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REUNITE... REFLECT... RECHARGE

Ron Kraus, MSN, RN, EMT, CEN, ACNS-BC, TCRN

I have been personally looking forward to many of us coming together again at EN21X for exceptional education, working in general assembly to further our association, reuniting with friends, making new friends, having fun, and recharging. Reunited, and it feels so good! That is a line from the 1978 hit song by Peaches and Herb, and that phrase is what I have been humming as we prepare to gather in-person and virtually at EN21X. EN21X will be a reunion of emergency nursing professionals who will be able to share the experiences of the pandemic over the last 18 months. A chance to reunite with one another to not only share, but to also appreciate the friendships we have made over the years and the new friends we will make. As many of you may know, the deadline for writing the President's Message is months in advance of the publication date. A personal struggle for me is to write the Message while attempting to foresee what might be relevant when it is published and into the next years. One idea I know will not change between how I feel while writing this now and the date of publication is "Reunion."

I can imagine that I am not alone in these thoughts and feelings focused on reunion. In-person gatherings and reunions are experiences that I have missed over the last year. As of today, much around the United States is returning closer to prepandemic norms, although many around the world are still at various stages of conquering the coronavirus. As we begin to see the beginning of recovery from the pandemic, let us remember to pause and treasure the things we missed because of the pandemic as we reexperience them. For example, I recently attended mass and realized how much I missed the singing and hearing our priest chanting.

As we make that so-needed human connection at cookouts, community gatherings, concerts, and parades, I hope you treasure it. I have enjoyed seeing uncovered faces out and about and sharing smiles in passing. These gatherings and outings remind me how much I missed the little things. I challenge myself and others around me to not take these things for granted in the future. We saw how quickly conditions can change for all of us and the huge impact this pandemic has had on the entire world. Once the pandemic infection control precautions are lifted, I encourage you to take the time to go to that concert, go to that event you have always wanted to experience, call that friend, make that road trip, have that adventure... do it for yourself. When you take this step, slow down for the focus—take time and breathe, take it all in.

Time is precious and we cannot get it back once it has passed, but we can make the best of the present moment and the future ahead of us. As we come together and make those in-person human connections that many have missed, remember the line from that song... reunited and it feels so good.

Stay positive, stay focused, and be the good!
ELEVATE.

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Changing Behaviors: The Behavior Change Wheel and Emergency Nursing

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In my emergency nursing practice, I was often treating patients after they had made some of the worst and riskiest decisions of their lives. A major challenge in emergency nursing is to provide nonjudgmental and compassionate care to patients in the throes of their emergencies, regardless of their risk-taking behaviors of vaccination status, daredevil stunts, alcohol use, drug use, tobacco use, suicide attempt, self-injury, interpersonal violence, sexual activity, weapon use, hazardous vehicle or machine operation, or dangerous or extreme sports and contests. Simply put, we often save patients from their own worst behaviors. Our patients' risky and emergency-inducing behaviors may seldom align with our personal priorities and values. The nurse may be tempted to engage in othering the patient, placing the patient at risk for lower-quality care.[1] Othering is a social process in which the nurse may see those who share their own worldviews within a hierarchically superior in-group and mentally polarize the patient into an outgroup associated with biased perspectives of negative characteristics, blame, and subordinate status. We are professionally committed, trained, and socialized to deliver nursing care with a therapeutic and nonjudgmental approach. Ethical principles,[2] cultural humility,[3] and some theoretical frameworks[4-6] can provide useful tools to successfully and effectively deliver nonjudgmental approaches in these patient-care situations. For example, *All my Relations* (Mitakuye Oyasin) is a spiritual and cultural mindset practice that can be learned through personal heritage, relationships, or immersion in Lakota Native American culture to approach all living things as the nurse would their own kin. This approach, with the deep respect of familial-like bonds, seeks understanding and commonality before judgment and othering. The purpose of this editorial is to briefly introduce the Behavior Change Wheel[4] as a shared mental model to nonjudgmentally understand human behavior and develop effective emergency nursing behavior change interventions.

Behavior change is foundational to patient care in emergency nursing. Emergency nursing practice involves supporting patient self-management to care for new wounds, infections, splints, mobility limitations, sensory loss, medication regimens, health care system navigation, follow-up appointments, and more. Best-practice emergency discharge procedures also include lifestyle behavior change coaching interventions such as smoking cessation and improving diet and physical activity habits. On the basis of an ever-evolving scientific foundation, emergency nursing practice also requires near-continuous professional behavior change for the nurse to maintain updated practice standards. Motivating human behavior change is multifaceted and can be riddled with resistance and barriers. Nurse scholars often use the Theory of Planned Behavior[5] or the Health Belief Model[6] to plan and develop interventions that target behavior change.[7-9] For example, McDonald et al[7,8] developed an injury prevention program to reduce distracted driving for teen drivers that was based on the Theory of Planned Behavior model components of attitude, norms, and perceived control. Likewise, Burchill et al[9] used the theory to assess nursing knowledge, skill, and attitudes regarding blood sample hemolysis prevention. My own early work was informed by the Health Belief Model[10] because I learned through cultural immersion and work experiences in multicultural spaces.[11] The Health Belief Model guides the nurse to consider how demographic variables, susceptibility to illness, severity of illness, cost of carrying out the behavior, perceived threat of illness, cues to action, health motivation, and perceived control may affect the likelihood of the patient engaging in any given health behavior. At those times when a patient's behavior is not congruent with the nurse's personal worldview or values, these theories inform therapeutic and nonjudgmental professional nursing to both understand

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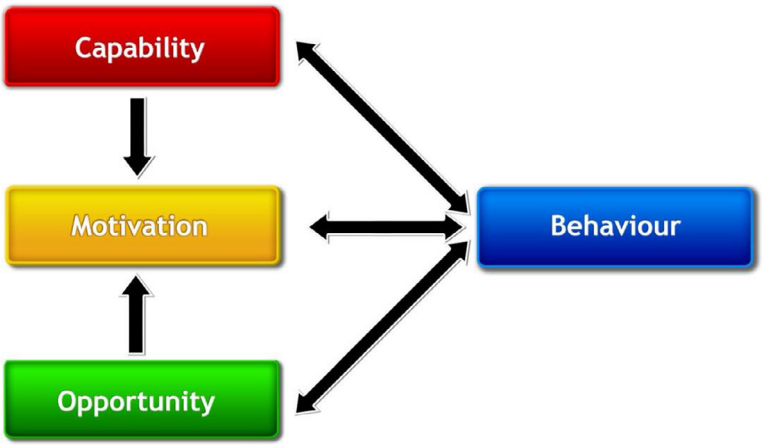

FIGURE 1

The COM-B system: a framework for understanding behavior. COM-B, Capability, Opportunity, Motivation, and Behavior. (Reprinted with author permission from Michie et al[4] and under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.)

patient motivations and respectfully develop mutually agreed on interventions to target behavior change. An important gap in the Theory of Planned Behavior and Health Belief Model is that a great deal of health behavior was simply never planned, rational, or consciously chosen. Rather, mental shortcuts (called heuristics in psychology), impulse, emotional drives, or unexamined or thoughtless habit may govern patient action. The Behavior Change Wheel[4] incorporates these additional emotional impulse and unhealthy habit dimensions. Better understanding of the Behavior Change Wheel model can aid the emergency clinician in developing effective interventions meant to target behavior change.

First, the emergency nurse can consider 3 foundational questions about the source of behavior using the Behavior Change Wheel[4]:

1 Is the patient capable of the behavior?
2 Does the patient have the opportunity to enact the behavior?
3 Is the patient motivated to enact the behavior?

The most fundamental factor underlying behavior is also referred to as the COM-B system, which is an abbreviation for Capability, Opportunity, Motivation, and Behavior (Figure 1). Here, capability, opportunity, and motivation all influence one another and interact with behaviors. The emergency clinician can further consider 2 subcomponents for each of these 3 underlying factors, visualized in the center circle of Figure 2. Capability requires psychological and physical capacity that nurses consider in routine care. Is the patient's cognitive capacity impaired by a history of stroke? Does arthritis limit their physical ability to complete the desired task? Opportunity requires a physical environment and social culture or worldview for the behavior to occur. On discharge, emergency nurses routinely recommend follow-up with community-based primary or specialty care that requires the patient to have access to the internet or telephone. People experiencing homelessness may have no opportunity to schedule these appointments. Cultural taboos may limit the social opportunity for patients to initially seek or continue some mental health treatments, genitourinary or reproductive care, or palliative care services. Motivation is the emotional energy to induce and direct behavior. Motivation is broken down into reflection and intentional processes of logical decision-making and automatic processes of habit, emotions, and impulses. A great deal of nursing care and instructions to caregivers at discharge involves assessing for gaps in patient capability, opportunity, and motivation for nursing interventions that either provide the target behavior for the patient who is dependent or enable and support the factors leading to the self-management health behavior. Although the Behavior Change Wheel is introduced here in relation to the individual patient, the concepts can also be applied to the unit, the nursing workforce on the unit level, or even a whole population. I found that usual nursing practice routines can often pragmatically overemphasize education alone as the predominant factor in behavior change. Nearly all of my patients cognitively understood in detail that smoking cigarettes was unhealthy behavior and had accurate knowledge about smoking cessation information. But we still routinely provide written instructions, rote

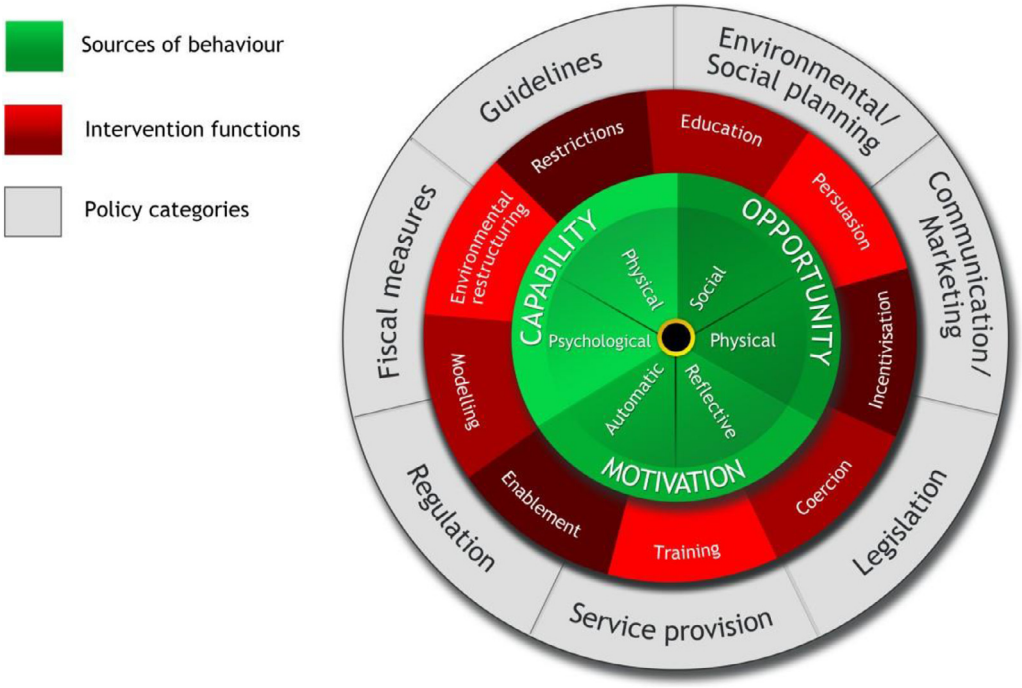

FIGURE 2

The Behavior Change Wheel. (Reprinted with author permission from Michie et al[4] and under the Creative Commons Attribution License, which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.)

verbal instructions, and follow-up resources for near-endless internet-based multimedia instruction. The Behavior Change Wheel can be particularly useful for devising strategies when the patient cognitively understands all the facts related to the desired behavior but still lacks other opportunity, capability, or motivation to try or complete the behavior change.

The second layer of the Behavior Change Wheel[4] (Figure 2) is composed of 9 intervention functions to address a deficit in capability, opportunity, or motivation and support successful behavior change. These intervention functions are education, persuasion, incentivization, coercion, training, restriction, environmental restructuring, modeling, and enablement. Successful nursing behavior change strategies often involve 1 or more of these interventions, and not all interventions are appropriate to each given situation. Table 1 includes each intervention, definition, and example in emergency nursing published in the *Journal of Emergency Nursing*. Many of these interventions focus on targeting emergency nurse workforce behavior, rather than focusing on clinical interventions for patient behavior change. We enthusiastically welcome manuscripts on clinical interventions for positive health behavior change in the patients and families served in the emergency care setting.

Government, organization, and unit policies are necessary to support effective and successful interventions. Thus, the third layer of the Behavior Change Wheel is composed of 7 policy categories: communication/marketing, guidelines, fiscal, regulation, legislation, environmental/social planning, and service provision. Table 2 provides definitions and emergency nursing examples published in the *Journal of Emergency Nursing*. The Behavior Change Wheel as a shared mental model allows emergency nurses to use systems thinking to analyze the success or failure of interventions with the broad need to strengthen, support, reform, create, or abandon related policies. More details on the links between the policy categories and intervention functions can be found in the original publication on the model by Michie et al.[4]

In conclusion, the Behavior Change Wheel[4] provides a useful evidence-based mental model for emergency nurses to better understand the barriers and support needed to meet the goals for both patient behavior and emergency nursing workforce behavior with a nonjudgmental and compassionate approach. Emergency nursing practice involves near-continuous patient education, coaching, and support to achieve a new behavior change. The Behavior Change Wheel provides a foundation for critical thinking when assessing if the patient has the skills, motivation, and

TABLE 1
Behavior Change Wheel interventions to support behavior change

Interventions	Definition[4]	Example from the *Journal of Emergency Nursing*
Education	Providing information or instruction focusing on knowledge and understanding	Knowledge test scores improved for emergency nurse participants using the ENA toolkit as an educational intervention on terminology, effective communication techniques, and types of gender-affirming surgeries in care of the patients who identify as LGBTQ+.[12,13]
Persuasion	Communication intended to appeal to feelings that motivate action	*Let's Choose Ourselves* intervention included a component about adolescent attitudes toward cell phone use during driving. The behavioral target was decreasing distracted driving as injury prevention.[8]
Incentivization	Connect action to reward or to expectation of reward	The Culture Change Toolkit included public recognition for emergency nurses on a gratitude board ("kudos" board) located in the emergency employee break room and a thank-you card program.[14]
Coercion	Connect action to punishment/cost or expectation of punishment/cost	Theoretically, emergency nurses can file police reports or press criminal charges against a patient who assaults the nurse at work in some jurisdictions.[15]
Training	Providing demonstration, information, or instruction focusing on attaining skills	A simulation intervention was designed for emergency nurses addressing skills of airway management and weight-based dosing calculation for a pediatric patient in status epilepticus.[16]
Restriction	Reduce opportunity to take a particular action or assign rules and prohibitions to prevent an action	Physical patient restraints may be applied for emergency patients who are assessed as a danger to self or others, thus reducing the opportunity for violent behavior, preferably after less-restrictive interventions and de-escalation have been attempted.[17]
Environmental restructuring	Changing the physical or social context	Reducing sensory stimuli for patients with autism by dimming lights, providing a patient room, and limiting the number of interactions with staff, visitors, or other patients may prevent overwhelming or overloading the patient.[18]
Modeling	Providing an example	A newly licensed nurse observes an emergency nurse preceptor's professional behavior of interacting with compassion and respect during patient care.[19]
Enablement	Remove barriers to action, increase opportunity or capability for action	Personalized care plan interventions were designed to increase opportunity to use available outpatient specialists and resources for patients with ≥4 emergency visits in the last year for the same health problem.[20]

ENA, Emergency Nurses Association; LGBTQ+, Lesbian, Gay, Bisexual, Transgender, Queer+.

TABLE 2
Behavior Change Wheel policy categories

Policy	Definition	Example from the *Journal of Emergency Nursing*
Communication/ marketing	Disseminating a message broadly using any or all components of multimedia modalities	In a single-institution study, the intervention as an electronic health record banner reminding the triage nurse to adhere to guidelines for sickle cell vaso-occlusive crisis. The intervention increased the proportion of patients triaged according to guidelines.[21] Although this intervention was not yet a policy at the institution, the study is an example of testing a potential new communication dissemination method policy for the organization.
Guidelines	Creating documents to recommend protocols or practices	ENA's Clinical Practice Guidelines such as the one on the Massive Transfusion Scoring Systems recommend specific nursing care activities.[22,23] In another example, outpatient antibiotic prescribing behavior for acute uncomplicated cystitis demonstrated poor concordance with national guidelines for empiric therapy prescribed with 22% duration, 77% of the dosing, and 70% of the therapy concordance.[24]
Fiscal	Using systems of insurance payment, organizational budgeting and payments, or taxation to increase or reduce costs	Sexual Assault Nurse Examiner/Forensic Nurse staffing program was redesigned to provide more thorough staffing coverage over a multihospital system with overall cost savings.[25]
Regulation	Establish rules or principles of action or practice	The ENA has advocated on the local, state, and national levels to establish, standardize, and expand the sexual assault nurse examiner role to best serve patients with care needs resulting from interpersonal violence or criminal behavior.[26,27]
Legislation	Making or changing laws	ENA's Government Relations team has successfully advocated for injury prevention and trauma system legislation addressing mandatory seat belt use, motorcycle helmet wear, ED violence, firearm safety, domestic and violent crimes, and trauma-funding reauthorization.[27]
Environmental/ social planning	Designing, changing, or regulating the physical or social context	Using a parking garage space, the triage and screening of patients with respiratory presentations was physically redesigned into a telemedicine-enabled drive-through system for patients with respiratory presentations to lower exposure risks to coronavirus disease.[28]
Service provision	Creating or delivering a service line	A bridge paramedic academic program was developed and delivered specifically for those already licensed as health care professionals.[29]

ENA, Emergency Nurses Association.

opportunity for the health behavior. Does the nurse have a habitual practice of delivering patient education in a set routine that isn't reaching the patient? Perhaps the patient does not have a deficit in cognitive capacity and understanding but a gap in motivation and opportunity. The Behavior Change Wheel can help emergency nurses think through the full breadth of potential intervention functions in addition to rote or habitual practices of merely providing more information alone. Above and beyond individual patient behavior, the theory can also help craft more effective nursing workforce practice change and population health interventions.

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It's Time to Provide Evidence-Based Care to Individuals with Sickle Cell Disease: A Call to Action

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In the current issue of the *Journal of Emergency Nursing*, Linton et al[1] report on their successful implementation of a clinical support tool (a banner to recommend emergency severity index [ESI] triage level 2) to improve the care of sickle cell disease (SCD) for individuals presenting to the emergency department with severe pain referred to as vaso-occlusive crisis (VOC). The researchers and clinical team are to be commended. The correct assignment of a high priority triage level is evidence-based and important to facilitate rapid placement in a treatment area to expedite pain management. Individuals with SCD experience sudden onset of excruciating pain that they often describe as feeling as though their bones are breaking. Historically, pain management for these individuals has been frustrating for patients and ED providers. Evidence-based management of SCD is a priority for the Emergency Nurses Association (ENA). The work by Linton et al[1] is in alignment with ENA's priorities that were reflected in 2019 at the General Assembly with the passage of resolution GA-19-09 (passed with 87.6% of the 653 delegates).[2]

GA-19-09, "Management of Vaso-Occlusive Episodes in Persons with Sickle Cell Disease in the Emergency Department," addresses an important topic for emergency nurses' care of individuals with SCD. The resolution provides background on SCD and aims to disseminate the National Heart, Lung, and Blood Institute (NHLBI) guidelines from the National Institutes of Health for the treatment of SCD, published in 2014, and includes recommendations for the treatment of VOC in the emergency department.[2] Specifically, a comprehensive pain assessment and rapid aggressive pain control are recommended. Assignment of ESI level 2 is recommended. In 2020, ENA published the ESI manual, which recommends a triage category of ESI level 2 for individuals who experience a VOC.[3] Administration of the first analgesic dose in 60 minutes from arrival, use of parental opioids, and development of individualized analgesic protocols when possible or a standard SCD protocol otherwise are also included. NHLBI also recommends repeat dosing, every 15 to 30 minutes until pain is controlled. Careful assessment and reassessment of pain and sedation are also important components of the guidelines. In 2019, the American Society of Hematology (ASH) published similar guidelines that align with the NHLBI recommendations supporting rapid aggressive treatment of pain and the use of individualized or standard SCD protocols.[4] The ASH guideline for treatment of VOC also recommends the use of subcutaneous and intranasal routes to facilitate rapid administration.[4] In particular, intranasal fentaNYL in children has been found to reduce the time to first dose.[5] The overarching goal of the recommendations is to facilitate rapid pain control and avoid hospitalizations by resolving the crisis in a timely fashion. Patients who receive rapid pain control are more likely to be discharged home and continue to manage their pain at home. These guidelines are supported by evidence.[5,6] In 2018, Tanabe et al[7] published findings from a randomized controlled trial comparing the reduction in pain score between patients treated with an individualized pain protocol and those treated with a standardized weight-based opioid protocol. Patients treated with the individualized protocol achieved a greater reduction in pain score from arrival to ED discharge when compared with those treated with a weight-based protocol. More patients were discharged home than admitted to the hospital when treated with individualized versus weight-based doses; however, this was not statistically significant. The NHLBI and ASH guidelines are evidence-based and should be followed.

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However, national implementation of the guidelines for SCD may continue to prove challenging. In a recent survey of 516 adolescents and adults with SCD and 243 ED providers from 7 regions of the United States, many barriers were identified. Overall, 48% of patient respondents reported never or sometimes being satisfied with their ED care. A total of 54% of patients reported not being treated in a timely manner, and 46% of patients believed physicians did not care about them; 35% believed nurses did not care about them.[8] In follow-up individual interviews, patients also identified high patient volumes, lack of SCD protocols, stigma, and poor communication with providers as barriers to ED care.[9] In an examination of a large national dataset of 17,1789 ED visits between 2003 and 2008, the time to physician evaluation from arrival was compared for all ED complaints (general complaints and long bone fracture) with a chief complaint with SCD.[10] Despite patients with SCD being assigned a higher acuity triage score, patients with SCD waited an average of 25% longer before seeing an ED physician when compared with the general complaint group. Given the recommendation of an ESI level 2 assignment, these are disturbing findings. Patients with low-priority complaints were still more likely to be evaluated by a physician quicker than those with SCD, a disease associated with many serious complications, severe pain, and an average lifespan of 30 years less than the US population. Even more disturbing, additional analysis compared the same outcomes only among Black patients in the sample. When compared with the long bone fracture group, patients with SCD waited an average of 50% longer for physician evaluation. These findings accounted for patient and hospital characteristics, triage level, and pain scores. These data clearly demonstrate disease stigma against treating individuals with SCD in the emergency department.

When examining barriers to ED care among the 243 ED providers, 75% of the respondents were unaware of the NHLBI recommendations for treatment of VOC; however, 98.1% reported being confident in their knowledge about caring for patients with SCD.[8] This is an important paradox and can be interpreted 2 ways: (1) providers may have actually internalized the evidence-based recommendations without realizing it and are providing evidence-based care or (2) they are not providing evidence-based care and are quite comfortable with this approach. This calls for the examination and comparison of individual ED SCD protocols, per the NHLBI and ASH recommendations. ED providers also identified the following as barriers to the treatment of VOC: opioid epidemic (62.1%), patient behavior (60.9%), crowding (58.0%), concern about addiction (47.3%), and implicit bias (37.0%).

Opioid Epidemic/Concern About Addiction/Patient Behavior

These 3 barriers to care are related and were identified by ED providers. Among health care providers, there is a long-standing perception that individuals with SCD are addicted to opioids; however, data to support this claim does not exist.[11] A review of national data from the Centers for Disease Control and Prevention from 1999 to 2013 compared deaths from opioid overdose between those with SCD and all other diseases. The total number of deaths from opioids during this time period was 17,4959 for individuals without SCD and 95 deaths for patients with SCD. These are compelling data; if individuals with SCD were truly addicted to opioids, there would be more than 6 overdoses per year. ED providers must abandon the belief that individuals with SCD are addicts seeking opioids; they are individuals with severe pain merely seeking relief.

The perception of opioid addiction has undoubtedly become more prevalent among the very real opioid epidemic. It is true that many patients with SCD experience both acute and chronic pain and require long- and short-term opioid therapy to manage pain. Yet emergency departments have strived to decrease the use of opioids because of the opioid epidemic; now we are on a slippery slope. Although the prescription of opioids by ED providers at discharge should be limited, treatment of severe pain with opioids still has its place in emergency care. Treatment of VOC is one example of when opioids are indicated, as they are clearly called out in the NHLBI and ASH recommendations for use in the emergency department and considered at the time of discharge.[2,4] If a patient with cancer or one who has experienced trauma described their bone pain or fracture as feeling as if their bones were breaking, would opioids be withheld? It is simply not ethical to withhold opioids from patients experiencing severe pain from any severe illness or injury, including SCD.

Racism and Implicit Bias

An important barrier to ED care for SCD identified by ED providers was implicit bias. In the US, most individuals with SCD are Black people. Implicit bias results from attitudes and beliefs we hold unconsciously.[12] In a recent systematic review of the literature that included 15 studies examining implicit bias among health care providers, low to moderate levels of implicit bias were identified in 14 of 15 studies.[12] Health care providers tended to think more favorably of white people than individuals of color. This bias was associated with negative patient/provider interactions, treatment decisions, and health outcomes.[12] The

role that systemic racism and implicit bias plays in the treatment of pain for individuals with SCD in the emergency department is undoubtedly high. This often-unrealized bias contributes to delays in treatment, undertreatment of pain, poor provider/patient communication, and mutual mistrust. Hoffman et al[13] demonstrated that white laypeople frequently believed Black people experience less pain than white people and also found that medical students and residents who endorsed this belief provided less accurate pain treatment to Black people. These findings are based on inaccurate beliefs of many biological differences between the races that are indeed not true. The current Black Lives Matter movement has increased dialogue about the topic of race in the US. There are countless calls to address systemic racism and implicit bias. A recent editorial in the *New England Journal of Medicine* eloquently addressed this issue and called out the opportunity to address racism that negatively affects care provided to individuals with SCD across the health care system.[14]

It is important that emergency nurses and other leadership begin to openly address racism and implicit bias. Many strategies have been suggested to reduce implicit bias. Marcelin et al[15] outlined an organizational model to decrease implicit bias; their approach is centered on leadership commitment to change. They identify specific organizational (leadership commitment and meaningful diversity training), individual (self-awareness and questioning stereotypes), and combination strategies (mentorship, cultural humility, and intentionally diversifying experiences). The Implicit Association Test is a validated assessment designed to measure an individual's level of implicit bias.[16] ED leaders should be encouraged to tackle this issue and can begin by administering the Implicit Association Test to all nurses in their department. Presentation of the results for the department can be the basis of a series of open discussions of how implicit bias affects nursing practice.

ENA is dedicated to improving health disparities resulting from racism and implicit bias. In the January 2021 issue of the *Journal of Emergency Nursing* in an editorial, Castner[17] discusses health disparities and introduces the January issue. Castner[17] reminds us of our ethical duty as nurses to reduce health disparities, which is outlined in our Emergency Nursing Code of Ethics.[18] ENA developed a resource for emergency nurses on the topic of racism: "Structural Racism in Health Care."[19] Specific to SCD and following the passage of GA 19-09, ENA developed the following resources specifically to improve management of SCD in the emergency department: (1) a SCD pediatric infographic and (2) a topic brief on the treatment of VOC. The next Emergency Nurse Pediatric Course and Trauma Nursing Core Course curriculum updates will include information on SCD. All of these resources will be available to ENA members.

Crowding

Finally, crowding was also recognized as an important barrier to providing care to individuals with SCD in the emergency department. Crowding is pervasive in emergency departments across the US. It is a long-standing problem that is perhaps the most difficult barrier that exists to receiving timely pain management; there are no easy solutions. Ensuring timely care based on acuity is essential. Creative solutions are needed. System interventions and ongoing education for ED providers are needed to ensure provision of evidence-based care to individuals with SCD. The first step is acknowledging that VOC requires rapid assessment, evaluation, and pain management.

Systematic Interventions to Address Care Are Needed

Linton et al[1] provided an excellent example of a systematic intervention designed to improve timely provision of analgesia to patients experiencing a VOC. The team developed a clinical support tool with a banner that recommended ESI level 2 for all patients presenting with a complaint of SCD at triage. The team conducted a blinded randomized control trial for 8 months. Nurses were randomized to either see the banner or not. Over the course of 8 months the triage category was evaluated for 384 visits. Nurses assigned to seeing the banner versus those who did not see the banner assigned the correct triage category more frequently (ESI 1 or 2), 65% versus 35%. Nurses also found the clinical support tool moderately acceptable, 4.1 to 4.9 on a 6-point scale. Although this is impressive, the goal of assigning the higher priority triage score is to facilitate rapid treatment of pain. However, this did not happen. There was no difference in the time to administration of analgesics between the intervention and control groups, 115 versus 107 minutes from arrival. Therefore, it is clear that there is a need for other systematic interventions along the care pathway to decrease the time to first analgesic.

Some emergency departments have instituted protocols to provide opioids in the waiting room for individuals with an individualized ED opioid protocol already developed by the patients' SCD provider. These plans should be readily available to the ED provider. Anecdotally, these protocols have not been associated with negative outcomes.

Reassessment of patients while in the waiting room is important, particularly if opioids are administered. Further data are needed to support this practice on a wider scale. Other systematic interventions include implementing a multidisciplinary quality improvement (QI) team focused on improving ED management of SCD. These groups can evaluate current SCD protocols and compare them with evidence-based recommendations. These teams can develop individualized opioid treatment protocols for VOC that can be made available to both the ED provider and the patient through their electronic health record patient portal. Both of these interventions are currently being evaluated in 2 trials funded by the National Institutes of Health: *Implementing an Individualized Pain Plan (IPP) for ED Treatment of VOE's in Sickle Cell Disease (ALIGN,* NCT04584528) and *Comparing Individualized vs. Weight Based Protocols to Treat VOE in SCD Occlusive Episodes in Sickle Cell Disease (COMPARE-VOE*, NCT03933397). QI teams should analyze important indicators such as time to first dose, triage category, and admission rates. The use of a health record audit and individualized feedback is often helpful. In the context of these discussions, teams can brainstorm other possible systematic interventions. This may include placement of patients with SCD in a specific unit in the emergency department or transfer to an observation unit after the provision of a few doses with some pain relief. Even with multiple system interventions, education of ED providers will still be required.

Educational Interventions

Educational efforts are necessary and should include registered nurses, physicians, nurse practitioners, residents, and physician assistants. Components of education should highlight (1) pathophysiology and complications, (2) implicit bias and racism, (3) the role of opioids, and (4) review of evidence-based guidelines in treatment of VOC, including ED-specific protocols. Many resources developed by ENA already exist and were described in earlier text. ENA and the American College of Emergency Physicians are members of the Emergency Department Sickle Cell Care Coalition.[20] This group includes numerous other professional associations and government organizations all with the goal of improving care for individuals with SCD in the emergency department. American College of Emergency Physicians also has numerous resources available for members and nonmembers.[20] In addition, a website was designed by several centers specifically for improving the ED treatment of individuals with SCD.[21] This website includes 8 short PowerPoint modules and associated 5- to 10-minute videos that support evidence-based care for a variety of acute complaints associated with SCD. Modules include the treatment of the *High ED Utilization and Perceptions of Addiction* and the *Treatment of VOC*.

It will be challenging to ensure all new nurses, advanced practice nurses, physician assistants, and physicians are up to date, especially given frequent high nursing turnover and the rotation of new residents in academic medical centers. For this reason, emergency nursing and physician leadership buy-in is critical. Standardizing the review of educational materials should be incorporated into new orientations for all types of providers. Leaders should engage and hold accountable nurse and physician educators, residency directors, and other leaders. One helpful approach may be to develop a SCD nurse and physician champion program. These individuals can obtain advanced knowledge of SCD and be accountable to oversee the education and QI efforts.

As registered emergency nurses, advanced practice nurses, physician assistants, and physicians, we always want to provide high-quality, evidence-based care. We do this in an incredibly challenging and demanding environment. All of our patients deserve our best; patients with SCD are no exception.

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Implementing Family Presence During Pediatric Resuscitations in the Emergency Department: Family-Centered Care and Trauma-Informed Care Best Practices

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In this issue of the *Journal of Emergency Nursing*, Vardanjani et al[1] report the findings of a rigorous umbrella review of 1 meta-analysis and 4 systematic reviews, which include a total of 70 studies that describe the impact of family presence on patients, families, providers, and clinical care processes regarding resuscitations and invasive procedures. This review of reviews concluded that family presence may benefit the people involved and does not have a negative impact on these individuals or on the clinical care processes. The included meta-analysis noted that family presence did not affect adult or pediatric clinical outcomes and may improve family psychological outcomes.[1,2] The 4 systematic reviews noted that parents desire the option of family presence; family presence is helpful to the child,[3] parent, and staff and does not cause additional psychological trauma; most families who were present during a resuscitation/invasive procedure would recommend being present to other parents; family presence provided a sense of control during the event and improved coping after the event while also dispelling doubts about the resuscitation/procedure; parental presence is associated with decreased behavioral disturbances after discharge and no differences in care processes[4]; parents prefer to have the choice to be present[5]; and family members of adult patients noted strong preferences for presence across multiple countries/cultures.[6]

In this commentary, we aim to provide guidance on the implementation of family presence in emergency departments, with a specific focus on pediatric resuscitations. Giving parents the option to be present during resuscitations and invasive procedures has become the norm in the approximately 500 pediatric emergency departments where resuscitations occur daily to weekly.[7] In pediatric emergency departments, family presence is often supported by training of staff before resuscitations and by a diverse group of practitioners—nurses, physicians, technicians, social workers, child life specialists, and chaplains—who are available to support families during resuscitations. However, for family presence to occur during most of the pediatric resuscitations in the United States, this practice must become standard in the more than 4500 general emergency departments where most of the total pediatric resuscitation events occur.[7] Of note, there are several challenges to implementing family presence during pediatric resuscitations in general emergency departments. Staff in these general emergency departments concurrently care for children and adults and often have limited access to pediatric-specific training. In addition, in many general emergency departments, pediatric resuscitations occur as infrequently as once every 5 years, giving staff limited

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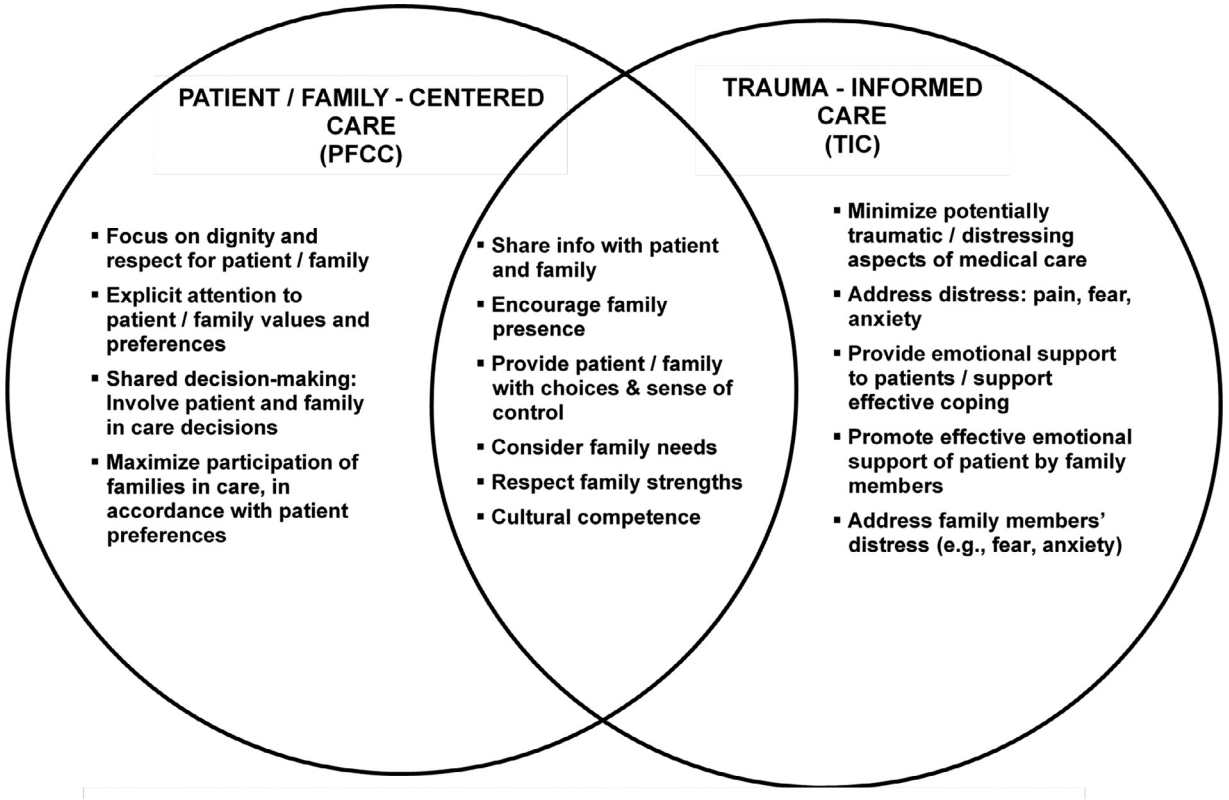

FIGURE

Elements of patient- and family-centered care and trauma-informed care. (Used with permission of the Center for Pediatric Traumatic Stress.)

opportunity to practice family presence. And although institution- and provider-level awareness and acceptance of family presence has grown remarkably—with half of general emergency departments having family-centered care policies for children[8]—staff in general emergency departments report concerns related to insufficient staffing to support families, a lack of space, and the potential negative effects on the providers as barriers to family presence.[9] Furthermore, implementation of pediatric evidence-based practices such as family presence is challenging in general emergency departments owing to the competing demands of efforts focusing on the more common adult patient population.

The first step in implementing family presence during pediatric resuscitations is to create a culture where staff are comfortable honoring and supporting a family's decision to enter or not to enter the resuscitation room. Staff education and training for family presence should include the principles of patient- and family-centered care (PFCC) and trauma-informed care (TIC). PFCC is care that emphasizes respect for patient and family perspectives and encourages patient and family participation in care and decision making.[10] Related to family presence, this may include parents communicating with the patient verbally about their care; touching the patient; and/or communicating with, or observing, the care team.[11] TIC, a closely related concept, refers to providing health care in a way that minimizes the potential for current or ongoing psychological trauma or posttraumatic stress related to illness, injury, or treatment experiences.[12] PFCC and TIC are complementary concepts (Figure); each is associated with improved health outcomes and better patient and family experience.

Without clearly defined practices or assessment metrics, it is difficult to train teams to provide optimal PFCC and TIC, and there is a high likelihood of significant interprovider variability in clinical practice. Developing granular, evidence-based practices with clinical tools related to PFCC and TIC will improve psychological outcomes for patients, their families, and their providers after pediatric resuscitations. The current American Academy of Pediatrics/American College of Emergency Physicians/Emergency Nurses Association guidelines recommend family presence during pediatric resuscitation and procedures and highlight the "development of a compendium of best

practices" as a needed area of research.[13] Two recent international surveys demonstrated that ED physicians, nurses, emergency medical technicians, paramedics, and other health staff commonly expressed interest in education and training on this topic, but few providers had received any formal education in specific skills.[14,15] In the current climate of growing awareness and provider acceptance, it is important to move beyond general policies and mere family presence; it is time to assess and improve specific family presence as well as PFCC and TIC practices within pediatric resuscitations in all emergency departments.

Our team has created a comprehensive set of resources and an online training module to support general emergency departments in implementing family presence, PFCC, and TIC. This work was funded by an Emergency Medical Services for Children Targeted Issues grant.[16] We developed a framework describing specific provider PFCC/TIC behaviors/best practices that are practical and feasible during pediatric resuscitations in all emergency departments (Family-Centered and Trauma-Informed Support [FACETS] of pediatric resuscitation). FACETS breaks down these behaviors into 6 domains that can be leveraged into individual core competency categories for training. The domains include (1) sharing information with the patient and family, (2) promoting family involvement in care/decisions, (3) addressing family needs/family distress, (4) addressing the child's distress (pain and emotional distress), (5) promoting effective emotional support for the child, and (6) establishing developmental and cultural competence.

An observational checklist for pediatric resuscitation based on FACETS was developed in a 3-step process:

1. A literature review demonstrated a paucity of specific instructions for providers regarding effective practices (eg, an evidence-based clinical guideline was published by Farah et al[17]) and limited existing instruments designed to analyze providers' family presence/PFCC/TIC behaviors.
2. An expert panel comprising specialists in pediatric emergency medicine, nursing, critical care, behavioral science, traumatic stress, and pediatric psychology identified 33 discrete provider behaviors across the aforementioned 6 comprehensive domains of PFCC/TIC.
3. A review of 26 pediatric resuscitation videos identified 38 additional discrete provider behaviors. These behaviors were distilled and organized to create an observational checklist that can be used in quality improvement efforts and can be freely downloaded by clicking on the internet link in the corresponding reference.[18]

The culmination of our work was the development of a 1-hour online FACETS training module for training staff of general emergency departments. We are currently analyzing data from a randomized clinical trial (NCT03640520) evaluating the efficacy of this online training module in improving individual providers' knowledge and confidence in the practice of FACETS, assessed through questionnaires and assessment of the teams' clinical performance during a set of simulated pediatric resuscitations. The FACETS training will be available on our website for public use at the corresponding internet address in the reference list[19] in the fall of 2021.

In future research we hope to engage patients/survivors and family members with lived experiences in our efforts to continue to develop and implement FACETS. Another article in this issue by Douma et al[20] describes a survivor- and family-led scoping review protocol to inform our understanding of the care needs of families experiencing cardiac arrest care. With the publication of 2 articles on family presence in this issue of the journal, we are excited to shift this field of research from "if" family presence should be implemented in emergency departments during pediatric resuscitations to "how" to implement family presence through robust training and quality improvement programs.

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Cesarean Scar Ectopic Pregnancy: A Case Report

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Contribution to Emergency Nursing Practice

- The current literature on cesarean scar pregnancy indicates that it is a relatively new type of ectopic pregnancy that is related to an increasing number of cesarean deliveries.
- This article contributes by providing evidence-based recognition, treatment, and clinical risk factors of a patient presenting with a cesarean scar pregnancy.
- Key implications for emergency nursing found in this article are: Pregnant patients with a history of a cesarean delivery must be evaluated for cesarean scar pregnancy. Cesarean scar pregnancy must be rapidly identified and treated to preserve fertility and reduce the chances of life-threatening maternal complications. Emergency nurses with knowledge of factors leading to cesarean scar pregnancy can promote positive patient outcomes.

Abstract

Background: A cesarean scar pregnancy is a rare, life-threatening obstetric emergency. Early recognition and prompt treatment of cesarean scar pregnancy is essential because of the risk for long-term reproductive complications associated with this condition.

Case Presentation: A 33-year-old gravida 6 para 5 female presented to the emergency department with pain to the suprapubic area. Following assessment and diagnostic testing, she was diagnosed with a cesarean scar pregnancy. The patient was admitted to the women's services department where she received a multidose regimen of methotrexate. The patient was discharged home, and no further surgical interventions were necessary. Two months after her visit to the emergency department, the patient has not had any complications related to the cesarean scar pregnancy.

Conclusion: This manuscript outlines the case of a patient presenting to the emergency department with a cesarean scar pregnancy that was promptly recognized and treated. It is important for emergency nurses to quickly recognize the risk factors and clinical presentation of a cesarean scar pregnancy to reduce maternal morbidity and mortality.

Key words: Case report; Cesarean scar pregnancy; Emergency nursing; Cesarean section; Pregnancy; Cesarean delivery

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Introduction

Obstetric conditions are one of the most common complaints among patients presenting to emergency departments in the United States.[1] Pregnant patients are at an increased risk of experiencing a medical emergency related to pregnancy complications. A serious but rare pregnancy complication is cesarean scar pregnancy (CSP). Patients diagnosed with CSP are becoming increasingly more common because of the frequency of cesarean deliveries combined with improved diagnostic technology. Therefore, emergency nurses must be able to quickly recognize a CSP and provide rapid interventions to reduce maternal morbidity and mortality.

Case Report

A 33-year-old gravida 6 para 5 female presented with a chief complaint of abdominal pain. The patient's history revealed no previous medical problems or medical diagnosis. The patient reported no home medications, no allergies, and a past surgical history of a cesarean delivery. She

reported that she was pregnant and that her last menstrual period was approximately 6 weeks earlier. Initial vital signs were as follows: blood pressure: 119/73; heart rate: 96 BPM, temperature 37.3 °C (99.2 °F) orally; and a pulse oximetry reading of 100% on room air.

On arrival, the patient reported that she was sent from an outpatient clinic to the emergency department for further evaluation following an abnormal ultrasound. A thorough physical examination revealed the patient to be awake, alert, and oriented to person, place, and time, with a Glasgow Coma Score of 15. The patient was calm and cooperative. The patient reported intermittent and cramping pain to her suprapubic area with no other symptoms. Her abdomen appeared normal with bowel sounds present in all 4 quadrants. The patient denied any vaginal discharge or vaginal bleeding. A pelvic exam revealed a closed cervical os with no evidence of bleeding, inflammation, or tenderness. The fundal height was not assessed because of the early gestational age.

Laboratory tests performed included a urinalysis, complete blood count, serum chemistry, quantitative human chorionic gonadotropin (hCG) level, and a blood type and screen. Pertinent lab results included a hemoglobin of 9.8 g/dL, hematocrit of 32.5%, and a hCG level of 7027 mIU/mL. Diagnostic testing consisted of an obstetric ultrasound. The ultrasound detected an intrauterine gestational sac with a fetal pole and active cardiac motion with a gestational age of 5 weeks and 6 days. However, the gestational sac was malpositioned and located within a cesarean delivery scar superior and anterior to the endocervical canal. Based on the results, the patient was diagnosed with a CSP.

The obstetrician on call requested that the patient be discharged and established an outpatient appointment with the patient scheduled for the following day. On assessment in the obstetrics and gynecology clinic the next day, the obstetrician sent the patient back to the emergency department. During her second visit to the emergency department, a repeat ultrasound was performed, which displayed an unruptured CSP. The emergency nurse administered an initial dose of intramuscular methotrexate. She was then admitted inpatient to the women's services department to receive a multidose regimen of methotrexate.

Following methotrexate administration, the patient's follow-up obstetric ultrasound detected an intrauterine gestational sac with no cardiac activity. Following discharge from the hospital, the patient was closely monitored outpatient by the obstetrician to ensure that she was able to pass all products of conception without the need for surgical intervention. No further medical or surgical interventions were required. Two months after the visit to the emergency department, the patient has not had any complications related to the CSP.

Discussion

CSP is an uncommon complication of pregnancy that occurs when the gestational sac is implanted in the myometrium at the exact scar site of a previous cesarean delivery.[2] A CSP is a relatively new type of ectopic pregnancy that is related to an increasing number of cesarean deliveries.[3] Rapid intervention and treatment of a CSP is associated with improved maternal prognosis. Therefore, it is important to evaluate and screen pregnant patients with a history of a cesarean section.[3]

CSP most commonly presents in the first trimester, although second trimester diagnoses have been reported.[4] Signs and symptoms of a CSP will vary depending on the severity and duration of the condition.[3,4] One-third of women are asymptomatic at the time of diagnosis.[4] Symptoms of a CSP include abdominal pain, pelvic pain, and painless vaginal bleeding.[5] Patients with a ruptured CSP may present with signs and symptoms of hypovolemic shock.[4]

Risk factors for CSP include a maternal age of older than 35 years, gravidity higher than 3 (especially gravidity higher than 5), history of a cesarean delivery performed at a rural facility, and an interval of less than 5 years (especially <2 years) between the current pregnancy and a previous cesarean delivery.[6] Although a cesarean delivery is a prerequisite to the development of CSP, it is uncertain if the number of previous cesarean deliveries further increases the risk.[4] There is evidence to suggest that the indication for prior cesarean deliveries may be a risk factor for CSP.[4] Patients requiring a cesarean delivery because of a breech fetal presentation are more likely to experience a CSP.[4]

The gold standard for diagnostic imaging to diagnose CSP is a transvaginal ultrasound.[7] Grayscale combined with color Doppler ultrasound imaging are recommended for CSP diagnosis.[4] Transvaginal ultrasound combined with an abdominal ultrasound with a full maternal bladder can help visualize the uterus in relation to the gestational sac and bladder.[4] One challenge in the diagnosis of CSP is distinguishing the condition from other pregnancy complications that may appear similar on ultrasound, such as cervical ectopic pregnancies, spontaneous abortions in transit, or low implantation of an intrauterine pregnancy.[4]

Treatment and management of CSP is based on the severity and duration of the condition. However, optimal treatment is not known at this time and is typically a combination of surgical, medical, and minimally invasive therapies.[4] Treatment modalities include surgical interventions, such as laparotomy, open abdominal surgery, transvaginal surgery, and curettage.[4] Administration of intragestational injection of methotrexate or potassium chloride without surgical intervention are also effective treatment options.[2,4] Systemic methotrexate treatment was found to be the least

effective treatment method in literature.[8] If left untreated, CSP complications include uterine rupture, maternal hemorrhage, hypovolemic shock, disseminated intravascular coagulation, and maternal death.[7] Undiagnosed CSP can result in a potential loss of fertility if complications necessitate a hysterectomy.[5]

Nursing Considerations

It is important for the emergency nurse to follow safe handling precautions if methotrexate is ordered, because this is a cytotoxic drug.[9] Personal protective equipment for hazardous drugs should be worn when administering methotrexate. This includes a protective gown, double chemotherapy-safe gloves, and eye/face protection.[10] Patient teaching following methotrexate administration should include: limit alcohol intake to reduce the risk of liver injury, increase fluid intake and avoid nonsteroidal anti-inflammatory drugs to reduce the risk of kidney damage, avoid folate in vitamin supplements and foods, and avoid prolonged exposure to sunlight.[10] Patients should be instructed to seek treatment immediately if they develop any type of rash or skin condition following administration, which can be indicative of methotrexate-induced cutaneous toxicity, an emergent medical condition.[10]

Patients that receive nonsurgical treatment should be instructed to undergo repeat ultrasound surveillance and beta-hCG level monitoring following discharge.[11] In addition to medication and follow-up teaching, patient teaching should include information on seeking emotional support, because a pregnancy loss can increase the risk of depression.[11] Patients should be instructed to follow up closely with their obstetrician before attempting to conceive again.[11]

Conclusion

To promote optimal patient outcomes, the emergency nurse should be knowledgeable about the clinical presentation and risk factors of a CSP. Recognizing the condition and quickly intervening can salvage fertility and decrease the occurrence of further maternal complications and mortality.

Author Disclosures

Conflicts of interest: none to report.

