negatively affects patients, hospital staff, and hospital-wide operations. Poor patient flow has been identified as a major contributing factor to ED overcrowding and boarding, which is directly linked to negative patient outcomes. This project implemented a multidisciplinary rounding team that addressed barriers to patient flow in real time. By reducing the inpatient length of stay bed capacity will improve, which in turn will help alleviate ED boarding and overcrowding.

Methods: This before-and-after process improvement project took place on a 30-bed, inpatient medicine floor of a level-I trauma, tertiary, regional transfer center. Multidisciplinary rounding was used to improve care team communication and collaboration. Concepts from a Real-Time Demand Capacity model were used in this project to help develop a plan for capacity issues regarding bed supply and demand. Outcome variables included inpatient length of stay and ED boarding hours.

Results: Implementation of multidisciplinary rounding resulted in a statistically significant reduction of 0.83 days in the length of stay for patients on this floor. By increasing inpatient bed capacity, ED boarding hours for patients targeted to the 3000-medicine floor was reduced by an average of 8.83 hours per month, a reduction > 50% from baseline.

Discussion: Increasing inpatient bed capacity helps decrease ED access block, and contributes to reducing ED overcrowding. Implementing a daily multidisciplinary rounding structure on the inpatient floor helped hospital throughput by expediting discharges, which in turn created inpatient bed capacity.

Key words: Emergency department overcrowding; Emergency department boarding; Patient flow; Hospital-wide overcrowding; Multidisciplinary rounding; Real-Time Demand Capacity

Introduction

Emergency department (ED) overcrowding and boarding is a global phenomenon that is linked to negative patient outcomes, places additional stress on ED staff members, and can have a negative impact on hospital financials.¹

ED overcrowding can stem from an array of issues such as increased acuity, poorly managed care, and delays in service provided by radiology, laboratory, and ancillary services.² According to Lindner and Woitok,³ issues that result in ED overcrowding can be broken down into the 3 sections of input, flow, and output, with lack of inpatient

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bed capacity being an important factor negatively affecting outflow from the emergency department.

Evaluating workflows or process improvement, or providing additional resources to the emergency department will assist in times of severe overcrowding and boarding but is not the ultimate solution.

There is a multitude of issues that contribute to ED overcrowding and boarding, but lack of inpatient bed capacity is usually a key factor.⁴ Understanding the negative downstream effects of poor patient flow that is caused by suboptimal inpatient discharge planning can be instrumental in creating organization-wide change. According to Okoniewska et al,⁵ ineffective discharge planning because of poor communication between the care team, patient, and family can lead to various delays, ultimately causing a backlog in the hospital system. A key to reducing ED overcrowding and boarding is focusing on improved discharge planning, especially once a patient has been placed into admission status. Senior hospital leaders along with ED leadership must advocate for improved inpatient discharge planning, and multidisciplinary rounds (MDRs) can assist in bridging the gap in communication among the members of the entire care team.

Along with the use of a daily MDR, specific aspects taken from a Real-Time Demand Capacity (RTDC) concept assisted the care team to have a better understanding of aligning inpatient bed capacity with hospital patient demand. According to Rutherford et al,⁶ “Failing to achieve hospital-wide patient flow—the right care, in the right place, at the right time—puts patients at risk for suboptimal care and potential harm.” By implementing a daily MDR along with an improved understanding of how capacity and demand influence patient outcomes, reducing ED overcrowding and boarding became a mainstay for this project team. In addition, educating the inpatient staff on the negative effects that stem from poor patient flow created a sense of urgency for improving the discharge process and creating inpatient bed capacity.

The purpose of this performance improvement project was to measure how a more structured approach to the inpatient discharge process would affect hospital throughput by creating a multidisciplinary escalation rounding format. Specific milestones such as an expected date of discharge, therapy needs, medication needs, and the discharge destination (skilled nursing facility, rehabilitation unit, etc.) were discussed during the MDR. The care team also addressed any home discharge needs such as durable medical equipment, a walker, cane, oxygen, or continuous positive airway pressure. Creating a “checklist” of specific needs helped

streamline the discharge process for this patient population and ultimately led to a more efficient and successful discharge.

Goals of this project included a decreased length of stay (LOS) for patients on the 3000-medicine floor from the baseline of 4.56 days and a reduction in ED boarding hours for patients who were admitted to the 3000-medicine floor, which is 17.25 hours on average.

Methods

This performance improvement project took place between February 2020 and August 2020. It is important to note that the time frame for data collection was during the early stages of the COVID-19 pandemic when major changes to health care services and staffing were taking place. The project setting is a large level-I trauma, tertiary, regional transfer center located in the Southeastern region of the United States, with multiple affiliate hospitals included within its operating umbrella. The hospital is a comprehensive stroke center and a cycle-IV chest pain center with catheterization laboratory availability 24 hours a day, 7 days a week, along with a cardiothoracic service line and pulmonary critical care. The system has 838 acute care beds and serves patients from 50 counties with a total of 36,478 adult inpatient admissions during the fiscal year 2017-2018.⁷ This project took place on the 30-bed, 3000-medicine floor, which has a primary patient population admitted to the internal medicine care team. The gap in practice identified included lack of aligning inpatient bed supply with patient demand, lack of a structured discharge planning process, and high amounts of ED boarding hours for patients targeted to this unit. On an average, there was a much higher inpatient bed demand than the available inpatient bed supply.

The priority intervention of this project included a daily MDR meeting that was executed to help bridge the gap in care team communication and to assist with developing solutions for discharge challenges. With regard to multidisciplinary rounding, Okoniewska et al⁵ stated, “these rounds represent the opportunity for all health care providers to report their progress or barriers with a patient and to provide a quick snapshot of the patient’s discharge status.” Barriers with a patient’s discharge were addressed in real time with the entire care team providing inputs. A representative from each specialty was able to give valuable inputs to help assist with reducing discharge challenges.

The implementation of a daily MDR began with creating a care team that involved representatives from physicians, nursing, case management, therapy, and pharmacy. After creation of the care team, 11 AM was determined to be the most feasible time to conduct the daily MDR meeting. A structured approach led by the attending physician was used to identify specific barriers and milestones to a patient's progression through the health care system. The goal was not only to identify barriers but also to develop solutions for the obstacles prohibiting patient progression. Education regarding ED overcrowding and boarding was provided to the care team. Understanding the negative effects derived from poor patient flow was the catalyst for change.

Another aspect of this project was taken from an RTDC concept, which was to ensure that time during the MDR was dedicated to discussing the number of incoming patients with regard to the number of expected discharges. An in-depth study published by the *Journal of the American Medical Association* reported that RTDC signifies a culture change in which hospital staff dedicate time to focus and prioritize patient flow along with predicting capacity by forecasting certain measures such as hospital occupancy, arrival times, discharge times, and hospital LOS.⁸ Understanding how many incoming patients a floor has and dedicating time to align inpatient bed supply with hospital patient demand is critical for reducing ED boarding hours. Furthermore, according to Boyle et al,⁹ hospital demand is not random, and overall daily demand can be predicted with an accuracy of approximately 90%.

The concept of RTDC was used to inform hospital leaders regarding the culture change needed in this hospital. Once the leaders understood the importance of dedicating time to prioritize patient flow, efforts to align capacity and demand were fully supported.

By measuring the average monthly case-mix adjusted LOS (CMALOS) for the 3000-medicine floor, we were able to evaluate if our interventions were successful in reducing the LOS. We also measured the average monthly hours of ED boarding for patients who were admitted to the 3000-medicine floor. Seven months of baseline data (July 2019-January 2020) revealed that ED boarding hours for patients admitted to the 3000-medicine floor averaged 17.25 hours per month. Considering that this project was initiated during the COVID-19 pandemic, it was imperative that patient flow was improved. According to Hartnett et al,¹⁰ ED visits during the COVID-19 pandemic for exposure, encounters, screening, and contact were nearly 4 times higher than that during the pre-pandemic period. Successfully reducing the LOS for inpatients on the 3000-medicine

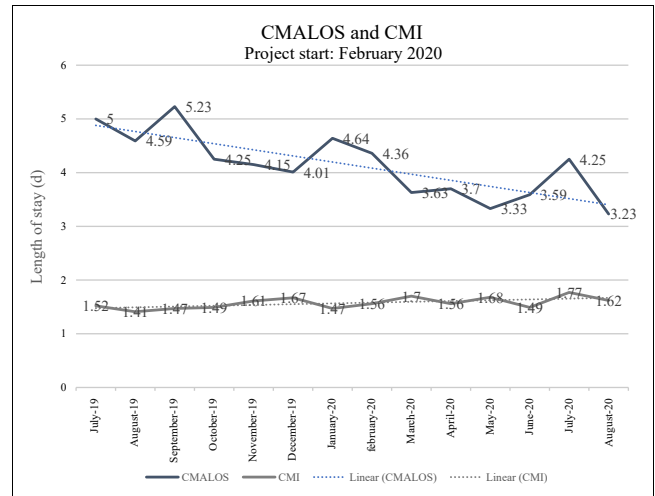


FIGURE 1

Case mix adjusted length of stay and case mix index. CMALOS, case-mix adjusted length of stay; CMI, case mix index.

floor should create inpatient bed capacity, removing the access block for patients coming from the emergency department. An independent samples *t* test was performed to evaluate the outcomes of this project.

Results

During this time frame, more than 850 patients were admitted to the 3000-medicine floor. The patient population consisted predominantly of those diagnosed with pneumonia, congestive heart failure, chronic obstructive pulmonary disease, and diabetes. The baseline CMALOS was 4.56 days and the poststudy CMALOS was 3.74 days, with a total reduction of 0.84 days in the overall LOS, which was better than our intended goal of 0.50 days within 6 months. An independent samples *t* test shows a statistically significant reduction from the baseline CMALOS 4.56 (SD = 0.45) compared with the project outcome CMALOS 3.74 (SD = 0.43), $t_{12} = 3.47$, $P = .005$, $d = 1.86$ (Figure 1).