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Development and Implementation of an Emergent Documentation Aggression Rating Tool: Quality Improvement

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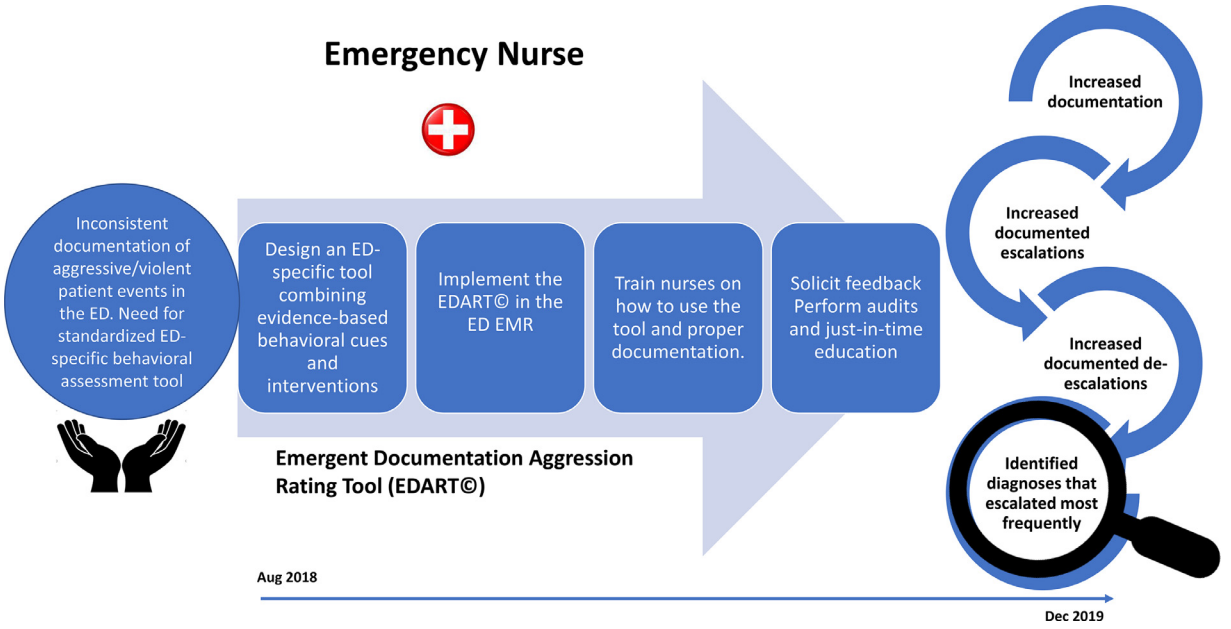

Development and Implementation of an Emergent Documentation Aggression Rating Tool: Quality Improvement

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Contribution to Emergency Nursing Practice

- The purpose of this quality improvement project was to design, implement, and evaluate feasibility of an ED-specific evidence-based tool with intervention guidelines to standardize the proactive assessment of, and intervention with, agitated/aggressive patients in the emergency department.
- A standardized assessment tool should capture better documentation of patients' behavior changes involved in aggressive/violent events and reduce restraints. The primary outcome of this quality improvement project was an increase in overall documentation of escalations and de-escalations over time after Emergent Documentation Aggression Rating Tool implementation.
- Key implications for emergency nursing practice based on this project are that the Emergent Documentation Aggression Rating Tool helped to refocus to a proactive practice and that the tool was feasible for assisting nursing staff to recognize early indicators of agitation/aggression and apply pre-emptive interventions in the emergency department.

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Abstract

Introduction: Workplace violence is prevalent in the emergency department, putting patients and staff at risk for harm. An ED-specific standardized tool is needed to promote a consistent assessment process to strengthen documentation of escalating patient behaviors, give justification for de-escalating interventions, and reduce restraints. The purpose of this project was to design, implement, and evaluate feasibility of an ED-specific tool to help nurses proactively identify and intervene with patients' escalating behaviors, capture better documentation of aggressive/violent patient events, and reduce restraint usage.

Methods: A quality improvement design was used. The Emergent Documentation Aggression Rating Tool was constructed by combining evidence-based behavioral cues for potential aggression/violence with observed behaviors and successfully implemented interventions in patients. Nurses were trained on how to use the tool to rate patients' behaviors and take necessary action. Chart data were collected from August 2018 to December 2019 at a Midwestern suburban hospital emergency department. Chart audits and just-in-time education were conducted after implementation. Survey data were collected to evaluate nurses' perception of the tool's usefulness.

Results: Use of the novel Emergent Documentation Aggression Rating Tool increased over time (67.36% in Quarter 3 2018 to 97.55% in Quarter 4 2019). After Emergent Documentation Aggression Rating Tool implementation, visual inspection of the time series indicated a decrease in percent restraints, and there was an overall increase in documented escalations de-escalations over time. The patients that escalated most frequently had diagnoses of alcohol use, suicidal ideations, pain-related complaints, or mental health issues.

Conclusion: The Emergent Documentation Aggression Rating Tool was feasible for emergency nurses to proactively identify and intervene with patients at risk for aggression/violence.

Key words: Violence in the ED; Aggression in the ED; Emergent Documentation Aggression Rating Tool; Emergency department; Nurses; Workplace violence

Introduction

PROBLEM DESCRIPTION

Workplace violence (WPV) affects patient and employee safety, affects physical and psychological well-being, and contributes to the rising cost of health care.[1] Frequent acts of violence in the workplace can lead to decreased work productivity,[2] increased risk for medical errors,[1] incident-related dissatisfaction,[3] and professional attrition.[1] Emergency nurses experience more patient- and visitor-related verbal and physical assaults than non-ED nurses.[2,4] Patient/family risk factors that may precipitate violence toward ED staff include mental health issues and misuse of alcohol or drugs.[4,5] Regardless of the cause, aggressive/violent events in the emergency department create an immediate safety risk for everyone involved. Patient-centered approaches are needed to ensure patient safety in these situations.

LOCAL PROBLEM

In 2016, internal chart audits revealed that the number of documented aggressive/violent patient events did not accurately reflect the number of actual events. Research has shown that such events often go unreported.[1,3,4,6,7] Our emergency nurses did not always report aggressive incidents because of the assumption that it is a typical part of the job, a sentiment we also noted in the literature.[6-8] Moreover, the audits identified inconsistent nursing documentation of aggressive/violent events including restraints. Rapid identification and de-escalation of patients' escalating behaviors are essential to avoid aggressive/violent events and restraint usage. We determined that an ED-specific tool was needed to promote proactive assessment that strengthens documentation of escalating behaviors and gives justification for interventions to avoid aggressive/violent events.

AVAILABLE KNOWLEDGE

A literature search for an ED-specific tool revealed that, although aggression assessment tools have been studied in other patient populations,[9-12] they were not practical for the ED environment. One assessment tool (Dynamic Appraisal of Situational Aggression [DASA]), previously validated in psychiatric inpatient settings, was recently studied in behavioral health patients in the emergency department.[13] The researchers found a significant association between the DASA scores and the likelihood for aggression/violence in ED patients with behavioral health problems.[13] However, the aggressive patients examined were only those with behaviors that led to physical or chemical restraints.

Few ED-specific assessment tools were identified in the literature,[14-16] and 1 of them requires knowledge of the patient's history of violence.[14] Emergency nurses often have little time to search the medical record pre-emptively for the patient's history of violence. Additionally, although the Australian violence assessment frameworks[15,16] identify behavioral cues that predict violence in patients with an unknown history, they do not include embedded de-escalation interventions for agitated/aggressive behaviors. To our knowledge, there were no existing standard protocols or validated tools that combined behavioral assessment with recommended interventions to help de-escalate ED patients.

RATIONALE

The Centers for Medicare and Medicaid Services (CMS) requires objective measurable assessments and least restrictive interventions to de-escalate aggressive behaviors and minimize restraint usage. A novel ED-specific assessment tool with embedded proactive interventions could meet the CMS requirements. Moreover, a standardized tool should capture better nursing documentation of aggressive/violent events, including escalations and de-escalations, and reduce restraint usage.

SPECIFIC AIMS

The purpose of this project was to design, implement, and evaluate the feasibility of an ED-specific assessment tool to help nurses rapidly identify escalating patient behaviors and implement recommended interventions.

Methods

DESIGN

A quality improvement (QI) design was used. The Saint Luke's Health System Institutional Review Board deemed the project as exempt from review because it was QI (protocol number The Saint Luke's Health System -20-173).

CONTEXT

This QI project took place in a 23-bed emergency department within a 160-bed hospital that offers 20 specialized health care services, including ST-elevation myocardial infarction and stroke care. The hospital belongs to a large

Midwestern health system, which consists of 18 area hospitals and several primary and specialty care practices. There were 29.70 full time employee emergency nurses at the project site. In July 2019, the health system announced plans to permanently close the emergency department of 1 of its behavioral health hospitals in closest proximity to our emergency department on October 31, 2019.

INITIAL INTERVENTION DEVELOPMENT

Three nurses from the emergency department formed a QI team in 2017 to develop an evidence-based behavioral assessment tool with intervention guidelines. The QI team constructed the new tool by combining behavioral cues for potential aggression/violence from the literature[15−18] with additional behaviors (eg, alcohol/substance intoxication)[5,18,19] and evidence-based interventions[5,20,21] that have been successful with our own patients. Chart audits helped to identify behaviors and characteristics exhibited by aggressive and/or violent patients and patients who required restraints to inform our intervention development.

During the initial tool development, with input from several ED physicians and nurses, and the ED Director, we classified specific behaviors based on their level of aggression/violence and placed them into 5 categories (levels): (1) nonthreatening (early indicators),[5,14-16,18] (2) signs of aggression,[5,14-16,18,19] (3) beginning of aggression,[16] (4) escalating aggression with no physical contact, including spitting and biting objects (eg, clothes, blankets, or bedrail), and (5) danger to self and others (eg, aggressive actions directed at others).

We integrated pre-emptive intervention suggestions into each behavior level, on the basis of evidence,[20,21] current hospital policies, and our own experience with successful de-escalating interventions. Nurses were able to make clinical judgments about which of the recommended interventions to implement at each behavior level. In addition, they could decide to implement interventions from lower behavior levels that might further benefit the patient.

Level 1 interventions included verbal de-escalation[20] by explaining what to expect during the ED visit, silent observation by nursing staff, attempt to distract or redirect,[20] and increase frequency of staff rounds. Level 2 interventions included establishing a verbal behavioral agreement with the patient regarding the behavior; increasing the frequency of nursing rounds; orienting or redirecting the patient to reality[20]; reassigning the room for optimal observation[20]; informing the physician/licensed independent provider (LIP), charge nurse, and supervisor of patient's escalating behavior; contacting security[5,21] to wand with a portable metal detector and/or search the patient for weapons in accordance with internal hospital policy and secure belongings as needed; and crisis intervention response team (CIRT) presence when appropriate.[21]

Level 3 interventions included using security/supervisor/charge nurse and/or CIRT[21] as mediators, modifying the patient's environment, and consulting the physician/LIP who may order close observation.[20] Level 4 interventions included one-on-one patient care,[20] consulting the physician/LIP for possible medication orders,[20] and activating the CIRT internal policy. Level 5 interventions included activating the CIRT internal policy and consulting the physician/LIP for medication and/or restraint interventions.[20]

The tool was named Emergent Documentation Aggression Rating Tool (EDART). Figure 1 displays an example of behaviors and corresponding interventions contained in the original assessment tool.

INITIAL INTERVENTION IMPLEMENTATION

Implementation of the EDART took place on August 6, 2018, and involved working closely with the Information Technology Department to build the tool into the electronic medical record (EMR). All ED patients were expected to have an EDART assessment. Once the EDART was available in the EMR, we educated the emergency nurses on its use and proper documentation. A staff meeting was held to introduce the tool, discuss the details, and answer questions. Additionally, we worked different shifts as clinicians and subject matter experts to provide all emergency nurses assistance and education as needed over a 4-week period. We conducted periodic audits to evaluate documentation using the EDART and provided just-in-time education on an individual basis. During this phase, we gathered informal verbal feedback over 5 day and night shifts from fellow nurses as informants on ease-of-use and any issues regarding interpretation of items on the tool. This feedback informed intervention revision.

INTERVENTION REVISION

Examples of improvements made from the feedback included adding 1) a timer, 2) another option to level 2, and 3) "not applicable" response option. The automatic timer reminded nurses to reassess the patient's behaviors. Because all patients were to be assessed at least on admission and discharge, nurses would get an EMR alert to complete the EDART at these times. If the patient's behaviors began to escalate to a level over 2, the timer would alert the nurse every 15 minutes to reassess and/or intervene more often. Responding to the alert was optional based on the

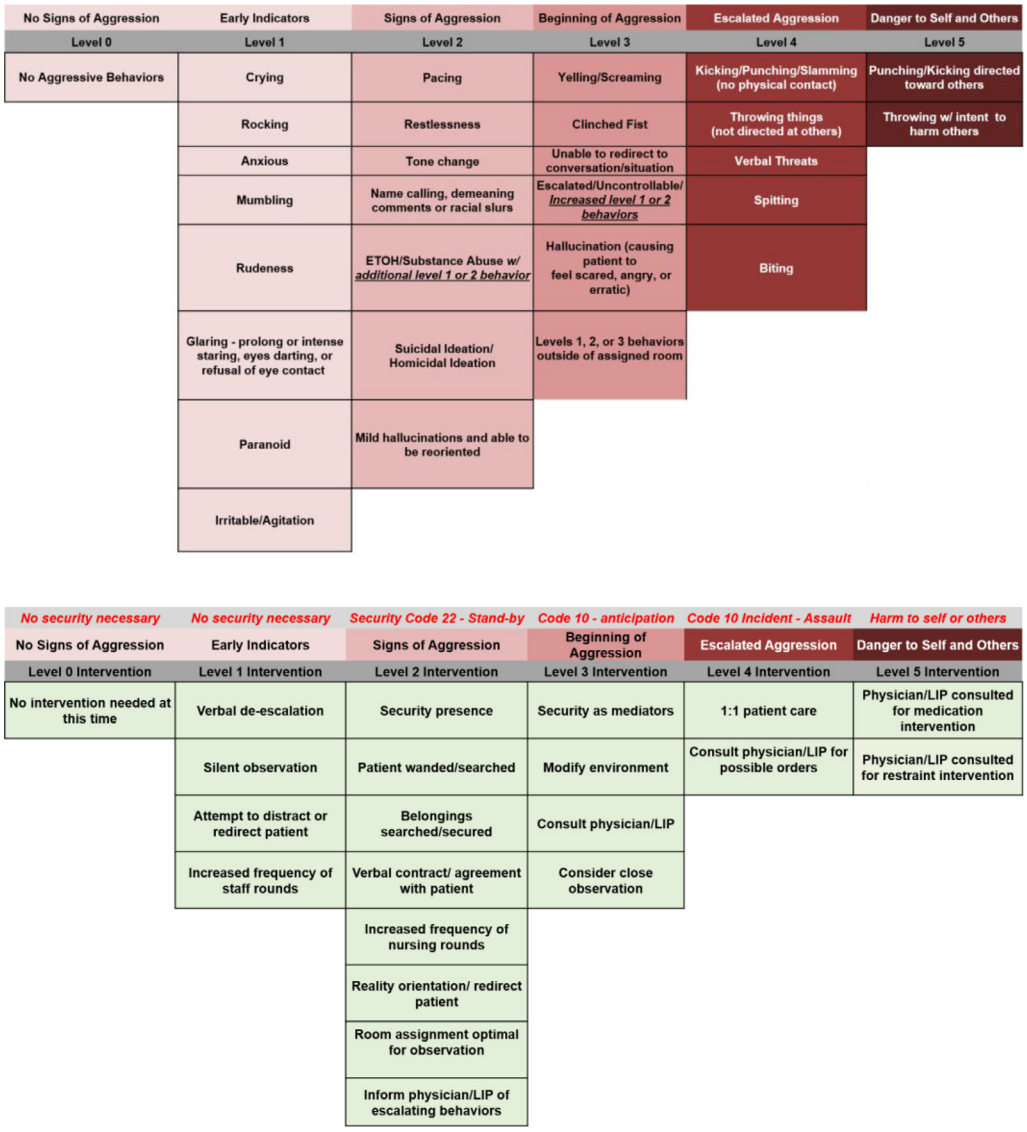

FIGURE 1

Example of behaviors and corresponding interventions in the EDART Tool. EDART, Emergent Documentation Aggression Rating Tool; LIP, licensed independent provider; ETOH, ethanol alcohol.

nurse's clinical judgment and patient assessment. We added an option for suicidal/homicidal ideation to level 2 and changed the wording from "alcohol/substance abuse" to "alcohol/substance use." We added EDART to the triage and disposition sections of the EMR and replaced the term "not applicable" with a 0 (calm) category.

STUDY OF THE INTERVENTION

We asked the nurses to complete an EDART for every patient on admission and discharge and with any behavior change while in the emergency department. As described below, we collected electronic medical record (EMR) chart data on the number of behavior escalations and de-escalations documented during the ED visits. Additionally, we collected EMR chart data on restraints applied during the project period. After noting a spike in restraints in the third quarter 2019, we reviewed the charts of the 10 patients who were restrained that quarter.

DATA SOURCES

Data from August 8, 2018, to December 31, 2019, were extracted from the EMR and imported into a Microsoft

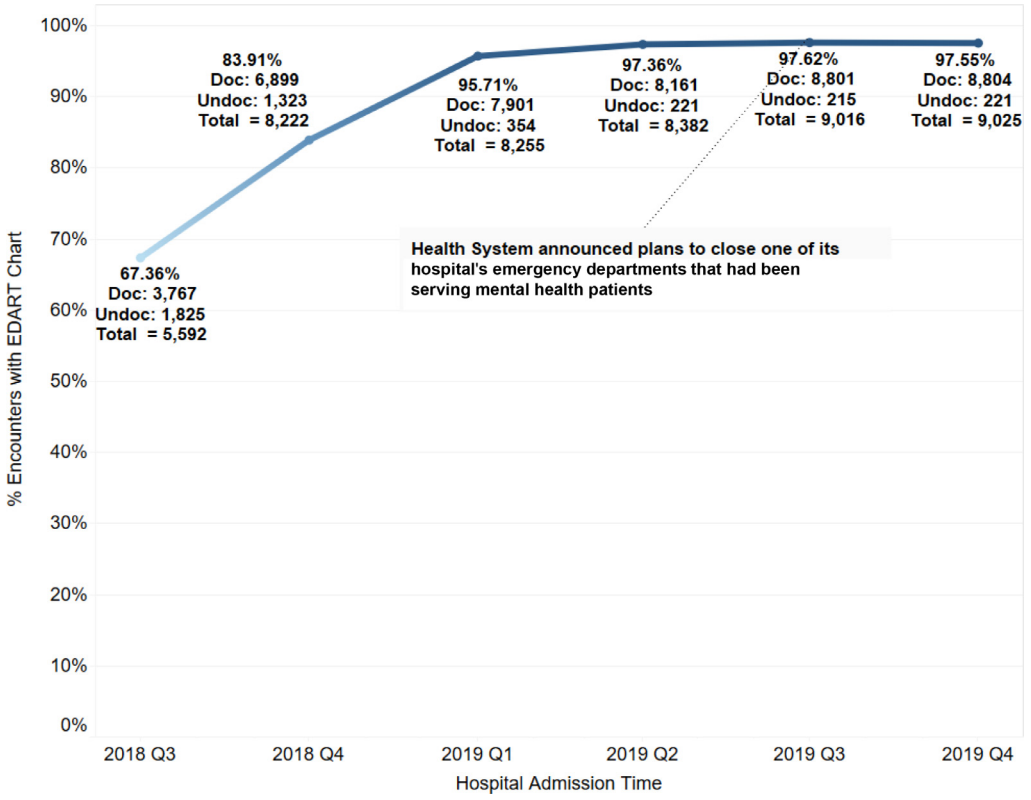

FIGURE 2

Percentage of patient visits documented with EDART tool in each quarter (total patient visits N = 48 492). Doc, documented; Undoc, undocumented; EDART, Emergent Documentation Aggression Rating Tool; Undoc, undocumented; Q, quarter.

Excel (Microsoft Corp, Redmond, WA) spreadsheet version 2008 (Build #13127.21506) for analysis. Emergency nurses were surveyed for feedback using a questionnaire designed for the purposes of this project (online supplement). Data from the nurses' surveys were compiled and reviewed.

MEASURES

We calculated the percentage of patient visits that emergency nurses documented using the EDART each quarter from the EMR repository. We examined the percentage of patients that escalated while in the emergency department and the percentage of total discharge de-escalations per quarter. Finally, we measured restraint usage per quarter before and after EDART implementation.

ANALYSIS

The analytic data consisted of 32 290 unique patients seen in the emergency department during the specified time period, with a total of 48 492 patient visits. Patients with more than 40 ED visits (major outlier range) were excluded from the analysis as outliers. We labeled patient visits as undocumented if the EDART was not opened or if behavior levels were not documented during the visit. Percentage of documented and undocumented visits were calculated per quarter. We measured the total number of escalations (movement from a lower to higher behavior level during the ED visit) and discharge de-escalations (movement from higher to lower behavior level at discharge from the emergency department) per quarter. This provided data on all the patients' behavior changes while in the emergency department. Restraint use before and after EDART implementation was analyzed, and statistical significance of these results was tested using a logistic interrupted time series model with time, EDART implementation, and an interaction term in the model. Finally, we identified the 10 most frequently presenting diagnoses in patients who had the most escalations during the study time frame.

Results

The analytic data consisted of 32 290 unique patients seen in the emergency department during the specified time

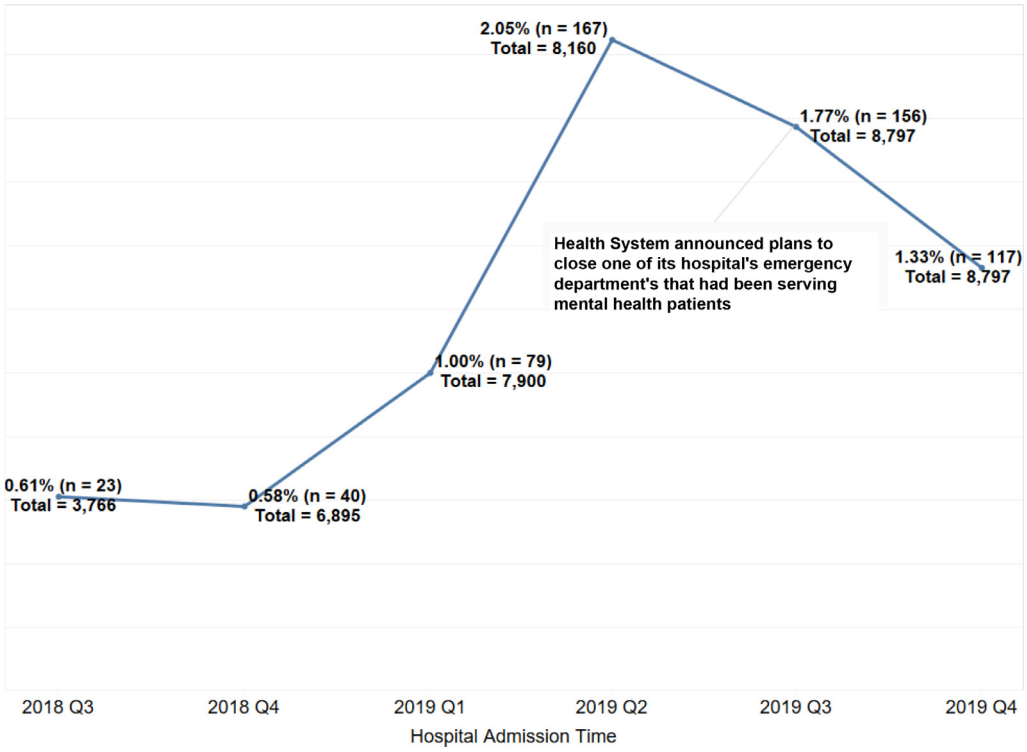

FIGURE 3

Percentage of patient encounters with documented escalation during the ED visit (total encounters with documented escalation N = 44 315). Q, quarter.

period, with a total of 48492 patient visits. Nursing documentation using the EDART increased over time (Figure 2); from 67.36% (3767/5592) of visits documented in third quarter 2018 to 97.55% (8804/9025) of visits documented in fourth quarter 2019. There was a significant difference between percent visits documented using EDART in third quarter 2018 and fourth quarter 2019 ($\chi^2(1) = 260.8$, $P < .001$).

After the implementation of the EDART, the total number of escalations increased slightly (Figure 3), from 0.61% (23/3767) in Q3 2018 to 1.33% (117/8804) in Q4 2019. The rate of discharge de-escalations increased over time. In third quarter 2018, 1.3% (49/3767) of total patient visits de-escalated by discharge, whereas 5.8% (507/8804) of total visits de-escalated in fourth quarter 2019 (Figure 4).

Before the EDART was implemented in August 2018, 0.11% (48/42 202) of total patient visits were in restraints over 5 quarters (Q3 2017-Q3 2018). After implementation, only 0.07% (29/40 566) of total patient visits were in restraints over the next 5 quarters (Q4 2018-Q4 2019) (Figure 5). The overall EDART effect on restraints, however, was not statistically significant (logistic interrupted time series model with time F=2.01, $P = .13$).

The most frequent 10 primary diagnoses for patients who escalated during the study time frame included psychoactive substance use, suicidal ideations, alcohol-related diagnosis, major depressive disorder, intentional/unintentional poisoning, restlessness and agitation, disorientation, anxiety disorder, and precordial pain (Figure 6).

Chart review of patients who were restrained in third quarter revealed that 3 of the 10 patients arrived in the emergency department already in restraints, 4 of the 10 presented with mental health issues, and 6 presented with substance/alcohol use.

EMERGENCY NURSE SURVEY RESULTS

Unexpectedly, the health system announced plans to close 1 of the hospitals with an emergency department that had been serving mental health patients in quarter 3 of 2019 (Figures 2-5). Three months after EDART implementation, we distributed paper surveys to all the nurses on day and night shifts to solicit feedback on the tool. Thirty of

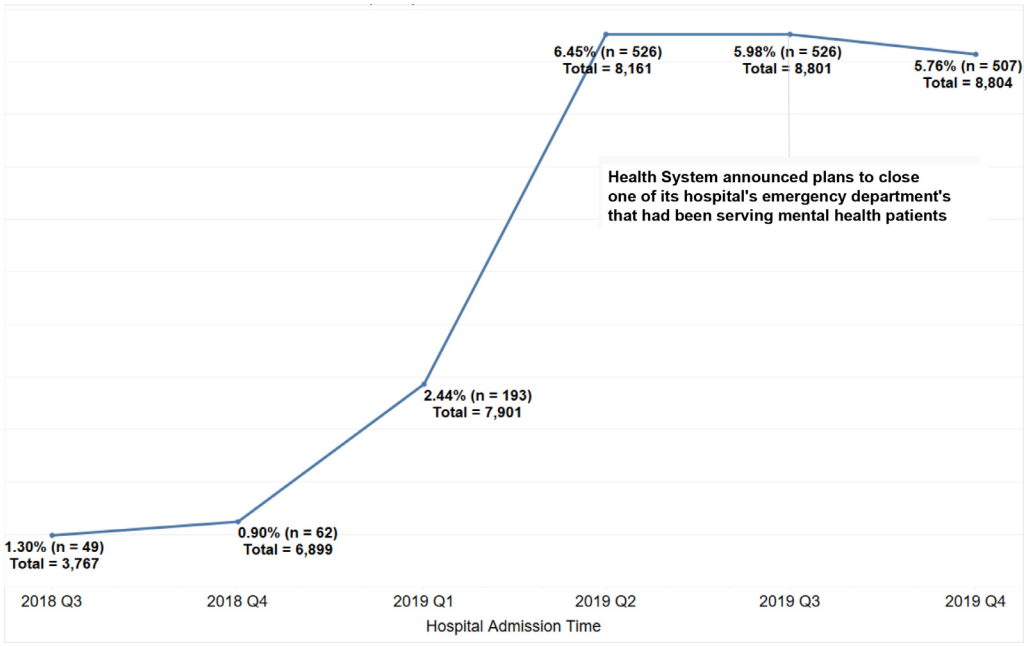

FIGURE 4

Percentage of total discharge de-escalations documented during the ED visit (total encounters with documented de-escalation N = 44 333). Q, quarter.

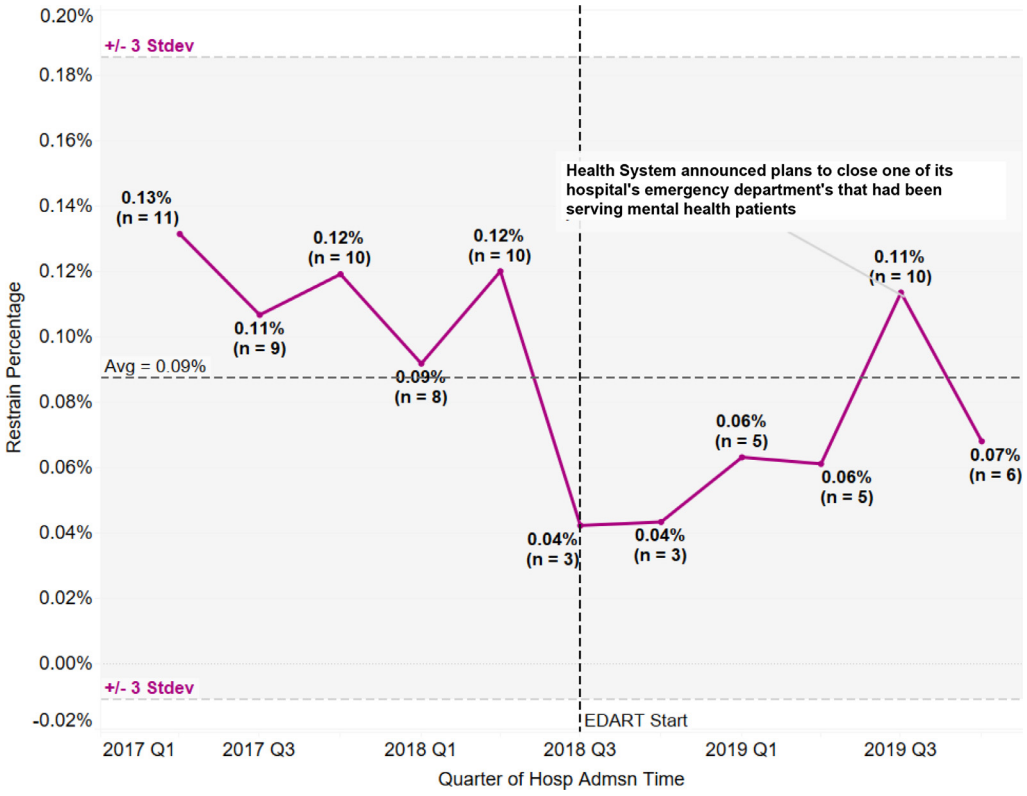

FIGURE 5

Restraint usage per quarter before and after EDART. EDART, Emergent Documentation Aggression Rating Tool; Hosp, hospital; Admsn, admission; Q, quarter; Avg, average.

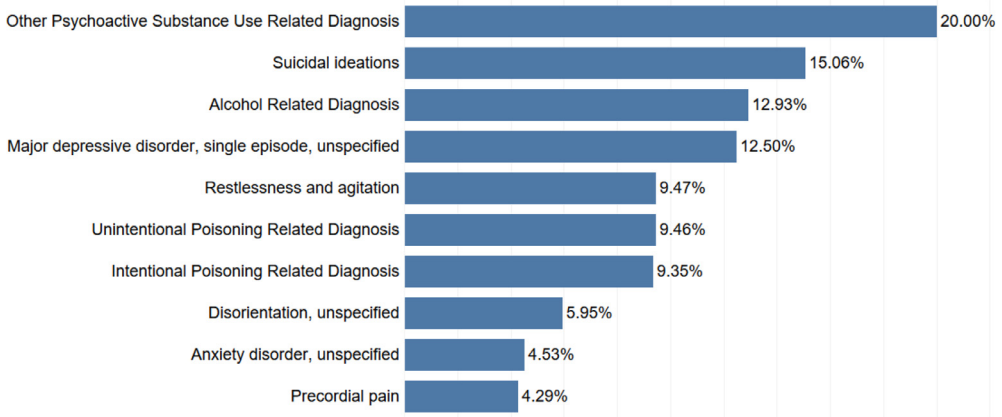

FIGURE 6

Top 10 diagnoses in the emergency department with which patients most frequently escalated.

48 completed surveys were returned. All 30 respondents agreed that the EDART was easy to use. Twenty-eight agreed that it increased their ability to offer early interventions on the basis of the patient's behaviors. Twenty-nine felt that there was no need to add more behaviors to the tool. Twenty-eight respondents indicated that the recommended interventions in the tool were sufficient. Twenty-nine felt that security benefited patient care, 30 agreed that security helped with patient de-escalations, and 29 responded that security improved patient and staff safety.

Discussion

SUMMARY

Before implementing the EDART, nurses' documentation of behavior escalations preceding aggressive/violent events was inconsistent. After implementation of the EDART in the emergency department, its use and documentation of aggressive events improved consistently over time. In third quarter 2018, documentation was only 67.36%. However, through audits and just-in-time education, documentation using the EDART increased to 97.55% in fourth quarter 2019 (Figure 2). These were done by 2 members of the project team who are emergency nurses and EDART subject matter experts. They compared EDART documentation numbers with the number of ED encounters, identified who did not complete EDARTS, and approached the nurses individually to discuss. They also randomly reviewed charts to compare notes with EDART scores and reviewed charts of patients who were restrained to determine if the trajectory of the ED visit was accurately reflected in the EDART scores.

Improvements to the tool based on feedback from staff helped to increase EDART usage. Currently, audits and education continue as needed.

As anticipated, visual inspection of the time series indicated a slight increase in the number of escalations over time (Figure 3). Similarly, the number of discharge de-escalations appeared to increase slightly over time (Figure 4). As the nurses became more familiar with the EDART, they began to identify and document escalating behaviors proactively and select recommended interventions to implement at the appropriate behavior levels. This was apparent in the slight increases in escalations and discharge de-escalations over time.

On rare occasions, physical restraints may be needed when interventions fail to de-escalate a patient who has become an imminent threat to themself or others. Although fewer restraints were applied after EDART implementation, the reduction was not significant (Figure 5). As noted in the results section, we observed a spike in restraints in the third quarter 2019. Early in the same quarter came the announcement of plans to permanently close an emergency department of 1 of the health system hospitals, which was in closest proximity to our emergency department. We speculated the possibility that this announcement might have led to an increase in patients presenting to our emergency department with substance/alcohol use and mental health issues at risk of escalation. We reviewed the charts of the 10 patients who were restrained during that quarter. Four of the 10 patients presented with mental health issues, and 6 presented with substance/alcohol use. Three of the 10 patients arrived in the emergency department already in restraints.

Results from this project comport with existing literature on ED-specific tools that prompt nurses to identify

behaviors at risk of escalating to aggression/violence.[13-16] Like the DASA,[13] the EDART provided a standardized structure, enabling proactive identification and documentation of behavior changes without requiring knowledge of patients' history of aggression/violence. The EDART tool further enhanced assessment by leveling escalating behaviors and making recommendations for de-escalating interventions.

FUTURE TOOL DEVELOPMENT AND TESTING

We did not attempt to validate the EDART as part of this project. Future studies should include usability testing with the System Usability Scale.[22] Additional research should include structured content analysis with a validated rating system[23,24] and testing for predictive validity and inter-rater reliability.[23] Other researchers used a modified Delphi technique, including calculation of content validity index, to validate a pressure ulcer risk assessment tool.[25] A similar technique could be used to validate the EDART.

INTERPRETATION

The results of this project indicated that it was feasible for emergency nurses to use EDART to identify and intervene with patients at risk for aggression/violence. It captured all types of patients and appropriately matched interventions to the patients' behavioral needs. Standardized documentation using the EDART provided evidence of the trajectory of the patients' behavior changes and interventions applied during the ED visit.

In January 2019, the EDART was implemented at a second hospital within the Health System and since then has expanded to all emergency departments across the health system. Leadership fully supported the expansion of EDART.

LIMITATIONS

Although we saw an increase in documentation using the EDART and documentation of behavior changes over time, because of the complexity of the tool's format, determining the most effective interventions at each behavior level was beyond the scope of this project. The closure of the emergency department of the system's behavioral health hospital close to our hospital may have affected the results of this project.

Although the nurses' survey responses after 3 months with the EDART in place suggested that they found the tool to be useful, this does not establish the tool's utility. Moreover, we did not examine the tool for its content, predictive validity and inter-rater reliability.

Implications for Emergency Nurses

The EDART addressed the need for a feasible ED-specific assessment tool and helped to refocus to proactive practice. This novel tool standardized the identification of at-risk patients and provided pre-emptive interventions to de-escalate aggressive behaviors in the emergency department. Thus, the EDART successfully matched appropriate interventions to each individual patient and served to capture documentation of these.

Conclusion

We developed, implemented, and evaluated the feasibility of a novel tool (EDART) to standardize management of aggressive/violent events. Through training, just-in-time education, and incorporating staff feedback, the use of EDART improved over time. Using the tool, staff were able to proactively identify escalating behaviors and intervene with appropriate interventions to de-escalate the patients. We observed slight increases in escalations and de-escalations with the EDART. Rigorous research is needed to evaluate the tool's usability and examine its content, predictive validity, and inter-rater reliability. Additional research is recommended to identify the most effective interventions at each level.

Author Disclosures

The authors report no conflict of interest with this project. Although Saint Luke's Health System has obtained a copyright for the EDART, the authors have not, and will not, receive compensation for this copyrighted assessment tool.

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Supplementary materials

Supplementary material associated with this article can be found in the online version at doi:10.1016/j.jen.2021.04.011.

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Development, Validation, and Implementation of a Guideline to Improve Clinical Event Debriefing at a Level-I Adult and Level-II Pediatric Trauma Center

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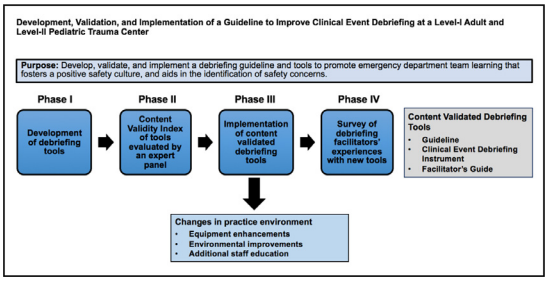

Development, Validation, and Implementation of a Guideline to Improve Clinical Event Debriefing at a Level-I Adult and Level-II Pediatric Trauma Center

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Contribution to Emergency Nursing Practice

- Current literature indicates that clinical event debriefings improve ED team performance by affording clinicians a forum to reflect and develop strategies for future high-quality patient care. However, most team members do not consistently engage in clinical event debriefings partially because of lack of guidelines or protocol for doing so.
- This article describes the first expert-validated clinical event debriefing tool in the ED setting that was implemented in a busy, level-I adult emergency department. Most participants found that the tool clarified ED debriefing requirements and was helpful to use.
- The key implication for emergency nursing practice is that implementing clinical event debriefing tools may be helpful to increase the frequency and consistency of clinical event debriefings in emergency departments and/or acute care settings.

Abstract

Objective: Clinical event debriefing is recommended by the American Heart Association and the European Resuscitation Council, because debriefings improve team performance. The purpose here was to develop and validate tools needed to overcome barriers to debriefing in the emergency department.

Method: This quality improvement project was conducted in 4 phases. Phase 1: Current evidence related to debriefing in the emergency department was reviewed and synthesized to inform an iterative process for drafting the debriefing guideline and instrument for documentation. Phase 2: Content Validity Index of the tools was evaluated by obtaining ratings of items' clarity and relevance from 5 national experts in 2 rounds of review. On the basis of experts' feedback, tools were revised, and a Facilitators' Guide was created. Phase 3: The validated debriefing tools were implemented. Phase 4: Debriefing facilitators completed a survey about their experience with using the new tools.

Results: The Content Validity Index of 71 debriefing tool items (guideline, instrument, Facilitators' Guide) was 0.93 and 0.96 for clarity and relevance, respectively. Of the 32 debriefings conducted during the first 8 weeks of implementation, 53% described patient safety concerns, and 97% described

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recommendations to improve performance. Most (94%) facilitators agreed that the guideline clarified debriefing requirements.

Conclusion: The use of debriefing tools validated by computation of the Content Validity Index led to the identification of safety threats and recommendations to improve care processes. These tools can be used in ED settings to promote team learning and aid in identifying and resolving safety concerns.

Key words: Debriefing; Communication; Safety; Patient care teams; Emergency services; Content validity

Medical errors are the third-leading cause of hospital deaths in the United States, after heart disease and cancer, with approximately 250 000 deaths attributed to medical errors in 2013.[1] Approximately 37%[2] to 70%[3] of patient harm is preventable within hospitals in the US. Errors in communication occur in more than 50% of trauma resuscitations in developed, resource-intensive countries.[4,5] Approximately 51% of preventable errors in admitted trauma patients occur during the initial phase of their treatment in the emergency department.[6]

Contemporary models of preventing errors focus on improving system processes and team dynamics. To improve safety, health care organizations can use high reliability organization (HRO) principles to establish a positive safety philosophy and operationalize a process-improvement culture.[7] Debriefings have been used by HROs such as aviation[8] and the military[9,10] to learn from events to mitigate future risk. Clinical event debriefing (CED) provides opportunities for teams to review a clinical event,[11-14] reflect on performance,[11-15] identify safety concerns,[11-14] and develop performance improvement strategies.[11,12,14] Debriefing has been associated with a 20% to 25% improvement in individual and team performance.[9] Accordingly, the American Heart Association[16] and the European Resuscitation Council[17] strongly recommend implementing a postevent debriefing process.

Despite the stated benefits of CEDs, most team members of clinical settings do not debrief frequently.[10,14,15,18] Approximately 50% of surveyed pediatric emergency nurses and physicians estimated that debriefing after resuscitations occurred less than 25% of the time.[14] One of the main barriers to consistent debriefing is the lack of debriefing guidelines and tools.[12,14,15,18-21] The resources available to guide this essential practice include an acronym framework,[22] an ED postresuscitation debriefing tool,[15] and debriefing scripts focused on general concepts,[18] simulation scenarios,[23] or trauma resuscitations.[13] Through the researchers' review of the literature, we found no ED-specific debriefing guidelines that have undergone a formalized validation process.

The aim of this project was to help overcome barriers to consistent debriefing in the emergency department through developing and validating standardized tools by computation of Content Validity Index. We describe the methods used to develop, validate, and implement a CED guideline and CED instrument (CEDI) that promotes ED team learning, fosters a positive safety culture, and aids in the identification of safety concerns.

Local Problem

In November 2016, emergency leaders sponsored a CED initiative with a complementary full-day course that trained 89 emergency nurses and physicians to become CED facilitators through experiential learning with simulation scenarios guided by an ED CEDI. Ongoing CED facilitator training was provided as a half-day course for newly hired clinical leaders. A dedicated interdisciplinary CED operations team reviewed completed CEDIs during bimonthly meetings to identify best practices to be disseminated to the ED staff, determine improvement opportunities, and formulate improvement plans. A CED was considered to have occurred based on the submission of a CEDI. Despite this training and the established follow-up system, the emergency department averaged 5.8 CEDs per month between November 2016 and December 2019.

Methods

This quality improvement project met the regulatory guidelines for exemption from institutional review board (IRB) review, determined by the Mamimonides Medical Center IRB Chair (2018-01-06 - "Clinical Event Debriefing").

CONTEXT

The setting for this project was Maimonides Medical Center (MMC), a 711-bed urban, academic medical center with a level-I adult and level-II pediatric trauma emergency department. Approximately 120000 patients visit the emergency department annually, which is staffed by 56 general emergency medicine (EM) and/or pediatric EM (PEM) attending physicians, 6 PEM fellows, 48 EM residents, and 200 emergency nurses.

INTERVENTIONS

This 4-phase project was designed to develop and validate standardized tools for conducting debriefing after any clinical event for which the team felt that it would be beneficial. We defined a clinical event as any patient care encounter, which encompasses a wide range of ED care (eg, trauma resuscitations, septic shock, or mental health emergencies).

Phase 1: Developing the ED CED Guideline and Revising existing CEDI

An appraisal and synthesis of available evidence related to CEDs in the ED setting led to the identification of 8 essential concepts of successful CED programs (Table 1). The concepts included the following: (1) debriefing protocols[12-15,18-21,24]; (2) positive perception of value[14,20,24,25]; (3) realistic time expectations[10-12,15,18,19,24,26]; (4) adequate facilitator education[18,19,24,25]; (5) post-debrief process[11,13,15,18,24]; (6) just culture[11-13,15,18,24]; (7) psychologically safe environment[11,12,15,18,27] and (8) private debriefing setting.[10-12,18] We used an iterative process to incorporate these essential concepts into a CED guideline draft. The existing CEDI was then modified to reflect the requirements outlined in the guideline to serve 2 purposes—inclusion of cues to guide facilitators through the debriefing process and discrete fields to document the debriefing. Notably, the revised CEDI included an area to affix a patient identifier and other fields for documentation of essential information.

Phase 2: Validating the CED Tools by an Expert Panel

Through our literature review, we first identified North American authors who were most frequently cited and had email addresses as corresponding authors. The authors met the following selection criteria: (1) health care professional with a graduate degree and (2) 1 or more peer-reviewed publications on debriefing implementation. We contacted them by email. All 5 authors accepted the invitation to serve as expert panelists. The reviewers used a Content Expert Rater Form (Supplementary Material 1) with 68 key-component items. The form instructed the experts to rate each item for clarity (yes/no) and relevance (high/low). The form also included a space for reviewers to comment qualitatively on each item.

Validation Measures and Analysis

We evaluated the expert ratings using the system for calculating the Content Validity Index (CVI) for items (I-CVI) and for an entire scale (S-CVI), adapted by application to a binary scale, rather than a scale with 4 levels.[28] An item was content validated if the proportion of affirmative agreements by experts (ie, I-CVI) regarding relevance or clarity was 0.78 or more.[28] Alternatively, the item was either omitted or revised (for a subsequent rating round) if the item had low agreement (<0.78). The tool was content validated if the mean proportion of agreement across items (ie, S-CVI) was 0.90 or more.[28]

The project committee conducted several meetings for iterative reviews of the expert feedback to revise all tool elements. Expert recommendations suggested incorporation of standardized scripting rather than the existing CEDI facilitator cues. We modified the CEDI accordingly and developed a third document, a CED Facilitators' Guide. In addition, on the basis of suggestions from the experts, we revised the documentation field from identifying and classifying only major patient safety issues to instead include all patient safety concerns.[29]

Experts then used the second version of the Content Expert Rater Form (Supplementary Material 2). An item was content validated if the proportion of affirmative agreements by experts (ie, I-CVI) regarding relevance or clarity was 0.78 or more.[28] The tool was content validated if the mean proportion of agreement across items (ie, S-CVI) was 0.90 or more.[28] Items that met the validation criteria were included in the final CED tools: (1) CED guideline (Supplementary Material 3), (2) CED Facilitators' Guide (Figure 1), and (3) CEDI (Figure 2).

Phase 3: Implementing the CED Tools

In November 2019, we implemented the CED tools. Initially, we introduced the CED process updates by emailing the CED guideline to all ED staff and emailing the CEDI and CED Facilitator's Guide to the 89 previously trained CED facilitators. Project leaders (S.T., A.A.) provided facilitators with brief in-service trainings to supplement the email content. Emergency nurse leaders discussed the CED guideline during interdisciplinary huddles daily for the first 2 weeks of the implementation. To increase clinicians' CED engagement, project leaders monitored clinical events in real time for CED opportunities and offered real-time informal coaching of any clinician engaged in facilitating a CED.

Although any clinical event could be debriefed, given the institutional and departmental focus on trauma care, facilitators were specifically encouraged to perform a CED after the initial care and stabilization of level-I trauma patients. Therefore, project leaders contacted clinicians approximately 20 minutes after level-I trauma activations to recommend a CED if time permitted. The proportion of level-I trauma activations with CEDs performed was tracked using our trauma registry. Facilitators placed completed CEDIs into secure drop boxes.

TABLE 1
Eight essential concepts incorporated into the emergency department CED guideline

Concept	Statements of evidence	CED guideline recommendations	Reference(s)
1. Debriefing protocols	The lack of debriefing guidelines and tools hinders consistent debriefing	Our CED guideline and tools provide debriefing structure. Facilitators use this guideline to lead debriefing and ensure completion of CEDI documentation.	12,14,15,18-21
	Assign someone to serve in the facilitator role if debriefing is not routinely practiced	Our facilitators are ED clinicians trained to serve in this role and are encouraged to lead the CED for the ED team involved in the clinical event. The assistant nurse managers or charge nurse address staffing needs to enable team members' CED participation.	12,18
	Nurses, physicians, or other clinicians not directly involved in ED care may be facilitators	Our facilitators are emergency medicine and nursing leaders, physicians, or registered nurses and may or may not have been involved in the care of the patient during the clinical event.	12,13,15,24
2. Positive perception of value	Clinicians perceive debriefing as a valuable component of practice	Our ED recommends CEDs for the team involved in caring for patients with level-I traumatic injuries and other events regardless of outcome—when everything goes well or when things do not go well.	14,20,24,25
3. Realistic time expectations	Complete debriefing as soon as possible after the event	Our CED guideline recommends initiating CEDs as soon as feasible after a clinical event and recognizes that debriefing after every clinical event is not practical.	10-12,15,18-19,24,26
	Limit debriefing to less than 10 min	Our guideline recommends dedicating 7 to 10 min for the CED to take place.	15,18,19
	Immediate debriefing facilitates staff's recall of details and may enhance retention of feedback given during the debrief	Our guideline recommends facilitating timely CEDs to help team members recall specific details regarding their experiences and to assist with applying lessons learned to future patient care.	11,12,15
4. Adequate facilitator education	Insufficient facilitator training causes staff's discomfort in leading debriefs and a possible neglect of initiating debriefs	Champions of our CED program offer a course that combines lecture, simulation scenarios, and discussions to prepare clinicians to facilitate structured CEDs.	18,19,24,25
5. Post-debrief process	Hospital leaders are responsible for the analysis of debriefing findings, facilitating necessary systems solutions, and disseminating information to staff	Our CED guideline requires the facilitator to escalate identified patient safety concerns in real-time to ED leaders, allowing for an immediate response that may involve systems solutions or staff education. Our ED leaders participate in bimonthly CED operations meetings to review CEDIs for performance improvement opportunities. Essential de-identified "lessons learned" are communicated to staff.	11,13,15,18,24

(*continued*)

TABLE 1 (***CONTINUED***)

TABLE 1
Continued

Concept	Statements of evidence	CED guideline recommendations	Reference(s)
6. Just culture	Foster an environment where staff feel comfortable to discuss all aspects of care without fear of reproach	Our CED Facilitators' Guide includes scripting that defines the purpose of a CED. Our emergency department recommends that the facilitator encourage team members to reflect and discuss the clinical event by focusing on the clinical management of patients, technical skills of clinicians, teamwork, and behavior concerns.	11-13,15,18,24
7. Psychologically safe environment	All participants must have an equal voice during debriefing	Our facilitators foster an atmosphere of inclusiveness, as all team members' participation is welcome and encouraged regardless of their role on the clinical team. Any team member involved in the care of the patient may request and participate in a CED.	11
	The environment must be nonjudgmental and safe	Our guideline recommends the CED process will occur in a nonjudgmental, safe environment, in which team members feel free to offer their opinions and ideas.	11,12,15,18,27
8. Private debriefing setting	Conduct debriefing in a private setting	Our emergency department recommends CEDs to take place in a setting within the unit that is absent of both patients and their visitors.	10-12,18
	Avoid the threat of litigation by debriefing in a safe setting	Our emergency department's CED information is confidential. Our facilitators secure the completed CEDI in a drop box. The CEDI is not a part of the patient's medical record.	12,18

CED, clinical event debriefing; CEDI, clinical event debriefings instrument; ED emergency department.