After implementation of this project, there was a significant reduction in ED boarding hours for patients admitted to the 3000-medicine floor. This project was initiated in February 2020, and as of August 2020, patients targeted to the 3000-medicine floor boarded, on an average, only for 8.43 hours per month. Overall, this is a diminution of 8.82 ED boarder hours per month, which is > 50% reduction from baseline.

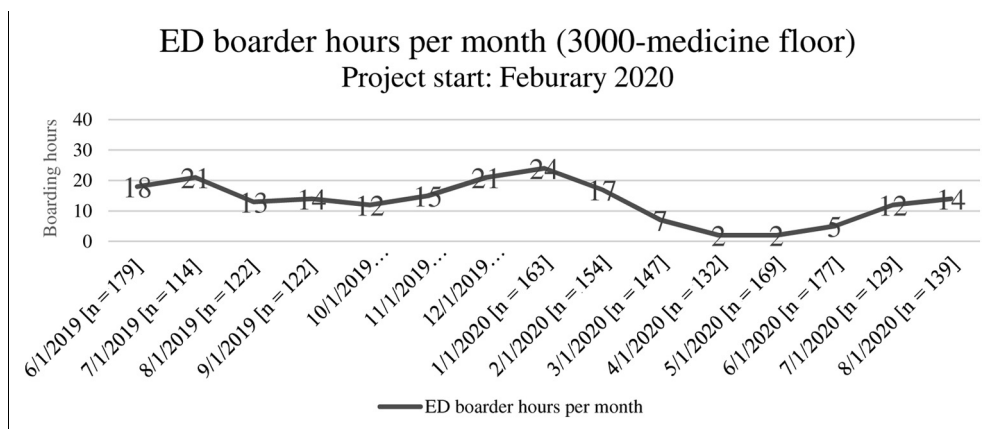


FIGURE 2
Emergency department (ED) boarder hours per month (3000-medicine floor).

According to Beckers Hospital Review,¹¹ reducing ED LOS by just 1 hour creates bed capacity for an additional 10,000 patient visits per year. Our goal was to reduce ED boarding hours by 10%. This was a huge success for the team. An independent samples *t* test shows a statistically significant reduction in baseline ED boarding hours 17.25 (SD = 4.40) compared with the project outcome 8.43 (SD = 5.97), $t_{13} = 3.29$, $P = .005$, $g = 1.70$. Given the extreme variability in ED boarding hours, a Mann–Whitney *U* test was conducted to ensure statistical significance; z -score = 2.37241, $P = .01778$, and the results are statistically significant at $P < .05$ (Figure 2).

Discussion

ED overcrowding has become a major problem across health care systems and poses a threat to both hospital staff and patients. “Various studies have developed definitions of ED overcrowding, but in its simplest form, overcrowding exists when there is no space left to meet the timely needs of the next patient requiring emergency care.”¹ When patients arrive to an overcrowded emergency department and the staff are unable to provide appropriate care, negative outcomes can begin to arise. Salway et al¹ posited, “ED overcrowding causes multiple problems for the ED patients and staff, including increased waiting times, increased ambulance diversion, increased LOS, increased medical errors, increased patient mortality, and increased harm to hospitals due to financial losses.” Overcrowding is a byproduct of “boarding,” which is described as holding an admitted inpatient in the emergency department because of a lack

of inpatient bed availability.¹² In addition, Pines and Grifey¹³ stated, “the medical errors affecting admitted patients in the ED may be related to, or more prevalent during periods of high ED boarding.” The combination of overcrowding and boarding places an added amount of stress on an already busy emergency department.

Understanding that boarding is one of the root causes of ED overcrowding, a major focus of this project was to develop processes that helped to reduce longer boarding hours. In many organizations, leaders tend to focus on improving processes, workflows, and policies that reside inside the emergency department. Research, along with supportive literature, indicates that substandard inpatient processes can be the culprit of poor patient flow. Challenges were only compounded by the COVID-19 pandemic. According to authors who published data that were collected during February 2020 and April 2020, the number of hospital admissions in their facility progressively increased compared with that during all ED visits in the past 5 years, rapidly exceeding the number of patients discharged.¹⁴ Other obstacles such as staffing shortages and resource management were all directly affected by the COVID-19 pandemic.

Lack of inpatient bed capacity is a leading cause for longer boarding hours for admitted patients who reside in the emergency department, creating overcrowding. In addition, it is important to consider that boarded patients in the emergency department are not being cared for by an ED physician from a medical provider standpoint. These patients are admitted and have been assigned to an admitting physician (hospitalist, intensivist, etc.) who is responsible for going to the emergency department to see the patient. The caveat to this is that boarded patients in the emergency department

are being cared for by emergency nursing staff, which affects their ability to properly care for incoming ED patients.

Building on the need for refocusing efforts to the inpatient side of the hospital, additional evidence supported this shift of internal practices. Lack of inpatient beds because of an “exit block” being created between the emergency department and the inpatient side is a key factor in ED overcrowding.⁴ Essentially, a full emergency department is a reflection of a full hospital. Delays in rounding, order placement, and completion of prescription plans contributed to a lack of effective communication among members of a patient’s multidisciplinary care team.¹⁵ Ragavan et al¹⁵ also made the argument that an extra day of inpatient stay could be attributed to poor coordination of the care team. To reduce ED boarding, this project focused on improving communication and collaboration among members of the inpatient care team, which has been established as a contributor to delaying patient flow when not performed efficiently. The use of a daily MDR was instrumental in bridging the gap between these major issues.

Inpatient staff acceptance of this project was critical for success. After the idea of a daily MDR was presented, information regarding hospital-wide overcrowding, ineffective discharge processes, and poor patient flow was shared. Building on that information, the connection on how these issues can have negative downstream effects such as ED overcrowding and boarding was established. Understanding how important the inpatient care team is for reducing ED boarding hours created a vested interest. When the staff realized how detrimental ED overcrowding and boarding is for patients and their colleagues, along with the understanding that they could help improve this situation, they fully realized how valuable this project was going to be.

The ability to reduce ED boarder hours to this extent stemmed from successfully improving bed capacity on the inpatient floor. The CMALOS was measured to gauge the performance of improving patient flow. Reducing the LOS for patients admitted to this floor assisted in improving inpatient bed capacity and allowed improved patient flow, which was key in reducing the ED boarding hours for patients assigned to this floor. The Case Mix Index was measured as well. According to Liu et al,¹⁶ “The DRG system classifies inpatients with similar clinical and treatment characteristics into groups, where patients in the same group are expected to use similar amounts of resources, thus incentivizing providers to enable effective cost management.” These DRGs are assigned relative weights, and hospital reimbursements are proportionate to the DRG assigned to a patient. Essentially, a DRG’s weight is the Case Mix Index, which is used to measure how sick and resource-intensive patients are. This was measured because the

intention of this project was not to reduce LOS by accepting patients who were not as labor intensive.

From a financial aspect, this large reduction can provide additional revenue to the organization. According to Beckers Hospital Review,¹¹ emergency departments with an annual visit rate of 30,000 patients and a 15% admission rate can gain additional revenue by decreasing ED LOS by just 1 hour. A reduction in ED LOS by 1 hour creates bed capacity for an additional 10,000 patient visits per year. The Studer Group¹⁷ reports that the average cost per ED visit is \$400. An additional 10,000 ED visits per year, with average revenue of \$400 for each visit could amount in excess of \$4 million per year. This is a conservative calculation considering that it is based on a reduction of ED LOS by 1 hour. This project was successfully able to reduce ED boarders for this patient population by more than 8 hours at a health care system with $\geq 65,000$ annual ED visits with a robust inpatient admission percentage.

The issues derived from ED overcrowding and boarding cannot be overcome by ED leadership, nursing staff, or even physicians. Attempting to remedy this situation by placing the responsibility for developing a solution on the shoulders of the ED staff can no longer be the expectation. There must be a hospital-wide understanding regarding the importance of patient flow, discharge planning, and how creating inpatient bed capacity can aid in reducing ED boarding hours. Daily MDRs on the inpatient floors along with a standardized discharge process can effectively reduce the inpatient LOS. This, in turn, creates inpatient bed capacity and can assist with placing admitted patients who are boarding in the emergency department.

Limitations

During this study, 2 specific limitations were identified. The COVID-19 pandemic placed immense pressure on the 3000-medicine floor staff. Both clinical and nonclinical staff were reassigned to other floors to care for patients with COVID-19, which hindered the effectiveness of the daily MDR. There were also times when staff members were quarantined for prolonged periods because of COVID-19–related illnesses, and this created staffing needs. This resulted in room closures on the floor, limiting the census.

This floor was dedicated predominantly for the placement of medicine patients who were being followed up on by the internal medicine team, but there were times when other patient populations would be placed on this floor. When beds were scarce on other floors, 3000-medicine floor beds were used for placing patients from other specialties such as surgery

and urology. These patients were generally followed up on by other physicians who did not participate in the daily MDR.

An independent samples *t* test was used to compare baseline data to project data. Although different statistical tests were considered, the decision to use an independent samples *t* test was made so that results could be easily interpreted by all readers.

Implications for Emergency Nurses

Understanding that poor patient flow affects emergency nurses on a large scale is paramount for hospital leaders. As inpatients experience delays with their care or discharge and the LOS is extended, this prohibits another patient from being admitted to that bed. When this happens, the flow of patients through a hospital system is significantly limited and a backlog of patients reside in the emergency department until a bed becomes available.