Evaluation of CEDI Data

CED operations meetings with ED medicine, nursing, and quality leadership reviewed CEDIs to establish a formalized process that promoted quality improvement with a focus on addressing patient safety concerns and recommendations for systems-based solutions. If necessary, project leaders would email CED facilitators for clarification or review the medical record for additional information to understand the need for improvements. The safety culture around CEDs was promoted by emails to all ED staff to recognize CED facilitators for their participation and reiterate that the CEDIs are regularly reviewed for improvement opportunities during ED leadership meetings. Project leaders sent out bimonthly emails to all ED staff about lessons learned and systems-based solutions to issues discussed during CEDs. Similarly, best practices to support high-quality team performance learned from the CEDs were shared with staff.

Descriptive statistics were used to summarize data elements of the CEDIs. Review of the electronic health record added additional demographic data. S.T. and A.A. completed a thematic analysis to describe the CEDI free-text response fields for "Patient Safety Concerns," "What Went Well," and "Recommendations."

Phase 4: Postimplementation Survey

We created an 11-item survey with a 5-point Likert Scale response related to CED facilitator experience with using the new CED materials (Supplementary Material 4). Three individuals completed a 6-question clinical sensibility test[30] of the survey. We invited clinicians who facilitated a CED during the 8-week implementation phase to complete the anonymous survey over a 2-week period using Qualtrics software (https://www.qualtrics.com). Project leaders (S.T., A.A.) did not participate in the survey. Descriptive statistics (frequencies and percentages) summarized the survey responses.

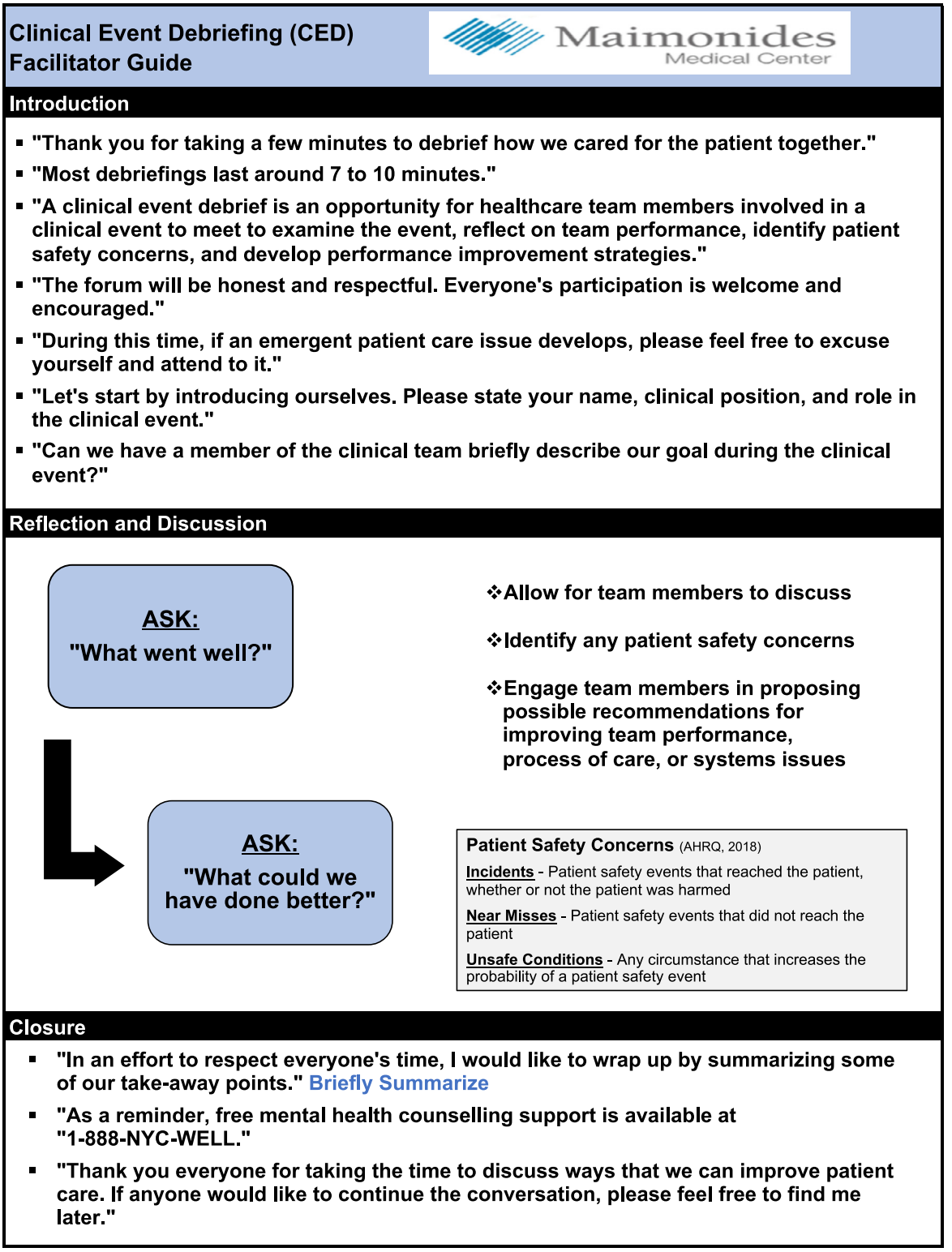
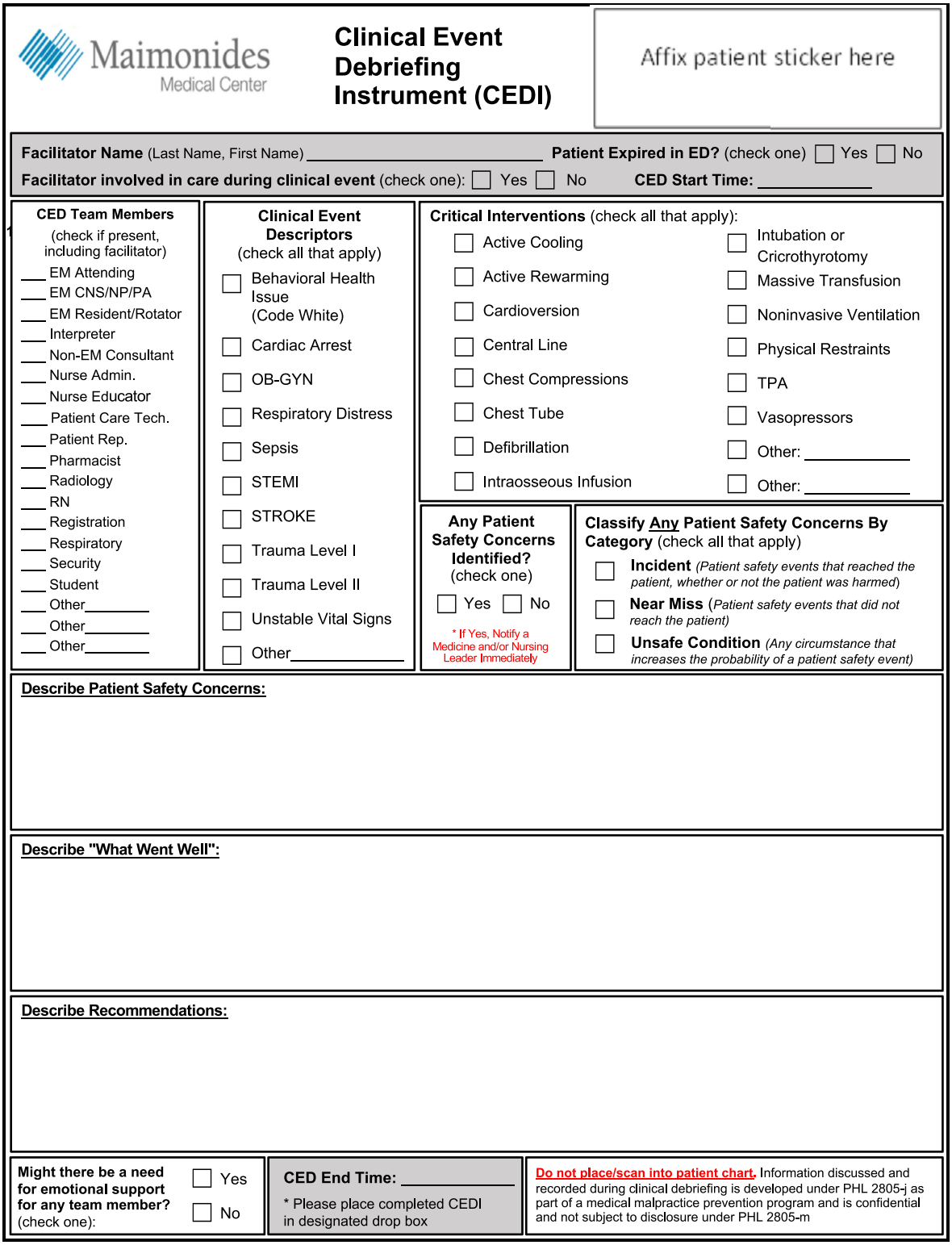


FIGURE 1

Validated *Clinical Event Debriefing Facilitators' Guide.* AHRQ, Agency for Healthcare Research and Quality; CED, clinical event debriefing.



Maimonides Medical Center

Clinical Event Debriefing Instrument (CEDI)

Affix patient sticker here

Facilitator Name (Last Name, First Name) _____ **Patient Expired in ED?** (check one) ☐ Yes ☐ No

Facilitator involved in care during clinical event (check one): ☐ Yes ☐ No **CED Start Time:** _____

CED Team Members
(check if present, including facilitator)

___ EM Attending
___ EM CNS/NP/PA
___ EM Resident/Rotator
___ Interpreter
___ Non-EM Consultant
___ Nurse Admin.
___ Nurse Educator
___ Patient Care Tech.
___ Patient Rep.
___ Pharmacist
___ Radiology
___ RN
___ Registration
___ Respiratory
___ Security
___ Student
___ Other_____
___ Other_____
___ Other_____

Clinical Event Descriptors
(check all that apply)

☐ Behavioral Health Issue (Code White)
☐ Cardiac Arrest
☐ OB-GYN
☐ Respiratory Distress
☐ Sepsis
☐ STEMI
☐ STROKE
☐ Trauma Level I
☐ Trauma Level II
☐ Unstable Vital Signs
☐ Other_____

Critical Interventions (check all that apply):

☐ Active Cooling
☐ Active Rewarming
☐ Cardioversion
☐ Central Line
☐ Chest Compressions
☐ Chest Tube
☐ Defibrillation
☐ Intraosseous Infusion
☐ Intubation or Cricothyrotomy
☐ Massive Transfusion
☐ Noninvasive Ventilation
☐ Physical Restraints
☐ TPA
☐ Vasopressors
☐ Other: _____
☐ Other: _____

Any Patient Safety Concerns Identified? (check one)

☐ Yes ☐ No

* If Yes, Notify a Medicine and/or Nursing Leader Immediately

Classify Any Patient Safety Concerns By Category (check all that apply)

☐ **Incident** *(Patient safety events that reached the patient, whether or not the patient was harmed)*
☐ **Near Miss** *(Patient safety events that did not reach the patient)*
☐ **Unsafe Condition** *(Any circumstance that increases the probability of a patient safety event)*

Describe Patient Safety Concerns:

Describe "What Went Well":

Describe Recommendations:

Might there be a need for emotional support for any team member? (check one): ☐ Yes ☐ No

CED End Time: _____

* Please place completed CEDI in designated drop box

Do not place/scan into patient chart. Information discussed and recorded during clinical debriefing is developed under PHL 2805-j as part of a medical malpractice prevention program and is confidential and not subject to disclosure under PHL 2805-m

FIGURE 2

Validated CEDI. CEDI, clinical event debriefing instrument; CED, clinical event debriefing.

TABLE 2
Clinical and demographic information of patients having had a documented CED during 8-week implementation

Characteristic	Total CEDIs	Level-Itrauma with CEDI	Other clinical events with CEDI
Total n	32	10	22
Patient age, n			
Pediatric (0-14 y)	2	0	2
Adult (≥15 y)	30	10	20
Clinical event description, n			
Cardiac arrest	9	-	9
Cardiac arrest and sepsis	1	-	1
Level-I trauma	10	10	-
Level-II trauma	5	-	5
Respiratory distress	2	-	2
Sepsis and unstable vital signs	1	-	1
Unstable vital signs	3	-	3
Other: seizure	1	-	1
Patient disposition, n			
Total admitted	17	6	11
Behavioral medicine	1	1	0
Medical floor	2	0	2
Medical ICU	3	0	3
OR, surgical floor	2	1	1
OR, surgical ICU	4	2	2
Pediatric ICU	2	0	2
Surgical ICU	3	2	1
Total discharged	7	4	3
Total expired in ED	8	0	8

CED, clinical event debriefing; CEDIs, clinical event debriefing instruments; OR, operating room; ICU, intensive care unit; ED, emergency department

Results

VALIDATION OF CED TOOLS BY EXPERT PANEL

The experts completed their first review of the CED tools using a 68-item Content Expert Rater Form. Of these 68 items, 33 items met the validation criteria with proportion of affirmative response (I-CVI) ≥0.78. These 33 items had no substantive expert suggestions that required further modification. The remaining 35 items either did not meet the validation standard or included experts' comments that suggested the need for further refinement.

The second iteration of the Content Expert Rater Form included 39 new or revised items (based on expert opinion). Of these 39 items, 38 items had a proportion of affirmative response (I-CVI) ≥0.78. One item did not meet this proportion for relevance and was omitted. At the completion of the second round of expert review, the CED tools met the validation standard of 0.90 for mean proportion of affirmative responses across all items, with S-CVI values of 0.93 and 0.96 for clarity and relevance, respectively.

CEDI IMPLEMENTATION DATA

During the initial 8-week implementation phase, 32 CEDIs were completed (Table 2). Of the 15 patients classified as having level-I traumatic injuries, 10 (66.7%) had CEDI documentation. Supplementary Material 5 displays the clinical and demographic information of all patients with level-I traumatic injuries during this time period and the presence of a corresponding CEDI.

CEDI documentation rates varied among the required fields. Of the 26 (81%) CEDIs with completed CED "start" and "end" times, the CEDs lasted a median of 8 minutes (IQR, 7-10). Of the 28 (88%) CEDIs with a documented response for "facilitator involved in care during clinical event," the facilitator was not involved in the clinical event 60% of the time. Only 1 CEDI documented

that emotional support for staff might be needed. Most (94%, n = 30) of the CEDIs included documentation of patient identifiers (patient sticker or medical record number), clinical event descriptors, and whether the patient expired in the emergency department.

All of the CEDIs included documentation of the facilitator's name. Of the 89 trained facilitators (13 senior residents, 20 nursing leaders, 56 attending physicians), 19 (21%) individuals led 1 or more CEDs, including 7 (54%) senior resident physicians, 6 (30%) nursing leaders (charge nurses or nursing administrators), and 6 (11%) attending physicians. Of the 31 (97%) CEDIs with documented team members, participation rates were highest for ED attending physicians (100%), followed by resident physicians (ED or rotating) (84%), emergency nurses (84%), ED nurse administrators (42%), consulting physicians (13%), ED patient care technicians (10%), students (10%), and respiratory therapists (3%).

CEDIs included documentation of a wide array of critical patient care interventions during the clinical event, including chest compressions (25%), intubations or cricothyrotomy procedures (19%), vasopressors (16%), central lines (9%), cardioversion (6%), chest tubes (6%), intraosseous infusions (6%), massive transfusion protocol (6%), noninvasive ventilation (6%), active rewarming (3%), blood transfusions (3%), defibrillation (3%), and suturing (3%).

Overall, 53% (n = 17) of the CEDIs included documented descriptions of actual patient safety concerns, of which 59% (n=10) were incidents (events reached the patient), and 41% (n = 7) were unsafe conditions. Most of the CEDIs (91%, n = 29) had the patient safety concern field completed, of which 31% (n = 9) checked "yes" for an identified patient safety concern with a subsequent description. Although 69% (n = 20) of the CEDIs had "no" checked in the patient safety concern field, 30% of these (n = 6) had a written description of an actual patient safety concern. Additionally, of the 9% (n = 3) of the CEDIs that did not have the patient safety concern field completed, 2 of these had a written description of an actual patient safety concern.

In a thematic analysis of the patient safety concerns, the researchers identified 5 overarching themes: (1) broken and missing equipment, (2) environmental issues, (3) lack of knowledge and poor clinical decision-making, (4) negative team dynamics (eg, communication, mutual support, situational awareness), and (5) lack of staff adherence to hospital policy (Table 3).

Descriptions of "what went well" were documented within all of the CEDIs. The thematic analysis identified 3 themes: (1) positive team dynamics (eg, communication, leadership, mutual support, situational awareness), (2) staff adherence to hospital policy, (3) strong clinicians' knowledge and decision-making (Table 3).

Descriptions of recommendations were documented in all but 1 of the CEDIs. In the thematic analysis, the researchers identified 4 themes: (1) fostering team dynamics (eg, encouraging proactive and closed-loop communication, engaging all disciplines in patient care, promoting leadership skills), (2) improving resource availability and functionality (eg, fixing broken equipment, locating missing equipment, designating locations for specific equipment and supplies, stocking supplies), (3) providing staff education (eg, clinical decision-making, hospital policies, location of equipment and supplies), and (4) leadership review and revision of hospital policy (Table 3).

ED PRACTICE ENVIRONMENT CHANGES

Leadership review and follow-up of completed CEDIs contributed to multiple ED practice modifications. These changes included equipment enhancements (eg, new manual blood pressure cuffs, an improved resuscitation suction set-up, repaired neonatal warmer), environmental improvements (eg, increased audibility of clinical alarms, increased patient visibility in vulnerable isolation room by adding large window to door, new charge nurse shift environment checklist), and additional staff education (eg, reinforced communication strategies during patient care, introduced smartphone application for language translation, promoted coordination with hospital security for patients brought in accompanied by police).

POSTIMPLEMENTATION SURVEY

The postimplementation anonymous survey was completed by 94% (n = 17) of the 18 eligible facilitators who led a debrief using the new CED tools (Supplementary Material 4). Of the survey respondents, 59% *strongly agreed* and 35% *agreed* that the debriefing guideline clarified the requirements for debriefing in the emergency department.

Discussion

Implementation of a validated CED guideline and instrument resulted in a significant increase in the performance of CEDs, increasing by 175% from a baseline of 5.8 CEDs per month to a postimplementation rate of 16 CEDs per month. This finding is in agreement with current recommendations that debriefing can be more regularly applied in practice by implementing guidelines that address known

TABLE 3
Thematic analysis of CEDI free-text response fields with examples of direct quotes documented on CEDIs

Field 1: "Patient Safety Concerns"	
Theme	**Direct quote**
Broken and/or missing equipment	• "TVP connectors were not there. Patient was peri-arrest requiring pacing and had to send MD to CCU to get connector (TVP wire)." • "EKG machine not working in a [neonate] after pushing adenosine".
Environmental issues	• "Clutter in Resus. Dialysis tubing crossing between rooms. Unable to get Zoll into Resus" • "Ambient temperature needs to increase in Pediatric ED"
Lack of knowledge and/or poor clinical decision-making	• "Inappropriate BP Cuff location placement due to Stab Wound, holding pressure arterial wound" • "Suction wasn't properly connected. Respiratory didn't want to call for help"
Negative team dynamics	• "Difficult Interaction with Anesthesia Team - This made it difficult to hear EMS" • "Delay in getting medications for actively seizing patient. Delay in putting patient on a monitor, delay in getting IV access, Took a while to get team to respond"
Poor staff adherence to hospital policy	• "Patient Assaulted. Security was not present when patient came in" • "Team didn't know about trauma before it rolled in. No pre-notification and no communication in triage"

Field 2: "What Went Well?"	
Theme	**Direct quote**
Positive team dynamics	• "Calm, no yelling, closed loop communication, well prepared, well defined roles, pre-briefing, time to prepare" • "ED and trauma teams worked well together. Quick response, prepared equipment prior to patient arrival"
Staff adherence to hospital policy	• "Language translation to family to explain cardioversion" • "Proper supervision for procedure by attending, Resident felt comfortable performing procedure, Time-Out prior to procedure"
Strong clinicians' knowledge and decision-making	• "Patient was intubated in resus on first attempt endotracheally, closed loop communication, Resident prepared various tube sizes" • "Quick response by team, prepared equipment prior to patient arrival in ED. FAST was done-showed pericardial effusion. Trauma attending opted to perform procedures in OR. Patient was dispositioned quickly - went directly to OR for emergent surgery."

Field 3: "Recommendations"	
Theme	**Direct quote**
Fostering team dynamics	• "For attendings to designate Team Leader to run the code to be clearer" • "Better communication from triage to let the team know about patients coming for Resuscitation or trauma"
Improving resource availability and functionality	• "Check Equipment at start of shift. (Issues with 2 of 3 manual BP machines)" • "Standardized TVP boxes and connectors. Make sure TVP connectors are stocked"
Providing staff education	• "Re-educate. Patient was a crime victim. Clothing was put in plastic bags instead of paper bags" • "Staff need reminder about trauma criteria. Patient was called as Level-II, upgraded to Level-I due to mangled extremity"
Leadership review and revision of hospital policy	• "Private Room for palliative extubation vs. should this be done upstairs inpatient" • "Follow up with Anesthesia team to clarify roles of each team in a Level-I Traumatic Arrest Activation."

TVP, transvenous pacing; ED, emergency department; BP, blood pressure; EMS, emergency medical services; CCU, coronary care unit.

barriers and promote a safety culture.[18,24] Although implementation focused on a specific debriefing trigger of level-I trauma activations, more than half of CEDs were ultimately unrelated to trauma, implying that the CEDs had value to the ED team and were feasible to complete in the busy ED setting. In addition, the purpose of our CED program was not to address psychosocial stressors; however, there was a referral program in place for any team member who may require emotional support.

Another factor contributing to the completion of CEDs in our clinical setting was a dyad model of leadership with emergency nursing and EM physicians that promoted global staff engagement in the CED program. Existing literature indicates that leadership support can encourage staff to participate in debriefings[11] and drive process improvements.[13] Survey responses revealed that our leadership team effectively closed the feedback loop on how safety concerns that had been identified during the debrief were being addressed. A common barrier to safety report submissions in many health care organizations is the staff perception of inadequate feedback from leadership.[31,32] Our CED review process incorporated a system to ensure consistent closed-loop communication between leadership and frontline staff to avoid this issue. This could have contributed to a sense by ED teams that CEDs were making a positive impact and might have influenced some facilitators to decide to engage in leading CEDs. Furthermore, survey findings indicated that most facilitators were not concerned about disciplinary consequences to ED team members related to the content discussed during the CED. These results are consistent with HRO principles in which there is a preoccupation with addressing failures by encouraging the reporting of unsafe conditions or safety concerns.[26]

The use of these new tools was associated with the identification of many patient safety concerns and teamwork best practices. The issues identified during the CEDs led to multiple modifications that contributed to improved quality and safety in the emergency department. These changes included equipment enhancements, environmental improvements, and additional staff education. These improvements in delivering care can be a powerful driver to maintain the sustainability for a CED process. In addition, ED leadership support of the program has helped to sustain the commitment necessary to continue this debriefing program which takes continuous effort given the high staff turnover often seen in the ED environment and the competing priorities for managing other quality improvement projects.

A common barrier to debriefing is a perceived lack of time.[10,11,14,15,18,19,25] Anticipating this barrier, our aim was to create flexible facilitator expectations, and our CED guideline outlined that the CED facilitator did not need to be involved in the direct care of the patient. During the initial 8 weeks after implementation, many CEDs were facilitated by EM attending physicians, senior residents, or emergency nursing leaders who were not directly involved in patient care during the clinical event. Although current evidence lacks consensus about which discipline should be responsible for facilitating CEDs, our findings are consistent with several other reports indicating that nurses,[12,13,24] physicians,[13,15,24] or clinicians not directly involved in ED care can effectively serve as debriefing facilitators.[24]

Survey responses related to the time needed to perform a CED adversely affecting ED flow were variable. Emergency departments are an unpredictable and complex setting. This can place a significant cognitive load on bedside providers. Practically speaking, although CEDs during this 8-week period averaged only 8 minutes, there is a time burden to coordinate those involved in the event to participate in the CED. This was not discretely determinable from this data set; however, our practical experience performing CEDs dictate anywhere from a 5- to 15-minute time investment to congregate providers for the CED. In future iterations of best practices, it may be preferable to further operationalize a process so that those less involved in active bedside patient care responsibilities can organize and facilitate CEDs in a timelier fashion. The facilitator survey did not reveal a clear advantage of paper versus electronic documentation. The CEDI itself was well received, likely attributable to the validation process to streamline inputs to the most essential elements.

Limitations

This project had several limitations. Variation in the facilitation of debriefing was possible. Project leaders (S.T., A. A.) provided consistent training to facilitators, but the quality of facilitation was not formally assessed and evaluated. Although the rate of CEDs for trauma activations was higher than the rate of debriefing cited in other studies,[19] a substantial minority (33%) of trauma activations were not debriefed. Project leaders have followed up with individual teams to identify perceived barriers to performing CEDs, which will be addressed in continued phases of this project. On the basis of our data, the researchers would recommend future change cycles to focus on identifying barriers to CED facilitation by clinicians providing direct patient care and testing interventions to eliminate these barriers.

Another limitation is that the 11-item postimplementation survey, which the research team developed, was not formally validated. However, we did have 3 individuals complete a sensitivity test to support the content and response process validity. The survey is intended to go beyond assessment of usability of the new CED tools, to also illuminate the facilitators' experiences with the updated CED process. Another limitation is that data for our analysis were taken from the documentation on the form. Given that the CEDIs were filled out by various team members, it is possible that documentation variability or omissions could have affected our data findings. To limit documentation issues, we attempted to standardize the design of the form with checkbox areas to make it simpler to use, and we pilot tested it with potential end users for their feedback. Because some of the debriefing facilitators might have been simultaneously facilitating and documenting, it is possible that they might have omitted some issues discussed in the open-ended questions on the CEDI. Lastly, this was a single-center project, and the conditions under which CEDs occurred in our setting might not generalize to other settings.

Implications for Emergency Clinical Practice

We used a rigorous process to develop, validate, and implement tools to standardize CEDs conducted by the ED interdisciplinary teams. Clinicians practicing in emergency departments and other health care settings may find our CED tools and processes helpful in promoting a culture of patient safety. This may be particularly true in settings where clinicians are focused on the provision of consistent debriefings or have a need to operationalize a standardized approach to CED practices among their clinical staff.

Conclusion

A validated CED guideline, CEDI, and CED Facilitators' Guide was developed and used by ED teams. CEDs frequently identified safety threats and provided opportunities to realize improvements in care processes. The CED facilitators perceived the guideline as clarifying regarding the CED requirements, the CED Facilitators' Guide as helpful, and the CEDI documentation as easy to complete. These CED tools could potentially be used or adapted in other emergency departments and clinical settings to promote team learning, foster a positive safety culture, and aid in the identification and resolution of safety concerns.

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Permission to Use: For tool use requests for teams interested in replicating this work or adopting the tools to their clinical site, please direct all correspondence to the first author.

Supplementary materials

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Operationalizing a Pandemic-Ready, Telemedicine-Enabled Drive-Through and Walk-In Coronavirus Disease Garage Care System as an Alternative Care Area: A Novel Approach in Pandemic Management

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Contribution to Emergency Nursing Practice

- The deployment and evaluation of a telemedicine-enabled drive-through and walk-in garage care system demonstrated improved throughput of patients classified as lower acuity with influenza-like symptoms who self-presented to the emergency department during the coronavirus disease pandemic.
- This quality improvement initiative describes telemedicine opportunities to reduce onsite staff and thereby increase physical distancing and reduce staff personal protective equipment use during the pandemic.

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Abstract

Objective: Emergency departments face unforeseen surges in patients classified as low acuity during pandemics such as the coronavirus disease pandemic. Streamlining patient flow using telemedicine in an alternative care area can reduce crowding and promote physical distancing between patients and clinicians, thus limiting personal protective equipment use. This quality improvement project describes critical elements and processes in the operationalization of a telemedicine-enabled drive-through and walk-in garage care system to improve ED throughput and conserve personal protective equipment during 3 coronavirus disease surges in 2020.

Methods: Standardized workflows were established for the operationalization of the telemedicine-enabled drive-through and walk-in garage care system for patients presenting with respiratory illness as quality improvement during disaster. Statistical control charts present interrupted time series data on the ED length of stay and personal protective equipment use in the week before and after deployment in March, July, and November 2020.

Results: Physical space, technology infrastructure, equipment, and staff workflows were critical to the operationalization of the telemedicine-enabled drive-through and walk-in garage care system. On average, the ED length of stay decreased 17%, from 4.24 hours during the week before opening to 3.54 hours during the telemedicine-enabled drive-through and walk-in garage care system operation. There was an estimated 25% to 41% reduction in personal protective equipment use during this time.

Conclusion: Lessons learned from this telemedicine-enabled alternative care area implementation can be used for disaster preparedness and management in the ED setting to reduce

crowding, improve throughput, and conserve personal protective equipment during a pandemic.

Key words: Pandemic; Coronavirus disease; Disaster management; Telemedicine; Alternative care area; Emergency department

Introduction

Pandemics and other disasters create sudden and unique challenges for emergency departments. The rapid patient-volume surges that accompany pandemics can quickly tax already crowded, resource-limited emergency departments. Crowding is known to have a negative impact on patient outcomes, including increased mortality.[1,2] This issue becomes more pressing when contagious infectious diseases necessitate the use of personal protective equipment (PPE) by health care workers.[3] Supply shortages increase the risk of exposure for both health care workers and other patients.[4,5] Together, potential crowding and PPE shortages necessitate novel approaches to managing ED throughput during pandemics.

The coronavirus disease (COVID-19) pandemic provided an impetus for innovation in emergency departments because previous disaster preparedness protocols may be insufficient in managing the influx of patients classified as low acuity with influenza-like illness (ILI).[6,7] Studies report that although ED visits decreased in the early months of the pandemic, as the rates of new COVID-19 cases increased locally, so did ED admission rates.[8] Multiple case studies have described new operational processes for triage, patient placement, diagnostics, and treatment in response to the pandemic.[3,9,10] Yet, few have proposed optimizing patient flow using telemedicine to enable physical distancing and thus reduce PPE use while interacting with patients.[11,12]

This paper describes a quality improvement evaluation of a novel patient flow process that uses a telemedicine-enabled alternative care area with drive-through triage to assess and test patients during the COVID-19 pandemic. The lessons learned from the implementation of the pandemic-ready, telemedicine-enabled drive-through and walk-in garage care system (Tele-Garage) can provide clinical and operational surge capacity guidance to other emergency departments in preparation for future pandemics.

Problem Description

The emergency department is located in the Western United States in a county that reported the first recorded COVID-19 death.[13] The emergency department was among the first in the US to experience census increases with worried patients experiencing ILI after potential exposures to positive COVID-19 cases. These patients could subsequently possibly expose staff to the virus. The hospital and ED leadership realized that an alternative care area was necessary to care for the rapidly increasing census of patients classified as low acuity who had been potentially exposed to create capacity for a possible surge of ED patients who were critically ill.

Available Knowledge

At the time of the implementation, a literature review for ED surge and capacity response included in our previously published garage simulation for the hemagglutinin type 1 and neuraminidase type 1 virus, also known as H1N1, in 2009 described the use of a drive-through triage and care system.[14,15] Although there have been descriptions of various triage and patient placement strategies in the emergency department,[3,16,17] few focused on the use of telemedicine. More recently, 1 academic medical center used iPads (Apple Inc) to reduce exposure and conserve PPE,[18] whereas another has used telemedicine carts in the ED−COVID-19 isolation rooms.[11] None have described the use of an alternative care area to streamline ED throughput using telemedicine.

Rationale

The fundamental premise of the proposed ED redesign hinges on an efficient patient flow using a drive- or walk-through system in an alternative care area that is enhanced with telemedicine (ie, the ED parking garage). Telemedicine refers to the provision of remote clinical services through real-time 2-way electronic communication between the patient and the health care provider.[19] The combination of drive-through patient flow and remote telemedicine-based assessment allows for increased physical distancing among the patients under investigation (PUI) for COVID-19, streamlining throughput and reducing overall ED length of stay (ED-LOS). The use of telemedicine also reduces the need for PPE for remote providers.

Specific Aim

The goal was to evaluate the implementation of the Tele-Garage on ED-LOS and the use of PPE during the multiple surges of the COVID-19 pandemic in 2020.

Methods

The design and implementation of the Tele-Garage was based on previous iterations of a drive-through triage and care system as a disaster response quality improvement project.[14] The addition of the telemedicine component required changes to the infrastructure and patient flow. The throughput process was designed to screen, evaluate, and test ED patients classified as low acuity and was scaled for high-volume minimal contact and PPE conservation.

CONTEXT

Quickly operationalizing the Tele-Garage from inception to active deployment required collaboration among multiple departments, including emergency nurse and physician leaders, information technology (IT), parking and transportation service, clinical engineering, and the office of emergency management. The Tele-Garage was operationalized within 12 hours with walk-in and drive-through routes, IT infrastructure, staff, standard work, and telemedicine. The state department of public health authorized the use of the parking garage as an alternative treatment area.

INTERVENTION

Table 1 shows the logic model of the Tele-Garage. Walk-in and drive-in patients were screened by a registered nurse (RN) to determine if they were low acuity with ILI. Eligible patients were remotely registered, and secure text messaging was used to exchange clinical information. The patients were assessed and swabbed for a COVID-19 test by physician protocol. Subsequently, they participated in a telemedicine visit with the provider and were then discharged. This process required critical elements of infrastructure and optimized patient flow, described in the Results section.

PPE was conserved through multiple mechanisms. First, instead of the requirement to don and doff PPE between encounters when in a room, RNs wore the same gown, N95 mask, and hair protection when the patient was in the vehicle—unless the patient was coughing—removing them only during breaks. Gloves were changed between patient visits with the use of a portable handwashing sink or gel. The registration clerk and the medical provider were located remotely and did not require a change in PPE between patient visits.

STUDY OF THE INTERVENTION

We evaluated the effectiveness of the Tele-Garage to increase ED throughput for patients classified as low acuity and reduce PPE use using continuous quality improvement methods. Operationalization challenges were tracked and resolved using Plan-Do-Study-Act methods.[20] A quality analyst extracted data metrics for the time period during which the Tele-Garage was in use.

MEASURES

Data were derived from the electronic health record database. Consistent with other studies,[21] the daily average ED-LOS was measured in hours from the time of initial presentation to the time of departure from the emergency department for all patients presenting during a 24-hour period starting at midnight. The percentage of patients with ED visits lasting less than 1 hour on the basis of the ED-LOS was calculated. The 1-hour interval was chosen because it was hypothesized to be an average time for a patient to go through the Tele-Garage. PPE use was estimated on the basis of the number of PPE sets (gloves, fluid-repellent long-sleeved gown, eye protection, and N95 mask)[5] expected to be used per patient classified as low acuity before and during the Tele-Garage implementation.

ANALYSIS

Statistical process control plots were used to visualize the interrupted time series before and when the Tele-Garage was deployed. Statistical process control plots are a quality improvement tool that graph how a process changes over time when an intervention is introduced.[22] The X-MR chart was used to display individual measurements (X) and the moving range (MR) of ED-LOS and PPE use. The p-chart that tracked the proportion of patients with ED visits lasting less than 1 hour has properties similar to those of the X-MR chart. We expected the average proportion of patients with ED visits lasting more than 1 hour to increase with each Tele-Garage opening.

ETHICAL CONSIDERATIONS

The project was reviewed by the facility's privacy and compliance office and was deemed quality improvement not requiring institutional review board evaluation.

Results

STRUCTURE

Infrastructure

To transform the ED parking garage into an operational telemedicine-enabled alternative care area, IT engineers

TABLE 1
Logic model for the pandemic-ready, telemedicine-enabled drive-through and walk-in COVID-19 garage care system

Inputs	Activities	Outputs	Outcomes	Impact
Interdisciplinary ED leadership support (nursing, physicians, transportation, IT, and engineering) Physical space in a parking garage next to the emergency department that allows vehicles to pull through to avoid reversing IT infrastructure (wireless network) Equipment (portable computers, printers, workstations on wheels, telemedicine station, and electricity generator) Clear signage Personnel: Screener RNs (1 FTE) Triage RNs (2 FTEs) Swabbing RNs (2 FTEs) Registrar (1 FTE) Telemedicine physician (1 FTE) Parking valet (1 FTE)	Set up the garage care area daily per standard workflow Secure messaging text group communication for all on-shift staff Screening patients in vehicles and walk-ins at the front of the emergency department Secure text messaging patient information for registration in the main emergency department Printing patient armband wirelessly on the garage printer and taping it on patient vehicle Nursing triage and vitals taking of the patient in vehicle or walk-in COVID-19, influenza, or streptococcal pharyngitis swab per standing physician protocol In-garage telemedicine visit with the provider located in the main emergency department Preprinted standardized discharge instructions (later in MyHealth app)	Number of patients in vehicles or walk-ins who were tested for COVID-19 in the garage care area Diversion rate to the main emergency department Duration of patient's registration Clear identification of patient in vehicle or walk-in Prompt communication between RN and telemedicine provider through comment section in EMR Physically distant interaction with provider through telemedicine while patient is in the vehicle	Reduction in overall ED length of stay Reduction in PPE use in the garage care area Improved patient satisfaction	Streamlined throughput for patients classified as low acuity during a pandemic PPE conservation during an acute disaster

COVID-19, coronavirus disease; IT, information technology; RN, registered nurse; FTE, full-time equivalent; EMR, electronic medical record; PPE, personal protective equipment.

installed the infrastructure for wireless connectivity. The Tele-Garage then supported internet-enabled equipment, including portable clinical and registration computers, a patient-identifying armband printer and a paper printer, wireless workstations on wheels (WOWs), and a telemedicine conferencing system. It was also equipped to support a wireless radiology machine for chest x-rays and a wireless point-of-care system for blood testing. An electricity generator situated outside the Tele-Garage provided power to all the wireless equipment. Processes for daily set-up and breakdown/storage were evaluated before developing a standard worksheet to promote consistency among staff. These processes included turning on the generator, attaching extension cords, and placement of WOWs, swabs, and PPE due to the added procedures for COVID-19 screening.

Patient Flow

A multidisciplinary team developed an intuitive, guided route through the Tele-Garage, shown in Figure 1. The vehicle and pedestrian flow paths started in front of the main emergency department and routed patients to the parking garage. The above-ground, open-air portion of the garage was used to reduce fume inhalation. To assist in garage navigation, clear signage was installed to augment verbal guidance on when to turn off the engine at various points along the route to decrease exhaust exposure to staff. Parking and transportation service valets were assigned to lead vehicles from the entrance of the garage to designated parking spots and guide vehicles entering the clinical area and exiting after discharge. The flow through the garage was modeled after the pull-through systems of gasoline stations in which vehicles drive forward through the parking spot to leave. This design eliminated the need for vehicles to drive in reverse at any point. This minimized the risk of injury, particularly to staff who wheeled the WOWs and telemedicine carts to vehicle windows. This design also enabled patients assessed as inappropriate for the Tele-Garage to easily exit the garage and enter the main emergency department through the standard path of travel.

PROCESS

Screening

Two RNs were stationed outside the main emergency department to screen patients: one focused on walk-in patients and visitors, and the other screened patients who presented in a vehicle. The screening RNs, experienced emergency triage RNs, shown in Figure 2, used a symptoms question algorithm to direct patients classified as low acuity (Emergency Severity Index[23] 4-5) who had respiratory complaints and/or required COVID-19 testing swabs to the Tele-Garage. A pulse oximeter and thermometer were available for the screener if needed to determine if the Tele-Garage was appropriate. Patients with Emergency Severity Index 1 to 3 were directed into the main emergency department through an outside path of travel. The RNs also used the infrared thermometer and pulse oximeter to recheck vital signs if the screening and clinical judgement indicated based on patient ill appearance or at-risk medical history.

Table 2 presents the screening questions and inclusion/exclusion criteria. Nonleading questions were used for an initial identification of patients' presentation to the emergency department, such as "What brings you to the emergency department today?" Identification of fever, cough, sore throat, or shortness of breath and without major medical history was used to rule in patients. Patients who presented without any symptoms but were concerned about potential COVID-19 exposure were also included.

Registration

Once a patient was screened as clinically appropriate for treatment in the Tele-Garage, the screener RN sent a secure text message with a picture of the patient's identification and phone number to the registrar located in the main emergency department. Secure messaging was enabled through a Health Insurance Portability and Accountability Act–compliant software platform (Voalte Platform; Hill-Rom Services, Inc)[24] on a hospital-issued smartphone for each clinical team member. Before each nursing shift start (7:30 AM, 11:30 AM, 3:30 PM, and 7:30 PM), a text group was created that included registration staff, Tele-Garage RNs, screener RNs, and the medical provider assigned to the Tele-Garage.

By the time a new patient arrived at the Tele-Garage, an armband was already printed remotely from the main ED registration on the printer in the Tele-Garage. The use of secure text messaging allowed the registration staff to stay within the emergency department, preventing exposure to the PUI and reducing the need to use PPE. Insurance information was obtained from the patient through a telephone call after the telemedical exam by a second registrar in the Tele-Garage with a WOW. This process eliminated the need for direct contact with the PUI and reduced the use of PPE.

Assessment/Triage

Two RNs triaged and assessed patients in the Tele-Garage: one RN covered the 6 vehicle bays, and the other RN

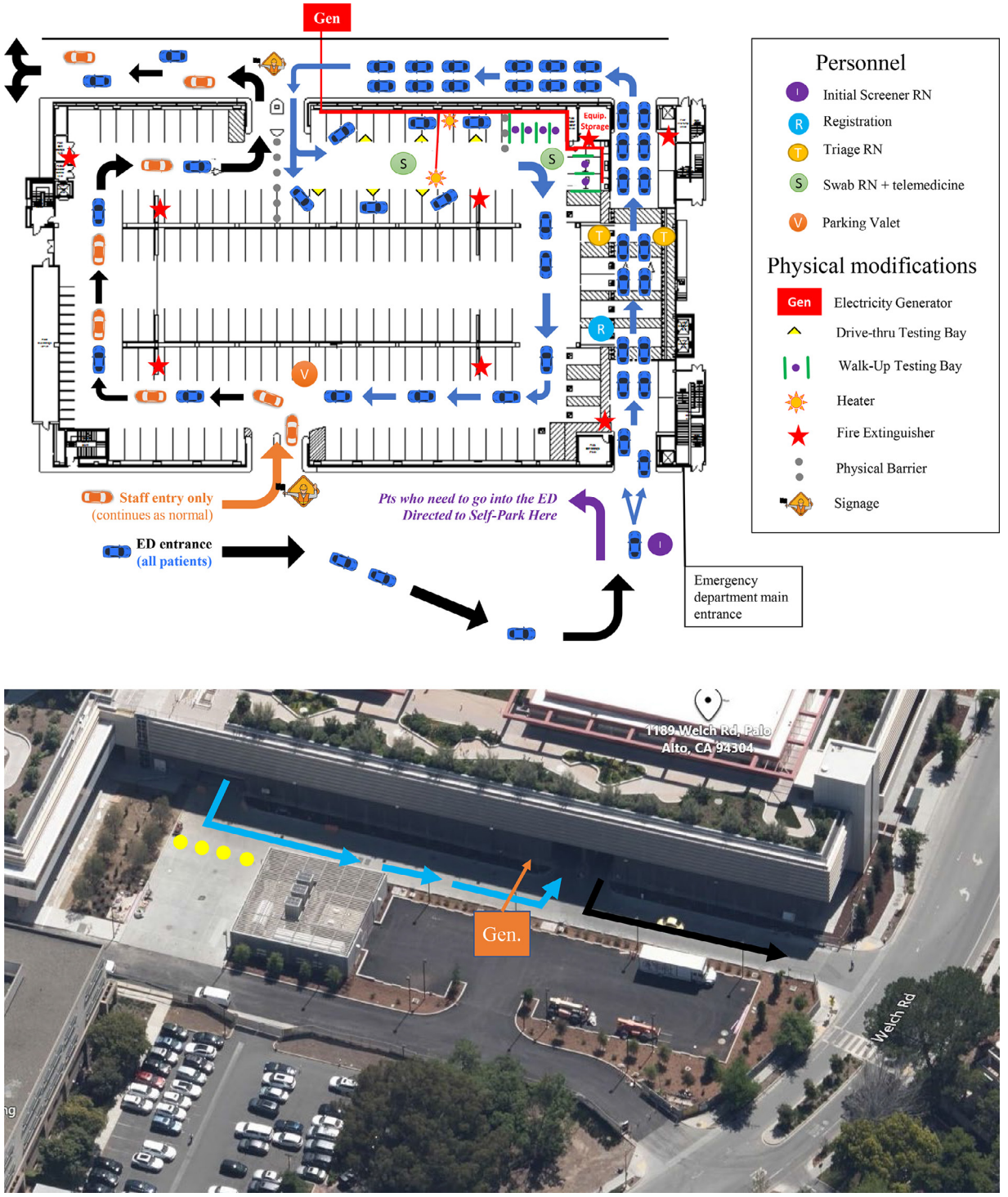

FIGURE 1

Details of the Tele-Garage patient flow. RN, registered nurse; Tele-Garage, pandemic-ready, telemedicine-enabled drive-through and walk-in garage care system.

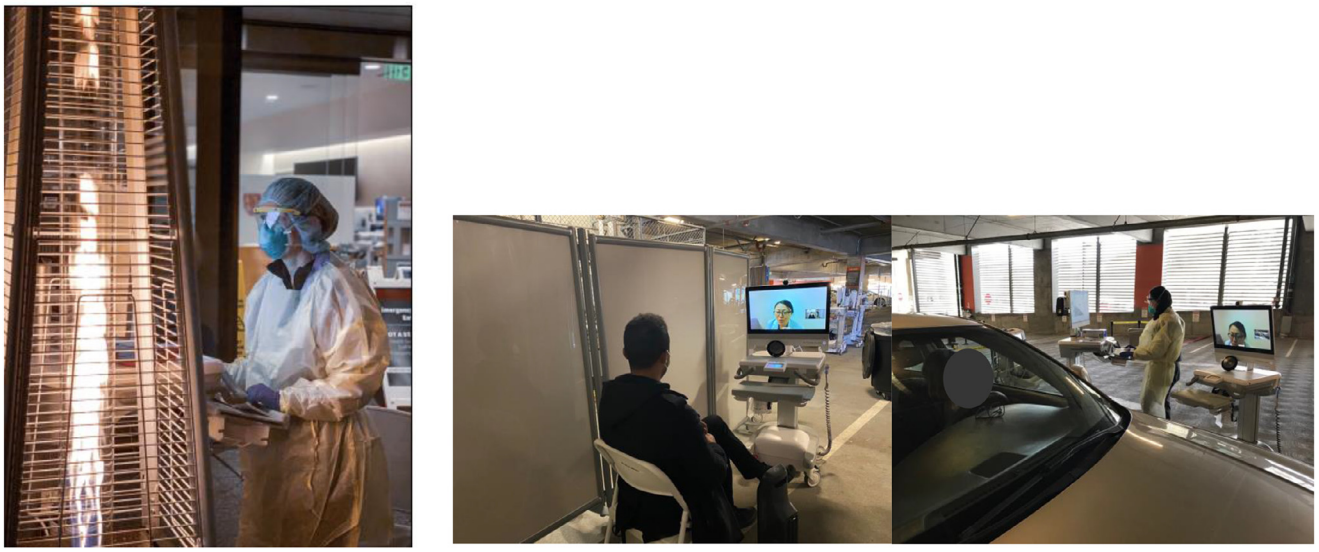

FIGURE 2
The screening registered nurses, telemedicine visit.

TABLE 2
Screening and inclusion criteria for telemedicine-enabled pandemic garage care system

Categories	Parameters
Age, y	≥2 and <65
Vital signs	Patients aged 2-3 y: HR < 160, RR < 40, SpO2 > 92% Patients aged 3-8 y: HR < 140, RR < 30, SpO2 > 92% Patients aged >8 y: HR < 110, RR < 20, SpO_2 > 92%
History of presenting illness	Patients with symptoms potentially due to viral etiology but without heart disease, lung disease, diabetes, or immunocompromised status
Previous testing	Not swabbed for any respiratory illness in the past 7 days
Number of resources	No resources needed other than swab testing

HR, heart rate; RR, respiration rate; SpO_2, oxygen saturation.

covered the 6 walk-in chair care areas. A float RN assisted as needed for volume and meal-break cover. For each patient, an RN retrieved an armband from the printer. Because the secure text message often included the vehicle type, they knew which armband was associated with which vehicle. The RN verified the information with the patient and secured the armband above the car window closest to the patient. Once patient identification was complete, the RN measured the patieint's temperature (using an infrared thermometer), oxygen saturation, and pulse and documented the results in the electronic health record.

Swabbing

To increase throughput, a protocol was developed that allowed the RN to order a COVID-19 swab per protocol, with provider signature to follow. On the basis of patient symptoms, the RN initiated a COVID-19 swab protocol order while the patient waited for the medical provider to appear on the telemedicine display. Influenza tests were also ordered on the same COVID-19 swab until the end of influenza season. Additional orders sometimes also included a rapid streptococcal pharyngitis swab test.

The RN scanned the patient's armband taped to the vehicle's window and acknowledged the order within the electronic medical record, which allowed the patient's order sticker to be printed from the WOW. The order sticker was checked with the patient to confirm patient identification and placed on the outer container of the swab. A bright green COVID-19 sticker was also placed on the lid of every swab container to notify the laboratory to take extra precautions before it was placed in a single biohazard bag. A laboratory runner retrieved specimens from the Tele-Garage every 15 minutes.

Telemedicine Visit

A key aspect of the Tele-Garage is the integration of telemedicine to enable remote assessment of prescreened patients. Although telemedicine was already being used in limited ways in the emergency department, it required a nurse colocated in the room with the patient to initiate the software. The platform was modified to be contactless and automatically answer after 2 rings. No physical contact was required by the patient to operate the telemedicine platform.

The telemedicine platform on wheels was positioned near the patient, and the camera was adjusted for full patient view. A speaker was positioned at the average level of a seated car driver. The RN notified the ED provider through a secure text message to initiate the telemedicine visit. The provider used a desktop computer within a consult room of the main emergency department. On conclusion of the visit, the provider communicated with the RN through the electronic medical record to initiate discharge. Occasionally, the ED provider securely texted the RN to notify them that the patient was to be brought to the main emergency department on the basis of additional information learned during the telemedicine assessment.

Discharge

Preprinted, standardized discharge instructions available in multiple languages were given to each patient. These instructions included information about test results, including their availability on the hospital's MyHealth app within 9 to 12 hours. A paper printer located in the Tele-Garage printed additional discharge instructions, if needed (eg, for patients receiving a streptococcal pharyngitis test in addition to the COVID-19 swab or instructions about how to reduce a fever).

Follow-up

An emergency nurse made calls to convey all positive results to patients and reinforced the preprinted discharge instructions regarding quarantine and returning for worsening symptoms. Follow-up calls were made at 7 and 14 days. The same RNs also reported positive results to the public health department for contact tracing purposes. The RNs called all patients with negative results who did not sign up for the hospital's MyHealth app.

OUTCOMES

Throughput

A total of 5493 patients received care in the Tele-Garage during the 3 times it was open (633 patients from March 12 to 25, 2020; 1204 from July 27 to August 16, 2020; and 4106 from November 23 to December 10, 2020). The average number of patients seen in the Tele-Garage was 112 per day with an average ED-LOS of 55 minutes. The throughput allowed for a 13% increase in the average daily total ED volume of patients during the 2 latter openings. During July and August, the overall ED volume increased by 11 patients from 233 patients to 244 patients per day. During November and December, the average daily ED volume increased by 117 patients per day from 311 to 429 patients per day.