Emergency nursing staff are tasked with not only caring for incoming ED patients but also being responsible for providing inpatient nursing care to all admitted inpatients who are boarding in the emergency department. It is critical to keep this in mind as the number of patients boarding in an emergency department rises. Emergency nurses must continuously assess and care for all inpatients boarding in the emergency department while simultaneously providing life-saving measures for all incoming ED patients.

One must also remember to factor in the concept that even though these patients are physically in the emergency department, the ED physician is no longer providing care to this patient population. An inpatient physician who has admitted and accepted a patient who is boarding in the emergency department oversees their care. The emergency nurse is responsible for contacting this physician, who is generally rounding and providing care to patients on the inpatient side of the hospital.

Conclusion

The use of a daily MDR has been a driving factor to strengthen the communication among the care team members and mitigate barriers for patient flow. Using an RTDC model has allowed care team members to better understand the importance of aligning inpatient bed supply and patient demand. Understanding that an overcrowded emergency department is a direct reflection of an overcrowded hospital is critical for hospital leaders. Although providing resources to the emergency department during times of overcrowding and boarding can alleviate some of the pressure, ensuring

processes are in place to improve inpatient bed capacity can assist as well. “The problem of emergency department overcrowding is now an institutional problem, requiring institutional solutions.”⁴ Multiple issues cause ED overcrowding and boarding, albeit this project proves that by reducing inpatient LOS and increasing inpatient bed capacity, ED boarding hours were significantly reduced for this patient cohort.

Author Disclosures

Conflicts of interest: none to report.

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EVIDENCE-BASED PROTOCOL FOR ADMINISTERING FIRST DOSE OF CEPHALOSPORINS VIA INTRAVENOUS PUSH IN THE EMERGENCY DEPARTMENT



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NCPD Earn Up to 8.5 Hours. See page 616.

Problem Description

Traditional practice has dictated that solutions with an osmolality of 600 to 900 mOsm/L, such as intravenous (IV) antibiotics, be administered via the intravenous piggy-back (IVPB) route. This practice is due to concern for phlebitis, local irritation, and infiltration during peripheral administration of hypertonic solutions. IV cephalosporins, when reconstituted with 0.9% sodium chloride injection, have an osmolality ranging from 575 mOsm/L with ceFA-Zolin to 1040 mOsm/L with Cefepime¹ and subsequently fall into the category of solutions with an osmolality high enough to be of concern. As a result, IV cephalosporins are typically administered via the IVPB route in the emergency department. However, 3 recently published articles²⁻⁴ have demonstrated safe administration of IV antibiotics via the intravenous push (IVP) route.

Current practice at the project site was to administer the first dose of all IV antibiotics in the emergency department via the IVPB route. Multiple factors combined to create an interest to explore IVP delivery of IV antibiotics in the emergency department. The overarching long-term goal of this work is to streamline nursing clinical practice and reduce the number of steps required for bedside nurses to complete routine medication administration tasks. Project-specific and contextual factors here include (1) fluctuations in availability of small-volume parenteral solutions due to manufacturing issues and natural disasters, (2) need for

timely administration of antibiotics per Sepsis Core Measures, and (3) importance of controlling costs and being good stewards of limited health care resources.

Available Knowledge

Three key events have escalated interest in exploring the feasibility of IVP delivery of IV cephalosporin antibiotics in the emergency department. First is the fluctuation in availability of small-volume parenteral solutions, often due to manufacturing issues and natural disasters. Historically, this has been an ongoing challenge, and most recently, production was notably affected after hurricane Maria struck the island of Puerto Rico as a category 4 storm in 2017. Mazer-Amirshahi and Fox⁵ reported that Baxter supplies approximately 50% of United States hospitals with small-volume saline bags (250 mL or less), and the manufacturing plant in Puerto Rico where these products are primarily made was significantly impacted by the storm, resulting in a severe supply shortage.

Next, the 2016 Surviving Sepsis Campaign guidelines recommended administration of broad-spectrum antibiotics within 1 hour of presentation in patients with sepsis and septic shock. Logistical challenges, such as immediate medication preparation and nurse availability to administer the medication, may interfere with successfully achieving the metric of timely antibiotic administration. Gregorowicz et al⁶ evaluated the time difference between IVP and IVPB administration of β -lactam antibiotics in 274 patients diagnosed with sepsis in the emergency department. The results demonstrate that IVP administration was associated with an approximately 32-minute time savings to β -lactam antibiotics administration and an approximately 32-minute time savings to completion of infusion of a broad-spectrum antibiotic. No adverse events related to infusion were reported in either group. The authors concluded that use of an IVP strategy may improve timeliness of antibiotic administration without sacrificing patient safety.

Finally, the shift toward high value care and the importance of controlling costs and being good stewards of limited

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health care resources have created the opportunity to explore the feasibility of IVP delivery of IV antibiotics. McLaughlin et al³ reported the cost of infusion supplies as \$9.53 for IVPB administration versus only \$0.83 for IVP administration, almost 11.5 times for IVPB administration. In addition, the authors reported that IVP administration provided cost savings to the patient as the billing costs are 4.5 times higher for IVPB administration than for IVP administration. In their project, by changing to IVP administration of IV cephalosporins in the emergency department, the authors reported institutional savings of \$10,000 during the 3-month project period, annualized to \$40,000 per year.

Rationale and Specific Aims

The purpose of this quality improvement project was to assess initial feasibility of implementing an evidence-based protocol for administration of first dose of IV cephalosporins via IVP in the emergency department. Currently, the Food and Drug Administration (FDA)^{4,7} has approved cephalosporins and 8 other antibiotics (meropenem, aztreonam, chloramphenicol, ampicillin, ampicillin/sulbactam, nafcillin, oxacillin, and colistimethate sodium) for administration via IVP. Piperacillin/tazobactam is not FDA approved for IVP administration, but research in the previously published literature⁴ has demonstrated administration IVP through a peripheral line to be safe and tolerable for adult patients.

We chose to focus specifically on cephalosporins for this quality improvement project because they are FDA approved for IVP administration, as well as because of the existing literature^{2,3} demonstrating safe administration via the IVP route. We chose the first dose owing to the pharmacodynamic effect of some antibiotics, such as cephalosporins, being time dependent. For time-dependent antibiotics, increasing the duration of infusion increases the duration for which the drug concentration remains above the minimum inhibitory concentration, and studies have reported improved clinical cure and survival with extended or continuous infusions. In theory, changing the rate of infusion to IVP administration may negatively impact the time above the minimum inhibitory concentration. Butterfield-Cowper and Burgner⁸ compared the time above the minimum inhibitory concentration between 30-minute and 5-minute infusions and included cefepime; they reported only minor differences in time above the minimum inhibitory concentration between 30-minute and 5-minute infusions. However, the data are limited and do not currently support the practice of IVP administration over 5-minutes beyond the first dose.

Previously published practice improvement project of IVP cephalosporin antibiotics in the emergency department by McLaughlin et al³ and the color-coded chart provided by Rafeq⁹ served as the informal models for this project. Similar to McLaughlin et al,³ this project focused on administration of first dose cephalosporins via IVP in the emergency department and evaluated cost savings and nurse satisfaction with practice change. The color-coded chart provided by Rafeq⁹ was adapted for use by the project site. The desired outcome was institutional cost savings and nurse self-reported satisfaction with the practice change and its effect on streamlining clinical practice. Other antibiotics approved for IVP administration and the timeliness of antibiotic administration were not assessed.

Methods

DESIGN

This was a quality improvement project using a color-coded information chart, informatics medication prescribing change, and nurse education intervention to assess the feasibility of IVP cephalosporin antibiotics in the emergency setting.

CONTEXT

The project setting was a 27-bed emergency department at a community hospital located in East Central Illinois with an annual volume of approximately 28,000 patients per year. Inclusion criteria were adult patients in the emergency department with a new prescription (first dose) for nurse administration of an IV cephalosporin. The project duration was 6 months, between December 2020 and June 2021. Seventy-two emergency nurses were employed at the site, with 60 emergency nurses on the email distribution list we received.

INTERVENTION

An interdisciplinary team including representatives from medical staff, pharmacy, and nursing worked collaboratively to develop a site-specific protocol describing administration of IV cephalosporins via the IVP route. A color-coded chart provided by Rafeq⁹ that recently appeared online provided the inspiration for the new protocol. The original example provided the name of the antibiotic, the dose, and the diluent volume. The example was adapted into a new evidence-based chart to meet site-specific needs; rate of administration was added and standardized as 5 minutes for all IVP cephalosporin antibiotics for ease and

TABLE 1

The chart for administration of IV cephalosporins via IVP. These color-coded charts were placed in clearly visible spots in the unit's medication rooms and at the nurses' stations

Antibiotic	Dose (g)	Diluent volume (mL) (0.9% NaCl or SWFI)	Rate of administration (min)
CeFAZolin	1	10	5
CeFAZolin	2	20	5
CefTRIAxone	1	10	5
CefTRIAxone	2	20	5
Cefepime	1	10	5
Cefepime	2	20	5

Sterile water for injection (SWFI) preferred to help minimize osmolality.

0.9% NaCl is acceptable but does increase osmolality and may result in phlebitis and increase risk for extravasation injury. Second and subsequent doses should be administered IVPB over 30 min or longer (helps to increase time above minimum inhibitory concentration).

IV, intravenous; IVP, intravenous piggyback; IVPB, intravenous piggyback; SWFI, sterile water for injection.

simplification. The preferred solution was sterile water for injection because it has an osmolality of 0, although 0.9% normal saline was also approved for use as a secondary solution if sterile water for injection was not available. Once completed, the protocol was approved by the facility's Chief Medical Officer.