Figure 3A is a chart of ED-LOS in hours per week from before to 2 weeks after opening of the Tele-Garage for each of the 3 time periods. The average ED-LOS decreased 17%, from 4.24 hours during the week before opening to 3.54 hours during the Tele-Garage operation, with a more stable, predictable process with minimal common-cause variation. The highest percentage decrease was noted in March 2020, when the ED-LOS decreased 24%, from approximately 4.99 hours during the week prior to 3.78 hours during the Tele-Garage operation.

The reduced ED-LOS resulted in a higher proportion of the total ED volume with visits lasting less than 1 hour (Figure 3B). Approximately 30% of the patient stays during the Tele-Garage time frames were noted to have ED-LOS lasting < 1 hour, a significant increase from the average 18% noted during the week prior.

PPE Use

Figure 3C is a chart of PPE use. Before the Tele-Garage opening, an estimated 4 PPE sets were used per patient classified as low acuity by the registration clerk, RN for assessment and swabbing, and provider visit. When the Tele-Garage was open, the RN would wear 1 to 2 PPE sets

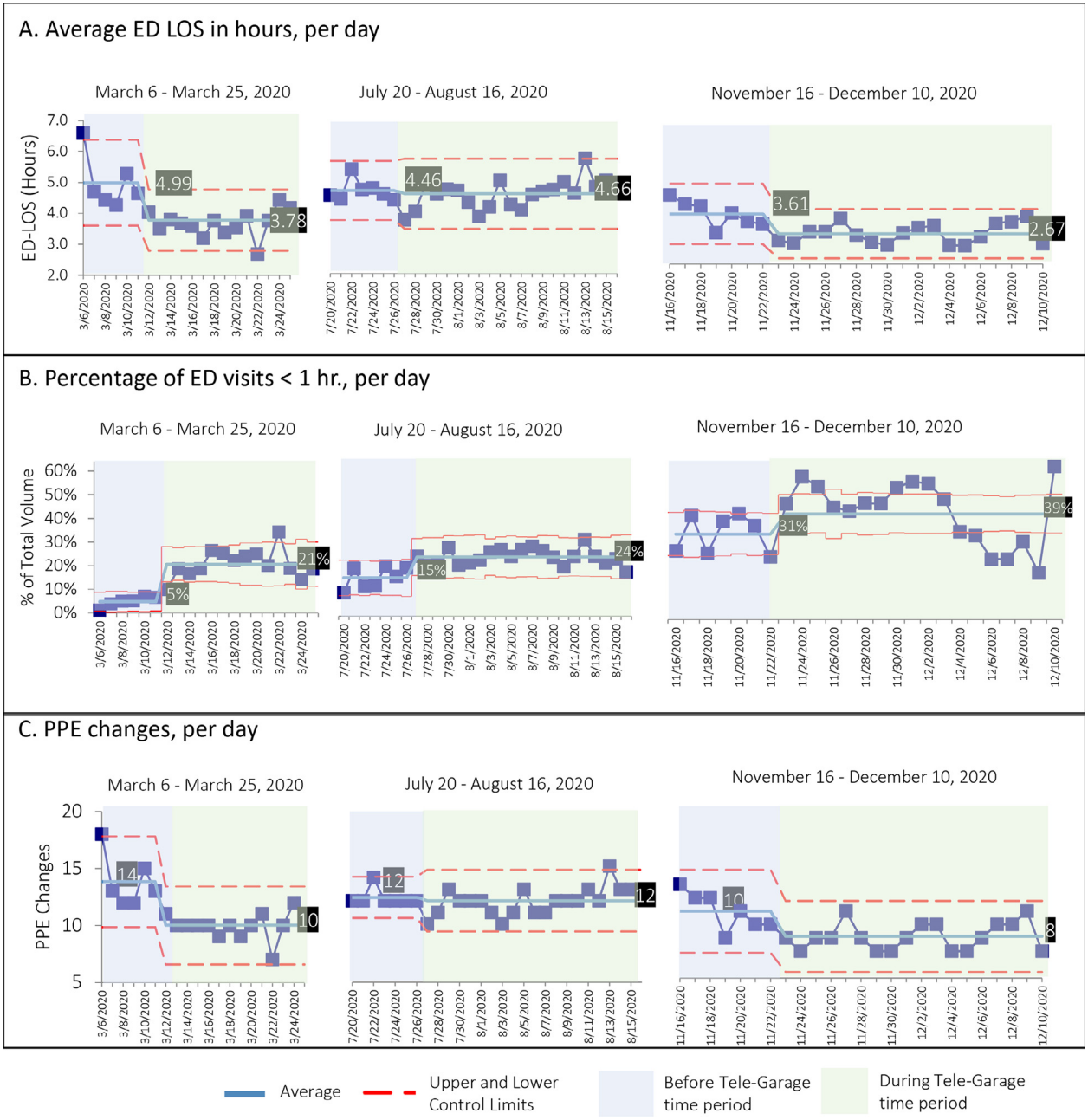

FIGURE 3

Tele-Garage metrics for the 3 operational periods in 2020. ED, emergency department; LOS, length of stay; PPE, personal protective equipment; Tele-Garage, pandemic-ready, telemedicine-enabled drive-through and walk-in garage care system.

for most of the shift as described previously. On the basis of the number of presenting patients classified as low acuity, this change in workflow resulted in an estimated 25% to 41% reduction in PPE use for this cohort.

Discussion

The Tele-Garage, located in close proximity to the main emergency department, was an essential component in the

optimization of care for patients classified as low acuity with ILI, ED throughput, and staff and patient safety from exposure during the COVID-19 pandemic. It resulted in a reduction in both face-to-face patient interactions and contact time. Physical distancing was maintained, except for the necessary swabbing, which consequently provided an additional level of protection to patients who were concerned about exposure from other patients at an emergency department.

The ED-LOS for patients seen in the Tele-Garage was notably lower compared with usual care in the main emergency department during the week prior. The processes implemented allowed for appropriate resource allocation and maximization of ED rooms for patients classified as higher acuity with ILI and patients with non-ILI chief complaints. In addition, telemedicine eliminated the need for PPE for registrars and providers. Of note, we could not perform a cost-estimate analysis of PPE savings owing to unreliable data from the supply chain.

Telemedicine has been embraced during the COVID-19 pandemic as an alternative care modality to minimize frontline provider exposure and conserve PPE.[25] Few case studies have explored using it in the emergency department to provide physical distancing and reduce interactions with PUI during the COVID-19 pandemic.[11,18] Our project is the first that combined using an alternative care area such as a parking garage to streamline patient flow for high-volume triage in addition to using telemedicine for patient assessment.

Although the Tele-Garage was deemed an overall success, it had to overcome several challenges in the 3 iterations of its deployment. The flow changed with each opening to become even leaner. At first, the screener RN would take a picture of the driver's license or identification card and send it securely to registration. With higher patient volume in December 2020, it became more efficient to station registration outside—at the opening of the garage—to perform a 2-minute registration with a WOW. Triage was also moved to a position right after registration to leave the treatment area for treatment only. We had the driver turn off the engine to avoid exhaust during the registration, triage, and treatment stages. Each day, a car would not restart. We obtained jumper cables and would jump start the car by asking the driver of the car next to them if they could assist.

Limitations

There are limitations to the generalizability of our approach. Other health care facilities may not have the facilities (eg, physical garage space) or the resources to quickly enable wireless connectivity for remote communication with the main emergency department and telemedicine visit. In addition, this alternative care area would still be prone to weather elements, especially in harsher climates. The Tele-Garage did not have climate control, with neither heat in the winter nor cooling in the summer, which could have affected staff productivity and satisfaction. Because our facility is in a mild-climate area, this was not identified as a pressing issue. Future work may focus on evaluating staff and patient satisfaction with care in the Tele-Garage.

Implications for Emergency Health Care Team

Rapid change during disaster situations will continue to challenge emergency nurses. The COVID-19 pandemic is one of these untested challenges. The American Nurses Association Code of Ethics states that nurses have the same obligation to self as to others. The ED leadership worked with staff to find ways to keep staff safe while meeting our ethical obligations to care for patients classified as infectious or potentially infectious. The development of the Tele-Garage is an example of a patient care and flow process that greatly assisted in meeting staff safety and the ethical obligations of patient safety and treatment.

A disaster event can be acute, such as an act of terrorism/natural disaster, or evolving, such as the COVID-19 pandemic. The safety of the health care team and conservation of safety equipment such as PPE must be considered during any disaster situation. We have demonstrated the Tele-Garage is a safe and feasible way to provide care for patients classified as low acuity during a pandemic. In the future, this model can be transitioned to care for patients classified as low acuity during natural disasters, influenza surges, and potentially contaminant scenarios, creating capacity for patients classified as higher acuity within the ED footprint.

Conclusion

Our proposed and evaluated new model of telemedicine-enabled, alternative care area patient workflow, the Tele-Garage, can be used as a blueprint by emergency departments to develop and rapidly implement their own plans to manage patients classified as low acuity safely and effectively. This model can be applied to other surge capacity situations such as infection contamination scenarios with a surge of communicable infection complaints or to treat minor injuries after a natural disaster.

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Author Disclosures

Conflicts of interest: none to report.

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A Time and Motion Analysis of Nursing Workload and Electronic Health Record Use in the Emergency Department

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NCPD Earn Up to 10 Hours. See page 827.

Contribution to Emergency Nursing Practice

- The current state of the literature indicates that the implementation of commercialized electronic health records (EHRs) has led to both advances and drawbacks to patient care. However, there is little in the literature examining the impact EHR usability has had on nursing workload and satisfaction in the emergency care setting.
- The main finding of this research is that nurses spent more time utilizing the EHR as compared to other tasks, including direct and indirect patient care.
- Key implications for emergency nursing practice from this research are identifying and addressing the specific usability issues within EHR systems that may hinder nursing workflow.

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Abstract

Introduction: The use of an electronic health record may create unanticipated consequences for emergency care delivery. We sought to describe emergency department nursing task distribution and the use of the electronic health record.

Methods: This was a prospective observational study of nurses in the emergency department using a time-and-motion methodology. Three trained research assistants conducted 1:1 observations between March and September 2019. Nurse tasks were classified into 6 established categories: electronic health record, direct/indirect patient care, communication, personal time, and other. Nurses' perceived workload was assessed using the National Aeronautics and Space Administration (NASA) Task Load Index.

Results: Twenty-three observations were conducted over 46 hours. Overall, nurses spent 27% of their time on electronic health record tasks, 25% on direct patient care, 17% on personal time, 15% on indirect patient care, and 6% on communication. During morning (7 AM-12 PM) and afternoon shifts (12 PM-3 PM), the use of the health record was the most commonly performed task, whereas indirect patient care was the task most performed during evening shifts (3 PM-12 PM). Using the National Aeronautics and Space Administration (NASA) Task Load Index, nurses reported an increase in mental demand and effort during afternoon shifts compared with morning shifts.

Discussion: We observed that emergency nurses spent more time using the electronic health record as compared to other tasks. Increased usability of the electronic health record, particularly during high occupancy periods, may be a target for improvement.

Key words: Workload; Job demands; Electronic health record; Time-motion study; Emergency nursing; Operations

Introduction

Since 2003, there has been a push to implement electronic health records (EHRs) throughout health care as part of a national task force deployed by the Institute of Medicine and Health.[1] This was further expanded on by the signing of the Health Information Technology for Economic and Clinical Health Act in 2009, which sought to promote the implementation of EHRs in hospital systems.[2] The adoption of commercialized EHRs across health care has helped facilitate complete patient records, improve shift-to-shift reporting, limit data entry errors, and enable more efficient delivery of health care.[3] Nevertheless, this expansion has not been flawless, with drawbacks of inefficient implementation including poor usability, low participant satisfaction, and a demise in time dedicated toward patient care.[4,5]

The emergency department, with its high patient acuity and dynamic workflow consisting of frequent interruptions, can be limited by an inflexible EHR that decreases productivity and hinders multitasking.[4] Health care providers are at a significantly higher risk of professional burnout when dissatisfied with the time spent on clerical tasks and decreasing time spent interfacing with patients.[5,6] Increased workload and resulting burnout among health care providers are detrimental to the quality of care delivery and clinical decision-making. For example, in intensive care unit settings, increased workload in the form of higher patient-to-nursing ratios is associated with increased morbidity and mortality.[7,8] Beyond the walls of the intensive care unit, increased workload in the emergency department was found to influence physicians' prescribing patterns, with physicians more likely to prescribe opioids when patient volumes are higher.[9]

There is evidence that the use and alternatively, the usability of an EHR affects meaningful patient-oriented outcomes. One study of neonatal intensive care nurses revealed that one of the most frequent unintended consequences of EHR use was a heavier workload along with changes to their workflow and modified communication patterns.[10] Nurses spend less time reporting and providing patient-family teaching in lieu of their increasing documentation requirements.[11] Cumbersome navigation of scattered information throughout the EHR slows cognitive processing of patient information.[12] This can adversely affect a nurse's ability to make rapid, real-time medical decisions and perform handoffs effectively and efficiently.[13,14]

Across different EHR vendors, time to complete tasks and error rates can vary widely, leading to errors in medication and diagnostic orders.[15,16] In addition, key performance indicators such as waiting room time, treatment time, and total time for patients discharged from the emergency department were increased immediately after the implementation of a commercialized EHR, when staff and health care providers are first learning how to use a new system.[17,18]

Previous research among medical-surgical and outpatient nurses found that a substantial proportion of a nurse's tasks may be devoted to the EHR.[19,20] Given the importance of context and the highly disruptive nature of the emergency department, EHR use among emergency nurses has not, to our knowledge, been previously described and is the subject of this analysis. A previously unpublished study from 2007 from our institution examined nursing work patterns in the ED setting and found that nurses spent 10% of their time on computer tasks and 32% on direct patient care.[21]

In this study, our objective was to (1) describe overall patterns of nursing workload in the emergency department, (2) measure the task load dedicated toward the use of the EHR, and (3) understand variation in emergency nurse workload across different times of the day. In addition, we sought to characterize any changes that may have occurred in time dedicated to the EHR since this was last studied at our institution 13 years ago.

Methods

DESIGN AND SETTING

We conducted a prospective observational study of emergency nurse use of the EHR using a continuous time-and-motion methodology.[22] Adapted from management science, a time-and-motion approach uses observation to measure the amount of time spent on tasks. The study was conducted at Vanderbilt University Medical Center (VUMC) in Nashville, TN. VUMC is a quaternary care academic medical center, and its emergency department has 80 000 annual patient visits. The emergency department has used Epic (Epic Systems Corporation, Verona, WI), a commonly available commercial EHR, since November 2017. Observations were performed in the highest acuity section of the emergency department to be consistent with our initial 2007 study. This section of the emergency department consists of 20 treatment rooms and 4 trauma resuscitation bays with nursing to patient ratios of 1:3.

OBSERVATION PROCEDURES

Three trained research assistants conducted 1:1 observations using a convenience sample of emergency nurses who consented to be observed between March and September 2019. The research assistants consisted of 2 medical students and a clinical research coordinator. Before conducting formal observations and to enhance reliability, the research assistants were trained through simultaneous

observations of a single nurse. The research assistants were given a guide defining workload categories and were observed by a senior researcher during a pilot observation training period to enhance the accuracy and reliability of the time-motion data collection. The observed nurses were typically assigned to 2 to 4 rooms per shift. Observations were conducted across different times in the day to capture potential variation in ED workload and flow, with a morning (8 AM-12 PM), afternoon (12 PM-3 PM), and evening (3 PM-6 PM) shift. Splitting observations is a standard methodology for time-motion studies conducted in the emergency department, where continuous observations can be disruptive and expensive to perform.[23,24] Observers were instructed to limit conversations with nurses and to position themselves in a way to avoid interruptions in nurse workflow.

PARTICIPANTS

Staff were included if they were an emergency nurse and were assigned to the high acuity pod during the period of observation. Nurses were excluded if they were assigned to a teaching role as workflow patterns may deviate from their normal practice. Eligible nurses were selected on the basis of availability through the review of the electronic whiteboard or by recommendation from the charge nurse. Nurses were consented verbally before data collection. Nurses were aware that their workload was being observed but were blinded to the purpose of the study. Charge nurses were not aware of the study purpose or aims.

DATA COLLECTION AND MEASURES

Time-and-motion data were collected using Research Electronic Data Capture (REDCap). REDCap is a secure, widely used web-based software platform designed to support data capture for research studies.[25] Research assistants used the tool to log, in real-time, what activity a nurse was performing. Timestamps and durations of tasks were automatically generated by the system. The data collection form can be seen in the Supplementary Figure.

Nursing activities were classified into 1 of 6 categories: EHR, direct patient care, indirect patient care (actions performed to benefit patient but do not involve direct patient contact), communication (discussions with other health care providers), personal time (non-health care–related tasks), and other (any other task not included in earlier text). These definitions were derived from literature review of previous time-motion studies and reviewed by a nursing manager for relevancy to our setting before their implementation.[26,27] The distinction between direct and indirect patient care is well described by the Nursing Interventions Classification System, a comprehensive, research-based standardized classification of nursing roles.[28]

Nursing staff's perceived workload was assessed using the National Aeronautics and Space Administration Task Load Index (NASA-TLX), a validated tool for measuring and conducting a subjective mental workload assessment.[29] The NASA-TLX is a multidimensional and widely accepted tool for measuring subjective occupant workload.[30] The NASA-TLX is also a quick, easy, and flexible survey that limits interruptions to nursing workflow and has been effectively used in previous nursing studies to measure overall subjective workload of a shift and multiple tasks.[31,32]

Toward the end of an observation session, nurses were given an electronic tablet with the NASA-TLX survey and asked to rate performance on a scale of 1 to 20 across 6 dimensions: mental demand, physical demand, temporal demand, effort, performance, and frustration. To help with understanding our findings, we asked the observed nurses to comment on the perceived workload and whether there were any barriers to accomplishing their work during the shift. These comments were reviewed for themes and are presented in the Discussion.

ANALYSIS

Statistical analysis was conducted using Stata/IC version 15.0 (College Station, TX). A Wilcoxon rank sum test was used to analyze the time spent on EHR tasks when compared with other tasks. We used 1-way analysis of variance to look at differences in NASA-TLX scores by the time of day. Any missing NASA-TLX data were excluded from statistical analysis.

ETHICAL CONSIDERATIONS

This study was approved by the VUMC Institutional Review Board (#181533). This study followed the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for reporting observational studies.[33,34] Observations were conducted on a convenience sample of nurses working in a research-centric emergency department in which participation in research is the norm rather than the exception. Before observation, study investigators collaborated with nursing leadership to develop a written script that was reviewed and approved by the institutional review board and electronically sent to all potential staff explaining the purpose and voluntary nature of the study. They were also informed that they could opt out at any time. Staff were then contacted 1 day in advance and verbally consented. Although we had a 100% participation

rate, recruitment focused on ensuring that participation was entirely voluntary. Furthermore, nurses were blinded from specific study objectives. There were no incentives offered to participate in the study and no penalties for declining participation. However, nurses often feel underrepresented in research and are eager to participate to educate patients of the research products about the nature and challenges of emergency nursing. We did not record the names of nurses observed or demographic information to protect participant privacy.

Results

All recruited nurses enrolled in the study. Twenty-three observations were conducted for a total of 46 hours between March and September 2019. The mean duration of observation per nurse was 120 minutes with a range of 56 to 169 minutes. In total, there were 9 morning observations, 9 afternoon observations, and 5 evening observations. A NASA-TLX survey was not completed in 3 of the 27 observations owing to participants declining or time constraints.

TASKS AND TIME

Overall, nurses spent a median of 27% (interquartile range [IQR] 23-33) of their time on EHR tasks, 25% (IQR 16-32) on direct patient care, 17% (IQR 6-24) on personal time, 15% (IQR 12-25) on indirect patient care, 6% (IQR 4-8) on communication, and 0% (IQR 0-2) on "other" tasks including cleaning patient rooms or documenting on paper (Table 1). The median time spent on EHR tasks was greater than on indirect patient care (11.8 minutes, $P = .003$; 95% CI, 4.1-20.5), communication (24.9 minutes, $P < .001$; 95% CI, 18.4-32.5), and personal time (15.1 minutes, $P = .005$; 95% CI, 4.8-24.3) (Table 2). There was no significant difference from direct patient care. As a proportion of tasks performed, the use of the EHR was the most frequent task performed overall (31%), followed by indirect patient care (23%), direct patient care (21%), communication (13%), and personal time (11%). During morning shifts, the highest median fraction of time was spent on EHR tasks and direct patient care. During afternoon shifts, nurses spent most of their time using the EHR, whereas indirect patient care was the task most performed during evening shifts.

NASA-TLX RESULTS

Overall, mean NASA-TLX scores (N = 20) indicated that throughout a shift, nurses had low levels of demand and frustration and felt that they could complete tasks effectively (Figure 1). However, when stratified by time of day, key differences were observed (Figure 2). Nurses had increased mental demand and reported effort (how hard they had to work to accomplish tasks) between morning, afternoon, and evening shifts ($F = 5.04$, $P = .02$, $F = 4.12$, $P = .04$). There were no statistical differences noted between physical demand, temporal demand, performance, and frustration across the 3 time points.

TABLE 1
Median time spent on tasks

Task	Median time, %	IQR
EHR	27	23-33
Direct patient care	25	16-32
Indirect patient care	15	12-25
Communication	6	4-8
Personal time	17	6-24

EHR, electronic health record; IQR, interquartile range.

Discussion

This study used direct observations of nurses working in the emergency department of a large quaternary care academic center to evaluate patterns of workload distribution. Our results identified that emergency nurses spent more time using the EHR than on direct or indirect patient care tasks (27%, 25%, 15%, respectively). In addition, the use of the EHR was the most frequent task performed by nurses during their shifts.

Our results demonstrated a substantial change in the amount of time spent on EHR tasks when compared with previous analyses of nurse workflow. In a 2010 study by Cornell et al,[35] charting tasks took up 9.9% of medical-surgical nurse time, with the most time spent assessing patients. Our results are comparable with literature on physician workflow. Research on emergency physician workflow in Denmark yielded similar numbers to ours, with physicians spending 25% of their time on direct patient care and 31% on documentation.[36] Similar time-motion analysis of inpatient hospitalists done by Tipping et al[37] showed that physicians spent more time using the EHR than on direct patient contact (25% and 17%, respectively). Increasing medico-legal liabilities and billing requirements have necessitated that physicians spend more time documenting in the EHR. Nurses, however, do not have the same requirements and, in previous research, have reported more positive attitudes toward the adoption of

TABLE 2
Median nursing time spent on EHR tasks compared with other tasks

Tasks	Difference, min	95% CI	Z value	*P* value
EHR vs indirect patient care	11.8	4.1, 20.5	−2.4	.003
EHR vs direct patient care	4.2	−7.5, 13.3	−0.7	.49
EHR vs communication	24.9	18.4, 32.5	−4.2	< .001
EHR vs personal time	15.1	4.8, 24.3	−2.9	.005

EHR, electronic health record.

EHRs in clinical practice when compared with physicians.[38] Despite this, our study revealed that nurses spent comparable amounts of time using the EHR as physicians.

Using the NASA-TLX, nurses in our study reported increased mental, physical, and temporal demands; increased effort and frustration; and decreased performance during afternoon shifts. During evening shifts, there was a sharp decrease in personal time tasks and time spent using the EHR, with an increase in the duration of time performing indirect patient care. It appears that during higher occupancy times, emergency nurses spend more time on patient care, leaving them less time to document or take breaks. Qualitative comments, particularly around the usability of the EHR, reflected on this cognitive toll associated with documenting during periods of increased patient load. Usability features that were a source of frustration included the multiple clicks required to collect information on patients, making nursing sign-out more tedious, and increased documentation requirements for patients waiting to be admitted (eg, boarded patients). One nurse commented on how the portability of computers in the emergency department facilitated flow more so on the inpatient side, allowing for concurrent patient care to occur when documenting. The EHR, as 1 nurse commented, "helps

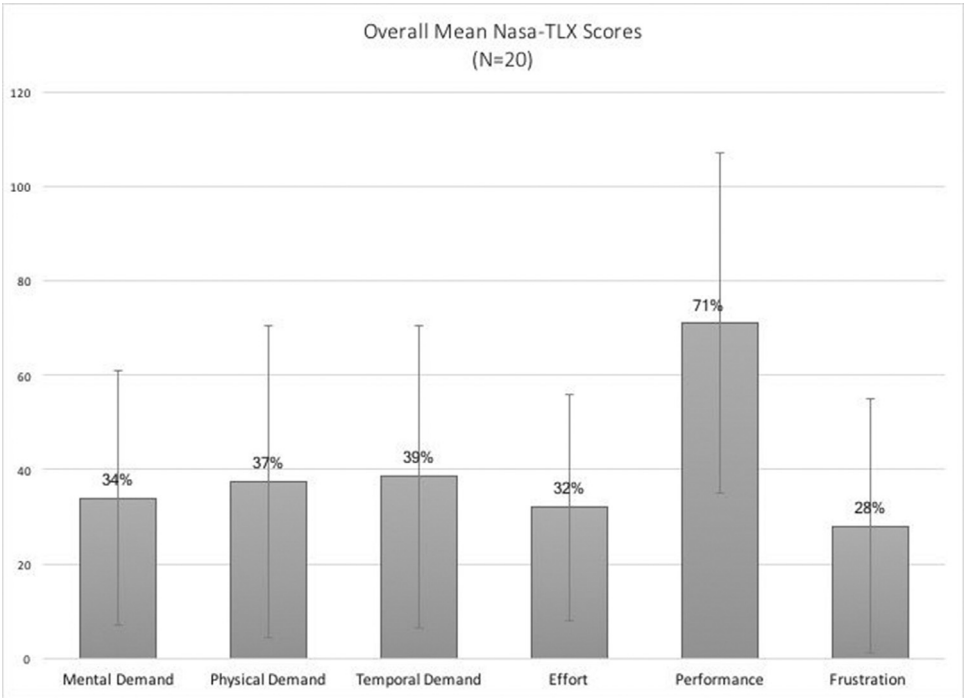

FIGURE 1
Overall mean National Aeronautics and Space Administration Task Load Index scores by dimension for emergency nurse (N = 20) electronic health record use. Bars represent the SD of scores.

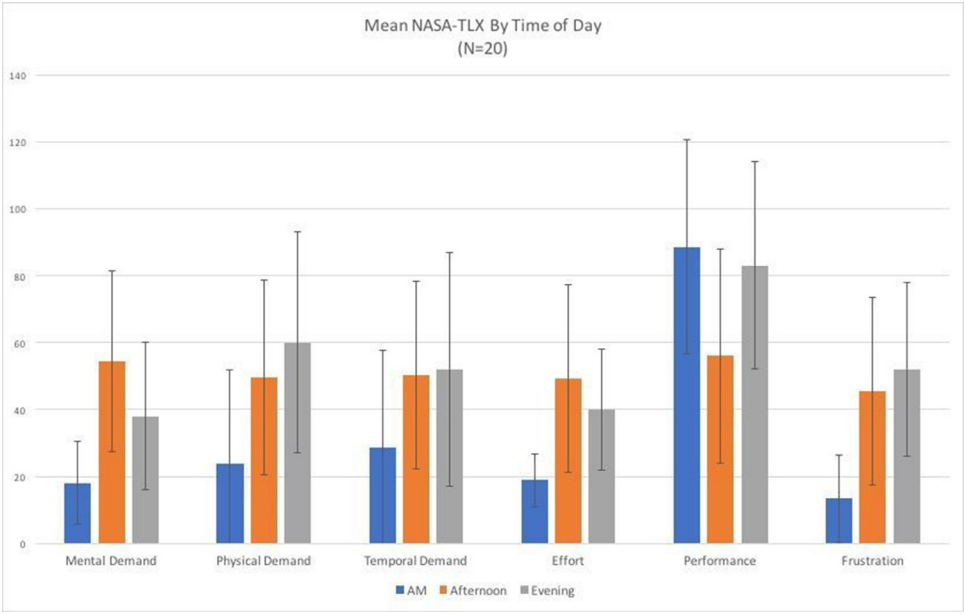

FIGURE 2

Mean National Aeronautics and Space Administration Task Load Index scores by time of day for emergency nurse (N = 20) electronic health record use. Bars represent the SD of scores.

more than it hurts, but can be challenging as someone getting to know the system."

Previous research has shown that EHR-related stress was associated with nursing-perceived physical demand and frustration.[39] Early phases of EHR transitions are associated with increased cognitive workload in nurses, but no long-term follow-up has been done. According to Black Book Market Research, self-reported satisfaction with EHRs among nurses is low, with 90% of nurses believing that their EHR has damaged their ability to communicate with patients.[40]

Although not designed as an exact-replication study, our data collection methods were similar to the 2007 Vanderbilt study examining emergency nursing use of an EHR and provide insight into how nursing use of the EHR may have changed over time at a single institution. In the study, 96.7 hours of data were evenly split between 8 morning and 8 evening shifts from emergency nurses working in the highest acuity pod. The observations at that time found that emergency nurses spent approximately 10% of their time using the EHR and 32% on direct patient care. The EHR used at the time was a homegrown system compared with the commercially available product implemented in 2017. Although we focused on a similar population of emergency nurses working with high acuity patients, potential confounders remain. For example, changes in team composition at the time of patient arrival both in the current study and in 2007, architectural design of the emergency department, nursing experience with the EHR, patient time spent in the emergency department (eg, newly arrived vs boarding patient), and historical changes in work processes are such examples that may introduce potential confounders that limit both a comparison between the 2 studies and further affect the results of the current study. Our observations show an approximately threefold increase in the proportion of time dedicated to the EHR since 2007. However, these findings may be limited in generalizability owing to the potential confounders described previously along with the specific operating nature of this quaternary care academic emergency department.

Further research is needed to understand why there has been such a substantial increase in time spent in the EHR. One issue frequently described in the literature and relevant to the ED setting is the increase of "alert" or "pop-up" fatigue resulting from frequent interruptions built into clinical systems.[41] In a setting such as the emergency department, where staff members are already burdened by frequent interruptions, additional interruptions created by an EHR may hinder interactions among ED staff and patients. To combat this, 1 study observed what unique alerts accounted for most of the interruptions in nursing workflow and made

changes accordingly, with significant reductions in weekly screen time.[42] Additional usability features to consider for the emergency department include the forgiveness and feedback of the system, whereby exploration within the EHR does not lead to errors and informs users what actions are about to be undertaken, as well as the effectiveness of language and simplicity of the design interface.[43] Nurses and physicians have historically felt excluded from participating in health system development initiatives and often cite the feeling that EHRs are designed to prioritize documentation and billing over patient care coordination and decision-making.[44,45] Therefore, any future endeavors to address usability issues must have buy-in from all end-users of health informatics systems.

Limitations

Our study had several limitations. First, the study was limited to nurses working in the highest acuity pod in the emergency department. In these pods, nursing to patient ratios are lower (1:3 patients), which may alter how workflow is distributed when compared with other areas of the emergency department. Second, observer interrater reliability was not formally measured nor was a priori sample size calculated as this study was designed to be descriptive in nature. Furthermore, training was conducted before the observations to enhance the reliability of the observations. Third, we used a survey instrument developed in REDCap for capturing time-motion analysis, which has not been validated. However, there were no reported issues with using this instrument during observations. Other limitations included the small sample of emergency nurses observed and constraints on the duration of the study and the time of day when the observations were conducted (there were no observations conducted after 6 PM). Nurses in our study were not blinded to observers and may have subsequently modified their behavior or the content of their qualitative comments. Our study lacked randomization, which may have introduced selection bias into our results. Finally, although it is possible that the same nurses were observed, subsequently reducing the generalizability, this was not part of our exclusion criteria and occurred infrequently.

Implications for Clinical Care

Our study demonstrated that more emergency nursing time was spent in the EHR than on direct or indirect patient care tasks. EHR documentation burden, usability, and nurse satisfaction are important areas for process improvement and innovation. Our study can serve as a single-site model assessment of the need for performance improvement to reduce EHR-related job demands and frustrations for the emergency nursing workforce.

Conclusions

In this single-center study, our findings demonstrated that time using the EHR was the most frequent task performed by emergency nurses. Furthermore, our study provides some insight into the impact that health information technology has on cognitive demands, frustration, and nursing satisfaction in the emergency department. Identifying the etiology of this increased workload may identify ways to reduce time spent on EHR tasks and subsequently increase the amount of time available for patient care.

Author Disclosures

Conflicts of interest: none to report.

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Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2021.03.007.

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System Level Informatics to Improve Triage Practices for Sickle Cell Disease Vaso-Occlusive Crisis: A Cluster Randomized Controlled Trial

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Contribution to Emergency Nursing Practice

- Patients with sickle cell disease do not often receive guideline-concordant care.
- An emergency severity index clinical decision support banner improves triage guideline concordance, without direct nursing education.
- Other nurse-directed interventions are necessary to sustain change.

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Abstract

Background: National Heart Lung and Blood Institute guidelines for the treatment of vaso-occlusive crisis among people with sickle cell disease in the emergency department recommend assigning an emergency severity index of 2 at triage. However, patients with sickle cell disease often do not receive guideline-concordant care at triage. To address this gap, a decision support tool was developed, in the form of a text banner on the triage page in the electronic health record system, visible to triage nurses.

Methods: A prospective quality improvement initiative was designed where the emergency severity index clinical decision support tool was deployed to a stratified random sample of emergency department triage nurses to receive the banner (n = 24) or not to receive the banner (n = 27), reminding them to assign the patient to emergency severity index category 2. The acceptability of the emergency severity index clinical decision support tool was evaluated with the Ottawa Acceptability of Decision Rules Instrument. Descriptive and bivariate (chi-square test) statistics were used to characterize the study's primary outcome, proportion of visits assigned an emergency severity index of 2 or higher. A generalized linear mixed model with clustering at the level of the triage nurse was performed to test the association between the banner intervention and triage practices.

Results: A total of 384 ED visits were included for analysis. Before study initiation, the percentage of sickle cell disease patients' visits with the proper emergency severity index assignment at triage was 37.04%. After initiation, the proportion of sickle cell disease patients' visits with an emergency

severity index of 2 or higher triaged by nurses in the intervention group was markedly higher in the intervention group than in the control group (64.95% vs 35.05%; $\chi^2 = 8.79$, $P \leq .003$). Accounting for clustering by nurse, the odds ratio for proper triage emergency severity index assignment was 3.22 (95% confidence interval 1.17−8.85; $P \leq .02$) for the intervention versus control. Surveyed triage nurses reported the emergency severity index clinical decision support tool to be moderately acceptable (nurses' mean Ottawa Acceptability of Decision Rules Instrument scores ranged from 4.13 to 4.90 on the 6-point scale; n = 11). There were no differences in ED experience outcomes including time to first analgesic or length of stay between the control and intervention groups.

Conclusion: Substantial improvements in triage guideline concordance were achieved and sustained without direct nursing education.

Key words: Sickle cell disease; Triage; Emergency nursing; Pain; Guidelines; Clinical decision support; EHR alert

Background

Sickle cell disease (SCD) is the most common autosomal recessive disease in the United States affecting nearly 100 000 individuals in the country.[1] The clinical hallmark of SCD is episodes of acute pain or vaso-occlusive crisis (VOC), which is the most common reason for visits to the emergency department.[2] This makes prompt and aggressive pain management a priority for providing quality guideline-concordant ED care.

National Heart Lung and Blood Institute (NHLBI) guidelines for the treatment of VOC in the emergency department recommend assigning emergency severity index (ESI) 2 at triage. ESI is a "five-level ED triage algorithm which" stratifies patients into 5 groups ranging "from 1 (most urgent) to 5 (least urgent) on the basis of acuity and resource needs."[3] However, patients with SCD often do not receive appropriate ESI scores at triage.[4] To address this gap, we developed an ESI clinical decision support (CDS) tool within the electronic health record (EHR) for ED triage nurses to improve the quality of ED care at triage. Typically, EHR interventions take the form of best-practice alert pop-ups requiring users to acknowledge and navigate back to their current task. The ESI CDS developed for this study took the form of a text-based banner on the EHR ED triage page, which was visible to users but did not require any actions on the part of the user. Our objective was to determine the effectiveness and acceptability of this passive ESI CDS tool in promoting guideline-concordant triage practices.

Methods

STUDY DESIGN

To evaluate efficacy of the ESI CDS tool, we designed a 2-arm parallel cluster randomized controlled trial among ED triage registered nurses. We chose a 1:1 cluster randomized design (instead of randomizing at the patient-visit level) to test the feasibility of this tool to change nurse behavior. ESI is assigned in a hierarchical fashion; visit ESIs are theoretically clustered by triage nurse. This group-level design minimizes the threat of intervention contamination that would occur if randomization was at the visit level "within" each triage nurse. Before the implementation of our project, stakeholder input was received from the Nursing Director of the emergency department. However, all clinical nurses included in the study were blinded to the study and to randomization. To evaluate acceptability, a convenience sample of nurses randomized to the intervention group completed the Ottawa Acceptability of Decision Rules Instrument (OADRI)[5] using a brief tablet-based self-administered electronic survey. Study data were collected and managed using REDCap electronic data capture tools hosted at the Icahn School of Medicine at Mount Sinai Hospital. REDCap (Research Electronic Data Capture) is a secure, web-based software platform designed to support data capture for research studies, providing 1) an intuitive interface for validated data capture; 2) audit trails for tracking data manipulation and export procedures; 3) automated export procedures for seamless data downloads to common statistical packages; and 4) procedures for data integration and interoperability with external sources. [27,28]

STUDY SETTING

Our study took place in the emergency department of a 1174-bed tertiary care academic referral center located in the upper east side of New York City, which sees over 100 000 visits per year and serves a diverse population that is 35% Latino, 29% black, 19% white, and 17% Asian and Other race. The emergency department uses a single EHR (EPIC, Madison, WI). In 2019, less than 1% of ED visits (N = 515) at our facility were SCD related.

STUDY SAMPLE

We included all active triage Registered Nurses (RNs) (N = 51) (Full-Time, Part-Time, Per-diem) to receive or not to receive the ESI CDS banner reminding them to assign the patient to ESI category 2 (Figure 1). The banner was triggered for all visits belonging to patients identified as having SCD using International Classification of Diseases-Ninth Revision (ICD-9) and ICD-10 codes in their problem list or medical history. Supplementary Table 1 lists all ICD-9 and ICD-10 codes used. A subset of ED triage nurses randomized to receive the ESI CDS banner participated in a brief survey evaluating acceptability of our intervention.

STUDY PROTOCOL

Nurses were randomized to receive the banner or not to receive the banner. The study's principal investigators (J.G. and N.G.) and all triage nurses were blinded to group randomization assignments. In the pilot data, we noted that some nurses triaged far more visits than others because they were scheduled for more triage shifts. To ensure balanced visit numbers between the intervention and control group, nurses were classified as being in the upper third, middle third, and lower third of total visits processed, on the basis of the 5-month pilot data. Within each stratum, random assignment to the intervention or control group was performed using a computer-generated random number list in SAS (Version 9.4). Nurses were intended to remain in their assigned group for the entire 8-month study period. Two months into the intervention, we evaluated the acceptability of the ESI CDS tool by structured interview. Emergency nurses were approached once before their clinical shift to ask a time convenient for them to participate in the survey.

DATA COLLECTION

We electronically extracted ED visit data for sickle cell patients' visits identified by ICD- 9 or ICD-10 codes (Supplementary Table 1) that triggered the ESI CDS banner using EPIC's Reporting Workbench feature. The primary outcome for our study was percentage of patients presenting with VOC who are designated ESI 2 or 1 (if nurses assessed patients' condition to be urgent enough to be an ESI of 1, this designation was not penalized and recoded in our analysis as 2). Secondary outcomes were ESI CDS tool acceptability among triage nurses as well as process measures that included door-to-nurse time, door-to-attending time, door-to-analgesia time, and length of ED stay. The OADRI was used to evaluate the acceptability of the ESI CDS tool in the second phase of our study.

OADRI INSTRUMENT

The OADRI was developed by a research group informed by the Ottawa Model of Research Use.[6] Researchers grouped various barriers and facilitators related to whether a research innovation was adopted into practice into 3 large categories: (1) aspects of the innovation, (2) decision making, and (3) environment. After pilot testing in a single tertiary care hospital, the 12-item instrument OADRI was validated via postal surveys among emergency physicians from Australia, Canada, the United Kingdom, and the US in the context of the Canadian C-Spine Rule and the Canadian CT head rule.[5]

Nurses were asked to indicate their level of agreement with each of the 12 statements on a 6-point scale ranging from 1, strongly disagree; to 6, strongly agree; or indicating "no opinion/don't know." The first 7 items were phrased such that a higher number indicated greater acceptability, and for the last 5, the opposite was true. The developers of the survey chose this strategy to avoid yes saying bias.[7] The final total score consisted of the mean of all 12 items (recoded where necessary) and ranged from 0 to 6. Noncompleted items were excluded from the final total scores. The mean of the remaining items served as the instrument score. Respondents who completed less than 8 of the 12 items were considered as not having completed the instrument and were excluded from the final analyses. Items for which "no opinion/don't know" was selected were coded as the middle of the scale in line with the original validation paper.[5]

DATA ANALYSIS

Sample Size Calculations

Before implementing the quality improvment (QI) project, we extracted the previous 5 months of SCD patients' ED visit data to inform sample size calculations. In the previous 5 months, there were 280 ED visits by 119 people with SCD presenting with VOC. These visits were triaged by 53 RNs. Given the rareness of SCD and scheduling assignments in which some RNs have more triage shifts than others, there was wide range of the number of patients triaged by each nurse (minimum = 0, maximum = 22). During this period, 37.04% of visits were assigned an ESI of 1 or 2. Using these data, we ran a null generalized linear mixed model to estimate the intraclass correlation coefficient as given by[8]:

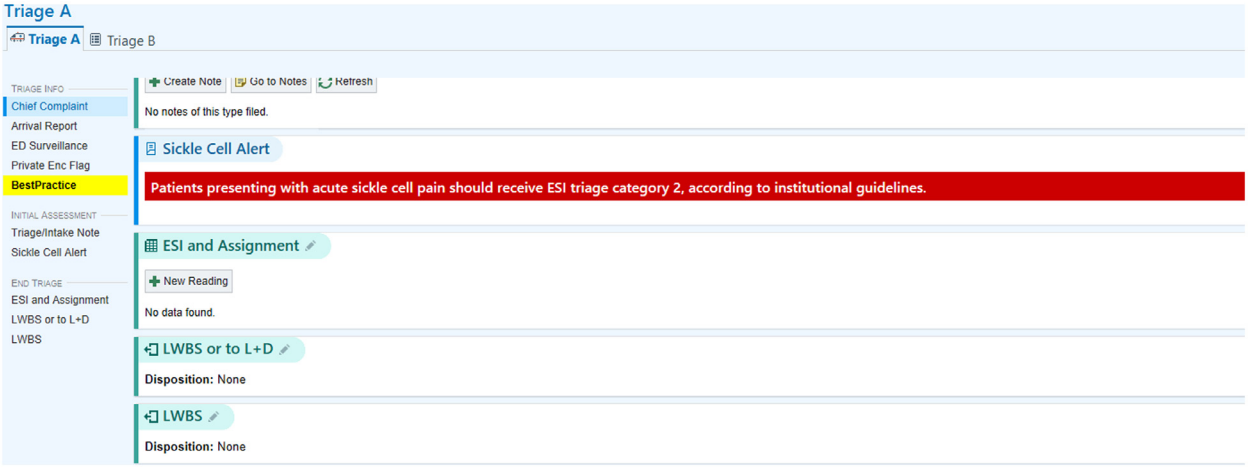

FIGURE 1

Best-practice alert. ESI, emergency severity index.

$$ICC = \frac{\tau_{00}}{\tau_{00} + \pi^2/3}$$

Where

τ_{00} is the proportion of between-unit [nurses] variance, and

$\pi^2/3$ represents the variance of the assumed latent variable describing each ED visit's propensity to be classified in a guideline-concordant manner (ESI 1 or 2) or not (ESI 3, 4, or 5).

In this null model, the triage nurse covariance parameter estimate was 4.56, producing an intraclass correlation coefficient of .58. We used the R package Cluster Power[9] to produce a range of effect sizes we could reasonably detect at varying 90% and 80% power given the following:

- α =.05,
- number of triage nurses per arm = 26,
- mean number of ED visits triaged per nurse = 5,
- coefficient of variation (ratio of cluster size standard deviation to mean cluster size) = 1.02,
- proportion of ESI 1 or 2 in the control group = 0.4 (we rounded up from .37 to be conservative),
- un-pooled standard errors, and
- the expectation that the proportion of ED visits assigned ESI 1 or 2 in the intervention group will be higher than in the control group.

To accommodate differences in required sample size in calculations with varying assumptions, we decided to let the QI intervention run until the end of the month when 350 SCD ED patient visits for VOC were accrued. A power sensitivity analysis is shown in Supplementary Table 2.[9]

OUTCOMES ANALYSIS

Descriptive and bivariate (chi-square test) statistics were used to characterize the study's primary outcome and balance between the control and intervention groups on other covariates of interest. A generalized linear mixed model (SAS proc GLIMMIX with logit link) with clustering at the level of the triage nurse was performed to test the association between the banner intervention and triage practices**.** For secondary outcomes, proc GLIMMIX with cluster statement for triage nurse was also used with appropriate distribution specified on the basis of the type of outcome (eg, for continuous, normally distributed time-to-event outcomes, linear was used).

ETHICAL CONSIDERATIONS

This protocol was submitted to the Icahn School of Medicine Institutional Review Board and deemed exempt from Institutional Review Board review. Nurses and SCD patients in the emergency department were not formally consented to the ESI CDS banner intervention; however, nurses did have the option to assent or decline to participate in the acceptability survey. We did not collect personally identifying data from the nurses (number of years in practice, sex, age, number of years as a triage nurse, etc) as they are not routinely documented to support patient care. Neither triage nurses nor SCD patients presenting to the emergency department were made aware of the ongoing quality improvement initiative. Before the initiative began, ED

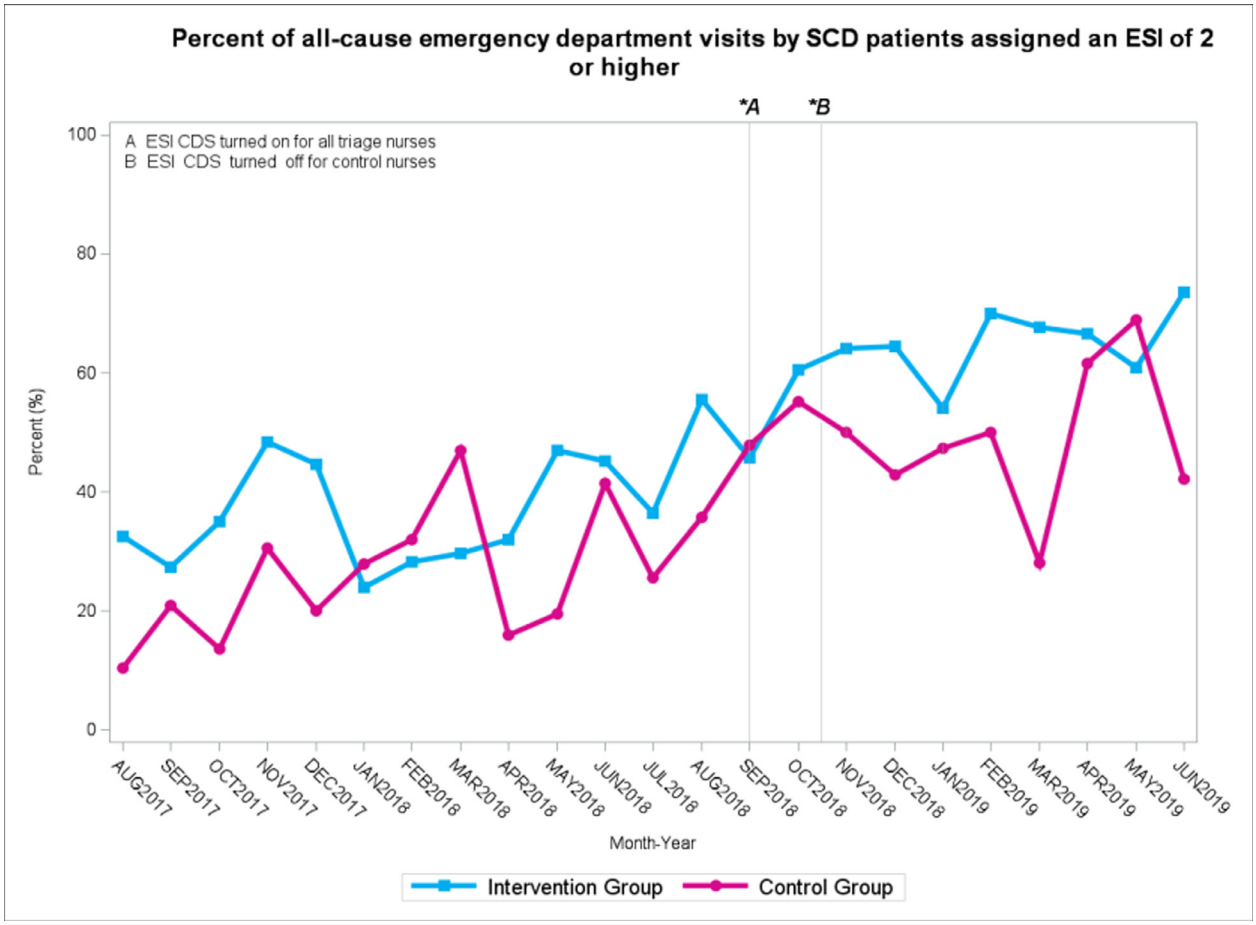

FIGURE 2

Percentage of all-cause ED visits by SCD patients. ESI, emergency severity index; SCD, sickle cell disease; CDS, clinical decision support.

TABLE 1

ED visit characteristics of patients with SCD for each group

Variable	Total		Intervention		Control		Difference groups
	N	%	N	%	N	%	*P* value
Nurses	51	100.0	23	46.0	27	54.0	≤.57
Sex							
Male	1130	56.4	465	27.0	501	29.1	≤.98
Female	873	45.6	362	21.1	391	22.8	
Race							
Black/African American	1385	69.2	571	33.2	618	36.0	≤.72
Not Black/African American	618	30.8	256	14.9	274	15.9	
No. of ED Visits triaged for VOC	Total		Intervention		Control		Difference median
	Median	IQR	Median	IQR	Median	IQR	*P* value
	3.0	5.0	4.0	5.0	3.0	4.0	≤.00
Patient's age at visit	26.0	14.0	26.0	16.0	26.0	14.0	≤.69
Patient's initial pain score	8.0	3.0	8.0	4.0	8.0	3.0	≤.15

IQR, interquartile range; VOC, vaso-occlusive crisis.

nursing leadership advised our team on the best ways to implement the intervention and provided support for the project.

CHANGES IN QI INTERVENTION PROTOCOL

Because of a miscommunication regarding which triage nurses should be assigned to the intervention and control groups, the ESI CDS tool was initially visible to all triage nurses from the beginning of the study in September 2018. This was discovered in November 2018, and the banner's visibility settings were corrected. Data in this manuscript are from after the ESI CDS tool's visibility settings were corrected in November 2018 and onward. The intent-to-treat results presented are in accordance with each nurse's planned group assignment. Figure 2 documents when these changes took place in superimposed on a line graph of percent of all-cause SCD patient ED visits assigned an ESI of 2 or higher each month from August 2017 (for historical reference) to June 2019.

Results

Of the 51 nurses randomized, 23 received the banner, and 28 were not to receive the banner. Between November 1, 2018 and June 30, 2019, there were 384 ED visits belonging to patients with at least one prior SCD diagnosis. Table 1 documents SCD patients' ED visit characteristics in the control and intervention groups. On average, each nurse included in the study triaged 4.9 SCD visits for VOC during the 8-month study period. Before the study was initiated, the baseline proportion of proper ESI assignment at triage was 37.04%. After study initiation, the proportion of SCD patients' visits with an ESI of 2 or higher severity triaged by nurses in the intervention group was markedly higher than in the control group (64.95% vs 35.05; χ^2 = 8.79, $P \leq .003$). In the generalized linear mixed model accounting for clustering by nurse, the fixed effect estimate = 1.17 (95% CI, 0.16−2.18) for proper triage ESI assignment was 3.22 (95% CI, 1.17-8.85; $P \leq .02$) for the intervention versus control group. Figure 2 depicts the percent of all-cause ED visits by SCD patient's assigned ESI category 2, demonstrating a secular trend in addition to the effect of our intervention.

For our secondary outcomes, mean door-to-nurse time (24.1 minutes for control group vs 25.2 minutes for intervention group; z value = −0.06, P = .95) and door-to-Attending time (54.0 minutes for control vs 55.3 minutes for intervention; z value = 0.29, P = .77) were not significantly different (Table 2). Door-to-analgesia time was borderline significantly different (106.7 vs 115.2 minutes for control vs intervention; z value = 1.91, P = .06). Mean length of ED stay was numerically longer among intervention group visits versus control group visits (789.8 minutes for control group vs 801.9 minutes for intervention group (z value = −0.21, P = .83) and not statistically significant between groups. Overall admission rate for patients presenting with VOC was 52%. Surveyed triage nurses reported the ESI CDS tool to be moderately acceptable (nurses' mean OADRI scores ranged from 4.13 to 4.90 on the 6-point scale; n = 11). Results of our acceptability survey are described in online Supplementary e-content.

Discussion

We derived our study from the 2014 NHLBI guideline for the acute management of SCD patients, which recommends assigning patients an ESI Triage Category 2. By doing so, patient care would be escalated and patients would receive immediate evaluation and treatment by the ED provider that includes rapid administration of an opioid analgesic, followed by re-assessment and repeat dosing every 15 to 30 minutes "until the pain is controlled."[3] Our study showed that a CDS-based intervention, in the form of a banner, was particularly effective in helping ED triage nurses begin to address an often unrecognized but

TABLE 2
Description of secondary outcomes

	Mean time		Mean score			
Variable	**Control**	**Intervention**	**Control**	**Intervention**	***Z* value**	***P* value**
Arrival-to-nurse time	24.1 min	25.2 min	846.2	844.7	−0.06	≤.95
Arrival-to-attending time	54.0 min	55.3 min	842.6	849.6	0.29	≤.77
Arrival-to-analgesia time	106.7 min	115.2 min	675.9	717.1	1.91	≤.06
Length of ED stay	789.8 min	801.9 min	862.5	857.4	−0.21	≤.83

important quality of care issue in adult patients with SCD in VOC. Unfortunately, improvements in proper triage ESI assignment did not result in improvements to other elements of NHLBI guidelines, such as time-to-analgesia. However, in light of our improvements in ED triage nurse recognition, we believe that our findings are worthy to be disseminated widely. Other quality improvement initiatives are currently underway to improve performance on other care metrics, namely, door-to-analgesia time.

Severe SCD pain should be considered a medical emergency and must be considered a diagnosis of exclusion. SCD pain can be associated with life-threatening complications, including sepsis, acute chest syndrome, aplastic anemia, stroke, pulmonary embolus, and organ failure, as well as negative physiological responses that occur when there are delays in receiving analgesia.[10] Tanabe et al[2] found that patients assigned a lower triage priority (level 3, 4, or 5) waited an average of 45 minutes longer before receiving their first analgesic when compared with patients who were assigned a higher triage level (level 1 or 2), despite pain scores being the same. These findings demonstrate how critical accurate triage assignment may be for SCD patients in VOC, as it has an adverse impact on the time analgesia is received. We implemented our study to address this issue, but found similar study findings to Tanabe et al[2]—there was no statistically significant improvement in time to administration of initial analgesic. This failure of ESI to result in more timely care for presumably sicker patients needs further research to determine clinically significant measures of our outcome.

To the best of our knowledge, our study was the first of its kind to systematically evaluate the impact of a CDS, in the form of a banner, on ESI assignment using a randomly assigned group of triage nurses. The literature is robust; however, in demonstrating that CDS is effective in facilitating and accelerating the implementation process and quality of care received by patients for a wide range of disciplines, including nursing, to enhance nursing decision-making and evidence based practice.[11]

A 2012 systematic review of 148 randomized controlled trials found that CDS integrated into EHRs are effective at improving health care process measures across diverse settings (preventive services [n = 25; odds ratio (OR); 1.42 95% CI, 1.27-1.58]), ordering clinical studies (n = 20; OR, 1.72; CI, 1.47-2.00), and prescribing therapies (n = 46; OR, 1.57; CI, 1.35-1.82), but evidence for clinical, economic, workload, and efficiency outcomes are lacking.[12] More recent studies, specific to the ED setting and not included in this systematic review, also support the adoption of evidence-based practices for computed tomography imaging use using CDS.[13,14] Mainous et al[15] found that an EHR based CDS system to identify potential transfusion iron overload in SCD patients improved management of adult patients with SCD in primary care (P <.001).

Many interventions found to be effective in translational research fail to be widely adopted or translated into meaningful outcomes. Several evaluation frameworks have been developed to facilitate translation of research findings. Some of these frameworks are intended to help guide both the development and evaluation of an intervention, whereas others are designed solely for evaluation, such as The Reach, Effectiveness, Adoption, Implementation, and Maintenance framework.[16] Our findings can be interpreted in light of the Reach, Effectiveness, Adoption, Implementation, and Maintenance framework. We have reported our reach, effectiveness, and implementation, but not maintenance. However, our future work will evaluate how this intervention can improve and sustain change, which will strengthen our study impact as well as causal associations about our intervention using a multimodal or multi-method quality improvement project.

STUDY STRENGTHS

Limitations

Typically, quality improvement interventions are multilevel and multimodal, often incorporating education, training, audit-feedback, and other techniques to improve the implementation process. A novel aspect of our study is that the EHR banner we implemented was purely informatics-based, without human education components, in an effort to maximize sustainability while minimizing resource utilization and nurse education would not have improved these 2 metrics. We maximized the potential of our quality improvement outcomes because our study was evidence-based and innovative, and we had stakeholder participation with nurse leadership. Our project was also relatively inexpensive and limited to the information technology time required integrating the banner into the EHR.

CDS faces its own challenges, which include alert fatigue and increased cognitive load. Although our banner is permanently active because of our study, future research is necessary to evaluate its sustainability and roll-out to other emergency departments in the health system.[17-21] Furthermore, we did not collect additional nurse-level demographic data before or after study implementation because of feasibility and logistics. These data were not

available to the team at the time of our study implementation, and these data were not available to our team after study implementation without additional cost of research coordinator time and effort. However, we agree that adding these additional data would be worthy of analysis or any future work. Additionally, our banner was only triggered if there was a SCD patient identified by ICD-9 or ICD-10 code in their problem history or if the triage nurses noted "pain" in their triage assessment. This may affect the interpretation and statistical analyses of our results although we believe this may be small because more than 80% of ED visits by patients who have SCD are for acute pain.[22] Furthermore, potential harms experienced by SCD patients were not explored and an analysis of the nurse and patient characteristics between groups was not evaluated for our desired outcome.

To improve performance among triage nurses for whom the banner is ineffective, an audit-feedback intervention may be beneficial. Improvements in guideline concordance were achieved and sustained without direct nursing education. However, triaging at ESI level 2 did not appear to automatically improve relevant care process measures. To improve performance among triage nurses for whom the banner is ineffective, an audit-feedback intervention may be beneficial. Our future work will involve other nurse-directed interventions to improve and sustain change, as well as future dissemination of the EHR banner to other hospital sites within our large academic urban health system. In principle, upgrading all SCD patients to ESI 2 is the right thing to do; however, individual ED departments function in many different ways, and upgrading all SCD patients to ESI 2 would mean other patients may wait longer.[3] Future research evaluating other novel ways to get SCD patients seen quickly is recommended. Nevertheless, our CDS was designed with careful consideration for delivery of the right information, to the right person, in the right format, and at the right time for the ED triage nurse workflow to optimize decision making for a rare condition.[23-26]

CROSS OVER PERIOD, QI DIFFUSION, AND RANDOMIZATION

Our study created a natural experiment and period of cross over. These implications allowed us to gain a deep understanding that when the alert is removed, clinical care would return back to baseline. The linear trend observed may be suitable for a hypothesis generating future study. Furthermore, risk of bias from diffusion of the intervention between groups and over time is also a possibility. However, we found that our intervention group was more likely to assign an ESI 2 category to SCD patients, after receiving the CDS banner, and it is likely that this risk would be minimal, if any.

Although our intervention group triaged more VOC patients when compared with our control, this occurred by chance. It is important to note, however, that if there was no stratification, this disparity between groups may have been more apparent. Thus, the stratification limited the imbalance, but did not eliminate it. To completely eliminate this disparity, future work may use a deterministic assignment rather than randomization. Adaptive randomization strategies could also be used in future work, or a multi-center trial, in which the risk of imbalance would decrease as our sample size increase.

Implications for Emergency Clinical Care

The NHLBI guidelines provide a framework to understand the elements of ideal emergency sickle cell pain care.[3] For patients experiencing only sickle cell pain, a pain management plan should be used, which involves rapid administration of an opioid analgesic followed by re-assessment and repeat dosing every 15 to 30 minutes "until the pain is controlled." This would be facilitated if patients with SCD are triaged rapidly and assigned high priority (ESI 2) for evaluation by a treating provider, in order to provide prompt pain management. A text-based banner on the EHR ED triage page that does not require any end-user action is a feasible and acceptable way to improve guideline-concordant care for ED patients in VOC, and may be an efficient measure to provide early analgesic prescription.

Conclusion

NHLBI guidelines for the treatment of VOC among people with SCD in the emergency department recommend assigning an ESI of 2 at triage. However, patients with SCD often do not receive guideline-concordant care at triage. An ESI CDS, in the form of a text banner, on the triage page in the EHR system was deployed to a random sample of triage nurses. Substantial improvements in triage guideline concordance (without improvement in clinical outcomes) were achieved and sustained without direct nursing education.

Author Disclosures

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This project was a quality improvement project and no human subjects were involved in the project.

Supplementary materials

Supplementary material associated with this article can be found in the online version at doi: https://doi.org/10.1016/j.jen.2021.05.007.

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SUPPLEMENTARY TABLE 1

ICD-9 and ICD-10 codes in patient problem list or past medical history to trigger the Emergency Severity Index clinical decision support tool for vaso-occlusive crisis in sickle cell disease.

Code type	Codes
ICD-9-CM	282.41
ICD-9-CM	282.42
ICD-9-CM	282.60
ICD-9-CM	282.61
ICD-9-CM	282.62
ICD-9-CM	282.63
ICD-9-CM	282.64
ICD-9-CM	282.68
ICD-9-CM	282.69
ICD-10-CM	D57.00
ICD-10-CM	D57.01
ICD-10-CM	D57.02
ICD-10-CM	D57.1
ICD-10-CM	D57.20
ICD-10-CM	D57.21
ICD-10-CM	D57.211
ICD-10-CM	D57.212
ICD-10-CM	D57.219
ICD-10-CM	D57.4
ICD-10-CM	D57.40
ICD-10-CM	D57.41
ICD-10-CM	D57.411
ICD-10-CM	D57.412
ICD-10-CM	D57.419
ICD-10-CM	D57.8
ICD-10-CM	D57.80
ICD-10-CM	D57.81
ICD-10-CM	D57.811
ICD-10-CM	D57.812
ICD-10-CM	D57.819

ICD, International Classification of Diseases; CM, Clinical Modification.

SUPPLEMENTARY TABLE 2

Power sensitivity analysis

Months	# of ED SCD patients with VOC	Mean # of patients triaged per nurse (n)	# of clusters (nurses assigning ESI) per condition	Coefficient of Variation (ratio of cluster size to SD mean cluster size)	Minimum % of patients with ESI = 2 in intervention group needed to detect effect
5	280	5	26	1.02	78.61
6*	340	6	26	1.02	78.43

ESI, emergency severity index; SCD, sickle cell disease; VOC, vaso-occlusive crisis.

* Estimated because ED electronic health record EPIC Workbench only allows a maximum of 5-month retrospective data pull.

The Effect of Family Presence During Resuscitation and Invasive Procedures on Patients and Families: An Umbrella Review

Authors: Ali Esmaeili Vardanjani, PhD Candidate, Mohamad Golitaleb, MSN, Kamel Abdi, MSN, Mansoreh Karimi Kia, MSN, Siamak Moayedi, MD, Mercedes Torres, MD, and Nahid Dehghan-Nayeri, PhD, Towhid Square MO, Arak, Iran, Sulimaniya, Iraq, Baltimore, Maryland

NCPD Earn Up to 10 Hours. See page 827.

Contribution to Emergency Nursing Practice

- What is already known: the concept of family presence during resuscitation and invasive procedures is a controversial issue and it has not been universally adopted by health care providers.
- The main finding of this paper is that the presence of parents and other immediate family members during resuscitation and invasive procedures has positive impacts on patients, families, and health care medical staff.
- Recommendations for translating the findings of this paper into emergency clinical practice include: A vital step toward implementing family presence during resuscitation is the provision of appropriate training for nurses and medical staff on family presence during resuscitation. Medical centers should provide the necessary training and support to implement this practice. Education and training are important for health care providers to learn essential communication skills, building practice confidence.

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Abstract

Introduction: The concept of family presence during resuscitation and invasive procedures is a controversial issue and has not been universally adopted by health care providers. Owing to the sheer number of studies in this field, we conducted this umbrella study to provide an overview of this concept with the aim of investigating the impact of family presence on patients, families, and resuscitation and invasive procedures.

Methods: In this review, using the Joanna Briggs Institute levels of evidence umbrella methodology guidelines, the authors searched PubMed, Google Scholar, Embase, MEDLINE, Web of Science, Scopus, and the Cochrane database for systematic review and meta-analysis studies that evaluated the presence of family during resuscitation and invasive procedures without time limit until July 2020. The following key words were used for the search: family presence; family witness; parent presence; parent witness; and resuscitation.

Results: A total of 254 articles published between January 1967 and July 2020 were screened. Five articles (1 meta-analysis and 4 systematic reviews) met the inclusion criteria. The review showed that family presence during resuscitation or invasive procedures does not have negative effects on family

members, patients, or the resuscitation or invasive intervention process. Family members focus on the patients, not the ongoing treatment. The presence of family members is beneficial for both family members and health care staff. None of the reviewed studies reported a negative effect on family members.

Discussion: The presence of parents and other immediate family members during resuscitation and invasive procedures has positive impacts on patients, families, and health care staff.

Key words: Family; Presence; Witness; Cardiopulmonary resuscitation; Invasive procedures; Umbrella review

Introduction

Historically, there has been a reluctance to allow family presence during resuscitation (FPDR) or invasive procedures.[1] Doyle et al[2] introduced the concept of FPDR in 1987. More than a decade later, Hanson and Strawser[3] introduced this concept in nursing textbooks. They showed that 94% of the families who had experienced this presence stated that, in similar circumstances, they would want to be present again during resuscitation and suggested that this be offered to other families as well. The American Heart Association and the European Resuscitation Council recommend providing the necessary facilities and support for family members to be present during resuscitation, stating that cultural and social factors should also be taken into account.[4,5] The European Rehabilitation Council considers FPDR to be a concept that places high value on the independence of patients and their families. This council has not outlined any concerns with regard to emotional harm to family members or interference during resuscitation. Despite these clinical guidelines on the importance of family presence, it remains a controversial issue. Many nursing leaders are reluctant to implement FPDR.[6,7] This is a result of negative perceptions of nurse managers about the potential dangers of FPDR, limited experience of implementing this program in the clinical setting, and lack of clinical policy guidelines.[5,8] In this regard, the concerns included lack of staff resulting in the inability to provide designated family support personnel at the bedside, lack of space in the resuscitation room to accommodate the family, and perception of a negative effect on the training of learners.[8] Unlike nurses and providers, patients and their families support FPDR.[9,10] Observing the resuscitation procedure reduces family members' feelings of helplessness and helps them through the grieving process by providing them the opportunity to witness the resuscitation efforts.[11,12] Since the publication by Hanson and Strawser[3] of their nursing textbook, many researchers in different parts of the world have studied FPDR. The number of systematic reviews, integrated reviews, and meta-analyses[8,13-20] is numerous and thus required an umbrella study. An umbrella review, also called review of reviews, is a systematic review of other systematic reviews that highlights their results and procedures, provides an overview of existing knowledge, gives quick access to a set of information, and provides a basis for comparing studies conducted on a particular topic.[21,22] We designed and conducted an umbrella review to determine, evaluate, and review the available evidence on the presence of family members during cardiopulmonary resuscitation and invasive procedures.

Methods

To conduct this review study, the umbrella methodology protocol of the Joanna Briggs Institute levels of evidence was used to identify search strategies and inclusion/exclusion criteria and then determine the research question, population, intervention, comparison group, and results.[23] In cases where several systematic reviews have addressed the same question, the umbrella review can provide a broader view by aggregating the results of these studies.[24]

SEARCH STRATEGY

Three researchers independently searched PubMed, Google Scholar, Embase, MEDLINE, Web of Science, Scopus, and the Cochrane database. The research was conducted in all the databases from inception of the study to July 2020 with no language restriction for publication using the following key words: family; witness; presence; resuscitation; invasive procedure; review; and meta-analysis. The exact query options included "family presence resuscitation" OR "family witnessed resuscitation" OR "family presence during resuscitation" OR "family presence during invasive procedures" AND review OR meta-analysis. In addition, "parents presence resuscitation" OR "parents witnessed resuscitation" OR "parents' presence during resuscitation" OR "parents' presence during invasive procedures" AND review OR meta-analysis were used. The authors selected and included those studies that qualitatively or quantitatively examined the presence of family members during resuscitation and

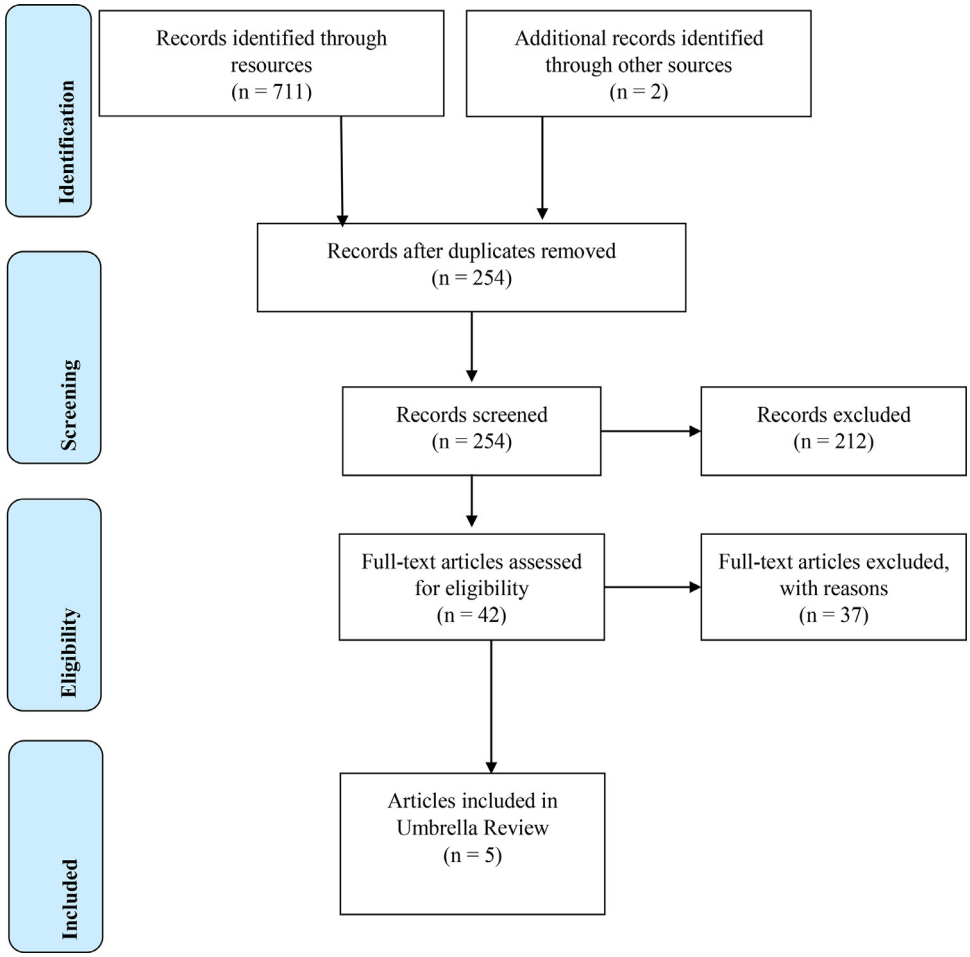

FIGURE
Flowchart of the selection of studies.

invasive procedures. Studies that examined the perspective of the resuscitation team members (nurses and physicians) regarding the presence of family members during cardiopulmonary resuscitation and invasive procedures were excluded from the study because they did not match the research question.

CRITERIA ACCORDING TO POPULATION, INTERVENTION, COMPARISON, AND OUTCOME

Population: adult and pediatric family members and patients undergoing resuscitation or invasive procedures.

Intervention: FPDR or family presence during invasive procedures.

Comparison: family absence during resuscitation or invasive procedures.

Outcome 1: family psychological outcomes: depression, anxiety, satisfaction with care. Family ability to cope. Family perspectives and experiences.

Outcome 2: patient outcome: patient mortality, resuscitation quality, the perspectives of patients about FPDR.

EVALUATING QUALITY AND SYNTHESIS

The Joanna Briggs Institute levels of evidence checklist was used to evaluate quality.[22] This checklist consists of 11 questions and has no scales and therefore lacks a defined standard score. The 11 questions guide the appraisal of systematic reviews or meta-analyses. Each question should be answered as "yes," "no," or "unclear." "Not applicable" is also provided as an option and may be appropriate in rare instances. We considered the minimum score for this questionnaire as zero and the

TABLE
Summary of articles selected for the umbrella review

	Author/year	Review design	Aim and purpose	Study sample/ inclusion period	Findings and results	PICO
1	Oczkowski et al,[18] 2015	Systematic review and meta-analysis	Whether offering family presence during resuscitation affected patient mortality, resuscitation quality, and family members' psychological outcomes	4 studies (3 in adults and 1 in pediatric patients) up to 2015	FPDR does not affect adult resuscitation outcomes and may improve family members' psychological outcomes. FPDR does not affect pediatric resuscitation outcomes.	P: patients undergoing resuscitation I: FPDR C: FPDR compared with usual care O: patient mortality, resuscitation quality, family members' psychological outcomes (depression, anxiety, satisfaction with care)
2	McAlvin and Carew-Lyons,[16] 2014	Systematic review	Evaluated the experiences of patients' family members when present during resuscitation and invasive procedures in pediatric critical care settings, specifically looking at satisfaction with care and ability to cope	6 articles 1995-2012	FPDR: parents desired to be present or at least be given the option; helpful to the child, parent, and medical staff; decreased parents' anxiety related to the procedure; no additional trauma was incurred; focus was on the child, not the resuscitation; no long-lasting memories of resuscitation. Satisfaction: want to be present again; would recommend being present to others; eased parents' fears; would not change anything about the situation when present compared with those not present; gained information about the child's condition; felt a sense of control. Coping: parents who were not present displayed more distress and were more disturbed; coping was more effective when parents could leave the room and return; better coping and better adjustment to death of child if present; gave parents peace of mind, dispelled doubts, and provided closure.	P: parents of children undergoing resuscitation and/or invasive procedures in the critical care setting I: FPDR C: family absence during resuscitation O: family satisfaction with care and family ability to cope
3	Salmond et al,[26] 2012	Systematic review	Examined the evidence on FPDR in adults from	17 articles (7 on patients' perspectives and 10	Among family members and patients, there exists strong support/preference for FPDR across all countries, and	P: family members and patients I: studies were descriptive

(*continued on next page*)

TABLE (*CONTINUED*)

TABLE
Continued

Author/year	Review design	Aim and purpose	Study sample/ inclusion period	Findings and results	PICO
		the perspectives of patients and relatives	on family members' perspectives) 1985-2010	generally the belief is that it is their right. Health care organizations should provide family members the option of FPDR on an "as needed" basis.	cross-sectional studies C: family absence during resuscitation or invasive procedures O: the perspectives of patients and relatives about FPDR
4 Dingeman et al,[28] 2007	Systematic review	Evaluated the current practice of parent presence; parent behavior during resuscitation; benefits and risks to children, parents, and clinicians	15 studies 1980-2006	Parents prefer to have the choice to remain at their child's side during complex invasive procedures and resuscitation.	P: pediatric patients undergoing resuscitation and/or invasive procedures I: FPDR C: — O: parents prefer to have the choice to remain at their child's side
5 Piira et al,[29] 2005	Systematic review	Assessed the effects of parental presence on children and parents	28 studies 1967-2004	No significant difference between the 2 groups. Children whose parents accompanied them during medical procedures showed fewer behavioral difficulties after discharge.	P: pediatric patients undergoing resuscitation and/or invasive procedures I: parent presence during medical experiences C: parent absence during medical experiences O: child's outcomes, parents' outcomes

PICO, Population, Intervention, Comparison, and Outcome; FPDR, family presence during resuscitation.

maximum as 11 (ie, a score of 1 for each question)[25]. If the answer was yes, a score of 1 was assigned, and if the answer was either no, vague, or inapplicable, a score of zero was assigned. The final score was expressed as a percentage. Thus, if the score obtained by a study was 11, it was reported as 100%. Considering the score obtained by using the checklist in our study (8 out of 11), the corresponding percentage (72.7%) would be expressed. Selected reviews were synthesized in a table and by three key questions: 1) does the presence of family members during resuscitation and invasive procedures have a negative impact on them, 2) does FPDR affect resuscication and invasive procedures? and 3) what is the effect of FPDR on patients?

Results

Overall, 713 articles were found in the initial database search (130 articles in Web of Science, 228 articles in Scopus, 101 articles in PubMed, and 254 articles in Google Scholar). After removing duplicate articles using EndNote software (Clarivate), 254 articles remained. Subsequently, 212 articles were excluded because they were not review studies. Of the 42 remaining review articles, 12 were systematic reviews or meta-analyses. Seven of these 12 articles were excluded because they examined the opinions of nurses and physicians regarding the presence of family members during cardiopulmonary resuscitation or invasive procedures. Ultimately, 5 articles were included in the study (Figure). These 5 systematic and meta-analysis studies scored more than 70% using the checklist proposed by the Joanna Briggs Institute levels of evidence.[22] Overall, five systematic reviews and meta-analyses that were conducted between 2005 and 2015 were included in this study. Of these 5 articles, 3 were specific to pediatric patients, 1 addressed adults, and the fifth included both. One of the articles evaluated the presence of family members during routine and invasive procedures, and the other 4 evaluated the presence of family during resuscitation and invasive procedures. Of these 5 articles, 4 were systematic reviews, and 1 was a meta-analysis (Table). In 2014, a systematic review by McAlvin and Carew-Lyons[16] revealed that parents who witnessed the resuscitation procedures performed on their child had a better acceptance of the death of their child and advised other parents in similar conditions to do the same too. Oczkowski et al[18] showed that the anxiety and depression scores of family members who had witnessed the resuscitation procedures performed on their loved ones were lower than those of the family members who were not present. Toronto and LaRocco[20] concluded that hospitals should adopt FPDR. The results of the systematic review by Powers[19] showed that education could be an effective factor in improving nursing leaders' understanding of FPDR and increasing their comfort and confidence in its implementation. In 2012, Salmond et al[26] published an international comprehensive systematic review examining FPDR. The results of this study showed that in every country studied, family members strongly preferred to be present during resuscitation and considered this presence to be their right.[26]

The results of these studies revealed that the presence of family members during resuscitation or invasive procedures did not have negative effects on family members, patients, or the care provided. FPDR did not interfere with the procedures and did not affect the mortality rate or the quality of resuscitation (duration, repetition, time interval between request and initiation) because family members focused more on their loved ones than on the ongoing procedures. The presence of family members was beneficial for both family members and patients.

QUESTION 1: DOES THE PRESENCE OF FAMILY MEMBERS DURING RESUSCITATION AND INVASIVE PROCEDURES HAVE A NEGATIVE IMPACT ON THEM?

FPDR did not cause psychological trauma to families and reduced the depression, fear, and anxiety caused by the treatment while increasing their sense of control over, and satisfaction with, the medical care.[27,28] Family presence provided information about the patient's condition for families.[27] Physical contact between the family and the patient made family members feel comfortable, accelerated the healing process, and increased the family's ability to adapt to the death of a loved one.[27] The presence of families often relieved the feelings of fear and suspicion by giving them peace of mind. Furthermore, most parents believed that their presence was beneficial to their child. Families considered this presence to be their right. Given the strong emotional bond among family members, the opportunity to be present during resuscitation or invasive procedures was comforting for all parties. Most families who have had this experience in the past requested this option for future interventions.

QUESTION 2: DOES FPDR AFFECT RESUSCITATION AND INVASIVE PROCEDURES?

The studies reviewed revealed that the presence of family members did not cause disruption in the resuscitation or procedural process.[28] In addition, it did not worsen the mortality rate or the quality of resuscitation (duration, repetition, and time interval between request and initiation)[18] because family members focused on their loved ones, not on the details of the ongoing medical procedures.[16]

QUESTION 3: WHAT IS THE EFFECT OF FPDR ON PATIENTS?

The presence of family was beneficial to patients, reduced the stress and anxiety caused by the treatment, and increased their satisfaction.[16,29] Furthermore, physical contact between family members was shown to accelerate the healing process.[16] In the Piira et al[29] review, 9 studies examined the behaviors of children after hospital discharge. Eight of these 9 studies did not show a significant difference between 1 group of children whose parents were present during medical procedures (invasive and noninvasive) and another group of children whose parents were not present. One study revealed that a group of children whose parents accompanied them during medical procedures had fewer behavioral difficulties when discharged from the hospital.[29] The result of this study is not in line with the result of our study. According to the result of their study, the presence of parents may not have a direct and clear effect on the child's anxiety and behavioral outcomes, but there are potential benefits for parents. It seems appropriate for physicians to provide an opportunity for parents to be present during the invasive procedures performed on their child.

Limitations

Although the concepts of family- and patient-centered care and existing guidelines recommend the presence of family members during resuscitation and invasive procedures, it is not universally adopted.[1,30,31] This may be due to a lack of support, comfort, and cooperation among medical staff. Arguments against family presence have focused on concerns with impedance to patient care, delayed initiation of resuscitation, distraction of resuscitation team members, and increased stress on medical providers owing to pressure from family members.[31]

Implications for Emergency Clinicians

Emergency nurses should be on the frontline of providing adequate information and guidance to families who wish to witness the resuscitation of their loved ones. The presence of family members during resuscitation and invasive procedures should be routinely presented as an option, while stressing both the advantages and disadvantages of such practice and eventually supporting the chosen actions. For this practice to be fully realized, ED managers and educators are encouraged to include family-centered care in the training modules of nurses to promote staff readiness in handling actual scenarios in which family presence would be warranted. Additionally, determining the availability of resources and the level of readiness of an institution to instigate family presence is imperative for the successful implementation of the practice. Moreover, utilizing the validated tool in this study, hospital administrators could be better assisted in accurately assessing family perception toward FPDR in their respective institutions and thus develop and implement policies regarding such practice, which could benefit both health care providers and recipients.

The first step for implementing the FPDR program is to define its guidelines and policies at medical centers. Next, an interdisciplinary team should be assigned to develop and expand the FPDR program. Education should be expanded, and the focus should be on the potential benefits for patients, families, and even health care professionals. The guidelines should outline the criteria for assessing family coping mechanisms to ensure uninterrupted patient care, including contraindications to the presence of family (eg, family members who exhibit violent behavior or distracting emotional outbursts or who are suspected abusers) and means to support families who are not present. A designated family member should be appointed to consult with the health care team during the resuscitation, whether families are present or not. It is imperative that standards be developed for all staff involved in FPDR to ensure the safety of patients, their families, and staff. Formal hospital policies regarding the presence of the family during resuscitation and invasive procedures should be prepared.[5]

Discussion

We investigated the effect of FPDR on the involved family members, patients, and members of the care team. The results of our umbrella review showed that FPDR has positive effects on family members and patients, while not affecting the mortality rate or the quality of resuscitation because family members focus on their loved one rather than the ongoing treatment. Similarly, Salmond et al[17] listed the benefits of FPDR as twofold: giving accurate and concise information regarding previous medical history to the resuscitation team members and improving the family's understanding of the patient's critical condition. During a resuscitation procedure, family presence provides the opportunity for family members to recognize the extent of the measures that were taken to attempt to save the patient's life. Family presence creates a situation for family members to be comforted beside their loved ones. FPDR can meet the emotional and spiritual needs of participants, facilitate the grieving process, and provide an opportunity for family members to bid their loved one farewell. In addition, in situations where resuscitative efforts may be

terminated, families have the opportunity to participate in this important decision-making process.[17]

This review demonstrates that families and parents consider it their right to accompany their loved one during resuscitation and invasive procedures. Their presence is beneficial to themselves, the patient, and the health care providers. Families have asked policy makers to provide the necessary basis for this rule.[1,16] One key barrier to implementing FPDR from a personnel perspective is the lack of written instructions.[1] A vital step toward implementing FPDR is the provision of appropriate training for nurses and medical staff. It has been shown that training improves nurses' support for family presence, as well as increases family invitations during resuscitation.[9] In addition to nurse training, interprofessional training for all medical team members is critical because resuscitation is an interdisciplinary task involving various levels of providers. Furthermore, including FPDR in the bedside teaching of resuscitation promotes its implementation.[1]

Considering the positive effects of FPDR, Salmond et al[17] assert that it is time to end previous paternalistic practices. This can be accomplished by allowing parents to make key decisions regarding the best therapeutic options for their child and if they would like to be present during these procedures. As such, clinical centers should prepare their staff and specialists for the presence of families during resuscitation and invasive procedures.[17] These studies have revealed that, over the years, the rate and willingness of families to accompany their loved ones during resuscitation and invasive procedures have increased. When presented with the option, more parents choose to be with their child during procedures and resuscitations.[1] Salmond et al[17] argue that families of patients should receive the necessary information about the anticipated procedure and required interventions. Then, involved families should be emotionally assessed and asked if they are interested in accompanying the patients. If the family chooses to accompany their loved one, they should be supported emotionally and continually throughout the resuscitation or procedure. The best practices regarding FPDR are clear: implementation requires informed and courageous health care professionals to accept responsibility for its success.[17]

Conclusions

The presence of parents and families during cardiopulmonary resuscitation and invasive procedures is safe and benefits patients, families, and medical professionals. Family presence provides the opportunity to witness the measures taken during the resuscitation, helps meet emotional and spiritual needs, and facilitates the grieving process. Medical centers should provide the necessary training and support to implement this practice.

Author Disclosures

Conflicts of interest: none to report.

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A Systematic Review of Primary Care and Payment Models on Emergency Department Use in Patients Classified as High Need, High Cost

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Contribution to Emergency Nursing Practice

- Frequent and discontinuous ED care may diminish high quality practice delivery.
- Four primary care and payment models are used to mitigate frequent ED use in high need, high cost patients: care management, care coordination, intensive primary care, and alternative payment models.
- Recommendations for translating the findings of this paper into emergency clinical practice include enhancing critical thinking about effective primary care referral practice at ED discharge and advocating for elements of primary care models and specific resources for in real time in the ED setting for high need, high cost patients.

Abstract

Introduction: Reducing costly and harmful ED use by patients classified as high need, high cost is a priority across health care systems. The purpose of this systematic review was to evaluate the impact of various primary care and payment models on ED use and overall costs in patients classified as high need, high cost.

Methods: Using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, a search was performed from January 2000 to March 2020 in 3 databases. Two reviewers independently appraised articles for quality. Studies were eligible if they evaluated models implemented in the primary care setting and in patients classified as high need, high cost in the United States. Outcomes included all-cause and preventable ED use and overall health care costs.

Results: In the 21 articles included, 4 models were evaluated: care coordination (n = 8), care management (n = 7), intensive primary care (n = 4), and alternative payment models (n = 2). Statistically significant reductions in all-cause ED use were reported in 10 studies through care coordination, alternative payment models, and intensive primary care. Significant reductions in overall costs were reported in 5 studies, and 1 reported a significant increase. Care management and care coordination models had mixed effects on ED use and overall costs.

Discussion: Studies that significantly reduced ED use had shared features, including frequent follow-up, multidisciplinary team-based care, enhanced access, and care coordination. Identifying primary care models that effectively enhance access to care and improve ongoing chronic disease management is imperative to reduce costly and harmful ED use in patients classified as high need, high cost.

Key words: Population health; Chronic disease; Primary health care; Emergency service

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Introduction

ED use has been rising steadily across the United States for the past 30 years.[1,2] Recurrent ED use is responsible for high costs of care, ED crowding, adverse patient outcomes, and

TABLE 1
Search terms for PubMed, Embase, and CINAHL

Database	Search terms
PubMed	(("Emergency Medical Services"[Mesh] OR emergency department*[tiab] OR emergency room*[tiab] OR health care util*[tiab]) AND ("Primary Health Care"[Mesh] OR primary care*[tiab] OR care coordin*[tiab] OR "Case Management"[Mesh] OR "Disease Management"[Mesh] OR "Case Managers"[Mesh] OR care manag*[tiab] OR disease manag*[tiab] OR "after-hours care") AND ("Dual MEDICAID MEDICARE Eligibility"[Mesh] OR "Medicare"[Mesh] OR "high-need high-cost" OR "high need high cost" OR "high cost" OR "high-cost" OR "high risk" OR "high utilizer")
Embase	('emergency department'/exp OR 'emergency department' OR 'emergency room' OR 'emergency visit') AND ('case manager'/exp OR 'care coordinator'/exp OR 'care coordinator' OR 'primary medical care'/exp OR 'primary medical care' OR 'out-of-hours care'/exp OR 'out-of-hours care' OR 'disease management') AND ('high-need' OR 'high-need high-cost' OR 'high-cost' OR 'high-utilizer' OR 'high-risk')
CINAHL	((MH "Emergency Service+") OR "emergency department" OR "emergency room" OR "health care utilization" OR "emergency visit") AND ((MM "Primary Health Care") OR "primary care" OR "primary practice" OR (MM "Case Management") OR (MM "Case Managers") OR (MM "Nursing Care Coordination (Saba CCC)") OR (MM "Multidisciplinary Care Team+") OR (MM "Disease Management+")) AND ((MM "Medicare") OR (MM "Medicaid") OR "high-need" OR "high-need high-cost" OR "high-cost" OR "high-risk" OR "high-utiliz*" OR "dual* eligibl*")

increased mortality.[3-5] Extensive evidence demonstrates the impact of frequent ED use on emergency nurses' ability to provide high-quality care, contributing to delays in antibiotic and analgesic administration, increased frequency of medication errors, and increased risk of stress and exposure to violence toward staff.[3,6] Frequent ED use is particularly harmful for patients classified as high need, high cost (HNHC), the small subset (5%) of adults who account for the majority of US health care costs.[7-9]

Patients classified as HNHC are defined as adults suffering from multiple (at least 2) chronic conditions with additional functional limitation (eg, difficulty bathing or feeding) or other complex psychosocial needs (eg, frailty, mental illness, or social isolation).[7-9] Owing to high rates of multimorbidity, patients classified as HNHC require ongoing and coordinated disease management between the primary and acute care settings.[8,10] Yet, many patients classified as HNHC experience challenges accessing timely care or reaching their provider.[9] Consequentially, patients classified as HNHC are 3 times more likely to use the emergency department than the average US adult and more likely to have an ED visit categorized as preventable through timely and routine primary care.[8-10] Thus, a patient classified as HNHC, for example, might be a Medicare-insured adult suffering from congestive heart failure, diabetes, and obesity who has visited the emergency department 3 times in the past month with worsening shortness of breath and lower-extremity swelling after failing to reach their primary care provider for 3 days.

Frequent and discontinuous ED care threatens the effectiveness of ongoing outpatient disease management owing to gaps in communication, inadequate discharge education, or poor care coordination between the acute and primary care settings.[11,12] Health systems are eager to identify strategies that effectively improve primary care delivery for patients classified as HNHC to reduce subsequent ED use.[13] Specific primary care models that expand accessibility to care and improve care coordination have been shown to reduce ED use.[14-16] For example, after-hours care (eg, access to evening and weekend hours) is associated with lower all-cause and nonurgent ED use.[16,17] Yet, the evidence is limited on how various primary care models affect ED use in the population of patients classified as HNHC with complex and chronic illnesses.

Frequent ED use also contributes to disproportionately high spending in the population of patients classified as HNHC.[18] Patients classified as HNHC spend more than twice as much on out-of-pocket expenses and nearly 4 times as much on medication and overall health care services as the average US adult.[10,18] Alternative payment models such as accountable care organizations have been identified as strategies to curb spending and incentivize providers for achieving high-quality outcomes for patients classified as

TABLE 2
Data extraction table

Author (year)	Study design	Sample	Definition of HNHC	Primary care model	Model definition	Result: All-cause ED use	Result: Preventable ED use	Result: Costs
Bailey et al[32] (2019)	Quasi-experimental	2235 model: 285 control: 1950	Age >18 y, Medicare, Medicaid, dual eligible, >2 hospitalizations or ED visits in last 6 mo, >1 chronic condition	Care coordination	Nonprofit health system in a medically underserved area in Tennessee, including (1) screening by nurses (2) patient engagement (3) medication and disease management (4) discharge planning and care coordination (5) community-based follow-up	Medicaid enrollees experienced 1.96 times fewer ED visits ($P <$ .05)	No significant difference	Decreased medical expenditures in model group (−$8690 per 6-month period; [95% CI, −$14 441 to –$2939]; $P <$ .005) Medicaid subgroup experienced an adjusted average decrease of −$15 998 (95% CI, −$24 427 to –$7568; $P <$ .001)
Baker et al[34] (2013)	Retrospective matched cohort study	1767	>2 clinic visits, Medicare, at least 1 of 3 conditions	Care management and telehealth	Two multispecialty clinics in Oregon and Washington offering care management integrated with telehealth for patient education and daily review of clinical needs	No significant difference		
Berkowitz et al [41] (2018)	Pretest/posttest	4686	Age >18 y, >1 chronic condition, visited PCP in last year, Medicare or Medicaid	Care coordination	Comparison of Medicare and Medicaid participants from 2012 to 2016 in Maryland: (1) discharge planning (2) daily interdisciplinary rounds (3) patient education (4) medication management (5) telephone follow-up after discharge (6) skilled home care and remote patient monitoring	90-d ED visit rates were reduced for Medicaid-insured patients by 133 per 1000 beneficiary episodes ($P <$ .01) No significant difference for Medicare-insured patients		For Medicaid-insured patients: aggregate cost of care was reduced by $59.8 million ($4295 per beneficiary episode; $P <$ .01) No significant difference for Medicare-insured patients

continued

TABLE 2
Continued

Author (year)	Study design	Sample	Definition of HNHC	Primary care model	Model definition	Result: All-cause ED use	Result: Preventable ED use	Result: Costs
Boult et al[28] (2011)	Randomized controlled trial	850	Age >65 y, "high risk" defined using claims-based predictive model	Care coordination	Fourteen primary care teams in 8 community-based primary care practices across Baltimore, MD, and Washington, DC: (1) comprehensive home assessment (2) creation of evidence-based care guide with patient (3) monthly patient monitoring (4) transitional care support (5) care coordination (6) self-management and patient education	No significant difference		No significant difference
Brown et al[30] (2005)	Pretest/posttest	17	>1 chronic condition, >1 inpatient admission in past year, life expectancy >3 y	Intensive primary care	(1) Longer appointment times for evaluation interviews (2) multidisciplinary assessment and follow-up (3) Frequent visits (weekly initially) (4) 24-h availability of a team member on call	Average ED visits were significantly different with pretest 6.9 visits and posttest 4.9 visits ($P = .05$) ED visits per month were not significantly different		No significant difference
Bui et al[42] (2019)	Pretest/posttest	1342	Age >18 y, >1 chronic condition, Medicare or Medicaid insured, identified as "high risk" by referral or risk-prediction model	Care management	Primary care-embedded case management with multidisciplinary teams, including a case manager, community health worker, health behavior specialist, and clinicians to provide individualized care	No significant difference		

continued

TABLE 2
Continued

Author (year)	Study design	Sample	Definition of HNHC	Primary care model	Model definition	Result: All-cause ED use	Result: Preventable ED use	Result: Costs
Capp et al[35] (2017)	Retrospective cohort	3802 model: 406 control: 3396	Age >18 y, >2 ED visits/hospital admissions in last 180 d	Community-based care coordination	A multidisciplinary program, part of a large urban academic medical center in Colorado: (1) intensive medical, behavioral health, and social care coordination services (2) home visits within 60 days of an ED visit or hospital discharge (3) behavioral screening and education with a provider, care coordinator, health coach, behavioral health evaluator, and community health worker	27.9% fewer ED visits ($P < .05$)		
Coleman et al[46] (2002)	Case control (nested)	297 cases (used the emergency department): 103 Controls (did not use the emergency department): 194	Age >65 y, multiple chronic conditions, history of high use or physician referral	Care coordination	Large group-model health maintenance organization in Denver metropolitan area offering the following: (1) timely follow-up after a change in treatment (2) care planning with few decision makers involved (3) patient self-report of care coordination	No significant difference	No significant difference	
Cross et al[40] (2017)	Longitudinal cohort	17 443	2 more conditions, enrollment in same primary practice with same provider for duration of study	Alternative payment models	Multiyear engagement by primary care practices in a pay-for-value program part of Blue Cross Blue Shield of Michigan	Lower odds of incurring any ED visit over time compared with control patients (OR, 0.88; $P = .0002$) No significant difference in number of ED visits overall (+3.2%, $P = .132$)		No significant difference over the 4-y study period

continued

TABLE 2
Continued

Author (year)	Study design	Sample	Definition of HNHC	Primary care model	Model definition	Result: All-cause ED use	Result: Preventable ED use	Result: Costs
Hardin et al[43] (2016)	Pretest/posttest	339	Age >18 y, >3 hospital or ED visits in past 12 mo	Care management	Conducted from 2012 to 2015 at an inner-city tertiary care hospital with a socioeconomically diverse and highly vulnerable population: (1) chart review with root-cause analysis (2) interdisciplinary care management plan with weekly follow-up (3) EMR integration	ED visits reduced by 43% ($P <$ .001)		Total direct expenses reduced by 46% ($P <$ .001) ED expenditures reduced by 50% ($P <$ .001)
Komaromy et al[32] (2019)	Quasi-experimental	770	Age >18 y, enrolled in Medicaid-managed care, >2 chronic conditions, either 1 hospitalization or >3 ED visits in past 6 mo	Intensive primary care	6 outpatient intensivist teams across New Mexico offering the following: (1) patient-centered interdisciplinary team care (2) motivational interviewing (3) care planning (4) walk-in appointments and after-hours support using a 24-h on-call system	Odds of an ED visit 12 months postenrollment were 53% lower (OR 0.47; 95% CI, 0.39–0.58) in exposed group		No significant difference
Newcomer et al[36] (2004)	Prospective cohort with control group	3079 Model: 1537 Control: 1542	Age >65 y, >1 chronic condition	Preventive care management	(1) Health-risk screening and planning (2) Ongoing monitoring (3) Caregiver and client support (4) Medication/treatment adherence (5) Transitional care	No significant difference		
Ouayogodé et al [47] (2020)	Cross-sectional study	1 402 582	Age >65 y, complex needs defined as frailty or >2 conditions	Care management	2017-2018 National Survey of ACOs evaluating the following: (1) chronic care management (2) predictive-risk stratification (3) transitional care	No significant difference		No significant difference

continued

TABLE 2
Continued

Author (year)	Study design	Sample	Definition of HNHC	Primary care model	Model definition	Result: All-cause ED use	Result: Preventable ED use	Result: Costs
Peikes et al[37] (2018)	Prospective cohort with control group	1 730 958 Model: 565 674 Control: 1 165 284	Spending 30% above the average	Alternative payment models	Multipayer support for 502 practices to implement the following: (1) enhanced access to care (2) preventive care (3) risk-stratified care management and care coordination (4) patient engagement	Slowed growth in ED visits by 2% ($P < .008$)	No significant difference	No significant difference in costs of care, regardless of Medicare financial support
Powers et al[29] (2020)	Randomized controlled trial	253 Model: 71 Control: 127	Adult Medicaid patients in the top 5% of total expenditures or Chronic Illness Intensity Index score with >3 ED visits or >2 hospitalizations or >2 conditions	Care coordination	Multidisciplinary care team at CareMore Health in Memphis, TN, consisting of a community health worker, a social worker, and a provider: (1) comprehensive medical, social, behavioral assessment (2) individualized care plan (3) frequent (at least weekly) follow-up	No significant difference		Patients randomized to complex care management had 37% lower total medical expenditures (adjusted difference, –$7732 per member per year; [95% CI, –$14 914 to –$550]; $P = .036$)
Ritchie et al[44] (2016)	Pretest/posttest	152	Age >18 y, >5 ED visits or >2 hospitalizations in the past 12 mo	Care management	Geriatric Resources for the Assessment and Care of Elders program implemented in 4 primary care clinics at a large urban academic medical center: (1) individualized care planning (2) comprehensive in-home assessment by a nurse practitioner/social worker team alongside a geriatrician, mental health liaison, and pharmacist	Decline in the median number of ED visits (5.5 to 0, $P = .015$) after enrollment in program		

continued

TABLE 2
Continued

Author (year)	Study design	Sample	Definition of HNHC	Primary care model	Model definition	Result: All-cause ED use	Result: Preventable ED use	Result: Costs
Schraeder et al [38] (2008)	Prospective cohort with control group	670 Model: 400 Control: 277	Age >65 y, determined to be high risk for mortality, functional decline, or increased health service use from screening survey	Care management	Collaborative care management in a multispecialty physician group practice across rural and urban Illinois offering the following: (1) risk identification (2) comprehensive assessment (3) collaborative planning (4) health monitoring (5) patient education (6) transitional care	No significant difference		No significant difference
Schuttner et al[45] (2018)	Pretest/posttest	65	Age >18 y, >1 chronic illness, >2 ED visits within 12 mo	Care coordination and after-hours care	Interprofessional care program (nutrition, behavioral health, pharmacy, and care coordination) implemented in an ambulatory clinic affiliated with a large academic care system in California located in an ambulatory clinic with extended hours and same-day urgent care access	12% monthly decrease in ED visits after model ($P < .001$)	17% monthly decrease in preventable ED visits ($P = .043$)	40 prevented visits over 21 m resulting in $93 000 cost savings, no statistical significance reported
Sledge et al[49] (2006)	Randomized controlled trial	96 Model: 47 Control: 49	Age >18 y, >2 hospital admissions per year in the 12 to 18 mo before recruitment	Intensive primary care	Urban, academically affiliated clinic offering the following: comprehensive interdisciplinary medical and psychosocial assessment (2) follow-up ambulatory case management for 1 year	No significant difference	No significant difference	No significant difference

continued

TABLE 2
Continued

Author (year)	Study design	Sample	Definition of HNHC	Primary care model	Model definition	Result: All-cause ED use	Result: Preventable ED use	Result: Costs
Weppner et al[39] (2018)	Prospective cohort with control group	208 Model: 104 Control: 104	Patients selected from an inter-professional academic primary care clinic based in a VA medical center Need risk prediction estimating the probability of hospitalization or death in the next 90 d	Care coordination	Patient-aligned care teams within a VA primary care clinic consisting of an interprofessional hour-long conference to develop and integrate care plan in medical record and coordinate follow-up and outreach	No significant difference		
Zulman et al[31] (2017)	Randomized controlled trial	583 Model: 150 Control: 433	Top 5% of overall facility costs or top 5% of VA patients Need risk prediction	Intensive primary care	Intensive multidisciplinary team-based program in the VA Health Care System: (1) comprehensive patient assessments (2) intensive case management (3) care coordination (4) social and recreational services	No significant difference		Significant increase in monthly person-level primary care costs (D-in-D [SE] = $30 [$14])

HNHC, high need, high cost; PCP, primary care provider; EMR, electronic medical record; ACO, accountable care organization; VA, Veterans Affairs; OR, odds ratio; D-in-D, difference-in-differences analysis.