Next, the project lead worked with the institution's informatics department to make changes to the computerized prescription, or order, entry system in the electronic medical record. The intention was to change the default prescription sentence for all IV cephalosporins administered in the emergency department to the IVP route. In actuality, the default route was changed for generic terms at the onset of the project and applied to brand name terms after 3-month interim analysis revealed the unintended omission from the requested changes. Education to providers was distributed electronically via email and included snapshot pictures of the changes made to the computerized order entry system.

Finally, education was distributed to nursing staff both electronically via email and posts to the staff's private Facebook group and face-to-face during morning staff huddles. In addition, nursing staff was also provided the color-coded chart (see Table 1) detailing instructions for administration to include antibiotic, dose, diluent solution and volume, and rate of administration. These charts were placed in clearly visible spots in the unit's medication rooms and at the nurses' stations.

Nurses were instructed to monitor for adverse reactions during administration of IVP cephalosporins for the duration of the patient's ED stay. Phlebitis, local irritation, infiltration, and reactions occurring during or immediately after administration or noted at any time during the patient's ED

stay were to be reported. Nurses were instructed to use the facility's existing electronic safety reporting system and complete a safety event monitoring (SEM) report in the event a patient experienced an adverse reaction. The SEM report did not include structured fields for phlebitis, local irritation, or infiltration. Any reports submitted related to medication administration and/or medication safety were tagged and directed to the pharmacy department for review and follow-up.

MEASURES AND STUDY OF THE INTERVENTIONS

Primary outcomes measured were (1) number of doses of IV cephalosporins administered via the IVP route, (2) number of adverse events reported, (3) institutional savings utilizing site-specific estimated costs of supplies, (4) nurse satisfaction with practice change, and (5) the perceived effectiveness of practice change in streamlining nursing clinical practice as assessed by postintervention electronic survey. Data sources for the number of doses, adverse events, and institutional cost savings were routinely collected in administrative datasets accessible to the hospital pharmacy department, including the electronic medical record repository and the facility's SEM reporting system. Emergency nurse satisfaction and perceived effectiveness of the practice change were assessed using a 2-item electronic survey developed for the purposes of this present project. The items were the following:

- (1) Cephalosporin antibiotics can be given IV push over 2 to 5 minutes. Knowing this, I would prefer to:
 - (a) administer IV push
 - (b) administer as an IV piggyback
 - (c) other

TABLE 2

Results of 2-question electronic postintervention survey distributed to staff nurses

	IVP	Percent	IVPB	Percent	Other	Percent
Q1: Preferred method for administration of IV cephalosporins	28	93.3%	2	6.7%	0	0%
	Yes	Percent	No	Percent	No opinion	Percent
Q2: Did practice change result in less time gathering equipment and infusion supplies, entering orders for carrier fluids, and documenting a secondary infusion?	25	83.3%	3	10%	2	6.7%

IV, intravenous; IVP, intravenous piggyback; IVPB, intravenous piggyback

(2) McLaughlin et al³ reported that by switching IV cephalosporins to the IVP route, nurses reported spending less time gathering equipment and infusion supplies, entering nursing orders for carrier fluids, and documenting a secondary infusion. Do you agree with these findings?

- (a) Yes
- (b) No
- (c) No opinion

No patient data were collected.

SURVEY PROCEDURES

After 1 week of project completion, an electronic survey using Survey Monkey was sent to 60 staff nurses included in the department email distribution list. In addition, staff were provided a link to the survey on the staff's private Facebook group. The survey was left open for 2 weeks. A reminder was sent using the same methods at the end of week 1.

ANALYSIS

Descriptive statistics were analyzed. Interim analysis was conducted at 3 months. Final analysis was conducted at the conclusion of the project at 6 months.

ETHICAL CONSIDERATIONS

The project was deemed quality improvement by facility's Ethics Committee and, therefore, did not require review by the Internal Review Board. No individual involved in the project had any conflicts of interest to disclose.

Results

NUMBER OF DOSES BY ROUTE AND INTERIM CORRECTIONS

A total of 761 doses of IV cephalosporins were administered via IVP route during the 6-month project period. A missed opportunity identified during the project period was that several doses of IV cephalosporins were still ordered to be administered via the IVPB route. At the 3-month check, we discovered that 134 doses of IV cephalosporins had still been ordered to be administered via IVPB. At this time, the project lead learned that informatics changes in the medication ordering process in the electronic medical record were only made to the generic names of IV cephalosporins and that if a provider typed the brand name of the IV cephalosporin into the EMR prescribing/ordering system, it still defaulted to the IVPB route. Additional changes to EMR ordering process to include addition of brand names of IV cephalosporins resulted in only 25 orders for IVPB route in the final 3 months of the project. In total, 159 doses of IV cephalosporins were still administered via the IVPB during the 6-month project period.

ADVERSE EVENTS REPORTED

In the institution's SEM system, 0 adverse events were reported.

COST SAVINGS

Using the facility's estimated cost of supplies for administration via IVP route was \$0.80 compared with IVPB route of \$5.23, estimated department savings were \$3,371.23 during the project period. With 159 doses of IV cephalosporins

still administered by IVPB during the 6-month project period, this resulted in an estimated cost savings loss for those doses of \$704.37. If all doses of IV cephalosporins had been administered via the IVP route, the estimated department savings during the 6-month project period would have been \$4,075.60, annualized to a department savings of \$8,151.20 per year.

NURSE SATISFACTION AND PERCEPTION OF EFFECTIVENESS

A total of 30 out of 60 (50%) responses were received to the electronic survey. Of the respondents, 28 (93.3%) favored IVP route, and 25 (83.33%) felt that practice change streamlined clinical practice by reducing time spent gathering equipment/infusion supplies, setup, and documenting secondary infusion (Table 2) (Supplementary Figure).

Discussion

SUMMARY

This project provides evidence to support that a site-specific protocol for administering first dose of IV cephalosporins via IVP route in the emergency department was feasible and cost-effective. In addition, administration of IV cephalosporins via IVP in the emergency department was favored by the majority of emergency nurses, and nurses report that the practice change streamlined nursing clinical practice by reducing time spent gathering equipment/infusion supplies, setup, and documenting secondary infusion. Results were consistent with the findings of others.^{4,5,7} Administration of IV cephalosporins via IVP route has the potential to address systems issues such as periodic fluctuations in availability of small-volume parenteral solutions as well as clinical issues such as need for timely administration of antibiotics and the desire for minimal fluid volume in certain patient populations.

A strength of this work was using objective data and measurements obtained directly from the electronic medical record and the facility's SEM reporting system. Pragmatically, this project design can be easily replicated without using additional resources outside of usual clinical operations.

FUTURE RESEARCH

Recommendations for future research include replicating the project over longer periods of time and prospectively collecting data on adverse events that may have occurred later after administration and ED disposition. In addition,

other recommendations include administration of first dose of IV cephalosporins via IVP in clinical areas other than the emergency department, an observational time study or time and motion study to evaluate the difference in nurse time spent preparing/administering IV cephalosporins IVP versus IVPB, and inclusion of other antibiotics that are FDA approved for IVP administration.

Limitations

This project has several limitations. The data were limited to medications administered to adult patients in a single department at a single institution. These factors limit the generalizability of the results. In addition, notification and tracking of adverse events were time limited to the patient stay in the emergency department and dependent on nurses completing a SEM report. It is possible that an adverse event did occur but occurred after the stay in the emergency department or was not reported by the nurse. Next, this project did not evaluate the impact of the practice change on timeliness of antibiotic administration as per the Sepsis Core Measures. The survey used to evaluate nurse satisfaction has not been tested for validity or reliability as it was developed for the purposes of this project. There was a possibility of response bias in the nurses who completed the survey. This project only explored administration of IV cephalosporins via IVP and did not include any of the other antibiotics currently approved by the FDA^{4,7} for IVP administration. The project informatics intervention was not implemented as intended until after the 3-month interim analysis.

Implications for Emergency Nurses

This project, as well as the work of McLaughlin et al,³ is the first to specifically address administration of IV cephalosporins via the IVP route in the emergency department. Given the fluctuations in availability of small-volume parenteral solutions, need for shortened time to first dose to meet Sepsis Core Measures, and the importance of controlling costs and being good stewards of limited health care resources, a transition away from IVPB traditional administration practice is necessary. In addition, nurses favored the practice change and described it as being effective in streamlining nursing clinical practice and reducing the number of steps required to complete routine tasks. Our protocol and quality improvement project here can be considered for replication at other practice sites.

Conclusions

Our protocol for administering the first dose of IV cephalosporins via IVP route in the emergency department at our site appears to be feasible and cost-effective. In addition, administration of IV cephalosporins via IVP in the emergency department was favored by emergency nurses. These nurses report that the practice streamlines nursing clinical practice by reducing time spent gathering equipment/infusion supplies, setup, and documenting secondary infusion. Results suggest that the protocol may be applied to administration of other IV antibiotics in the emergency department.

Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

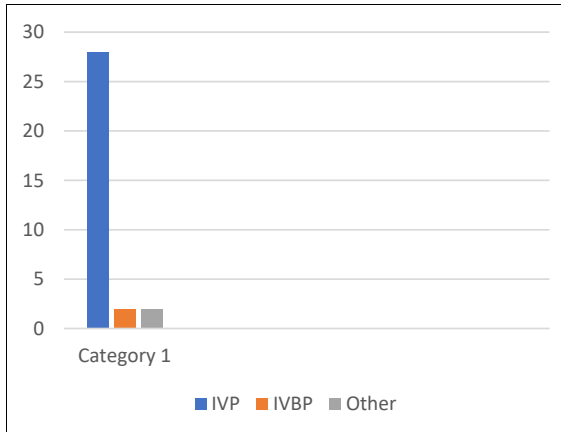
Supplementary data related to this article can be found at <https://doi.org/10.1016/j.jen.2022.03.004>.

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Supplementary Data



SUPPLEMENTARY FIGURE

Results of 2-question electronic postintervention survey distributed to staff nurses.

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