HNHC.[19-21] Yet, little research has been done to understand how innovative payment models outside of typical fee-for-service models may affect downstream ED use and overall health care costs in the population of patients classified as HNHC. Thus, the purpose of this systematic review was to identify existing primary care–based models and evaluate their impact on ED use and overall costs in patients classified as HNHC.

Methods

SEARCH STRATEGY

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were used as a foundation for this review.[22] A comprehensive literature search was performed by 1 author (A.B.) in PubMed, Embase, and CINAHL for peer-reviewed studies published from January 2000 to March 2020. The search strategy used Medical Subject Headings and field descriptions that were combined with general search terms. The Medical Subject Headings terms "emergency medical services," "emergency department," "primary health care," and "primary care" were used in conjunction with terms describing patients classified as HNHC. We used terms to describe both patients classified as HNHC as well as patients who are frequent ED users (ie, "high-need," "high-cost," "high-need high-cost," "high-risk," and "high utilizer") to be as inclusive as possible. Medicare and Medicaid search terms were also included to ensure the inclusion of a broad spectrum of patients. Additional searches were performed by manually searching relevant journals and reference lists of included articles in the *Journal of Emergency Nursing*, *Academic Emergency Medicine*, *Journal of Emergency Medicine*, *The American Journal of Managed Care*, and *Annals of Family Medicine*. Table 1 provides the search terms used for all databases.

ELIGIBILITY CRITERIA

Studies were included if they (1) evaluated primary care or payment models based in the primary care setting, (2) evaluated the outcomes "ED use" and "costs," (3) were conducted in the US, and (4) included adults classified as HNHC who were aged above 18 years. The authors selected studies that either explicitly included the term "HNHC patients" or sampled their populations using HNHC indicators (ie, adults with at least 2 chronic conditions, high frequency of acute care use, or top 5% of total expenditures).

Studies were excluded if they (1) did not fit the inclusion criteria, (2) were considered gray literature (eg, editorials, conference abstracts, or unpublished manuscripts), and (3) were not written in English. Models that were implemented exclusively in the hospital setting or in specialty practices (eg, radiology, ophthalmology, or postoperative surgery clinics) were excluded because these participants were not generalizable.

DATA EXTRACTION

Data were extracted from each article on the basis of a priori–defined categories established in previous research and systematic reviews of ED use.[23,24] For each study, data were extracted referring to study design, sample, definition of population of patients classified as HNHC, model type and definition, and outcomes. The outcomes of interest included all-cause ED use, preventable ED use, and overall costs. Table 2 presents the data extraction from each study.

QUALITY APPRAISAL

Two authors (A.B. and S.K.) independently reviewed and appraised each of the 21 studies using the Downs and Black tool.[25] The Downs and Black tool consists of 27 questions surrounding population characteristics, generalizability, assessment of confounders, and appropriateness of statistical analyses.[25] Individual subscales as well as overall total score on the Downs and Black tool have demonstrated high internal consistency as well as test-retest and interrater reliability for both randomized and nonrandomized studies.[25] The Downs and Black tool has been modified for items that do not apply to nonrandomized studies or when adequate information is not provided to calculate power.[26,27] The modified Downs and Black tool has a maximum score of 28.

The Downs and Black tool consists of 5 subscales: (1) reporting, (2) external validity, (3) bias, (4) confounding, and (5) power. All items have "yes," "no," or "unable to determine" responses and are scored as 0 (no) or 1 (yes), except for the reporting subscale (0 to 2). The reporting subscale addresses whether the study provides sufficient information to develop an unbiased assessment of the findings, such as a list of principal confounders. The external validity subscale evaluates whether the findings are generalizable to the population from which the study subjects were drawn. Finally, the power subscale addresses whether the findings could be due to chance.

Results

LITERATURE SEARCH

After removing duplicates, our initial search yielded 2140 titles. Two authors independently screened the studies for eligibility, leaving 51 full-text studies to be evaluated. Of

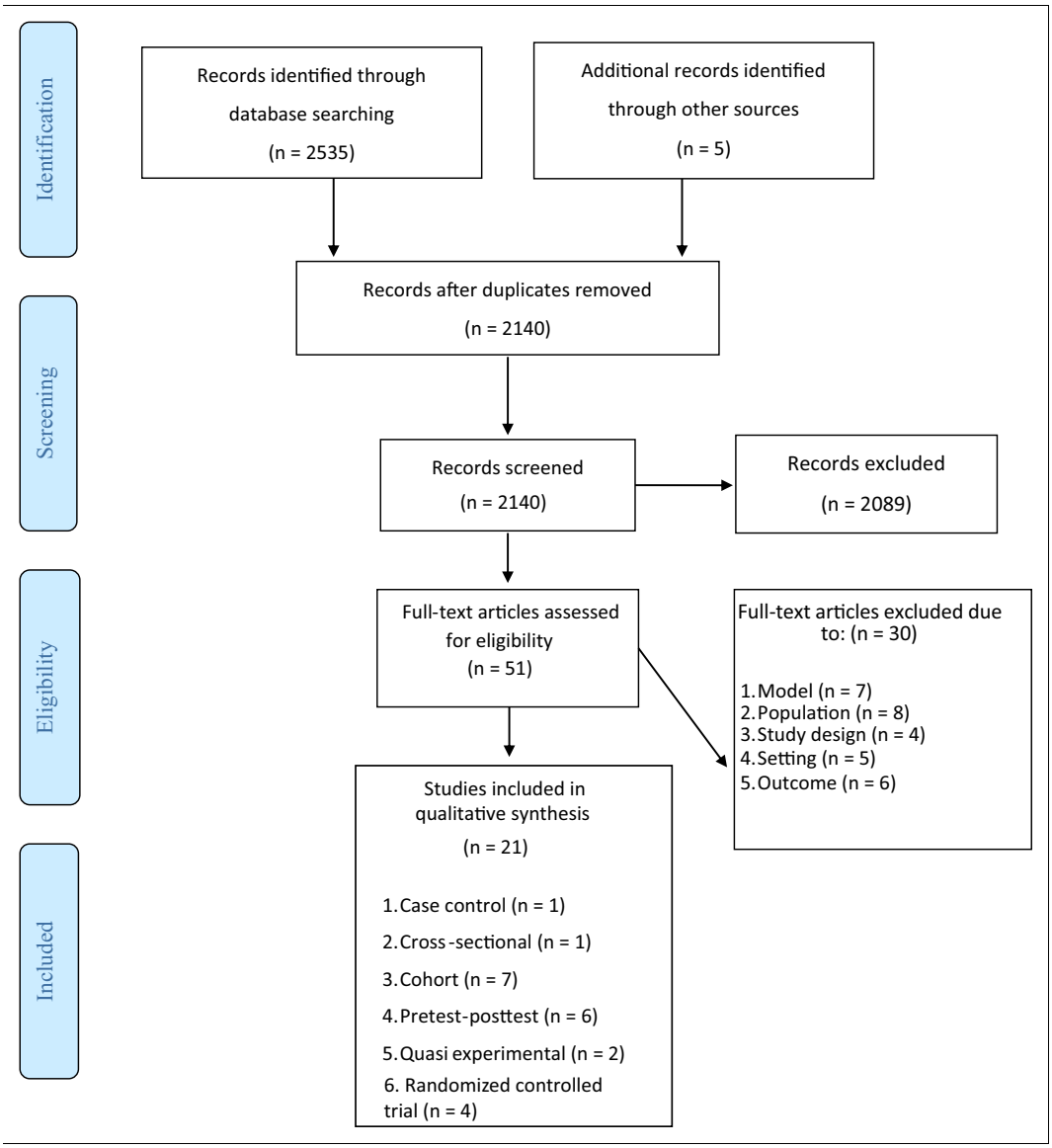

FIGURE
Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.[22]

these, 30 articles were excluded owing to differing populations (n = 8), settings (n = 5), and outcomes (n = 6). Studies were also excluded if the models were not based in the primary care setting (n = 7) or if they were not published in peer-reviewed journals (n = 4). The Figure demonstrates the search strategy and eligibility using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram.[22]

DESCRIPTION OF INCLUDED STUDIES

The outcomes of interest included all-cause ED use, preventable ED use, and overall costs. Table 2 presents the data extraction from each study. The final review included 21 studies that met the eligibility criteria. Of these, 4 studies were randomized controlled trials,[28-31] and 2 were quasi-experimental studies.[32,33] Seven studies were cohort studies, including 2 retrospective cohorts,[34,35] 4 prospective cohorts

with control groups,[33-39] and 1 longitudinal cohort.[40] In addition, 6 pretest-posttest studies,[30,41-45] 1 nested case control,[46] and 1 cross-sectional study were included.[47]

QUALITY APPRAISAL RESULTS

The studies ranged in score from moderate (score = 17[35] out of a total score of 28) to high quality (score = 25[28,31]) on the Downs and Black tool (Supplemental Table 1). The factors that led to lower-quality scores across all studies included items related to randomization, blinding of treatment and outcome assessment, and allocation concealment. A large proportion of the studies (16 out of 21) either did not report a power calculation or did not have sufficient power to detect a treatment effect. Overall, all studies demonstrated high quality for the reporting and external validity subscales, indicating a low risk of bias.

PRIMARY CARE MODELS AND OUTCOMES

This review identified 4 models currently used to support primary care for patients classified as HNHC: (1) care coordination, (2) care management, (3) intensive primary care, and (4) alternative payment models. This review reports significant findings for the outcomes, including all-cause ED use, preventable ED use, and overall costs.

Care Coordination

Eight studies evaluated care coordination models, defined as models that focus on the organization and integration of patient care activities across all patients and providers involved to effectively share information and achieve safer care.[28,29,33,35,39,41,45,46] There was wide variability in model components and activities across studies; yet, all care coordination models included multidisciplinary assessment, comprehensive discharge planning, disease education, medication management, and follow-up or remote monitoring with patients.

Of the 8 studies implementing care coordination, 4 demonstrated statistically significant reductions in all-cause ED use,[33,35,41,45] 1 demonstrated reductions in preventable ED use,[45] and 4 reported reductions in overall costs.[29,33,41,45] One study that evaluated 3802 patients classified as HNHC with high ED use involved pre- and post-implementation of a multidisciplinary, community-based care coordination model integrated in an urban, academic medical center in Colorado.[35] This model integrated community medical, behavioral, and social services in conjunction with home visits and frequent follow-up. The study showed 29.7% fewer ED visits ($P < .05$) after patients classified as HNHC were enrolled.[35] A study by Schuttner et al[45] enrolled 65 patients classified as HNHC in an ambulatory clinic affiliated with a large academic care system within southern California. The clinic offered interprofessional care coordination and behavioral health services alongside after-hours and same-day urgent care. Patients classified as HNHC reported a significant 12% monthly decrease in all-cause ED visits ($P < .001$) and a 17% monthly decrease in preventable ED visits ($P < .05$) resulting in a $93 000 cost savings over 21 months.[45]

The study with the largest sample size among care coordination models compared the outcomes of 4686 Medicare and Medicaid patients classified as HNHC over 4 years in Maryland as part of the Johns Hopkins Community Health Partnership.[41] Berkowitz et al[41] found that of the 1000 Medicaid beneficiary episodes, ED visits were reduced by 133 visits over the 90-day study period ($P < .01$), and costs per Medicaid beneficiary episode were reduced by $4295 ($P < .01$).[41] There was no statistically significant reduction in ED visits or costs of care for Medicare patients. Similarly, Bailey et al[33] found that significant changes in ED use were limited to Medicaid (rather than Medicare) patients enrolled in their program, with a 39% decrease in ED use ($P < .05$). Exposure to the care coordination model was associated with an average decrease in medical expenditures of $8690 over 6 months (95% CI,–$14 441 to –$2939).[33] Additional subgroup analyses demonstrated again that the decrease in costs was limited to Medicaid patients, with an adjusted average decrease of $15 998 (95% CI, –$24 427 to –$7568; $P < .001$) in total Medicaid expenditures compared with the patients in usual care.

Finally, Powers et al[29] conducted a randomized controlled trial among patients classified as HNHC enrolled in a program offering multidisciplinary care coordination and care planning with a primary care provider, community health worker, and social worker. No significant reductions in ED use were found; yet, the patients randomized to the program had 27% lower total medical expenditures than the patients in usual care (absolute reduction of $7732 per patient per year, $P < .05$).

Care Management

Care management is a primary care model referring to activities often led by nurses to support disease management, assess health needs, facilitate communication with providers, and navigate the health system.[8,47] Seven studies evaluated care management, and all incorporated interdisciplinary collaborative care, individualized assessment, risk identification, monitoring, and patient education.[34,36,38,41,43,44,47]

Only 2 studies reported statistically significant differences in all-cause ED use,[43,44] no studies reported significant findings related to preventable ED use, and 1 reported significant reductions in cost.[43]

Hardin et al[43] developed and tested a care management model at an inner-city tertiary care hospital serving a highly vulnerable and socioeconomically diverse population, including many patients experiencing homelessness, unemployment, substance abuse, and psychiatric illness. The study was conducted with 339 patients classified as HNHC and included root-cause analysis of high health service use, interdisciplinary management, and frequent follow-up, demonstrating a 43% reduction in mean ED visits ($P < .001$) and reductions for both total direct expenses (47%, $P < .001$) and ED expenditures (50%, $P < .001$). Ritchie et al[44] evaluated the impact of a care management model consisting of individualized care planning managed by a large interdisciplinary team; home assessments; and primary care, mental health, and pharmacist consultations. Over 100 observation days, median ED visits significantly declined postimplementation (from 5.5 to 0; $P < .05$) for 152 adults classified as HNHC.

Intensive Primary Care

The intensive primary care model is a team-based, multidisciplinary approach to increase the intensity, frequency, and accessibility to primary care services to support patients classified as HNHC.[8,48] Four studies evaluated the impact of intensive primary care on patients classified as HNHC.[30,32,49] Traditional primary care settings often lack the ability to effectively manage and support the complex care required for patients classified as HNHC.[48] Of the 4 studies, 2 demonstrated significant reductions in ED use,[30,32] and 1 showed a significant difference in overall costs when patients were enrolled in intensive primary care models.[31]

Brown et al[30] implemented an intensive primary care model consisting of longer appointment times for evaluation interviews, multidisciplinary assessment and follow-up, weekly visits, and 24-hour availability of a team member on call. Among the patients classified as HNHC who were enrolled, average ED visits were significantly decreased (6.9 preimplementation to 4.9 postimplementation, $P = .05$), but no significant difference was found in ED visits per month. Komaromy et al[32] conducted a quasi-experimental study of 6 outpatient intensivist teams across New Mexico supporting Medicaid patients classified as HNHC through motivational interviewing, care planning, walk-in appointments, and after-hours care using an on-call system. For patients enrolled in the intensive primary care model, the odds of an ED visit 12 months postenrollment were 53% lower (odds ratio 0.47; 95% CI, 0.39–0.58) than for those receiving usual care.

Zulman et al[31] conducted a randomized controlled trial of 583 patients classified as HNHC receiving intensive outpatient care in the Veterans Affairs Health Care System. Patients classified as HNHC were enrolled with multidisciplinary teams and received comprehensive patient assessments, intensive care management and coordination, and social services. This model found no significant differences in ED use, but it was associated with a significant increase in monthly person-level primary care costs (difference-in-differences analysis [SE] = $30 [$14]).

Alternative Payment Models

Two studies evaluated alternative payment models consisting of value-based payments to align incentives and improve care for patients classified as HNHC.[37,40] Alternative payment models have been increasingly implemented across the US to improve access and quality of primary care while allocating limited resources more effectively.[19] In particular, these payment models incentivize quality over quantity of care by reimbursing providers for primary care activities that are often excluded from the fee-for-service payment structure (eg, care management, phone follow-up, and extended time).[11,50,51]

Cross et al[40] evaluated the effects of a multiyear pay-for-value payment model on patients classified as HNHC assigned to primary care providers participating in Blue Cross Blue Shield of Michigan's physician group incentive program. The patients enrolled in the program had lower odds of incurring an ED visit over the 4-year period than the control group (odds ratio, 0.88; $P < .01$), despite not differing in the number of ED visits. Peikes et al[37] tested the impact of the Comprehensive Primary Care Initiative developed by the Centers for Medicare & Medicaid Services, including multipayer support for practices to enhance primary care delivery, patient engagement, and disease management activities. The patients enrolled in these practices reduced all-cause ED visits by 2% ($P < .05$) over the 4-year initiative. There were no significant differences in preventable ED visits.

Discussion

This review synthesized 21 studies evaluating various primary care and payment models and their impact on ED use and overall costs in the population of patients classified

as HNHC. Studies were of moderate to high quality. There were 4 major primary care models examined across the studies, including (1) care coordination, (2) care management, (3) intensive primary care, and (4) alternative payment models. Overall, 10 studies reported significant differences in all-cause ED use.[30,32,35,37,40,43-45]

The studies included in this review were of acceptable quality; yet, a little more than half of the studies (11 out of 21) showed no significant difference in ED use. These findings could be attributed to small sample sizes, insufficient power to detect a treatment effect, or because of variability in the outcomes evaluated. For example, although some primary care models found no significant changes in use or spending, they might have demonstrated positive results for patient-reported outcomes or quality of care. In addition, the lack of significant difference in ED use may be partially explained by the fact that one-size-fits-all models of care have had mixed results in the population of patients classified as HNHC owing to heterogeneity in diagnoses, symptom severity, medical literacy, and social needs.[52] Patients classified as HNHC have high rates of multimorbidity, often with additional functional limitations, disability, and socioeconomic challenges such as social isolation or housing instability.[8,10] Individualizing models of care to the unique medical and social needs of patients classified as HNHC is imperative to making sustainable improvements in quality of care and ED use.[8,53,54]

Both studies evaluating alternative payment models demonstrated significant reductions in ED use.[37,40] These findings are consistent with recent research that shows that the adoption of patient-centered medical homes is associated with lower ED use, specifically among patients with chronic illness.[55] In existing fee-for-service payment structures, health systems are reimbursed for the services they provide and are disincentivized to invest in care models that might reduce outpatient or inpatient use.[56-58] In addition, research has found that aggregate savings in prevented acute care visits might not be substantial enough to have a large effect on overall spending within the population of patients classified as HNHC.[59] Thus, implementing alternative payment models may be an effective strategy to align incentives and reimburse providers and health systems for high-quality care delivery for patients classified as HNHC.[11,19,20]

Limitations

This study has some limitations, including the potential for missed studies during the selection process. Given the lack of standardization in the definition of patients classified as HNHC, studies may have been missed that evaluated patients classified as HNHC but used a unique definition. Because this systematic review includes cohort and cross-sectional studies, causation between primary care models and ED use cannot be established. Finally, most of the studies (16 out of 21) either did not report a power calculation or did not have sufficient power to detect a treatment effect.

Implications for Emergency Clinical Care

Although enhancing primary care delivery can improve access to care and ongoing disease management, no model will successfully reduce acute care use if the emergency department is, in fact, where patients prefer to receive care. Nurses in the emergency department can play an integral role in assessing the individual preferences and unique needs of patients classified as HNHC. This review can educate emergency nurses as they discuss the availability and quality of primary care models at practices where patients classified as HNHC patients receive care to advocate for specific resources (eg, psychiatry or social work) or care models (eg, care coordination or care management) in real time within the ED setting.

Conclusions

This review identified 4 models currently used to enhance primary care delivery to patients classified as HNHC: care coordination, care management, intensive primary care, and alternative payment models. Consistent with recent research, care coordination and care management had mixed effects on both ED use and overall costs. Future research should explore why variability exists in the effectiveness of primary care models within the population of patients classified as HNHC. Contextualizing these findings will enable a better understanding of how to enhance primary care delivery and ongoing disease management for this population of patients classified as costly and complex.

Author Disclosures

Conflicts of interest: none to disclose.

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Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2021.01.012.

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SUPPLEMENTAL TABLE 1

Quality assessment scores: Downs and Black tool

Author (Year)	Bailey et al[32] (2019)	Baker et al[34] (2013)	Berkowitz et al[41] (2018)	Boult Et al[28] (2011)	Brown et al[30] (2005)	Bui et al[42] (2019)	Capp et al[35] (2017)	Coleman et al[46] (2002)	Cross et al[40] (2017)	Hardin et al[43] (2016)	Komaromy et al[32] (2019)	Newcomer et al[36] (2004)	Ouayogodé et al[47] (2020)	Peikes et al[37] (2018)	Powers et al[29] (2020)	Ritchie et al [44] (2016)	Schraeder et al[38] (2008)	Schuttner et al[45] (2018)	Sledge et al[49] (2006)	Weppner et al[39] (2018)	Zulman et al[31] (2017)
Reporting																					
1. Hypothesis, aims, objective clearly described	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2. Main outcomes in Introduction or Methods	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
3. Patient **c**haracteristics clearly described	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
4. Model clearly described	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
5. Principal confounders described	2	1	2	2	0	2	2	2	0*	1	2	2	2	2	2	0*	2	2	0*	2	2
6. Main findings clearly described	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
7. Random **v**ariability estimates provided for outcomes	1	1	1	1	1	1	0	1	1	0	1	1	1	0	1	1	1	1	1	1	1
8. Adverse events reported	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
9. Characteristics of patients lost to follow-up described	1	0	0	1	1	1	0	1	0	0*	1	1	1	0*	1	1	1	1	1	1	1
External **v**alidity																					
10. Probability values reported for main outcomes	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
11. Subjects asked to participate were representative of population	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0*	1	1	1	1	1	1
12. Subjects were representative of population	0	1	1	1	1	1	0	1	1	1	1	1	1	1	0*	1	1	1	1	1	1
Internal **v**alidity																					

continued

SUPPLEMENTAL TABLE 1
Continued

Author (Year)	Bailey et al[32] (2019)	Baker et al[34] (2013)	Berkowitz et al[41] (2018)	Boult Et al[28] (2011)	Brown et al[30] (2005)	Bui et al[42] (2019)	Capp et al[35] (2017)	Coleman et al[46] (2002)	Cross et al[40] (2017)	Hardin et al[43] (2016)	Komaromy et al[32] (2019)	Newcomer et al[36] (2004)	Ouayogodé et al[47] (2020)	Peikes et al[37] (2018)	Powers et al[29] (2020)	Ritchie et al [44] (2016)	Schraeder et al[38] (2008)	Schuttner et al[45] (2018)	Sledge et al[49] (2006)	Weppner et al[39] (2018)	Zulman et al[31] (2017)
13. Staff, places, and facilities representative of population	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
14. Participants blinded to treatment	0*	0	0	0	0	0	0	0	0	0	0	0*	0	0	0	0	0	0	0*	0	0*
15. Researchers blinded to outcome assessment	0	0	0	0	0	0	0	0	0	0	0	0*	0	0	0	0	0	0	0*	0	0*
16. Data dredging clearly described	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
17. Analysis adjusted for length of follow-up	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
18. Appropriate statistical tests performed	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
19. Compliance with model was reliable	1	0	0	0	1	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
20. Outcome measures were reliable and valid	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
21. Participants recruited from same-source population	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1
22. All participants recruited over same time period	1	0	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	1	1	1
23. Participants randomized to treatment	0	0	0	1	0	0	0	0	0	0	0	1	0	0	1	0	0	0	1	0	1
24. Allocation of treatment concealed from investigators and participants	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0*	0	0	0	1	0	0*
25. Adequate adjustment for confounding	1	1	1	1	0*	1	1	1	0*	0*	1	1	1	1	1	0*	1	1	0*	1	1

continued

SUPPLEMENTAL TABLE 1
Continued

Author (Year)	Bailey et al[32] (2019)	Baker et al[34] (2013)	Berkowitz et al[41] (2018)	Boult Et al[28] (2011)	Brown et al[30] (2005)	Bui et al[42] (2019)	Capp et al[35] (2017)	Coleman et al[46] (2002)	Cross et al[40] (2017)	Hardin et al[43] (2016)	Komaromy et al[32] (2019)	Newcomer et al[36] (2004)	Ouayogodé et al[47] (2020)	Peikes et al[37] (2018)	Powers et al[29] (2020)	Ritchie et al [44] (2016)	Schraeder et al[38] (2008)	Schuttner et al[45] (2018)	Sledge et al[49] (2006)	Weppner et al[39] (2018)	Zulman et al[31] (2017)
26. Losses to follow-up taken into account	1	1	0*	1	1	0*	0*	1	0*	0*	1	1	1	1	1	1	1	1	1	1	1
Power																					
27. Sufficient power to detect treatment effect	0	0	0	1	0	0	0	1	0	0	0	0	0	1	0	0	0	0	0	1	1
Total out of 28	21	19	20	25	20	22	16	24	17	18	23	24	23	22	22	19	22	23	22	24	25

Total score for the modified Downs and Black scale = 28.
Item 5: If a list of principal confounders was provided, studies received a score of 2; they received a score of 1 if the list was partially provided; and 0 if no confounders were described.
Item 27: Studies received 1 if they explicitly stated that sufficient power was reached, and 0 if power was not reached or there was no report of power calculation (Downs and Black, 1998; O'Connor et al, 2015).
* Unable to determine.

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The Needs of Families During Cardiac Arrest Care: A Survivor- and Family-led Scoping Review Protocol

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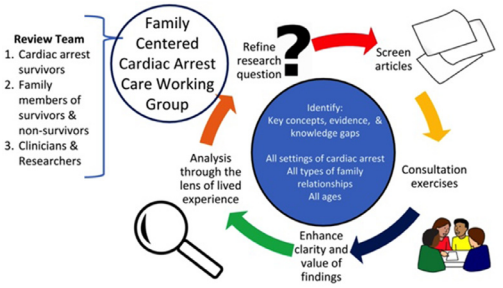

The Needs of Families During Cardiac Arrest Care: A Survivor- and Family-led Scoping Review Protocol

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Contribution to Emergency Nursing Practice

- In the current literature the care needs of families experiencing cardiac arrest care of a loved-one are not well described.
- This article contributes a framework to systematically search the literature to answer the review question, "what are the care needs of families experiencing cardiac arrest of a loved-one?"
- Key implications for emergency nursing practice is that patient and family centered cardiac arrest care is an emerging concept of importance to nursing care.

Abstract

Introduction: Sudden cardiac arrest is a leading cause of death. Family members often witness the event and attempt resuscitation. The physiological and psychological impact of a loved one's death, witnessed or unwitnessed, can be significant and long-lasting. However, little is known about the care needs of families during the cardiac arrest care of a loved one. This scoping review protocol was designed with, and will be performed in partnership with, persons with lived experience of sudden cardiac arrest (survivors and family members of survivors and nonsurvivors alike).

Methods: The review will be performed in accordance with accepted methods such as the Arksey and O'Malley methodology framework and the Levac extension. We will search multiple databases, and Google Scholar for both qualitative and quantitative scientific literature. Articles will be screened, extracted, and analyzed by a team with lived experience of cardiac arrest. Two reviewers will conduct all screening and data extraction independently. A descriptive overview, tabular and/or graphical summaries, and a directed content analysis will be carried out on extracted data.

Discussion: This protocol outlines a planned literature review to systematically examine the nature of existing evidence to describe what the care needs of families

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experiencing the cardiac arrest of a loved one are. Such evidence will contribute to the development of strategies to meet identified care needs. Persons with lived experience participated in the creation of this protocol, and they will also participate in the execution of this review as partners and coinvestigators, not as research subjects or participants.

The results of the scoping review will be disseminated upon completion of the work described in this protocol.

Keywords: Patient-centered care; Family-centered care; Cardiac arrest; Patient and public involvement; Survivorship

Introduction

Sudden cardiac arrest (CA) is a leading cause of death worldwide.[1] In many jurisdictions, the survival rate after out-of-hospital CA (OHCA) remains lower than 10%, despite half a century of cardiopulmonary resuscitation advocacy, life-support guidelines, and invasive therapies. Given the finality of CA for most of the victims who experience it and the more than 50% of the survivors of CA who face long-term cognitive and/or physical disabilities,[2-5] it can be argued that the families and loved ones of those who experience CA share in the burden of this disease.[6-9] However, relatively little is known about the families' perspective on CA. This scoping review protocol was designed to identify the broad themes that describe the care needs of the families of victims of sudden CA and how best to address those needs whenever present.

CARDIAC ARREST

CA is defined as the loss of functional mechanical cardiac activity resulting in an absence of systemic circulation.[10] Sudden CA affects the lives of hundreds of millions of people around the world every year. CA is often categorized as having either occurred OH or in hospital (IH).

OUT OF HOSPITAL CARDIAC ARREST

It is estimated that every year 275 000 people in Europe experience CA and are treated by emergency medical services; yet, only 29 000 of them survive to hospital discharge, a survival rate of 10.5%.[11] In England alone, 28 729 CAs were attended to outside of hospitals in 2014, which amounts to 53 cases per 100 000 of the resident population, with 8% surviving to hospital discharge.[12] Meanwhile, in the United States, 35 communities reported the incidence of CA as 55 per 100 000 person-years.[13] The worldwide weighted incidence estimates according to person-years of treated CAs outside of hospital are 59.4 in Asia, 49.7 in Australia, 34.4 in Europe, and 53.1 in North America. The calculated survival-to-hospital-discharge rate ranges from 3.0% in Asia to 9.7% in Australia, with hospital discharge rates being 7.6% in Europe and 6.8% in North America.[14]

IN-HOSPITAL CARDIAC ARREST

IHCA is an acute event that can potentially affect any patient who is hospitalized.[15] Historically, an IHCA was often viewed as a condition with such poor outcomes that resuscitation may not even be warranted, but improvements have been made over recent decades.[16,17] To date, the incidence of IHCA worldwide has not been well described. The American Heart Association's Get With The Guidelines—Resuscitation registry[18] as well as the National Cardiac Arrest Audit from the Resuscitation Council (United Kingdom) and the Intensive Care National Audit & Research Centre provide the best insight into IHCA incidence.[19] On the basis of US data from 2003 to 2007, the incidence of IHCA in the US was estimated to be 211 000 annually or approximately 6 to 7 CAs per 1000 admissions.[18] Data from 2008 to 2017 show that the incidence increased to 292 000 annually or 9 to 10 IHCAs per 1000 admissions.[15] In contrast, the UK data estimate an incidence of 1.6 IHCAs per 1000 admissions from 2011 to 2013.19 Generally, the survival rate for IHCA is estimated to be 25%.[16]

FAMILY-CENTERED HEALTH CARE

Despite great effort in both OH and IH settings, most CA care is unsuccessful and ends in death. The death of a loved one has long been described as the most impactful life event a person can experience.[20] Moreover, the death of a loved one such as a child can have an effect that lasts many decades.[21] Consideration of the family's needs during and after the care of their loved one is at the core of family-centered care.

A family, as it relates to participating in and receiving health care services, is defined by the patient or, in the case of minors or those without decision-making capacity, by their surrogates. In this context, the family is composed of persons both related and unrelated to the patient, who provide support and with whom the patient has a relationship of significance.[22]

Patient-centered care involves respectful care provision through decision-making that includes the patients' beliefs, preferences, and values.[23] A natural extension of this concept is family-centered care, which acknowledges the family members' position and importance as well as the contribution that they often make by acting as patients' caregivers, representatives, surrogates, and decision-makers.[24] A universal model of family-centered care has been developed that includes the key components of consideration of the family context; patient, family, and care provider collaboration; dedicated policies and procedures; and illness-specific education.[25]

Patient- and family-centered care have been demonstrated to improve the quality of health care.[26] Families are increasingly recognized as an essential part of the health care team whose position in decision-making should be formalized through applicable policies and procedures.[27] The concept and practice of family-centered CA care is in its infancy. This review represents an important early step in shaping its development.

FAMILY PRESENCE DURING CARDIAC ARREST CARE

The predominant family-related intervention relative to CA care is the facilitation of "presence," or being present to witness the resuscitation efforts by the health care team. In being present, family members may (1) choose to be actively involved in the resuscitation, (2) communicate with their relative and the provider team, (3) perceive the reality of death, and (4) see both comforting and distressing images.[28] Recommendations by numerous resuscitation guidelines,[29] learned societies,[30] hospital systems,[31] and health care personnel support the practice of family presence during resuscitation. Despite this, family presence during resuscitation, regardless of the outcome, remains controversial.[32] In a recent randomized clinical trial,[7] family members who were offered the choice of being present during resuscitation (including IHCA care) experienced improved clinical indicators related to posttraumatic stress syndrome, improved anxiety and depression scale scores, and less complicated grief when evaluated a year later.[32]

Although it is likely a central feature of family-centered CA care, the facilitation of family presence can inappropriately be viewed as a panacea for the care needs of families during CA care. Moreover, a family's presence (or absence) has emerged as a false dichotomy where families must choose to be fully in one state or the other. This is an oversimplification and incomplete conceptualization of family-centeredness that leaves much unknown about other family care needs, besides their presence or absence. We cannot assume to know what families need without first asking them.

This review will explore what the care needs of families during sudden CA are, regardless of the setting (OHCA or IHCA). This review intends to address the following research question: "What are the care needs of family members during the cardiac arrest of a loved one?" This research question has been previously identified by an international priority-setting partnership of clinicians, investigators, and carers, led by researcher K.N.D. and the James Lind Foundation.[33]

Objective

The objective of this paper is to disseminate the search protocol. The project is designed to systematically map evidence of family care needs during CA care to identify key concepts, types of evidence, and knowledge gaps for all settings of CA, as well as all types of families, family relationships, and ages of patients and family members.

Methods

Scoping review methods have been chosen owing to the exploratory nature of our research question, the absence of any prior knowledge-synthesizing in this topic area, and the diverse knowledge sources located during pilot-searching.[34,35] This search method will chart relevant research and gray literature to identify research gaps that may guide future research and systematic reviews surrounding the topic. Guided by the Arksey and O'Malley[36] framework, the enhancements by Levac et al,[37] and the 2020 guidelines of the Joanna Briggs Institute (JBI),[38] this review will follow a 6-stage framework: (1) research question identification, (2) relevant studies' identification, (3) eligible studies' selection, (4) data charting, (5) collating, summarizing, and reporting of results, and (6) contributor-provided resources.

The Arksey and O'Malley[36] framework and the enhancements by Levac et al[37] will be operationalized in this review in the following ways:

1. We will reflect on and revise our research question if required on the basis of the types of studies returned by our search and the lived experience of our team members.
2. Each article will be screened by at least 1 team member with lived experience to make sure that we are applying our inclusion criteria through the lens of their experience.

TABLE 1
PCC framework

Search concept	Description
Population	Families: Family membership is determined by the patient or, in the case of minors or those without decision-making capacity, by their surrogates. In this context, the family may be related or unrelated to the patient. They are individuals who provide support and with whom the patient has a significant relationship.[22]
Concepts	Cardiac arrest: Cardiac arrest is the sudden and unexpected loss of heart function. It is a medical emergency with high mortality rate that increases relative to delays and/or interruptions in treatment. Cardiac arrest may result from a wide range of etiologies, including trauma, ischemia, arrhythmia, sepsis, and overdose. Care needs: The needs of families, including formal and informal services as well as tangible and intangible supports. May include information, presence, resources, and follow-up at a later date.
Context	Sudden, unexpected, and treated: All settings, in-hospital and out-of-hospital settings, patients undergoing any degree of resuscitation, including first aid.
Publication year range	None.
Language	All, as long as there is an English abstract. Translation services will be employed as required.

PCC, Population, Concept, and Context.

3. Two team members will independently chart the findings from the included articles and compare the results with our research question and with each other to ensure that there is agreement in the interpretation of the reported findings.
4. We will undertake a consultation exercise where we report our findings to members of our Family-Centered Cardiac Arrest Care working group, composed of survivors of CA, family members of survivors and nonsurvivors, and health care professionals who routinely provide CA care. The goal of our consultation will be clear reporting of our findings in a manner that is helpful for both care recipients and care providers.

The Preferred Reporting Items for Systematic Reviews and Meta-Analyses Extension for Scoping Reviews (PRISMA ScR) will guide how this review is reported.[39] In addition, the PRISMA Extension for Protocols was to structure this protocol manuscript.[39-41] Our systematic gray literature search strategy will follow previously accepted peer-reviewed methods.[42,43]

TABLE 2
Pilot search results (June 15, 2020)

Concept	Description
1. Heart arrest/ or out-of-hospital cardiac arrest/	32 960
2. ([Cardiac or heart or cardiopulmonary or circulat*] adj [arrest or standstill or asystol* or resuscitation] or [ventricular-tachycardia or ventricular-fibrillat* or asystole or pulseless electrical activity]).mp.	108 000
3. 1 or 2	108 000
4. (Family-centred* or family-centered*).mp.	4657
5. ([Family or families or guardian* or parent or parents or parental or spouse* or partner* or adult children] adj12 [involve* or care or caring or needs or support* or satisfaction or perspectives or grief or emotional distress or PTSD or traumatic stress]).mp.	213 204
6. Professional-family relations/	14 783
7. 4 or 5 or 6	220 408
8. 3 and 7	813

PTSD, posttraumatic stress disorder.

This review will be performed in partnership with coinvestigators who have lived experience of CA as survivors or as family members of persons who experienced a CA (family members of survivors and nonsurvivors alike). For the purposes of this review, our coinvestigators either had a CA themselves or were physically present to provide early resuscitation or witness the resuscitation at their home or hospital. Our work is guided by the principles of patient engagement, defined by Marlett et al[44] as "collaborative research that is done by, with and for patients to inform health care and health research decisions and questions." Our investigation will be performed in a manner that Macaulay et al[45] describe as "a mutually respectful relationship based on sharing responsibilities, costs, and benefits." Our goal is to engage our patient/family coinvestigators through an "equitable collaboration with individuals, families and communities affected by a health topic at all stages of the research process, from conception of the study idea through dissemination of results/findings."[46] Identification and mitigation of the common challenges and ethical issues of patient-partnered research[47] will be actively mitigated through consultation with the local Strategy for Patient-Oriented Research Unit[48] and university research ethics office.[49]

IDENTIFYING THE RESEARCH QUESTION

The JBI Population, Concept, and Context framework will be employed to ensure that the study selection connects the research question with the eligibility criteria.[38] Hence, the research question: "What are the needs of families experiencing the cardiac arrest of a loved one?"

The secondary questions to be explored on the basis of the breadth of the evidence returned include (but are not limited to):

- How do families want to be treated by health care providers?
- What information, resources, or environmental accommodations do families want to be provided?
- What factors contribute to unmet care needs in families experiencing CA?
- What are the family characteristics associated with certain care needs?
- In what settings, countries, and systems is evidence originating from?
- Determine the value of performing additional synthesizing studies such as a systematic review and meta-analysis or a meta-synthesis.

ELIGIBILITY CRITERIA

The JBI Population, Concept, and Context framework (Table 1) will determine the eligibility of studies that address the research question and guide the selection process.[38]

IDENTIFYING RELEVANT STUDIES

This scoping review will include all observational and experimental research published in peer-reviewed journals. We will also search gray literature for policy and procedures, clinical governance documents, and unpublished research that address our research question.

Published evidence will be sourced from multiple electronic databases and Web search engines that index the full text or metadata of scholarly literature. These include MEDLINE, Embase, CINAHL, ProQuest Dissertations & Theses Global, SocINDEX, Scopus, Web of Science, PsycINFO, and Google Scholar. Additional literature will be sourced from searches of the reference lists of articles and forward citations using "Cited by" logs for the included research.

The author will contact the corresponding author/s of all potentially relevant studies directly when articles are electronically unattainable to attain them. These authors will also be consulted at the completion of the search to identify any studies that may have been missed.

An academic librarian (L.D.) with expertise in obtaining literature on health care and social sciences will be consulted on the search strategy and its execution and will join as a coinvestigator in the completion of this review. Furthermore, to ensure the feasibility of conducting this scoping review, a pilot search was conducted on 1 database (Ovid MEDLINE) by 2 reviewers using a draft search strategy that included relevant Medical Subject Headings and keywords such as "heart arrest/ or out-of-hospital cardiac arrest/" and "(family-centred* or family-centered*).mp." The complete pilot strategy, including truncations, combinations, and results thereof, is provided in Table 2. Our systematic gray literature search strategy will consist of 4 parts: (1) internet search (Chrome anonymous browser for depersonalized Google search without geographical bias), (2) targeted website search of emergency medical services, emergency departments, and critical care and resuscitation organizations, (3) gray literature database search with a focus on conference proceedings, theses, and dissertations, and (4) social media platform search, including blogs. Gray literature sources and databases will be identified using the Canadian Agency for Drugs and Technologies in Health's Grey Matters, a practical tool for

searching health-related gray literature.[50] The purpose of our gray literature search is to search citations for additional published literature and to gain insight from relevant policy, procedure, and clinical governance documents regarding what care is being provided to families during CA care.

PATIENT/FAMILY COINVESTIGATOR PREPARATION AND COLLABORATION

Our coinvestigators with lived experience will be involved in steps 2 through 5 of the JBI 6-stage framework ([2] identifying relevant studies, [3] selecting eligible studies, [4] charting of data, [5] and collating, summarizing, and reporting of the results). To facilitate this involvement, the project lead will meet one-on-one with each coinvestigator to provide an orientation to the review and determine the amount of training required. Our coinvestigators vary in review knowledge and experience, from an expert clinician-scientist who has led reviews to a person without research training. Although the former may only receive a quick introduction to the study, the latter will receive an orientation to each stage of the study, including the research question and goals, participation in lessons in screening, training in the use of screening software and undertaking multiple calibration exercises, identification of relevant findings in the included articles, and charting of the findings in a results table. Posttraining competency will be assessed by calibration reports during the screening phases and supervision of consensus meetings between article screeners and data extractors. Biweekly meetings will be held with the novice members of the team.

TABLE 3
Data extraction form and charting table

Description
1. Author and year of publication
2. Title
3. Aim of the study
4. Quantitative, qualitative, or mixed methods
5. Specific study design
6. Country of origin
7. The setting of cardiac arrest (in-hospital vs out-of-hospital)
8. Patient demographics
9. Family demographics
10. How long after arrest data collected
11. Etiology of cardiac arrest
12. Key findings
13. Care need(s) identified
14. Theoretical framework
15. Data collection methods
16. Data analysis process
17. Conclusions
18. Notes

STUDY SELECTION

We will manage the search results using a reference manager software program (Covidence, Melbourne, Australia).[51] At least 2 investigators will independently screen the references' titles and abstracts against the inclusion criteria, obtaining a copy of eligible studies to determine their final inclusion. We will describe the entire eligibility and selection process in a PRISMA flowchart and report the reasons for the exclusion of ineligible studies in a specific table.

INCLUSION CRITERIA

The following criteria will ensure the inclusion of various sources of evidence and perspectives:

- Articles relating to the care needs of families experiencing CA care (including peer-reviewed studies of all designs, research letters, personal narratives, conference abstracts, and proceedings).
- The CA event, as informed by our coinvestigators with lived experience, begins at the time the family member is discovered without signs of life (absent of vital signs) and extends to the time the victim is no longer accessible (if deceased) or is discharged to home or rehabilitation setting.
- Articles describing the needs of youths and children will be analyzed separately.
- Articles describing the needs of families experiencing suicide or homicide will be analyzed separately.
- Gray literature relating to policy, procedure, or position statements regarding the care of families experiencing CA care.
- All dates and languages (English abstract required).

EXCLUSION CRITERIA

The scoping review will exclude the following:

- Expected deaths such as those in palliative care and hospice care, as well as those related to medical assistance in dying.

- Family members' experience of a loved one's death with a standing "Do not resuscitate" or "Do not attempt resuscitation" order in place.

The PRISMA ScR flowchart will capture and present a summary of the screening and inclusion and exclusion processes.[39]

CHARTING OF DATA AND TRUSTWORTHINESS

Before the extraction of study findings and any analysis, the coinvestigators performing the extraction will undertake a reflexive exercise to improve the validity of the reported findings and help prevent biases in reporting.[52] We will identify and record what team members believe the care needs of families are and how they should be met so that we can prevent their inadvertent insertion in our study results, which would affect interpretation.

A data extraction form and table will be used to extract and summarize relevant information from the located literature. This process will be performed by 2 investigators, working independently, to ensure that the data extracted are relevant, answer the research question, and address the eligibility criteria. Furthermore, the investigators will independently electronically populate the form with extracted data from each included article. In the event of disagreements during this process, a third team member will intervene through discussion until resolution through consensus. Owing to the iterative nature of this process, the data extraction form (Table 3) will be continually updated to ensure that it is current and captures phenomena of interest.

COLLATING, SUMMARIZING, AND REPORTING THE RESULTS

The synthesis of the findings will be collectively described, coded, analyzed, and summarized by all team members in relation to the study objective, research question, and eligibility criteria. Any discrepancies will be resolved by consensus among the team members throughout the process.

Basic numerical counts will be provided to describe the articles included in the review, such as the number of family members and the time elapsed from death to data collection. If quantitative results can be pooled, descriptive statistical summaries will be provided. Qualitative results will undergo basic content analysis and be reported as counts and descriptions. The results will be presented in a summary chart.

The results will describe the needs of families during CA care and identify literature gaps. If possible, a conceptual model will be constructed to represent the review findings to aid in understanding. Suggestions for future research on the basis of the study findings will be summarized and reported on.

We anticipate that our review will take 12 months to complete. On the basis of the workflow used in our past reviews,[43,53-55] protocol development will require 2 months; search refinement, execution, and training team members will take 3 months; title and abstract screening will take 2 months; and full-text review and extraction will also take 2 months. We anticipate that data analysis, consultation exercises, and preparing a manuscript for publication will require a further 3 months.

Discussion

The aim of this scoping review protocol was to plan to systematically map evidence of family care needs during CA care to identify key concepts, types of evidence, and knowledge gaps. To our knowledge, there is no prior systematic search and review of the published literature on this topic. Furthermore, there are few reviews that partner fully with coinvestigators who have the lived experience of the phenomena under review to refine the research question, methods, and analysis. Through our partnership we intend to maximize the validity of the search and interpretation of our findings.

Our nonsystematic pilot review of the literature has found this to be an area that is underresearched. The care of families is absent from international resuscitation guidelines or is limited to offering presence only.[56,57] The reviewed literature seems to describe the experience of family members as full of uncertainty, of giving control to health care providers, and of advocating for their loved one.[58,59] Only very recently has the concept of family "cosurvivorship" appeared in the resuscitation literature.[5] We believe that the proposed review will make a worthwhile contribution to the knowledge base for care providers and health system leaders.

The rigorous and systematic nature of our review will identify relevant research findings related to our research question. Owing to the exploratory nature of our research question and the limited research conducted on this topic, we have created a broad search strategy and study inclusion criteria that seek to capture both direct and indirect evidence and provide the most comprehensive inquiry into family care needs during CA care.

Family-centeredness is a core principle of high-quality health care. Without a conceptualization of what families need, it is impossible to provide family-centered care, establish baseline performance, determine areas that need improvement, and determine if practice changes have led to

progress. The results of this review may identify strategies to address the needs of families, which will help to guide the selection of interventions that are suitable for further study and can be used in subsequent family-centered care initiatives. The findings from the completed review will be disseminated and could be used to inform pedagogic planning and policy pertaining to the hospital and IH support of families experiencing CA care.

Limitations

Conducting a scoping review with no time and language limitations can prove time-consuming and costly. Hence, strict timelines will be implemented to ensure that the process is cost-effective, and it is completed.

Author Disclosures

Conflicts of interest: none to report.

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EMERGENCY NURSING

Evaluating Empiric Therapy for Acute Uncomplicated Cystitis in the Outpatient Setting: A Retrospective Cohort Study

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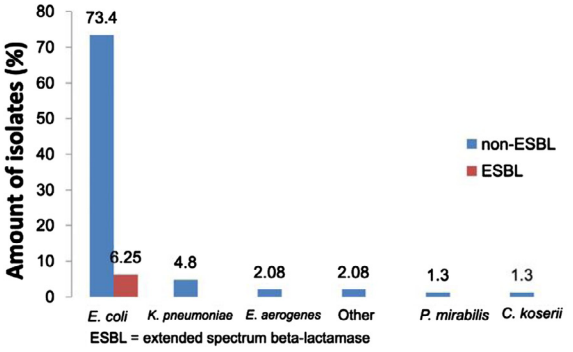
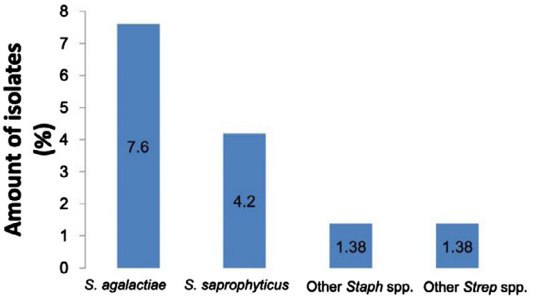
Section Editor: Darleen Williams, DNP, CNS, CEN, CCNS, CNS-BC, EMT-P

144 Urine Cultures

Gram Negative Uropathogens



Gram Positive Uropathogens

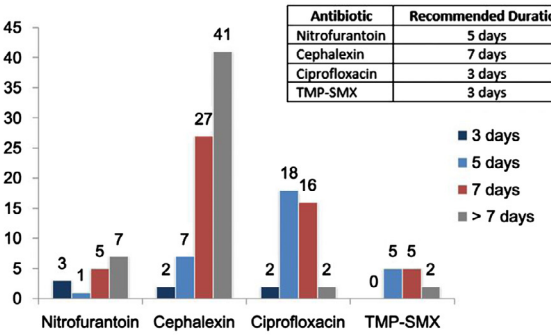


Concordance with Acute Cystitis Treatment Guidelines

Criteria	n, (%)
Empiric therapy prescribed	98 (70)
Dosing of empiric therapy prescribed	107 (77)
Duration of empiric therapy prescribed	31 (22)

Duration of Therapy

Antibiotic	Recommended Duration
Nitrofurantoin	5 days
Cephalexin	7 days
Ciprofloxacin	3 days
TMP-SMX	3 days



Concordance	7%	35%	7%	0

Recommended Emergency Departments evaluate antibiotic prescribing patterns for concordance with national clinical practice guidelines and opportunities to improve antibiotic stewardship.

Evaluating Empiric Therapy for Acute Uncomplicated Cystitis in the Outpatient Setting: A Retrospective Cohort Study

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Section Editor: Darleen Williams, DNP, CNS, CEN, CCNS, CNS-BC, EMT-P

NCPD Earn Up to 10 Hours. See page 827.

Abstract

Objectives: To evaluate the empiric therapy prescribed for acute uncomplicated cystitis in the outpatient setting (emergency department and ambulatory care clinics) and to characterize uropathogens for discordance between the therapy prescribed and susceptibility.

Methods: A retrospective review was conducted at an inner-city emergency department and multiple clinics to evaluate the empiric therapy prescribed and the uropathogens isolated from culture for patients with acute uncomplicated cystitis.

Results: A total of 144 urine cultures were included. Among the patients, 53.4% were empirically prescribed cephalexin, 20.1% ciprofloxacin, 11% nitrofurantoin, and 8.3% trimethoprim/sulfamethoxazole. The most common uropathogen was *Escherichia coli* (72.4%), followed by *Streptococcus agalactiae* (7.6%) and *Klebsiella pneumoniae* (4.8%). Of the 107 *E. coli* isolates, 9 were extended spectrum beta-lactamase–producing. *E. coli* antimicrobial susceptibilities were as follows: ceFAZolin (97%), nitrofurantoin (96%), cefTRIAXone (91%), ciprofloxacin (87%), and trimethoprim-sulfamethoxazole (59%). The concordance rates with the Infectious Diseases Society of America treatment guidelines for acute uncomplicated cystitis and local resistance patterns were as follows: empiric therapy prescribed (70%), dosing of empiric therapy (77%), and duration of empiric therapy (22%). For empiric therapy prescribed and susceptibility mismatch, 5.6% of the isolates were not susceptible to therapy, 76.4% were susceptible to therapy, 14% did not have susceptibilities, and 4.2% did not receive therapy.

Conclusions: Most of the cases of acute uncomplicated cystitis at the subject institution can be managed safely and effectively with nitrofurantoin or first-generation cephalosporins. Institutions should use national guidelines in conjunction with local resistance and prescribing patterns to improve antibiotic prescribing in the outpatient setting.

Key words: Infectious disease; Urinary tract infection; Antimicrobial stewardship

Introduction

The outpatient setting, including the emergency department and ambulatory care centers, has been identified by the Centers for Disease Control and Prevention (CDC) as an area in which interventions are needed to improve antimicrobial stewardship (AMS). The emergency department is a unique setting that sees a high volume of patients compared with other outpatient settings, and it would benefit greatly from AMS interventions.[1,2] In 2014, emergency medicine providers were responsible for prescribing 14.2 million antibiotics, and it is estimated that 30% of all antibiotics prescribed in this setting are unnecessary.[1] The benefits of AMS programs and interventions are well known and include, but are not limited to, improved patient outcomes, decreased antimicrobial resistance, and decreased incidence of *Clostridioides difficile* infections (CDIs).[1,2] In an effort to combat inappropriate prescribing patterns of antibiotics in the outpatient setting, the CDC issued the "Core

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Elements of Outpatient Antibiotic Stewardship" in 2016. These core elements include a commitment to prescribe antibiotics safely, develop policies to improve antibiotic prescribing, track and report prescribing patterns, and educate providers and patients on antibiotics.[1,3]

Acute uncomplicated cystitis is 1 of the most common indications for the prescribing of antibiotics in the outpatient setting, and multidrug-resistant organisms (MDROs) are increasing among uropathogens.[4,5] The Infectious Diseases Society of America (IDSA) guideline for the treatment of acute uncomplicated cystitis and pyelonephritis currently recommends nitrofurantoin, fosfomycin, or trimethoprim/sulfamethoxazole (TMP-SMX) as first-line agents for empiric treatment. The IDSA warns against the use of TMP-SMX empirically if the resistance prevalence for *Escherichia coli* is known to exceed 20%.[5,6] Fluoroquinolones, owing to a high prevalence of resistance, and beta-lactams, owing to lower efficacy than other agents, are reserved as second-line agents. This guideline, however, was published 10 years ago, and specific recommendations from the guideline may not be applicable to every institution because local antimicrobial susceptibility to *E coli* and other common uropathogens varies significantly among regions.[5] In an effort to improve AMS in the outpatient setting at our institution, the objectives of this study were to evaluate the prescribing patterns and to characterize uropathogens in the outpatient population with acute uncomplicated cystitis.

Methods

STUDY DESIGN

This study was a retrospective observational cohort study conducted in the emergency department of a tertiary teaching hospital and an associated ambulatory care center in the United States from January 1, 2016, to June 30, 2016. This study was approved by the St Joseph's University Medical Center Institutional Review Board (EX#2017-25).

STUDY SETTING AND POPULATION

The institution serves a multicultural patient population and the emergency department experiences a high patient volume with more than 160 000 visits annually. The ambulatory care center has many clinics within, including an adult medicine clinic, HIV clinic, and adult and adolescent obstetrics and gynecology clinic. Both the emergency department and ambulatory care center commonly prescribe antibiotics for various indications, including acute uncomplicated cystitis.

The eligible patients were identified through bacterial urine isolates from these centers. The IDSA defines patients with acute uncomplicated cystitis as nonpregnant, premenopausal women with no known urologic abnormalities. Therefore, this study included nonpregnant women between the ages of 16 and 45 years who were diagnosed with acute uncomplicated cystitis in the emergency department or ambulatory care center. The diagnosis of acute uncomplicated cystitis was based on the provider's diagnosis in the assessment/plan of the electronic medical record (EMR). Patients with a known urologic abnormality or comorbidity, genitourinary surgical procedure in the preceding 90 days, or whose condition warranted hospitalization were excluded. Patients who received antibiotics in the preceding 90 days, were hospitalized for 72 hours or more in the past 90 days, or those who resided in a long-term care facility (ie, nursing home or subacute rehabilitation center) were excluded because exposure to the health care setting and recent antibiotic use increase the risk of infection with an MDRO. Patients with urine cultures positive for fungi were also excluded.

DEFINITIONS

We used the 2010 IDSA guideline for the treatment of acute uncomplicated cystitis and pyelonephritis and local susceptibility patterns from our institution-specific antibiogram to define appropriate empiric therapy. Regimens of nitrofurantoin 100 mg twice daily for 5 days and cephalosporin therapy such as cephalexin 500 mg every 6 to 8 hours for 7 days were considered appropriate regimens. Cephalosporins were considered appropriate empiric treatment regimens because they are cost-effective agents for the patient population specific to our institution. Empiric therapy with TMP-SMX or fluoroquinolones was not considered appropriate owing to *E coli* resistance rates of 40% and 34%, respectively, on the basis of our institution-specific ED antibiogram.[5] The recommended duration of therapy for the treatment of acute uncomplicated cystitis was defined as 7 days for cephalexin, 3 days for ciprofloxacin, 5 days for nitrofurantoin, and 3 days for TMP-SMX.[5]

OUTCOMES

The primary end point was the choice of empiric therapy and duration of therapy prescribed for acute uncomplicated cystitis in the outpatient setting. The secondary end points included concordance between the empiric therapy prescribed and susceptibility to the uropathogen, number of revisits to the emergency department or ambulatory care center within

14 days of receiving initial empiric therapy, and characterization of the susceptibilities of the urine isolates.

DATA ANALYSIS

Descriptive statistics were calculated using Excel for Mac version 16.4 (Microsoft Corporation).

Results

Of the 1783 bacterial urine isolates evaluated, 144 were identified and met the inclusion criteria. Baseline characteristics can be found in Table 1. For the empiric therapy prescribed, most of the patients were prescribed cephalexin (53.4%), followed by ciprofloxacin (20.1%) and nitrofurantoin (11%) (Table 2). The duration of therapy varied and lacked consistency with current recommended treatment durations for select antimicrobials for acute uncomplicated cystitis. The appropriate duration of therapy prescribed was as follows: nitrofurantoin (31%), cephalexin (9%), ciprofloxacin (5.2%), and TMP-SMX (0%) (Figure 1).

The most common uropathogen observed was *E coli* (72.4%), followed by *Streptococcus agalactiae* (7.6%) and *Klebsiella pneumoniae* (4.8%). Of the 107 *E coli* isolates, 9 were extended-spectrum beta-lactamase (ESBL)−producing species (Figures 2 and 3). *E coli* antimicrobial susceptibilities were as follows: ceFAZolin (97%), nitrofurantoin (96%), cefTRIAXone (91%), ciprofloxacin (87%), and TMP-SMX (59%). These susceptibilities for *E coli* were consistent with the institution-specific ED antibiogram with the exception of ciprofloxacin (66% vs 87%) (Table 3).

TABLE 1
Baseline characteristics (N = 144)

Characteristic	N = 144 Mean (SD)	n (%)
Age, y	28.4 (8.4)	
Height, cm	161.24 (28.3)	
Weight, kg	71.4 (20.8)	
Positive urinalysis		129 (89.5)

TABLE 2
Empiric therapy prescribed

Empiric therapy	N = 144 n (%)
Cephalexin	77 (53.4)
Ciprofloxacin	29 (20.1)
Nitrofurantoin	16 (11)
Trimethoprim/sulfamethoxazole	12 (8.3)
No therapy	6 (4.2)
Other	4 (2.7)

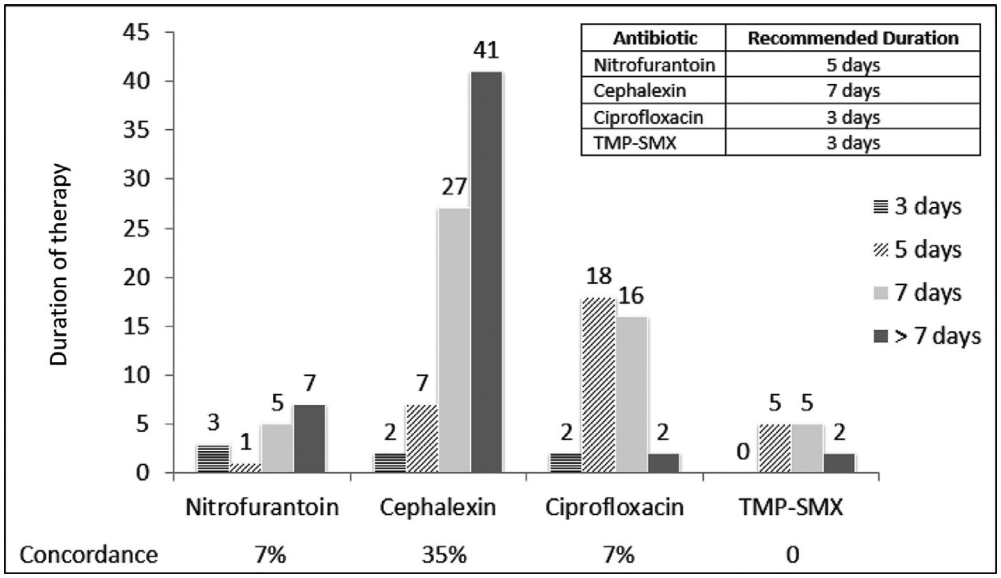

FIGURE 1
Duration of therapy prescribed and concordance with current recommendations. TMP-SMX, trimethoprim/sulfamethoxazole.

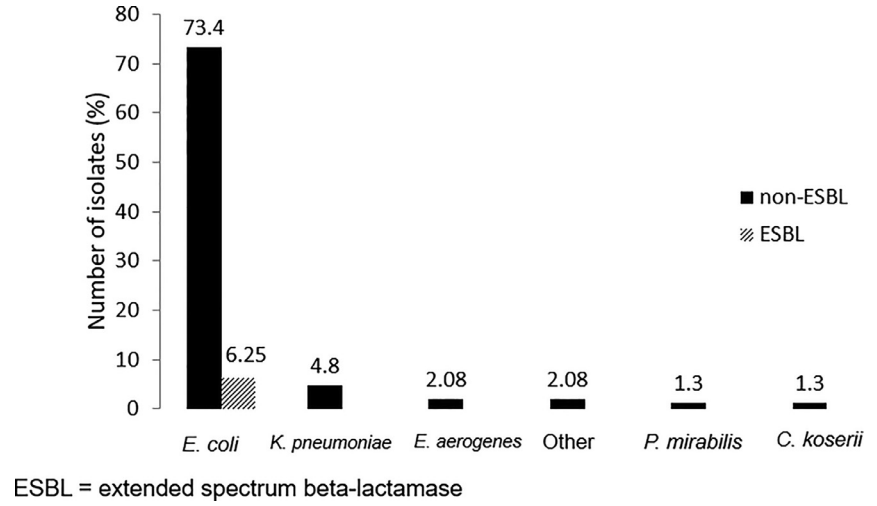

FIGURE 2

Characterization of gram-negative uropathogens (N = 144). ESBL, extended-spectrum beta-lactamase; *E coli, Escherichia coli; K pneumoniae, Klebsiella pneumoniae; P mirabilis, Proteus mirabilis; E aerogenes, Enterobacter aerogenes; C koseri, Citrobacter koseri.*

The concordance rates with the IDSA guideline for the treatment of acute uncomplicated cystitis and local antimicrobial resistance patterns were as follows: empiric therapy prescribed (70%), dosing of empiric therapy prescribed (77%), and duration of empiric therapy prescribed (22%). Only 5.6% of the isolates were not susceptible to the empiric therapy prescribed. Most of the isolates (76.4%) were susceptible to the empiric therapy prescribed, 14% did not have susceptibility reported (ie, *S agalactiae*), and 4.2% were not prescribed empiric therapy. Eight revisits to the emergency department or ambulatory care center were identified owing to failed

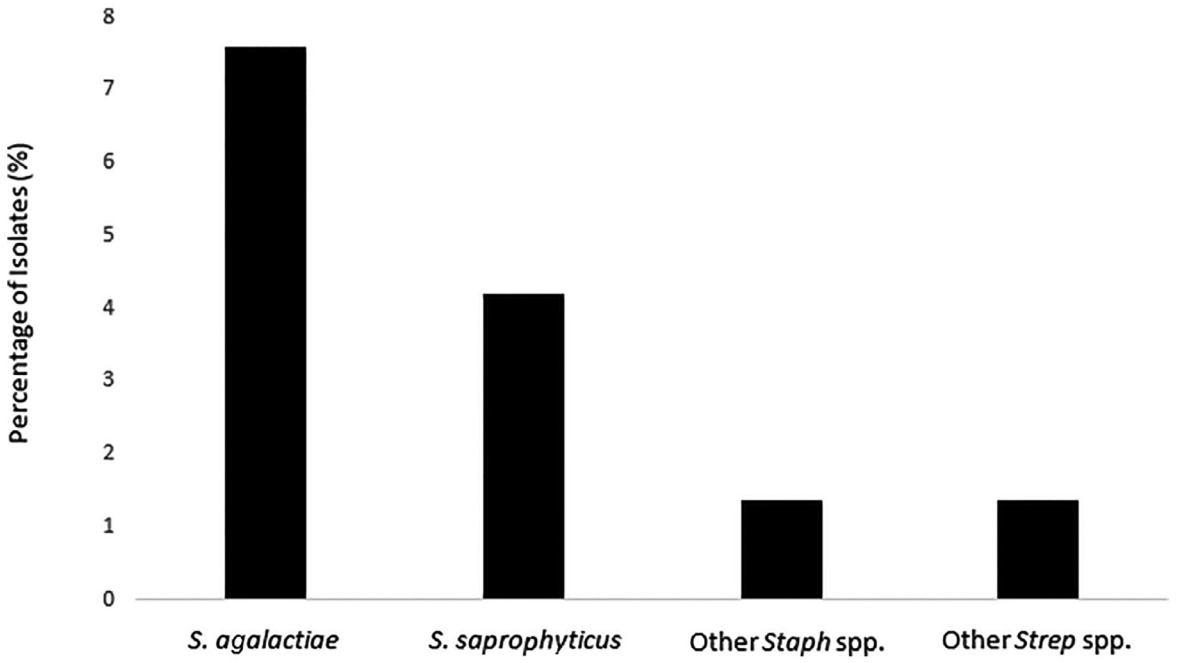

FIGURE 3

Characterization of gram-positive uropathogens (N = 144). *Str agalactiae, Streptococcus agalactiae; Sta saprophyticus, Staphylococcus saprophyticus; Staph* spp, *Staphylococcus* species; *Strep* spp, *Streptococcus* species.

TABLE 3
***E coli* susceptibility**

Percent susceptibility	Ciprofloxacin	Nitrofurantoin	TMP-SMX	CefTRIAXone	CeFAZolin	Total isolates
E coli isolates from study population, %	87	96	59	91	97	105
E coli isolates from 2016 antibiogram, %	66	94	60	83	N/A	1765

N/A, not applicable; *E coli, Escherichia coli*; TMP-SMX, trimethoprim/sulfamethoxazole.

therapy (ie, resistance to empiric therapy), complicated infection (ie, pyelonephritis or renal calculi), or no initial empiric treatment prescribed.

Discussion

MDROs are a growing concern in the US. It is estimated that MDROs are responsible for approximately 3 million infections and 35 000 deaths in the US.[2] Antibiotics are often not optimally prescribed up to 50% of the time, which contributes to the development of MDROs.[3] Antibiotics are also not always safe, and their use carries the risk of drug-drug interactions, development of CDIs, and adverse drug events such as allergic reactions.[1,2] The outpatient setting is afflicted with inappropriate prescribing patterns, and there is a growing need to improve AMS in this setting. In 2009, antibiotics prescribed in the outpatient setting accounted for 60% of the total antibiotic expenditure in the US.[7] Using 2010 to 2011 data, Fleming-Dutra et al[8] sampled nearly 200 000 ambulatory care visits to evaluate the appropriateness of antibiotic prescribing. Approximately 13% of the visits were associated with a prescription for an antibiotic, and at least 1 in 3 antibiotics were inappropriate.[8] In 2015, the CDC estimated that nearly 270 million antibiotic prescriptions were dispensed, 30% of which were inappropriate. Many of these antibiotics prescribed in the outpatient setting were discordant with current guideline recommendations. The CDC is committed to improving the prescribing of antibiotics in the outpatient setting, and it released the "Core Elements of Outpatient Antibiotic Stewardship" in an effort to bring about change at the national level.[1,3]

AMS interventions reduce inappropriate prescribing of antibiotics as well as adverse drug events. Such interventions should be carried over from the inpatient setting to the outpatient setting.[9] Interventions include the CDC's "Core Elements" in addition to using EMR, guideline implementation, delayed prescribing, and point-of-care testing. The development of an outpatient AMS program should be multidisciplinary and include pharmacists, physicians, and other providers.[10,11] Institutions have demonstrated successful AMS interventions in the emergency department. Dinh et al[12] used many of these outpatient AMS recommendations to establish a program in the emergency department of their institution in France with the goal to improve the prescribing patterns of antibiotics in this setting. In 2 years after implementing the AMS interventions in their emergency department, there was a statistically significant reduction in not only the amount of inappropriate antibiotics prescribed, but also in the overall amount of antibiotics prescribed.[12]

We chose to evaluate the prescribing patterns and susceptibilities of uropathogens for acute uncomplicated cystitis because it is a common indication that results in a prescription for an antibiotic at our institution. There is also a national concern that resistance is increasing among uropathogens.[4,5,13-15] Bacterial pathogens that are typically responsible for acute uncomplicated cystitis are *E coli* and, to a lesser extent, other *Enterobacteriaceae* (*K pneumoniae* and *Proteus mirabilis*) and *Staphylococcus saprophyticus*. Our study population saw similar rates of *E coli* compared with national rates (75%-90%).[4,5] Our study had 9 patients with ESBL-producing *E coli*, demonstrating that MDROs can be observed in patients with acute uncomplicated cystitis from the community. Although this finding is concerning given the population, the potential risks of using broad-spectrum antibiotics empirically and overprescribing of antibiotics in general outweigh the benefits because the incidence was low.

On the basis of the results of this study, we recommend nitrofurantoin for a total duration of 5 days as the first-line agent for the empiric treatment of acute uncomplicated cystitis at our institution, unless contraindicated (ie, creatinine clearance <30 mL/min or suspected pyelonephritis).[16-17] *E coli* demonstrated acceptable susceptibility to nitrofurantoin (96%) in our study population. Nitrofurantoin demonstrated activity against all 9 ESBL-producing *E coli* isolates as well. This is consistent with other studies demonstrating that nitrofurantoin has consistent and acceptable activity against MDROs.[4,13,14] The amount of *K pneumoniae* isolates (4.8%) in our study was not sufficient to determine a susceptibility pattern for

nitrofurantoin because the number of *K pneumoniae* isolates was less than 30. *P mirabilis* is intrinsically resistant to nitrofurantoin; however, the amount of *P mirabilis* isolates (1.3%) in our study population was not concerning enough to recommend against the use of nitrofurantoin as the empiric first-line agent.[17] There were no treatment failures in our study population secondary to empiric nitrofurantoin use. The IDSA also recommends nitrofurantoin and fosfomycin as first-line options for the empiric treatment of acute uncomplicated cystitis.[5] At our institution, fosfomycin is restricted, with use limited to specific clinical scenarios such as patients with documented cystitis with an MDRO in which other agents cannot be used or for patients with allergies to other antimicrobials.

A first-generation cephalosporin such as cephalexin for a total duration of 7 days is an appropriate alternative to nitrofurantoin for the empiric treatment of acute uncomplicated cystitis at our institution. The IDSA currently reserves beta-lactam agents as alternatives for the treatment of acute uncomplicated cystitis because studies have demonstrated beta-lactams to be inferior to other treatment options.[5] In our study population, *E coli* had adequate susceptibility to ceFAZolin (97%), which can be used as a surrogate marker for other first- and third-generation cephalosporins for urinary isolates.[18] Cephalexin is also a cost-effective option for our patient population. We recommend against the use of third-generation cephalosporins at our institution for the empiric treatment of acute uncomplicated cystitis because these broader-spectrum agents may increase the risk of the development of infections with an ESBL and are generally not cost-effective for our patient population.[19] We caution providers that if they do choose a beta-lactam for empiric therapy then these agents require a longer treatment duration and closer follow-up than other agents.[4,5]

The IDSA currently recommends that fluoroquinolones be reserved as an option for the empiric treatment of acute uncomplicated cystitis because overuse can contribute to worsening fluoroquinolone resistance. Fluoroquinolones have a role in the treatment of more serious infections than acute uncomplicated cystitis, and increased resistance has been observed.[5] In 2016, the US Food and Drug Administration (FDA) issued a drug safety communication warning against the use of fluoroquinolones for acute bacterial sinusitis, acute exacerbation of chronic bronchitis, and uncomplicated urinary tract infections (UTIs) owing to safety concerns.[20] The FDA recently strengthened its current warning for fluoroquinolones, advising prescribers of potential blood glucose disturbances, central nervous system effects, and risk of rupture of aortic aneurysms.[21,22] Despite having adequate susceptibility, we recommend that fluoroquinolones be reserved as an option for the empiric treatment of acute uncomplicated cystitis at our institution in light of the recent FDA warnings and that they be limited to use in more serious infections.

Although TMP-SMX is considered a first-line agent by the IDSA for the empiric treatment of acute uncomplicated cystitis, its use is not recommended in this setting if the *E coli* resistance prevalence is known to exceed 20%. The resistance threshold of 20% in which TMP-SMX is no longer recommended in the treatment of acute uncomplicated cystitis is derived from consistent in vitro and mathematical data. For other antibiotics, there are limited data to recommend resistance levels that would preclude the use in acute uncomplicated cystitis.[5] In our study population, *E coli* susceptibility to TMP-SMX was only 59%, which is consistent with our institution-specific ED antibiogram (60%), and therefore TMP-SMX is not recommended for the empiric treatment of acute uncomplicated cystitis at our institution because it could potentially lead to treatment failure.

To address the discordance of duration of the therapy prescribed with current recommendations observed in our study, an in-service was provided to the ED staff to provide education on optimal prescribing for acute uncomplicated cystitis. In addition, a new EMR system was recently implemented, and the duration of therapy for antimicrobial agents was optimized to help guide prescribers. On the basis of the findings of our study, we also developed an institution-specific guideline for the empiric treatment of acute uncomplicated cystitis for the medical staff to use that includes antimicrobial recommendations as well as pricing information of various agents because appropriate, cost-effective options are critical to our patient population. This guideline has since been uploaded on the institution's AMS web page.

Implications for Emergency Clinical Practice

This study was a needs assessment at our institution to evaluate the antibiotic prescribing patterns for acute uncomplicated cystitis in the outpatient setting (emergency department and clinics) and how they aligned with the national treatment guidelines as well as local susceptibility patterns. Antimicrobial resistance is on the rise, and AMS efforts in the outpatient setting, including the emergency department, are an important measure to combat this. Overall, we found significant discordance with the prescribing practices at our institution and national guidelines. We recommend that institutions evaluate their antibiotic prescribing patterns for common antibiotic indications in the emergency department and develop methods to improve them. By identifying areas for improvement, developing institution-specific

guidelines, and providing education, all health care professionals on the team in the emergency department have a role in improving antibiotic prescribing. Clinicians prescribing antibiotics, pharmacists verifying antibiotic orders, and nurses discharging patients with antibiotics can use these resources to intervene and improve antibiotic stewardship.

Limitations

This study has possible limitations, including the fact that it was a single-center study and retrospective in design. We were not able to confirm adherence to the empiric regimen prescribed; revisits to other institutions; or adverse effects of antibiotics, such as CDIs or drug-drug interactions. By IDSA definition, a UTI in male patients is considered a complicated UTI. Our findings therefore cannot be applied to male patients because this was a study exclusion. In addition, 16 patients were diagnosed with acute uncomplicated cystitis, but they complained of flank pain, which may be indicative of pyelonephritis.

Conclusion

Our study demonstrated that most of the cases of acute uncomplicated cystitis can be managed safely and effectively with nitrofurantoin or first-generation cephalosporins. Our findings are consistent with national literature, demonstrating high rates of *E coli* (75%-90%) and a lower incidence of MDROs in this patient population.[5] We recommend that institutions use national guidelines, local resistance patterns, and institution-specific antibiograms in conjunction with education to improve the prescribing patterns in the outpatient setting, including the emergency department.

Author Disclosures

Conflicts of interest: none to report.

Acknowledgments

Dorothy McCoy, PharmD

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Accuracy and Acceptance of a Self-Collection Model for Respiratory Tract Infection Diagnostics: A Concise Clinical Literature Review

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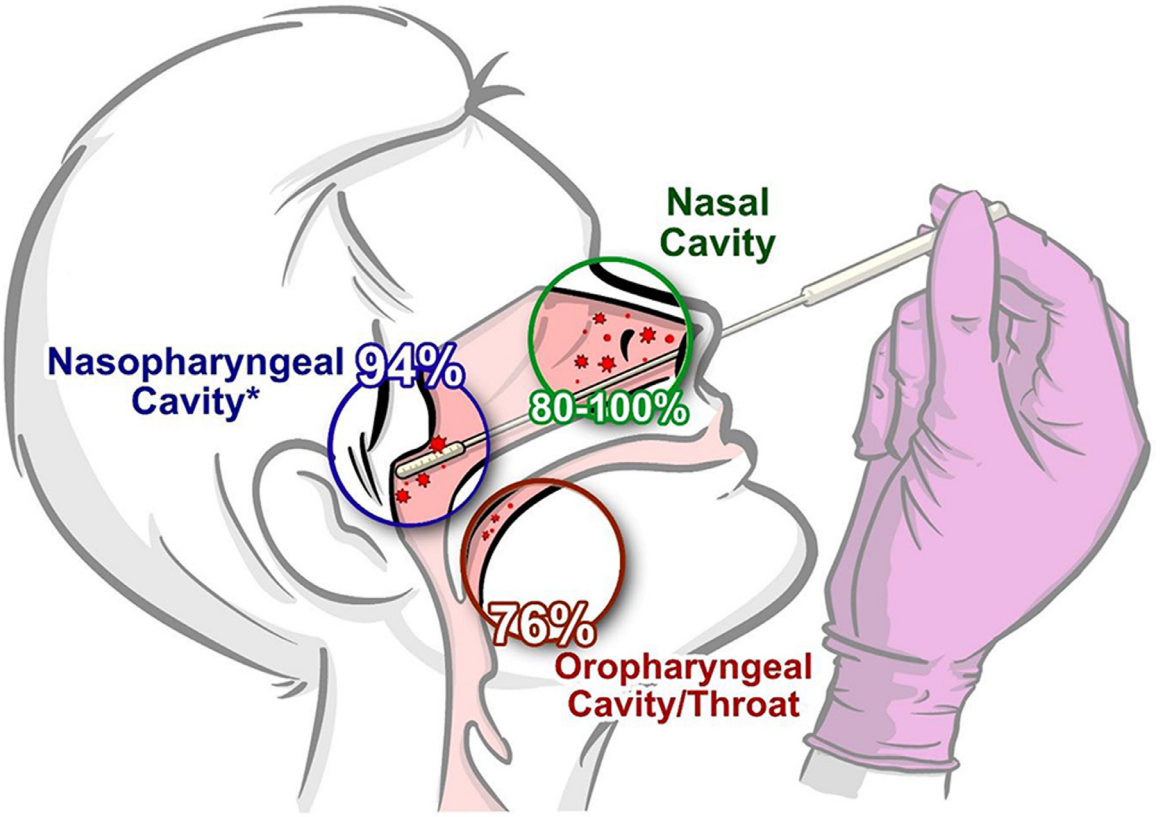

Accuracy and Acceptance of a Self-Collection Model for Respiratory Tract Infection Diagnostics: A Concise Clinical Literature Review

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Abstract

Background: Nurses are the primary clinicians who collect specimens for respiratory tract infection testing. The specimen collection procedure is time and resource-consuming, but more importantly, it places nurses at risk for potential infection. The practice of allowing patients to self-collect their diagnostic specimens may provide an alternative testing model for the current COVID-19 outbreaks. The objective of this paper was to evaluate the accuracy and patient perception of self-collected specimens for respiratory tract infection diagnostics.

Methods: A concise clinical review of the recently published literature was conducted.

Results: A total of 11 articles were included the review synthesis. The concept of self-collected specimens has a high patient acceptance rate of 83-99%. Self-collected nasal-swab specimens demonstrated strong diagnostic fidelity for respiratory tract infections with a sensitivity between 80-100%, this is higher than the 76% sensitivity observed with self-collected throat specimens. In a comparative study evaluating a professionally collected to a self-collected specimen for COVID-19 testing, a high degree of agreement (k = 0.89) was observed between the two methods.

Conclusion: As we continue to explore for testing models to combat the COVID-19 pandemic, self-collected specimens is a practical alternative to nurse specimen collection.

Key words: Respiratory tract infection/testing; Respiratory tract infection/diagnostic; Respiratory tract infection/self-collect; COVID-19; Emergency department

Introduction

Respiratory tract infections (RTIs) are prevalent communicable diseases and are the third leading cause of death worldwide.[1,2] It is estimated that a new infectious disease emerges at a rate of one per year,[3] making early disease detection critically important. As witnessed during the 2009 H1N1 outbreak and the 2020-2021 coronavirus disease 2019 (COVID-19) pandemic, emergency departments across the United States experienced surges in RTI presentations.[4] Unanticipated swells in the patient census often result in downstream adverse effects on clinical operations, particularly to the nursing workforce.[5] As the patient census increased so did the need for additional nursing coverage. Early diagnosis of RTIs is essential to the management of these patients as it can expedite decision points such as treatment, disposition, and containment. Furthermore, early diagnosis may aid patients with selecting the proper health care channel for their illness, potentially

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alleviating the problem of ED crowding. In this study, we explored the accuracy of self-collected specimens for RTI testing, the patient's perception of a self-collection model, and its potential role in the emergency department's clinical operations. For this article, the term COVID-19 was used to refer to both the virus (severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) and the disease state (COVID-19).

Background

On March 11, 2020, just more than 2 months after the first confirmed case in China, the World Health Organization declared the COVID-19 outbreak a global pandemic. Delays in containment efforts, fueled by personnel and supply shortages, allowed millions to become infected with COVID-19.[6-10] Nurses have been essential in the efforts to minimize the spread of COVID-19. In 2 studies evaluating nurse staffing models during the pandemic, facilities with higher staffing allocations for nurses experienced lower rates of COVID-19 infections and deaths.[11,12] For this reason, it is important to develop strategies to safeguard the nursing workforce against the risk of infection, and one such strategy may be the implementation of a self-collection model for respiratory pathogens. In a self-collection model, patients swab themselves to procure the needed specimens for testing.

The emergency department has traditionally served as an access point for patients with acute RTIs, many of whom are likely to receive testing by means of a nasopharyngeal swab administered by a nurse. The Centers for Disease Control and Prevention endorsed in 2020 the nasopharyngeal swab as the preferred specimen collection method for COVID-19, with preliminary data suggesting higher viral concentration in the nasal and nasopharyngeal cavities.[13,14] The nasopharyngeal swab procedure presents a considerable infection risk to the nurse owing to their proximity to the patient and the swab's propensity to induce sneezing or coughing.[15,16]

To further exacerbate the problem, mass testing initiatives for COVID-19 have been hampered by supply shortages such as the personal protective equipment needed to keep nurses safe.[7,17] More importantly, an ease of community access to test sites has proven difficult[16] as patients' ability to use testing sites may be limited by a lack of transportation or the site's hours of operation. A potential solution to this problem is to offer an alternative testing option such as a self-collection model. In a community-based survey study by Hall et al,[8] as many as 88% of participants reported a willingness to self-collect specimens. Self-collection diagnostic research has proven promising in the area of self-collected specimens for sexually transmitted infections. The implementation of a self-collection model for RTIs may alleviate unnecessary pressure on critical resource chains while improving community access to testing.[18] In general, it is also felt that self-collection diagnostics have the potential for economic savings, with a self-collection model projected to be 5 times more cost-efficient than a professionally collected model.[19]

Before implementing a self-collection model for RTIs, it is important to determine the diagnostic accuracy of self-collected specimens. Misdiagnosis of COVID-19 could lead to the reintroduction of infected individuals back into the general population as seen in transmission cases in long-term care facilities.[20] False-negative results could also lead to complacency when caring for patients with COVID-19 symptoms, and additional confirmatory testing such as chest computed tomography imaging[21] can significantly increase the patient's ED length of stay and health care cost.

Although the self-collection research for respiratory viruses has been somewhat inconsistent,[22,23] the results are promising, nonetheless. Studies evaluating alternative collection techniques such as the nasal or oropharyngeal swab methods demonstrated similar diagnostic outcomes to the nasopharyngeal swab but with stronger patient acceptance.[7,19] Furthermore, in their recent update, the Centers for Disease Control and Prevention endorsed in 2020 both the nasal and oropharyngeal swab methods as acceptable sources for COVID-19 polymerase chain reaction (PCR) testing. Providing patients with alternative testing options should result in higher testing rates.

The objective of this article was to conduct a concise clinical review of the recently published literature to evaluate the accuracy and acceptance of self-collected specimens for RTI diagnosis. A meta-analysis of self-collected specimens for influenza diagnosis was published by Seaman et al[19] as a comprehensive review of articles published between 2009 and 2017. Given the current COVID-19 pandemic, we reviewed more recent literature to explore the potential of a self-collection model for COVID-19 testing.

Methods

A literature search on the topic of self-collected specimens for RTI diagnostics was conducted, including articles from 2017 to September 1, 2020. Although our project was intended as a rapid, concise clinical review to inform practice and not meant to function as a full systematic review or meta-analysis of the literature, the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2009

guidelines[24] were used to provide overall structure to the review process.

SEARCH PARAMETERS

The following search parameters were used to search PubMed/Medline, Scopus, and Embase databases: *(influenza* OR *virus* OR *COVID-19* OR *SARS-CoV-2)* AND *self-collect; (influenza* OR *virus* OR *COVID-19* OR *SARS-CoV-2)* AND *self-collected; (influenza* OR *virus* OR *COVID-19* OR *SARS-CoV-2)* AND *self-collection; (influenza* OR *virus* OR *COVID-19* OR *SARS-CoV-2)* AND *patient-collected*; and *(influenza* OR *virus* OR *COVID-19* OR *SARS-CoV-2)* AND *self-swab.*

ELIGIBILITY CRITERIA

Search results were filtered to include only clinical trials, meta-analyses, randomized controlled trials, reviews, and systematic review−type articles. Results were also filtered to include only articles published between 2017 and September 1, 2020. All article titles were reviewed using a key word search to determine topic relevance. The key words included: respiratory tract infection, virus, influenza, COVID-19, SARS-CoV-2, self-collect, and self-swab. Articles with one or more of these words in their title progressed to a secondary screening in which the article titles and abstracts were reviewed for topic relevance.

SYNTHESIS

The level of evidence was assigned to each manuscript using the Johns Hopkins Nursing Evidence-Based Practice criteria.[25] A concise summary of the findings of each study was synthesized in a table and a narrative.

Results

The literature search yielded a total of 22 955 articles across all databases (Scopus: 8465; PubMed: 9006; Embase: 5484). Using a key word search, it was determined 4782 had one or more key words related to the topic of interest. After reviewing each article's title alone or title and abstract, along with the removal of duplicated results, 13 articles were determined relevant to the topic of RTI self-collection research. Note that one of these articles was added during manuscript review and was originally missed using our methods owing to corrupted text in the title field in the downloaded file. Two additional articles were also removed after determining that they were protocol proposals and did not include any diagnostic or comparative data, resulting in 11 reviewable articles (Figure). Each article's level of evidence is presented in the evidence summary table (Table).[25] Of the articles included in this review, 1 was a meta-analysis, 2 studied the acceptance of self-collection by patients, and 8 articles evaluated the diagnostic accuracy of self-collected specimens either as a sole variable or in comparison with professionally collected specimens.

PATIENT PERCEPTION OF A SELF-COLLECTION MODEL

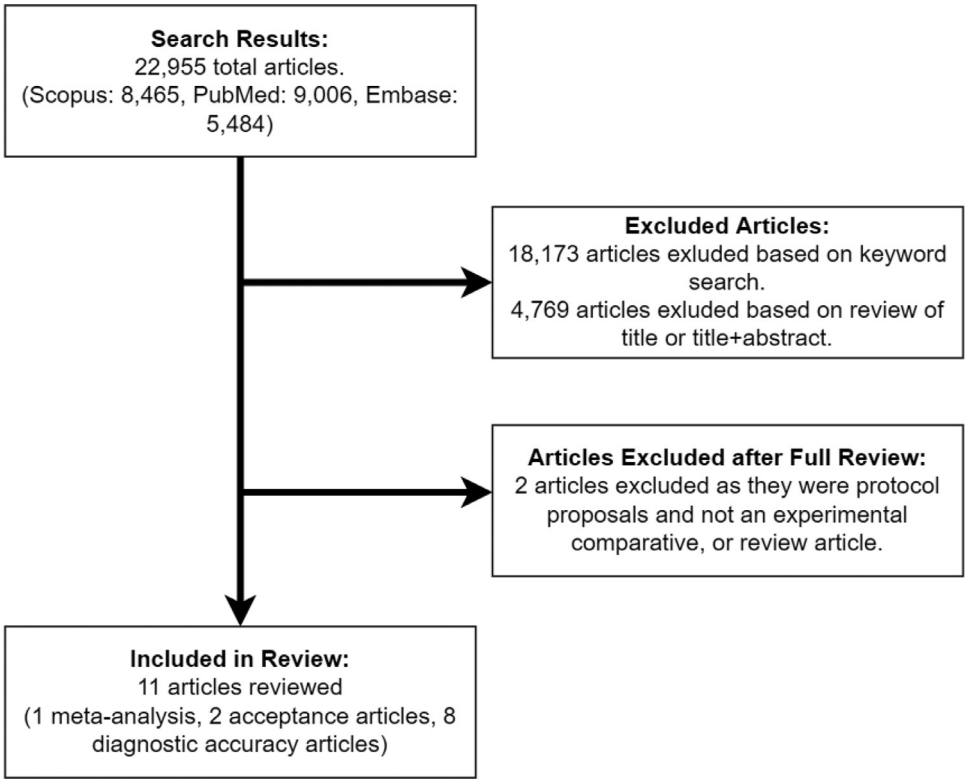
The acceptance of a self-collection model is important to pragmatic implementation in clinical practice. Research by teams Hall et al[8] and Valentine-Graves et al[9] provided some insight on patients' perception of various self-collection methods for respiratory pathogens. According to data from Hall et al,[8] 1435 participants were surveyed with most (88%) rating in favor (agree or strongly agree) of a self-collected saliva specimen and an 83% acceptance rate for self-collected throat specimens. In a similar study conducted by Valentine-Graves et al,[9] 148 participants were surveyed regarding their perception of 3 mail-in self-collection methods (saliva, oropharyngeal swab, and dried blood spot card) with 84% of the participants reporting high acceptance of all 3 methods. Similar acceptance was seen in another study of adults and children with both cohorts, respectively, reporting 99% and 96% acceptance of a self-collection model.[26] Valentine-Graves et al[8] also asked the study participants to rate their confidence level regarding the integrity of their collected specimen with 87% reporting "confident" or "very confident." Data from these studies provide a better understanding of the patient's willingness to not only self-collect for respiratory pathogens but also their acceptance of a distance testing model.

Critics of the self-collection model have cited collection errors by the patient as a potential barrier to a successful implementation. As reported in 1 study, approximately 24% of mail-in specimens had one or more errors related to packaging and shipping.[27] In the same study, only 37 of 124 (30%) participants reported reviewing the instructional material before proceeding with the self-collection procedure. In a qualitative survey study assessing patients' perception of a self-collection model, most of the dissatisfied comments pertained to unclear collection instructions or overly complicated collection kits.[9] Despite the collection errors, the submitted specimens were still adequate for PCR testing. Nevertheless, these studies demonstrated the potential for patient errors that could translate to lower compliance rates or errors in the downstream diagnostic results.

TABLE
Level of evidence and results summary for the reviewed articles.*

Authors	Level of Evidence	Results Summary	Study Location
Hall et al[8]	IIIb	1435 participants surveyed regarding self-collection of specimens for COVID-19 research. 88% reported high acceptance of saliva self-swab, while 83% reported high acceptance of a self-collected throat swab. Home self-collection was preferred over drive-through or clinic-based collection.	United States of America
Valentine-Graves et al[9]	IIb	148 participants surveyed regarding willingness to self-collect for COVID-19 testing, 84% reported high acceptance of a self-collection mail in testing model. 87% reported "confident" to "very confident" in their ability to collect an adequate specimen for testing.	United States of America
Adeniji[17]	IIIc	Data from this literature review demonstrated self-collected specimens are equally as adequate as professionally collected specimens for respiratory tract infection testing.	South Africa
Tenover et al[27]	IIIc	135 self-collected specimens were mailed in for testing, 23% of these specimens had one or more packing or shipping errors. A comparative study evaluating the results of self-collected and professionally collected specimens demonstrated 95% agreement between the two collection methods with 53% of participants preferring the self-collection method.	United States of America
Wehrhahn et al[18]	IIb	236 participants, each with specimens collected by self-collection and professional collection. Both samples were evaluated for SARS-CoV-2 and other respiratory pathogens. The self-collected and professionally collected specimens demonstrated a high degree of agreement with a k = 0.89.	Australia
Seaman et al[19]	IIa	A meta-analysis of 14 studies comparing self-collected with professionally collected specimens when testing for influenza. When compared to professionally collected specimens, self-collection had a pooled sensitivity of 87% and a specificity of 99%.	Australia
Altamirano et al[23]	IIb	30 participants, each providing 3 specimens (self-collected nasal swab, professionally collected nasal swab, and professionally collected oropharyngeal swab) for SARS-CoV-2 testing. The sensitivity and specificity of the self-collected specimens were 100% and 95%, respectively.	United States of America
Haussig et al[26]	IIb	102 participants provided 225 self-collected swabs. 100% of the swabs tested positive for c-myc DNA, suggesting specimen adequacy. 53% of the specimens tested positive for one or more viral pathogen(s).	Germany
Goyal et al[29]	IIb	235 participants enrolled into a two-arm comparison study (community-108 or clinic-based-127). Self-collected nasal swabs had a sensitivity of 88% when compared with a professionally collected nasal swab. When compared with a professionally collected nasopharyngeal swab, self-collected nasal swabs had a sensitivity of 78%. The specificity was 100% for both methods. 99% of participants reported acceptance of the self-collected nasal swab method.	Thailand
Fisher et al[28]	IIb	63 participants provided 115 paired self-collected nasal and throat swabs. The sensitivity of the self-collected nasal swab was 96%, while the self-collected throat swab was 76%. Self-collected nasal swabs also had a lower median CT value when compared to self-collected throat swabs (25 vs 32).	United States of America
McCulloch et al[30]	IIb	185 participants each provided a self-collected nasal swab and professionally collected nasopharyngeal swab for SARS-CoV-2 testing. When compared with a professionally collected nasopharyngeal swab, the self-collected nasal swab had a sensitivity of 80% and a specificity of 98%. A high degree of agreement was observed with a k = 0.81.	United States of America

*Johns Hopkins Nursing Evidence-Based Practice criteria. CT, cycle threshold.



FIGURE

PRISMA flowchart of literature search process and results. Search parameters yielded 22 995 articles, only 11 included in review synthesis based on topic relevance. PRISMA, Preferred Reporting Items for Systematic Reviews and Meta-Analyses.

SELF-COLLECTION DIAGNOSTIC ACCURACY

In the meta-analysis conducted by Seaman et al,[19] 13 articles on self-collected respiratory pathogens were reviewed to evaluate the diagnostic accuracy of self-collected specimens. When compared with a professionally collected nasal swab, self-collected nasal swabs had a pooled diagnostic sensitivity of 87% (95% CI, 80%-92%) and a specificity of 99% (95% CI, 98%-100%). Seaman et al[19] also reported high acceptance of self-collected nasal swabs by patients.

In a study conducted by Fisher et al,[28] self-collected nasal swabs and self-collected throat swabs by individuals with RTI symptoms showed a sensitivity of 96% (95% CI, 88%-99%) and 76% (95% CI, 65%-85%), respectively. These data are consistent with findings from a 3-arm (self-collected nasal swab vs professionally collected nasal swab and professionally collected oropharyngeal swab) study that evaluated self-collected nasal swab for COVID-19 testing, with a sensitivity of 100% (95% CI, 72%-100%) and specificity of 95% (95% CI, 74%-100%).[23]

In a comparative study conducted by Goyal et al,[29] the acceptance rate and diagnostic accuracy of self-collected versus professionally collected specimens were evaluated in geriatric patients with RTI symptoms. Participants in the first cohort were asked to provide a self-collected nasal swab specimen at the onset of their symptoms, whereas the second cohort had 3 swabs (self-collected nasal swab, professionally collected nasal swab, and professionally collected nasopharyngeal swab) collected at the presentation to a geriatric clinic for their symptoms. All subjects were asked to rate their acceptance of the self-collected and professionally collected methods. Of the 235 participants, 99% reported that the self-collection method was acceptable and easy to perform. In the community cohort, 92% of the self-collected specimens tested positive for ribonuclease P, indicating it was an adequate specimen, whereas 99% of the clinic-based specimens were positive for ribonuclease P. The sensitivity of self-collected nasal swabs, when compared with professionally collected nasal swabs, was 88% (95% CI, 40%-100%), whereas self-collected nasal swabs versus professionally collected nasopharyngeal swabs had a sensitivity of 78% (95% CI, 40%-97%).[29] Despite demonstrating a consistently higher sensitivity for respiratory pathogens, there were no significant differences between a

nasopharyngeal swab (94%) and a nasal swab (89%).[16,29] The sensitivity rate between a self-collected nasal swab and a professionally collected nasal swab was also not statistically significant.[16,29] These data are consistent with another comparative study (self-collected vs professionally collected) by McCulloch et al[30] in which the sensitivity and specificity of a self-collected nasal specimen were 80% (95% CI, 63%-91%) and 98% (95% CI, 94%-100%), respectively.

The 2 remaining comparative studies evaluated the diagnostic accuracy of self-collected specimens but implemented descriptive and Cohen's kappa statistics to report their findings. Haussig et al[26] enrolled participants in a longitudinal study looking at self-collected respiratory specimens collected at the onset of symptoms. Participants were asked to self-collect nasal swab specimens and mail them in for testing. Of the 225 swabs received, 151 participants reported symptoms consistent with an RTI and had an overall 71% positive rate for 1 or more respiratory pathogen. By contrast, the asymptomatic cohort (58) only had a 14% positive rate for respiratory pathogens.[26] In the Wehrhahn et al[18] article, the diagnostic accuracy of self-collected specimens for COVID-19 testing was compared with professionally collected specimens. Using Cohen's kappa statistics, the authors found that self-collected specimens had a high agreement (κ = 0.89) with professionally collected specimens.[18] In another study comparing self-collected with professionally collected specimens, there was also high agreement (95%) between the 2 collection methods when testing for influenza.[27]

To quantify specimen quality, cycle threshold (CT) values were collected in some of the reviewed studies. The CT value is the threshold in which the fluorescent signal used in PCR testing is able to detect the target gene of interest. In general, lower CT values ($\leq$29) equate to higher concentrations of nucleic acid in the test specimen. The CT values from 2 studies showed consistent readings for self-collected specimens and professionally collected specimens,[18] with a correlation coefficient of 0.81, $P <$ .001.[30] Another study showed the median CT values for self-collected nasal swabs (25) being consistently lower than self-collected throat swabs (32) when the data were aggregated from 8 different viral tests, suggesting a higher viral concentration with nasal swabs.[28]

Discussion

The diagnostic accuracy of self-collected respiratory specimens has received a lot of attention within the past decade of research, but the recent global pandemic has made it a priority to reevaluate self-collection as a viable alternative testing model. Self-collected specimens have shown similar diagnostic accuracy to professionally collected specimens while garnering higher patient acceptance.

The COVID-19 pandemic has become a world-changing event and has highlighted a grave need for a global reevaluation of our approach to managing epidemic or pandemic scale outbreaks. Delays in our testing initiatives allowed the disease to spread rapidly across borders, infecting millions, and resulting in global economic hardship.[31] Despite efforts to contain the disease, infection and death rates continue to rise. Many health facilities are forced to operate at critical mass despite personnel and supply shortages.

A self-collection model is a logical shift in the testing paradigm. As demonstrated, patients are very accepting of the self-collection concept[8,9,19,32] and have shown that they can collect reliable specimens.[18,28] The diagnostic sensitivity and specificity for self-collected specimens have been largely consistent with professionally collected specimens when testing for RTIs,[16,19,23,28,29] with similar results observed for COVID-19 testing.[18,23]

Limitations

We must acknowledge the limitations in our review findings and the potential barriers to a successful implementation of a self-collection model. Patients have openly admitted to not reviewing the instructional material included in the self-collection kits, potentially resulting in collection or packaging errors.[27] In addition, reliance on a courier service to collect specimens may not be a cost-effective means of gathering specimens, particularly if an ad hoc approach is implemented.

The research team followed the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines when developing our search parameters. However, our search parameters were not registered on a prospective register such as Prospero, limiting the repeatability of our study design. We recognize the potential for missed literature as our search yielded a small collection of articles. Most of the studies in this literature review were pilots or feasibility studies with small sample sizes, resulting in generally wider CIs. An additional limitation of findings reported in this review is the lack of a gold standard when comparing the sensitivities of self- and professionally collected specimens. Therefore, this could result in a compounding effect leading to an overestimate of the true sensitivity of the test for the disease. Each study implemented varied collection methods, specimen sites, and onset of symptom windows—all critical factors in

determining specimen quality and diagnostic outcomes.[29] The articles reviewed included a wide distribution of studies across multiple nations with differing cultural preferences and resource systems. It is important to consider these variables when trying to generalize the findings.

Implications for Emergency Nursing Practice

Emergency departments have experienced significant surges in their patient census since the COVID-19 pandemic began, and these fluctuations have proven taxing to the nursing discipline, including nurses who are working additional and longer shifts.[33,34] The implementation of a self-collection model for RTIs can offset the burden of specimen procurement from the nursing staff while mitigating their infection risk. By allowing patients to collect their own specimens, whether for home testing or in an emergency department, nurses are freed to prioritize their efforts to other tasks, such as caring for the critically ill. Furthermore, providing patients with the means to confirm their diagnosis before engaging with the health care system could significantly improve their length of stay in the emergency department. Alternatively, a prehospital diagnosis could prove valuable for emergency departments with an established telemedicine infrastructure to care for patients with lower acuity symptoms. More importantly, patients who were previously unable or unwilling to access conventional testing sites now have an alternative testing option. Information from a home test kit could also aid patients in making better-informed decisions regarding the proper use of health care channels. The benefits of a self-collection model also include potential economic savings as it reduces our reliance on costly personal protective equipment and the personnel needed to staff testing sites. These are all important variables for future pandemic planning.

Conclusion

Nurses are the primary clinicians who collect respiratory specimens, potentially placing nurses at risk for infection. Nurses have also been extracted from their home departments to staff testing facilities during the pandemic, further exacerbating the nursing shortage. As we continue to explore for alternative testing models to combat the COVID-19 pandemic, a self-collection model is a practical option. The reallocation of this task to the patient has the potential for cost savings but more importantly, improved patient and nursing satisfaction.

Author Disclosures

Conflicts of interest: none to report.

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Emergency Nursing Review Questions: September 2021

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Section Editors: Carrie A. McCoy, PhD, MSPH, RN, CEN, and Sara Webb, MSN, C-PNP, CFNP, C-NPT

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 child is brought to the emergency department by a parent because the child suddenly began to exhibit obsessive-compulsive behaviors. The child is alert and oriented and has normal vital signs. Which of the following history, obtained in triage, is most important to report to the health care provider?

A. Recent sore throat
B. Recent camping trip
C. Recent travel to South America
D. Recent tick exposure

2. Several patients were brought to the emergency department after exposure to radiation after a nuclear incident. In addition to decontamination, based on the type of exposure, potassium iodide (KI) was ordered. When administering KI, which of the following is important to consider?

A. The priority group for administration is young adults aged 18 to 30 years.
B. It protects the lungs after inhalation of radioactive dust.
C. A single dose given 4 hours after exposure will protect the patient.
D. Patients may complain of a metallic taste or burning in the mouth and the throat.

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3. All of the following pediatric patients present to the emergency department after a fall in which they struck their heads. Which of the following patients is at the highest risk for a closed head injury (CHI)?

A. A 12-month-old who fell off a sofa and has a small frontal hematoma
B. An 18-month-old who fell against a coffee table and has a small cut on the eyebrow
C. A 3-month-old who fell off of a changing table and sustained a temporal hematoma
D. A 20-month-old who fell 2 ft from a swing and vomited once

4. A patient with a diagnosis of substance use disorder (SUD) presents to the emergency department with acute pain from a fractured femur. The patient is currently on medication for opiate use disorder (MOUD). Which of the following should the nurse anticipate in managing this patient?

A. Administration of SUD medications
B. No administration of opioids
C. Discontinuation of patient's MOUD
D. Administration of intravenous opioid

5. A patient presents to the emergency department after accidently spilling a 25% solution of hydrofluoric acid on his foot. The patient drove immediately from his worksite to the hospital. After removing the shoe, which of the following is the priority?

A. Flush with water or saline.
B. Apply calcium gluconate gel.
C. Medicate for pain.
D. Draw labs for calcium, magnesium, and potassium.

ANSWERS

1. Correct answer: A

This child may be exhibiting signs of a pediatric autoimmune neuropsychiatric disorder associated with streptococcal infection, abbreviated as PANDAS. Unlike the symptoms of obsessive-compulsive disorder, which usually develop over months to years, symptoms of pediatric autoimmune neuropsychiatric disorder associated with streptococcal infection appear rapidly either simultaneously with symptoms of group A streptococcal infection or shortly after symptoms of infection subside. It is thought that in some children streptococcal infection causes an autoimmune response in the basal ganglia. The incidence is more common in boys and before the age of 12 years. Interventions include antimicrobials to treat the infection, and in some cases, additional treatment may be required to treat neuropsychiatric symptoms.[1]

2. Correct answer: D

Radioactive incidents can result in the release of radioactive iodine. The thyroid gland cannot tell the difference between radioactive iodine and regular iodine. Absorption of radioactive iodine increases the risk of thyroid cancer (B). KI is a supplementary measure used to protect the thyroid by preventing the uptake of radioactive iodine. The priority groups for administration of KI are infants, children, and pregnant women (A). The first dose is given as soon as possible after exposure, and the dose needs to be repeated daily until the exposure risk has been eliminated (C). Some patients may complain of a metallic taste or a sensation of burning in the mouth and the throat (D).[2]

3. Correct answer: C

In children younger than 2 years, 70% to 80% of CHIs are the result of falls. Those at highest risk are infants younger than 12 months and those that fall from more than 3 ft, such as from changing tables, countertops, shopping carts, and caregiver arms (C). Children with frontal hematomas are less likely to have an underlying CHI than children with an injury to the temporal-parietal region, which has a higher risk for intracranial bleeding because the middle meningeal artery is located in this area (A). In children younger than 2 years, a single episode of vomiting has not been identified as a predictor of CHI (D).[3]

4. Correct answer: D

This patient should receive an appropriate dose of intravenous opiate to treat severe pain (D). Relapse rates are not associated with the short-term use of opiates. Medication-assisted therapies for SUD are not intended to treat pain (A). They are intended to manage the SUD. Additional measures, such as traction in this case, may be used to manage the injury and pain, but an opiate may still be needed (B). The patient's MOUD therapy does not need to be discontinued and can be a key to relapse prevention (C).[4]

5. Correct answer: A

Treatment for this patient includes decontamination, neutralization of the toxin, and correction of electrolyte imbalance to avoid systemic toxicity. The first priority is to flush with water or saline (A). After proper decontamination, the toxin should be neutralized, which in this case involves the topical application of a calcium gel. Calcium gluconate is preferred, but calcium carbonate may also be used (B). Systemic absorption is more likely with concentrations more than 20% and the involvement of more than 2.5% of body surface area. Thus, this patient should have labs drawn and any electrolyte imbalances, such as hypocalcemia and hypomagnesemia, corrected (D). As the gel neutralizes the fluoride, the gel will turn white, and the pain should subside. Use pain medication cautiously because pain is a guide to the effectiveness of the topical therapy (C).[5]

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Delirium in Emergency Departments: Is it Recognized?

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Abstract

Background: Delirium is a complex neurocognitive manifestation of an underlying medical or surgical abnormality such as substance abuse, infection, sepsis, or organ failure. A recognized risk factor for delirium is advanced age (age >65 years). The projected demographic changes over the next 2 decades suggest that the number of aging adults will grow dramatically, and emergency nurses will see an increasing number of older patients manifesting the wide range of neuropsychiatric symptoms associated with delirium.

Method: An examination of 5 commonly used delirium assessment tools was undertaken specific to clinical features, use, scoring, findings, advantages, and disadvantages.

Findings: Numerous factors contribute to the lack of effective delirium recognition. However, emergency nurses, with educational support, can successfully use the delirium assessment tools to recognize delirium.

Conclusion: Emergency nurses face challenges in recognizing delirium. One key challenge for many of these nurses is the appropriate use of assessment tools suitable for the ED setting.

Key words: Delirium; Registered nurses; Tools

Introduction

Delirium is an acute confusional state, described as an acute disorder of attention and cognition.[1,2] The presenting signs and symptoms include hallucinations, restlessness, agitation, combative behavior, calling out, moaning or making other sounds, and/or lethargy. Fuchs et al[3] identified that 32% of the older patients (aged >65 years) experienced delirium during hospitalization across all types of acute care units,[3] with higher prevalence in the intensive care unit.[3,4] Lange et al[5] found that delirium was prevalent in 12.5% of all patients and undiagnosed in 24.1% of the patients. Other researchers have reported different prevalence rates of delirium,[6,7] contributing to the conclusion that delirium is frequently not recognized or assessed by staff. Contributing to this conclusion is the fact that the utility of delirium screening tools is uncertain.

Delirium occurs in 7% to 20% of the older adults (aged >65 years) in the emergency department; yet, emergency nurses do not routinely evaluate ED patients for delirium, thus missing almost 70% of the cases.[8] Older patients in acute care facilities, including the emergency department, are at high risk for developing delirium. The contributing risk factors are the presence of comorbidities, the use of psychoactive medications, and advanced age. Emergency departments are often crowded,[9] placing nurses under pressure to simultaneously care for critically ill patients in general and older adults at risk for, or exhibiting, delirium in particular. In a national study, Lee[10] reported that delirium recognition by both nurses and physicians was poor in a sample of ED patients. The results also indicated that a significant number of these patients could have been discharged with unrecognized delirium. Their findings were similar to the early work of

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Boucher et al,[6] who documented unreported delirium in older patients in the emergency department, and supported by Arendts et al[11] in a more recent study. Boucher et al[6] as well as Arendts et al[11] reported that a risk screening and warning or action card (response by staff if delirium screening is positive) intervention in the emergency department did not significantly improve the rates of delirium detection. Registered nurses are well situated to systematically screen for, and recognize, delirium in older patients in the emergency department because of their significant presence at the bedside. Acute mental status changes in older adults in the emergency department are not routinely assessed using a standardized tool.[6,12] The reasons for a lack of assessment include an underappreciation of delirium and its impact on clinical outcomes. Explored in this paper are some of the common delirium screening tools and the challenges to their use by registered nurses within the context of the emergency department.

TABLE 1
Sample of delirium assessment tools

Tool
4AT (4 A's Test, abbreviated mental test)
CAM (Confusion Assessment Method)
The Intensive Care Delirium Screening Checklist
interRAI-AC (International Resident Assessment Instrument–Acute Care)
Nu-DESC (Nursing Delirium Screening Scale)
PrDICT (Predicting Emergency Department Delirium with an Interactive Computer Tablet)
PRISME (an acronym that can assist in identifying and relieving underlying factors that are modifiable and can contribute to the onset and perpetuation of delirium)
RADAR (Recognizing Acute Delirium as Part of Your Routine)
SQiD (Single Question in Delirium)
The Memorial Delirium Assessment Scale

Background

The *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition) defines delirium as a disturbance of consciousness, accompanied by a change in cognition that cannot be better accounted for by a preexisting or progressing dementia.[2] Delirium develops over a short period of time—hours to days—and can fluctuate throughout the course of the day. It is characterized by a reduction in clarity of awareness, inability to focus, distractibility, and change in cognition. It is commonly experienced by older adults on admission to a hospital or during hospitalization.[3-6]

Older adults constitute the largest percentage of acute care admissions within both the United States and Canada.[13,14] Leslie et al[15] estimated that delirium affects up to 50% of the hospitalized older adults and costs more than $164 billion (2011) per year in the US. More recent economic data are not available, but delirium is responsible for adding more than $22 000 to the cost of a hospital stay.[16] Delirium has been associated with poor hospital outcomes, including increased morbidity and mortality, prolonged length of stay, long-term care admission, and functional decline.[17-19]

With older adults being a substantial proportion of the patient demographics in the emergency department, delirium investigation should not be excluded from the assessments routinely conducted by nurses. Although ED providers may not have adequate time to perform in-depth delirium assessments, tools have been developed to help nurses assess, identify, and document delirium. A list of current tools is found in Table 1. Brief delirium assessments such as the Brief Confusion Assessment Method and 4 A's Test (4AT) have been validated in older ED patients[20,21] and require nurses to perform brief bedside cognitive testing. Although these assessment tools often take just 1 to 2 minutes to complete, nurses continue to underuse them in high-volume or crowded emergency departments.[22]

The presence of nurses at the bedside and their frequent assessments of older patients have ideally positioned them to recognize delirium.[23] Emme,[24] using a qualitative design with a focus group and individual interviews, concluded that the time that nurses spend with patients offers them the opportunity to detect subtle changes in behavior, potentially leading to the recognition of delirium. The researcher also noted that when dementia or mental health issues such as depression or psychosis are involved, delirium recognition is perplexing and problematic to recognize. A nurse's early recognition of delirium in the emergency department can reduce the negative consequences associated with it. El-Hussein and Hirst[25] described delirium as having the characteristics of "hiding and camouflaging," which can lead a nurse into believing that a patient's delirious state is their baseline. The rapid turnover of patients in the emergency department and the nursing staff's lack of adequate knowledge to identify changes in older adults' mental status complicate the problem of delirium underrecognition. Moreover, the clinical, fast-paced, and working environment in the emergency department may itself contribute to a rapid decline in cognitive function in older patients, making delirium recognition more challenging.

TABLE 2
Comparison of screening tools

Screening tool				
CAM	**RADAR**	**4AT**	**interRAI-AC**	**Nu-DESC**
Clinical features tested				
(1) Acute onset and fluctuating course; (2) inattention; (3) disorganized thinking; (4) altered level of consciousness	When nurse is administering medication: (1) Was the patient drowsy?; (2) Did the patient have trouble following your instructions?; (3) Were the patient's movements slowed down?	(1) Alertness; (2) abbreviated mental test; (3) attention; (4) acute change or fluctuating course	Four delirium items: (1) acute change in mental status from baseline; (2) mental function varies over the course of the day; (3) episode of disorganized speech; (4) easily distracted	(1) Disorientation and/or misperception; (2) inappropriate behavior; (3) inappropriate communication; (4) illusions/hallucinations; (5) psychomotor retardation
Use				
Individuals classified as high risk Minimal training required Nurse and physician use Completion in less than 5 minutes	Patients at risk for delirium (aged ≥65 y) Nurses during administration of scheduled medications	Patients at risk for delirium (aged ≥65 y)	Patients aged ≥70 y Used by trained research nurses	Used by nurses
Screening				
Item 1 and 2 with either 3 or 4 indicates positive CAM result of delirium	"Yes" to 1 or more items = positive RADAR result indicating delirium	Range of possible scores for each item 0-4 Score of 4 or greater = possible delirium ± cognitive impairment; 1-3 = possible cognitive impairment; 0 = delirium or severe cognitive impairment unlikely	Each item scored (0 = behavior not present; 1 = behavior present)	Each item scored (0 = no symptom; 1 = present but mild; 2 = present and pronounced/intense) Score of ≥2 = positive screen

continued

TABLE 2
Continued

Screening tool				
CAM	**RADAR**	**4AT**	**interRAI-AC**	**Nu-DESC**
Findings				
Sensitivity (94%-100%) Specificity (90%-95%) Negative predictor (90%-100%) Patient 20 times more likely to be delirious if rated positive by CAM	Sensitivity (73%) Specificity (67%) Each positively scored item increases chances of capturing delirium by 43% 73 times more delirium cases per minute than 3 assessments conducted with CAM and HDS		Sensitivity (82%) Specificity (91%) Positive (72%) and negative (95%) predictor value Patient screened positive = 10 times more likely to be delirious Patient with cognitive impairment 3 times more likely to be delirious if screened positive	Against CAM: sensitivity (85.7%); specificity (86.8%) Repeat studies: sensitivity (95%-96%); specificity (79%-87%)
Advantages				
Rapid identification of delirium Additional questionnaire component (total of 9 diagnostic criteria) Ability to detect various abnormal mental states Systematizes observation and documentation	No direct questioning Observation only Baseline functioning and additional information sources not required Can be completed during every medication administration Can detect hyper- and hypoactive forms of delirium Takes average of 7.2 s to complete Was not perceived to increase workload	Easy to use and rapid assessment tool	High negative predictor	Easy use perceived by nurses Takes little time to complete
Disadvantages				
Specific to use in older patients May be contraindicated in psychiatric disorders aside from delirium and dementia	Cannot be used if patient does not have scheduled medication	Does not test features such as disorganized thinking Abbreviated mental test may be contraindicated in patients with dementia or other cognitive impairments	Admission assessment requires 24-h observational period Tool was not used in isolation and was part of broader assessment	Specificity not as high as other tools such as CAM Overestimated the presence of delirium when compared with CAM

Data for delirium tool CAM from Inouye et al[31] (1990), RADAR from Voyer et al[32] (2015), 4AT from Bond and Goudie[33] (2015), interRAI-AC from Salih et al[34] (2012), and Nu-DESC from Solberg et al[35] (2013).
CAM, Confusion Assessment Method; RADAR, Recognizing Acute Delirium as Part of Your Routine; 4AT, 4 A's Test; interRAI-AC, International Resident Assessment Instrument–Acute Care; Nu-DESC, Nursing Delirium Screening Scale; HDS, Hierarchic Dementia Scale.

Delirium Screening Tools and Nurses

Delirium has been shown to go undetected by nurses working in the emergency department[6,10]; therefore, the systematic use of validated, standardized assessment tools is crucial. El-Hussein and Hirst[25] found that some registered nurses, working on acute care units, could identify a delirium tool but were unaware of its components or how to use it. Of note, research has identified that although delirium screening is frequently taught, there were inconsistencies in how it was taught, who taught it, and what screening tools were introduced to students.[26,27] Kennedy et al[22] acknowledged that without adequate training on how to use delirium assessment tools, the sensitivity and specificity of most of the tools were at best modest. The authors wrote that consequently these tools should not serve as a standalone test for ED delirium. Rather, they could serve as a supplement to other systematic delirium screening processes.[2]

A review of the literature identified a number of delirium screening tools. Shown in Table 2 is a comparison among the Confusion Assessment Method (CAM), Recognizing Acute Delirium as Part of Your Routine (RADAR), 4AT, International Resident Assessment Instrument–Acute Care (interRAI-AC), and Nursing Delirium Screening Scale (Nu-DESC) tools identified in our search and selected for comparison because of their repeated identification in the literature. There were several screening tools that were identified as of limited use, including the Memorial Delirium Assessment Scale,[28] Single Question in Delirium,[29] and Predicting Emergency Department Delirium with an Interactive Computer Tablet.[30] The CAM is the gold standard for delirium recognition, with high sensitivity and specificity rates: 94% to 100% and 90% to 95%, respectively.[31] However, each tool is constructed differently. As illustrated in Table 2, each tool has advantages and disadvantages regarding its use.

Voyer et al[32] introduced the delirium screening tool called RADAR, which requires only observation by the primary nurse. Different from the CAM, this tool takes approximately 7 seconds to administer and was designed to be applied during routine medication administration at the bedside. Similar to the CAM, RADAR requires nurses to answer 3 simple questions (Table 2). In the study by Voyer et al,[32] an 82% to 98% agreement between the research assistant and primary nurse occurred, whereas the RADAR questions were in agreement with the respective CAM items 52% to 85% of the time. Voyer et al[32] suggested that for each positively scored item in RADAR, the possibility of detecting delirium increased by 43%. RADAR was also found to be successful in identifying both hyper- and hypoactive forms of delirium and was not considered burdensome to nurses. One disadvantage to RADAR is that it is designed to only be used by nurses when observing patients taking medications. If a patient does not require scheduled medications, then the functionality and utility of RADAR become nonexistent in recognizing delirium.

The interRAI-AC algorithm was also found to be successful in detecting delirium because those screened positive by the tool were 10 times more likely to be delirious than not, and in the case of patients who were cognitively impaired those screened positive by the tool were 3 times more likely to be delirious.[34] InterRAI-AC is limited as an isolated delirium tool, given that it was examined as part of a broader assessment. Solberg et al[35] found that although Nu-DESC improved detection and awareness of delirium slightly, no significant results were noted other than the tool overestimating a positive delirium screen when compared with the CAM. The 4AT assessment tool developed by Bellelli et al[36] was implemented in a quality improvement project in Scotland. Although this tool seems to be straightforward and requires minimal training, it does not assess for disorganized thinking or speech, which is indicative of delirium.

The CAM is a standardized, validated measure that has gained widespread use in screening for delirium. It continues to demonstrate preference by staff over other tools, but this does not mean that research should be limited to its use. When choosing a delirium screening tool, the context and setting of patients and nurses need to be considered.

The electronic health record delirium assessment component of a quality assurance initiative implemented by Solberg et al[35] was found to improve nurse–physician communication and subsequent treatment for patients who screened positive for delirium. Better interdisciplinary communication can occur if nurses are provided with objective cognitive and delirium assessment tools. Despite the various tools available for delirium screening, each tool has advantages and disadvantages regarding its use, potentially pointing to a debate about which tool is the most appropriate for delirium recognition. Some tools may save nurses time, but this may be at the expense of the accuracy of the assessment.

Implications for Emergency Nursing Practice

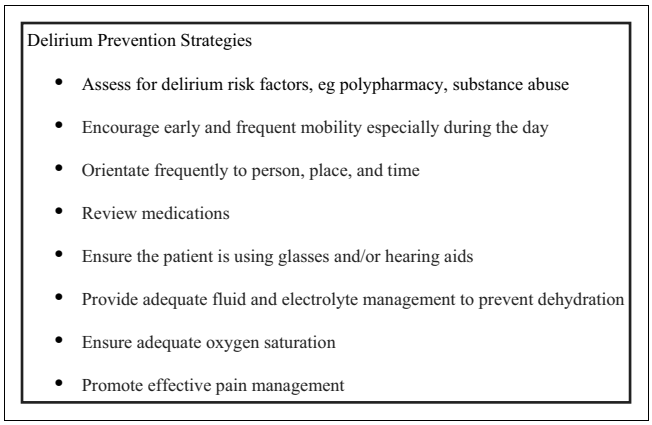
Preventing delirium is the most effective strategy for reducing its occurrence and related complications in older adults in the emergency department. Delirium frequently leads to poor health outcomes, including cognitive and

physical deterioration, longer hospital stays, and institutionalization.[17-19] Successful preventive strategies should be focused on reducing the risk factors (Figure). When delirium occurs, nurses need to address all evident causes, provide supportive care, prevent complications, and treat behavioral symptoms.

El-Hussein and Hirst[25] qualitatively investigated the clinical reasoning processes of registered nurses to understand their delirium recognition skills. The researchers found that the participants used a biomedical, physiological, or pathologic approach to recognize delirium. This tendency hindered recognition because the nurses viewed physiological indicators as a rule for the "stability" of a patient. If a patient's presentation did not match a registered nurse's definition, delirium was not recognized by that nurse. It is always the responsibility of the registered nurse to pursue learning if a knowledge deficit is self-identified. One strategy to obtain this knowledge might be through self-directed learning, often a requirement of the hours of training required to maintain one's license. However, this implies that the emergency nurse is aware of a personal knowledge gap and is invested in ongoing learning about delirium.

Differentiating delirium from normal aging requires that clinical educational opportunities and resources be provided to registered nurses.[22] ED educators need to ensure that staff nurses are adequately educated. Patient outcomes can be positively affected by the integration and application of sufficient delirium teaching to nursing staff.[21,22] O'Sullivan et al[21] found that introducing participants to a website designed for delirium learning significantly increased delirium knowledge compared with participants unexposed to the website. Varghese et al[37] concluded that an educational program delivered over a 6-week period increased delirium knowledge and recognition and improved nursing practice in the use of the CAM tool.

An extension of education is coaching. Gordon et al[38] provided participants an educational session, pretest, and tool overview before initiating bedside coaching. Bedside coaching included support and immediate feedback to nurses using the new detection tool, followed by an assessment comparison between an expert clinician and the staff nurse. Pre-and posteducation chart reviews indicated that this intervention was successful in significantly increasing the rates of delirium recognition. Mentoring opportunities are a strategy to help novice registered nurses develop their delirium assessment skills. Previous experience was found to be an asset for delirium recognition among registered nurses.[25] In contrast, less-experienced registered nurses were more diligent in their efforts to uncover delirium than nurses with more experience. One reason for this finding may be that nurses searching for obvious indicators had reduced opportunities for observing delirium compared with those who took a holistic approach to patient assessment.



FIGURE

Organization factors specific to nursing practice that might contribute to the challenges of tool use include computer order sets and specific time requirements of mandated nursing tasks.[25] Other factors include the unit type, culture, and implementation strategies to which a registered nurse is subject. Unit policies and procedures set out by an organization can influence the type of delirium recognition tool used by registered nurses. To address underrecognition of delirium on an organizational level, policy change may be required to standardize assessments and successfully integrate delirium tools into routine emergency nursing practice. In addition, staffing levels of emergency nurses may need to be increased to equip them with more time for holistic patient interactions to improve delirium recognition.

Delirium and dementia often present with similar symptoms (Table 3). Delirium may be imposed on dementia, a potential health challenge when older patients are transferred from a continuing care facility to an acute care hospital. It is important for nursing staff in the emergency department to recognize the contribution that informal care providers such as family can make to the recognition of delirium in an older patient. Through conversing with them, the registered nurse can obtain baseline data such as previous cognitive status, primary language, and possible contributing factors to the symptoms demonstrated by the older patient in the emergency department. Mailhot et al[39] examined the ability of the family-rated Family CAM to identify delirium in the emergency department among patients with and without dementia as compared

TABLE 3
Delirium or dementia?

Features	Delirium	Dementia
Description	Delirium is a serious disturbance in mental abilities that results in confused thinking and reduced awareness of the environment.	Dementia is a general term for loss of memory, language, problem-solving, and other thinking abilities that are severe enough to interfere with daily life.
Duration	Acute	Chronic
Prognosis	Reversible	Lifelong
Onset	Appears in a few hours or days	Develops slowly over a few years
Symptoms (may include but not limited to)	Confused thinking	Anxiety
	Disorientation	Confusion
	Easily distracted	Difficulty in communicating
	Experiences hallucinations	Memory loss
	Reduced awareness of environment	Paranoia
	Suddenly not able to do something as well as they used to	
Among possible causes	Variety of medical conditions, eg, dehydration, sensory impairment, variety of medical conditions, stress	Neurodegeneration in the brain
		Vascular deficits
		Neurometabolic disorders
Intervention goal	Reverse confusion by identifying and addressing precipitating causes	To delay decline in cognitive and physical functioning

with the CAM. Using the Family CAM as part of a systematic screening strategy for the emergency department that could be supplemented by the families' assessments was promising and contributed to earlier detection by nurses.

Conclusion

Clear understanding of delirium presentation in older patients is important to provide quality nursing care in the emergency department. It is the responsibility of registered nurses working in the emergency department to assess older patients for the presence of delirium. In this paper, we have discussed the use of assessment tools in the recognition of delirium and identified some of the challenges that nurses face in the use of these tools. Yet, there is a need to acknowledge and encourage registered nurses working in the emergency department to educate their colleagues and to advocate within their acute care facilities for a teamwork approach to the assessment and treatment of delirium.

Web Resources

American Delirium Society https://americandeliriumsociety.org/delirium-resource-list

Delirium Resource Centre https://www.lhsc.on.ca/critical-care-trauma-centre/delirium-resource-centre

Network for Investigating Delirium: Unifying Scientists https://deliriumnetwork.org/resources/

Royal College of Psychiatrists https://www.rcpsych.ac.uk/mental-health/problems-disorders/delirium

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Submissions to this column are encouraged and may be submitted at jenonline.org. Authors are encouraged to contact Section Editor Joan Somes, PhD, RN-BC, CEN, CPEN, FAEN, NRP someswasblackhole@gmail.com for presubmission guidance.

Development and Implementation of a Pediatric Telesimulation Intervention for Nurses in Community Emergency Departments

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NCPD Earn Up to 10 Hours. See page 827.

Abstract

The need for virtual education for nursing staff has dramatically increased because of social distancing measures after the coronavirus disease pandemic. Emergency departments in particular need to educate staff on caring for patients with coronavirus disease while concurrently continuing to ensure education related to core topic areas such as pediatric assessment and stabilization. Unfortunately, many nurse educators are currently unable to provide traditional in-person education and training to their nursing staff. Our inter-professional team aimed to address this through the rapid development and implementation of an emergency nursing telesimulation curriculum. This curriculum focused on the nursing assessment and initial stabilization of a child presenting to the emergency department in status epilepticus. This article describes the rapid development and implementation of a pediatric emergency nursing telesimulation. Our objectives in this article are (1) to describe the rapid creation of this curriculum using Kern's framework, (2) to describe the implementation of a fully online simulation-based pediatric emergency training intervention for nurse learners, and (3) to report learners' satisfaction with and feedback on this intervention.

Key words: Education, Nursing; Telesimulation; Pediatrics; Simulation training; Emergency nursing

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Introduction

Because of the global coronavirus disease (COVID-19) pandemic, emergency nurse educators needed to rapidly develop and implement novel methods to provide continuing education to front line staff.[1-3] This involved either a cessation of existing educational activities or a transition from in-person education to distance learning. To ensure adherence to physical distancing and the safety of themselves and their learners, many educators used free video conferencing platforms such as Zoom. In the emergency department, nurse educators faced a unique challenge in that they needed to ensure ongoing education of core content and competencies while concurrently providing new education on COVID-19-related topics. Unlike operating rooms, outpatient clinics, and other areas of care,

the emergency department could not close down and/or cease to provide care to non-COVID-19 related conditions.

Pediatric emergency care is a specific area that has created significant challenges for nurse educators. COVID-19 restrictions have compounded the baseline challenges that nurse educators face in providing pediatric education in the community ED setting. Community emergency departments typically care for both children and adults, and the vast majority of acutely ill and injured children in the United States (>90%) are seen in these emergency departments, whereas specialty pediatric centers provide care to 10%.[4] Community emergency departments in particular faced a decreasing volume of overall pediatrics, with a concurrent increase in the proportion of critically ill children, often with delays in presentation. In general, in the US, ED census declined by 42% since the onset of the pandemic; however, patient acuity has increased (because of delays in presentation and/or lack of access to care).[5] This census decline and acuity shift has triggered educators and pediatric experts to explore alternative models of education to maintain the knowledge and competencies of nursing staff in the community ED setting.

This article describes the rapid development and implementation of a national pediatric emergency nursing telesimulation that was implemented for 3 weeks across 18 ED sites. This curriculum was developed using Kern's model,[6] engaged an established group of emergency educators involved in the international simulation collaborative group, Improving Pediatric Acute Care Through Simulation (ImPACTS, impactscollaborative.com), and focused on a high priority clinical topic area of pediatric status epilepticus (SE).

Background

The majority of acutely ill pediatric patients do not present to academic medical centers but to community emergency departments in the US, and 69% of those emergency departments see fewer than 15 children per day.[5] The most recent Joint Policy Statement from the American Academy of Pediatrics states, "All EDs must be continually prepared to receive, accurately assess, and at a minimum stabilize and safely transfer children who are acutely ill or injured."[7] In situ simulation has shown improvement in adherence to guidelines and best practices for acutely ill children in the emergency department.[8] Simulation-based training is frequently used for ongoing pediatric training in many emergency departments, but because of limitations of in-person pediatric simulations in the setting of the COVID-19 pandemic, there is an increased need for continued pediatric education via telesimulation.[2]

Methods

The need for ED nursing staff to maintain pediatric education can be met through a completely remote telesimulation-based curriculum, where participants can engage in simulation from geographically distinct locations. Here, we address the development and execution of this telesimulation.

This telesimulation curriculum was developed by an inter-professional team of content experts including pediatric emergency medicine physicians, pediatric intensive care physicians, pediatric nurses, nurse educators, and respiratory therapists. Following Kern's framework, we conducted a general needs assessment, and a problem was identified that revealed pediatric critical care as an area of focus with the current approach largely relying on in situ simulation and in-person training that could not be conducted because of physical distancing rules. Our targeted needs assessment identified that we should focus on the initial management of a child with SE presenting to the emergency department. Simulating SE allows nurses to consider pediatric-specific physiology, rehearse airway management, and calculate weight-based dosing. Learning objectives were established on the basis of the most recent guidelines from The American Epilepsy Society[9] and were guided by Kirkpatrick's educational levels of reaction and learning.[10]

The objectives of the simulation were for participants to (1) demonstrate 3 critical actions in the first 2 minutes of care for a pediatric patient seizing for more than 5 minutes presenting to the emergency department, (2) list the first- and second-line medications and calculate doses for SE with and without intravenous access, (3) identify when a

TABLE 1
Participant demographics

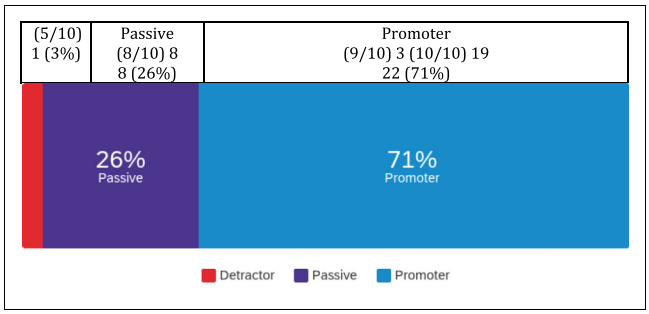
Participants from 18 sites*	Mean (range)
Years worked as a registered nurse (n = 138)	8 (0-41)
Years worked as a registered nurse in the emergency department (n = 138)	5 (0-30)
Approximate no. of pediatric patients cared for each month (n = 138)	182 (1-2000)
Amount of simulation sessions attended earlier (n = 41)	14 (0-100)

* California, Indiana, Connecticut, New York, Massachusetts, Rhode Island, Maine, Vermont, New Hampshire, and Ontario, Canada.

patient in SE requires transfer to a tertiary care center or admission, and (4) demonstrate family presence and family-centered care in a pediatric patient with a seizure. We selected telesimulation as our educational strategy because of the restrictions for in-person simulations/learning. The team authored a case to meet the goals and objectives, which was conducted using the Zoom videoconferencing platform. Community ED sites were recruited through the ImPACTS collaborative network. Our team recruited 18 community ED sites in the US and Canada (Table 1). Approximately 2 to 10 individual nursing learners were then recruited by the Pediatric Emergency Care Coordinators (PECCs) or Educators at each community emergency department. During the planning phase, our team made the decision to focus on nurse learners at the respective sites owing to concerns of physician availability and engagement. In addition, many sites communicated that physician furloughs were happening, and they simply did not have the staffing to participate in nonclinical activities. This project was reviewed by the Indiana University Institutional Review Board and was deemed exempt as an educational intervention.

The telesimulations were completed at each site over the Zoom videoconferencing platform during a 1-hour time frame using the emerging telesimulation platform American College of Emergency Physicians SimBox. All of the learners participated on a voluntary basis. Many sites had larger teams of 4 to 8 learners during the telesimulation; in this case, to enhance learning opportunity, 2 to 4 nurses took active participant roles, and the remainder took an observer role throughout the scenario. The telesimulation and debrief were facilitated by 2 experienced simulation facilitators, a pediatric emergency nurse, and another pediatric content expert (physician or nurse). Each facilitator was provided training and tips specific to telesimulation.

Every learner was provided with the same prebrief via a YouTube video,[11] which detailed what to expect and how to use the video conferencing system and demonstrated the option to call "time out" to clarify information, address technical difficulties, or huddle with their team. The video continued to a simulated ermegency medical services report with the telesimulation that followed. The lead facilitator shared their screen that displayed a YouTube video stream of a child seizing overlayed on top of an evolving set of vital signs displayed on a monitor. The vital signs changed over time on the basis of the preprogrammed scenario that was recorded in a "simulation on rails format." Each of the 18 simulations followed an identical clinical course for the patient. The lead facilitator ensured an appropriate evolution of the case using the preplanned vital signs (this lies in contrast to traditional simulation format with dynamic changes in response to provider actions). To ensure that no nursing participant worked outside of their scope of practice, a scripted physician role was portrayed by one of the facilitators. This allowed for the nurses to have autonomy while creating a realistic environment. The case ran for a total of 10 minutes, during which, the lead facilitator used a checklist to score the team performance and guide the debriefing. After completion of the case, a reflective debrief was completed by the nursing team and facilitators. The learners and facilitators had the opportunity to provide feedback on the simulation session, which was collected via an online survey (Qualtrics, Provo, UT) using a quick response code link. The survey included a net promoter score (NPS) on the likelihood that a participant would recommend this experience, the validated Modified Simulation Effectiveness Tool (SET-M) to measure the simulation effectiveness,[12] 8 statements using 5-point Likert scales, and demographic questions.



FIGURE

Net promoter score. How likely are you to recommend this session to a colleague 0-10?

Results

Telesimulations were scheduled across 19 emergency departments, and 18 were conducted (1 was canceled owing to no staff participation). A total of 86 learners participated with experience ranging from new graduates to 41 years of nursing experience and an average of 14 simulations completed previously (Table 1). A total of 7 facilitators were involved in the telesimulations (4 physicians, 3 nurses). Overall, learners reported being likely to recommend this curriculum to others, with the majority reporting a high NPS (Figure). Learners reported a high level of agreement with statements of satisfaction on Likert scales (Table 2). Learners reported a high level of effectiveness as measured by the simulation SET-M (Table 3). In free text, learners reported a safe learning environment in which they felt more

TABLE 2
Agreement with statements related to this session as a whole

Question: this session improved my____:	Strongly agree (total number (%)	Somewhat agree (total number (%)	Do not agree (total number (%)
Teamwork/communication skills in pediatric acute care	22 (70.97)	9 (29.03)	0 (0.00)
Psychomotor skills in pediatric acute care	16 (51.61)	13 (41.94)	2 (6.45)
Knowledge of pediatric acute care	26 (83.87)	5 (16.13)	0 (0.00)
Comfort in pediatric acute care	19 (61.29)	11 (35.48)	1 (3.23)
Telesimulation is effective compared to other distance-learning methods-online case discussion, discussions, lectures, etc...	24 (77.42)	7 (22.58)	0 (0.00)
Telesimulation is effective compared to traditional in-person simulation/ debriefing	9 (29.03)	18 (58.06)	4 (12.90)
Having a cofacilitator enhanced my learning during this session	28 (90.32)	3 (9.68)	0 (0.00)
The cofacilitators worked well together	28 (90.32)	3 (9.68)	0 (0.00)

empowered to make clinical decisions and improved comfort and knowledge in acute pediatric care. Facilitators reported that the technology was simple to use, the script was easy to follow, and learners were engaged and actively participated in debriefing. Supplementary Table reports the performance in the scenario across the 18 simulations, which was used to guide debriefings across sites.

Lessons Learned

Our team demonstrated success in implementing a telesimulation curriculum with nursing staff from a set of community emergency departments throughout the US and Canada. The PECC or Educator at each site was able to observe the expert-facilitated telesimulation at their site. The learners found telesimulation more effective than other distance-learning methods, although not as effective as in-person simulation on the postsimulation evaluation (Table 2).

The majority of barriers our team experienced occurred during the project recruitment phase. Because of the ramifications from the COVID-19 pandemic, many hospitals had been forced to make financial cuts and were unable to justify additional time and/or payment for educational activities. We mitigated this barrier by designing the educational experience to be completely voluntary instead of a required component of education for staff. During the project period, a large variability in participation was noted related to COVID-19 census surges. Some emergency departments were experiencing very high clinical volumes, and others were experiencing decreased clinical volumes. Many nurses relayed that they felt burnt out and unable to complete telesimulation in addition to ED nursing responsibilities. Additionally, many nurses were joining from home and did not have access to resources that would typically be available if caring for an ill child in the emergency department. Some learners also had difficulty connecting to Zoom because of poor internet connections or difficulty using Zoom due to nonoptimal devices.

Lessons learned from this implementation include the need to provide better guidance on how to use teleconferencing software. After discussing with the PECCs and facilitators, a more explicit prebrief on how best to use Zoom would be beneficial to provide to future learners. In addition, we suggest encouraging participants to test their audio and video connection before the telesimulation, to use Zoom on a desktop or laptop as opposed to a phone or tablet, and to use a Wi-Fi connection instead of a cellular connection. Providing copies of clinical resources typically available in the emergency department for the learners to use at home would also improve the simulation experience. Many learners joined from home, which made scheduling and attendance more achievable; however, we noticed family and children interacting with them during the sessions.

TABLE 3
Simulation effectiveness tool[12]

SET-M results (N = 31)

Prebriefing	Strongly agree n (%)	Somewhat agree n (%)	Do not agree n (%)
Prebriefing increased my confidence.	22 (77)	6 (19)	3 (10)
Prebriefing was beneficial to my learning.	23 (74)	7 (23)	1 (3)
Scenario			
I am better prepared to respond to changes in my patient's condition.	22 (71)	9 (29)	0 (0)
I developed a better understanding of the pathophysiology.	14 (45)	15 (48)	2 (7)
I am more confident of my assessment skills.	18 (58)	12 (39)	1 (3)
I felt empowered to make clinical decisions.	20 (65)	10 (33)	1 (3)
I developed a better understanding of medications.	21 (68)	10 (33)	0 (0)
I had the opportunity to practice my clinical decision-making skills.	18 (58)	13 (42)	0 (0)
I am more confident in my ability to prioritize care and interventions.	20 (65)	10 (33)	1 (3)
I am more confident in communicating with my patient.	18 (58)	11 (35)	2 (7)
I am more confident in my ability to teach patients about their illness and interventions.	21 (68)	9 (29)	1 (3)
I am more confident in my ability to report information to health care team.	21 (68)	10 (33)	0 (0)
I am more confident in providing interventions that foster patient safety.	20 (65)	10 (33)	1 (3)
I am more confident in using evidence-based practice to provide care.	22 (71)	9 (29)	0 (0)
Debriefing			
Debriefing contributed to my learning.	23 (74)	8 (26)	0 (0)
Debriefing allowed me to verbalize my feelings before focusing on the scenario.	20 (65)	10 (33)	1 (3)
Debriefing was valuable in helping me improve my clinical judgment.	25 (81)	6 (19)	0 (0)
Debriefing provided opportunities to self-reflect on my performance during simulation.	24 (77)	6 (19)	1 (3)
Debriefing was a constructive evaluation of the simulation.	24 (77)	6 (19)	1 (3)

FUTURE DIRECTIONS

This education tool was designed for PECCs to lead their own telesimulations without the presence of experts from the ImPACTS team. To assist PECCs in independently facilitating telesimulations at their own sites, our team will provide resources, scripts, and telesimulation video. This will allow the community emergency departments to have more frequent pediatric simulation experience without having to coordinate with the academic medical centers. In

addition, our team is interested in exploring future telesimulation work with an inter-professional team to include physicians and additional ED support staff. Our team at ImPACTS continues work with the American College of Emergency Physicians SimBox project team to provide more telesimulation options.

Conclusion

Conducting a multicenter pediatric telesimulation for nursing staff in the community ED setting was feasible and well received by nurse learners. Overall, learners positively scored our telesimulation tool on the SET-M objectives and promoted the experience to colleagues on the NPS. Moving forward, our goal is to expand this curriculum and to promote and support other community emergency departments across the US to run these simulations independently.

Author Disclosures

Conflicts of interest: none to report.

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Supplementary Material

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2021.01.013.

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Supplementary Table: Telesimulation checklist (n = 18 teams)

Status epilepticus checklist	n (%)
1. Verbalize airway response in first minute	12 (67)
2. Verbalize glucose check in first 3 minutes	8 (44)
3. Verbalize correct dose of lorazepam IV/IO as first line agent at any point in the case	13 (72)
4. Verbalize correct dose of midazolam IM/IN at any point in case	5 (27)
5. Verbalize need for second line agent	13 (72)
6. Allow parent to stay in room	10 (55)

IV, intravenous; IO, intraosseous; IM, intramuscular; IN, intranasal.

Situational Analysis

Author: Lisa A. Wolf, PhD, RN, CEN, FAEN, FAAN, Schaumburg, IL

NCPD Earn Up to 10 Hours. See page 827.

Abstract

Situational analysis is not commonly used in nursing research; however, its usefulness in examining complicated phenomena that are locally situated makes it an effective approach to emergency nursing problems. This paper describes the situational analysis approach as an extension of the grounded theory method and uses 3 studies to demonstrate the effectiveness of this qualitative approach.

Key words: Qualitative research; Grounded theory; Emergency nursing; Workplace environment

Situational analysis is a qualitative approach that can be used in a wide variety of research types that draw on ethnography, interview, and historical discursive materials.[1] It is used in educational research,[2] sociology,[3] and anthropology.[4] It is especially useful in complicated environments such as the emergency department and in settings with multiple layers of involvement, such as the pediatric intensive care unit.[5] This paper seeks to describe the method as one uniquely suited to understand phenomena of interest in the emergency care setting by giving examples of successful theory construction and the description of complicated phenomena.

An understanding of grounded theory is important to describe situational analysis. Grounded theory is a qualitative method, whose purpose is to construct a theoretical understanding of 1 or more phenomena in the studied world.[6] Critical to this process is simultaneous data collection and analysis, which allows the researcher to hone in on the most important and central aspects of a phenomenon. It is a way to see patterns and relationships using a qualitative approach and ultimately results in a coherent and predictable understanding of a phenomenon. This understanding can then be used to derive interventions to address the identified problem or situation.

The process of grounded theory is pretty straightforward and simple.[7] Start with a general idea or question about process, such as "What is the process of emergency nursing triage?" Or "What are the elements of workplace bullying in emergency settings?" Then, the researcher can do the following:

1. Interview people individually or in groups to produce transcripts.
2. Read over the transcripts (several times, to really get a feel for the text).
3. Identify categories that arise from the data (ie, are there things that different people are all focusing on?).
4. Think about how these categories are related to each other in an explanatory way.
5. Use the understanding of these relationships to build a theoretical model by checking the model against the rest of your data.
6. Present the results of the analysis using quotes from the transcripts to support the categories and overarching themes.[8]

As a method of both data collection and data analysis, situational analysis extends traditional grounded theory as described by Strauss and Corbin[7] and by Glaser and Strauss.[6] It applies a postmodernist understanding of issues of concern as marked by positionalism, fragmentation, complexity, contradiction, and situatedness.[1] It allows for the understanding of a problem in the context in which it occurs, which is valuable to understanding the preexisting conditions of the problem. Specifically, situational analysis can be a useful tool for fostering research that is socially responsive and engaged with the community concerns of occupation and workplace,[3] which translates well to nursing research. It can be used not only to derive theory, but also as a descriptive explanatory method.

Situational analysis as a method uses a cartographic (mapping) system in 3 main approaches: situational maps that lay out the human, nonhuman, and discursive elements of a phenomenon and seek to examine the relationships among them; social worlds maps that circumscribe

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the elements of the phenomenon and situate them in the arena in which the phenomenon occurs; and positional maps that lay out positions taken and not taken around the circumstances of the phenomenon and identify sites of silence.[1] As Clarke[1] described it, situational analysis uses the same traditional grounded theory analysis techniques of open coding, selective coding, and theoretical coding; the analysis seeks to explicitly map and include the ways in which environmental settings, multiple discourses, social structures, policies, and cultures influence actions. It offers a visual analytic approach that can be helpful to see the connections among categories.[3] Our research group has used situational analysis in 3 significant studies, one of which generated a validated theory of workplace bullying,[9,10] one that described the situation of assessment for firearms risk in ED patients[11] and finally one that examined the impact of legalized cannabis on ED workload.[12] Each of these problems was intimately connected to the social situation in which it occurred; therefore, this method was extremely useful in uncovering elements that had not yet been described as contributing factors.

Theory of Bullying in Emergency Settings

In this study,[9] the participants identified a variety of human elements that affect the quality and quantity of bullying incidents in the ED workplace, including nurses and other ED staff, charge nurses, ED managers, and patients. In situational mapping, the charge nurse role was identified as a primary driver for bullying in the presence of a cultural narrative that is permissive of workplace bullying. Also included in this category were administrators and human resources personnel who either addressed or ignored bullying behaviors.

Nonhuman elements of the ED practice environment that contributed to bullying included nurses' emotional burden; a high-stress, chaotic workplace; and violent, aggressive, and entitled behavior from patients toward staff. The social worlds maps of this phenomenon described both the situational circumstances and the social dynamics that encouraged or discouraged bullying. Areas of commitment and engagement were identified by separating the focus group participants into staff nurses and managers, directors, and educators and allowing these different groups to discuss their perspectives freely.

From these data, we were able to uncover bullying dynamics of aggression and exclusion, including selective reporting—relaying information to managers and administrators highlighting negative nursing behavior and omitting context—breeding a culture of failure that leads to deficiencies in nursing practice and patient care. We were also able to situate behaviors that were identified or ignored specifically owing to the socioclinical environment and the power gradient between administration and staff that can cause fear of retaliation, discourage reporting, perpetuate bullying behaviors, and stymie managers who seek solutions.

The last type of mapping, positional maps (actor response), described the positions taken (and not taken) by each group. These data yielded understanding of responses to bullying in 3 primary manifestations: acting as the guilty bystander, maintaining the status quo, and calling it out.

This grounded theory, derived through qualitative situational analysis, was validated using a quantitative method in a subsequent study[10] and found to be an accurate representation of relationships among the elements identified in the theory as intermediate outcomes of bullying in emergency nursing.

Emergency Nurse Assessment for Risk of Injury due to Firearms

Our exploration of this situation[11] was conducted using a mixed-methods approach, with survey data triangulated by qualitative data. Situational mapping showed that the human elements that contributed to assessment of firearm-injury risk included emergency nurses, their patients, and visitors, some of whom may have a history of firearm violence (e.g., gang members, visitors who bring weapons into the emergency department in states with concealed carry laws). Nonhuman elements included "the government" and the perception that asking about in-home access to firearms jeopardizes a patient's Second Amendment rights.

Social worlds mapping uncovered the importance of regional and local differences in the focus group participants' understanding of firearms-risk assessment. Some nurses viewed firearm prevention as a public health issue rather than an intrusive, confrontational question. In addition, in contrast to the survey findings, the focus group participants reported that local attitudes about firearm ownership and the pervasiveness of ownership affected the willingness of the nurse to ask about access to firearms, especially in rural communities where patients are likely to be known to health care providers.

Positional maps note the site of silence, which is ignored but is nevertheless obviously and painfully present. In this study, a critical finding was a fear of patients vs fear for patients. The focus group participants repeatedly discussed reluctance to ask patients about access to firearms and risk of injury, specifically because they worried that the patients had weapons on their person or readily available; if the patient became offended by the question, they feared

that the patient would use the gun on the ED staff. This finding was important because it describes a barrier to assessment that had not heretofore been acknowledged in the literature and may not have been uncovered using another method of inquiry.

Impact of Emergency Nursing Workload After Cannabis Legalization

This study[12] benefited from the use of situational analysis because ED patient presentations due to or complicated by cannabis use are a phenomenon involving personal, clinical, and societal understanding of cannabis use and its effects. The nonhuman elements included postlegalization effects such as wider availability of cannabis, stronger potency of hybrid varieties, inconsistencies in dosing and labeling, and lack of provider and patient knowledge regarding the plethora of cannabis products and related symptomology. The identified human elements comprised patients, their family members, and emergency nurses with social concerns about legalization and subsequent wider use of cannabis resulting in specific populations presenting in greater numbers with symptoms that lead emergency providers to suspect high patient illness acuity. The emergency department itself is a factor in the perception, creating a "problem of geography"[13] and leading nurses to perceive presentations involving changes in cognition as emergent. Importantly, we were able to identify a site of silence around the beneficial effects of cannabis use. The findings from this study yielded a deep understanding of educational and process deficits affecting emergency nurses and their ability to care for patients with cannabis-related symptoms.

Conclusion

Situational analysis is not commonly used in nursing research; yet, it is a valuable approach to examine complex situated phenomena such as those we encounter in the emergency setting. Research that leads to intervention should have a deep and rich understanding of the elements of a problem, including facilitators, barriers, and other situational and positional factors that affect nursing and patient outcomes. These 3 studies provide examples of complex phenomena and how using situational analysis as a qualitative approach uncovers elements that are not necessarily discoverable using other qualitative approaches.

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