THE LEADER BESIDE

Chris Dellinger, MBA, BSN, RN, FAEN

Co-Leading. Is it difficult? Intimidating? Fun? Comfortable because you share the load?

This is the fourth in a series exploring Co-Active Leadership (five types of leadership). Today, I am curious about the "Leader Beside."

When I look around my hospital, I see many instances of the Leader Beside in action. Many may never have considered it "leadership" because it does not fit the traditional model. But it is a valuable leadership style. Let us explore this beautiful dance!

I like to think the Leader Beside represents a strong, effective partnership. In it, both individuals lead, and they offer wisdom, insight, and guidance for every aspect of their duties. This is the leadership that happens when both take full responsibility for all the work. Yes, I said "all," because regardless of who handles which task in the moment, both accept responsibility for those tasks and the results. They are in it together.

So, it is a seamless partnership that flows intuitively between them. It may flow back and forth but not overstep boundaries because, for this leader, work is a partnership.

Sure, it may seem a mystery how two people seem to think and act as one in the moment and whose actions flow seamlessly between them. It is a dance where the two ebb and flow from spotlight to shadow, supporting, elaborating, and adding value to their co-leader's output. Each adds wisdom to the task at hand – they may gracefully step up and just as gracefully move back in service to – surprise! – the needs of the job as well as successful tasks, goals, and objectives.

Leaders Beside check any "must be seen as the one in charge" notions at the door and fully embrace the collaborative co-equal leadership mode. There is no jockeying for position, no one-upmanship, no competition, no sense of less than.

The work, activity – the purpose – thrives with the dual attention of two who work quite in sync with one another. Behold, the Leader Beside. Is it any wonder it is a "dance?"

How does that translate to the work we do? Take an ED setting, specifically a nurse and a physician. The two work simultaneously to provide optimal care for patients. They may need to work quickly, and when a true Leader Beside mode is in force, outsiders may see them as thinking as one person – anticipating needs, attuned to one another's actions, and aware of next steps. Does it matter which one makes the next move? Or deftly anticipates a need? The two work seamlessly with each other's strengths, weaknesses, preferences, and abilities. When two co-active leaders channel the Leader Beside, there is no "ME" present, but there is certainly a strong "WE."

Does that mean the two are coequals? Not necessarily, in rank at least. One may have more seniority, more status. But that is not what creates the leaders in this model. It is the sharing of knowledge, ability, presence, and trust. The Leader Beside team trusts one another to lean into what is needed in the moment, to anticipate, to support and to lead. The two are stronger for that coleadership.

The Leader Beside model of leadership enhances the balance between them. When they're working together, we see a true partnership and teamwork that achieves excellence in patient care, throughput, staff, and patient satisfaction.

The old saying, "TEAM means Together Everyone Achieves More" is fitting for this model. We must have a shared vision or common goal we work toward – together. We must embrace the synergy that has a significant impact on the department and our patients. The Leader Beside creates a greater sense of belonging to a higher purpose. Besides, being part of something bigger than ourselves leads to personal satisfaction and gratification, too.

I am convinced this type of leadership is a win-win. The Leader Beside elicits more involvement and integrates the strengths and weaknesses of each leader to form a fine

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balance of great leadership. Plus, when this model is active, everyone is uplifted because the model proves how we all have value to add and contributions to make. Everyone has something to bring to the table. When we are part of a Leader Beside environment, we are more willing to step up, accept responsibility, contribute, and bring our best selves to the table.

Just imagine the possibilities! What if we started mentoring new leaders in a Leader Beside model? How much might they learn when an experienced Leader in Front fully shares leadership? What an empowering thought for both. For the existing leader, it might be the joy of helping the emerging leader step up and grow. For the emerging leader, it might be the joy of having an amazing environment with support.

Either way, it is an empowering win-win-win – not only for the participants but for the organization itself.

Author Disclosures

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Writing for Publication in Emergency Nursing

Anna Valdez, PhD, RN, PHN, CEN, CFRN, FAEN, FAADN

Have you ever considered writing for publication? What stops you from writing? When I was an aspiring author, one of the things that stopped me was feeling that the process was unfamiliar and outside of my comfort zone. I was concerned that what I had to write about was not as important as the work of scholars whom I admired. Fortunately, I worked past that discomfort and decided to become an author. In part, I did this because I had a mentor who helped refine my writing. I share this because I know there are many emergency nurses worldwide with important stories, projects, and research to share. We at Journal of Emergency Nursing (JEN) want to read your manuscripts, and I hope this editorial inspires you to start writing. I am going to discuss some key considerations and some resources that are available to you to support your authorship at JEN.

Getting Started

The first step in writing for publication is preparing for success.[1] I recommend you begin by identifying what you want to write about and where you want to publish. Knowing this

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will help you to determine where to submit your manuscript. Have you researched, extensively studied a clinical topic, developed clinical practice guidelines, or completed quality improvement (QI) projects? If so, a scholarly journal such as JEN is the best place to publish. When considering what journal to publish in, you should consider whom you want to reach, what the journal typically publishes, and whether your topic adds something new to the scholarly literature.[1] Understanding who will be most interested in and impacted by your work will help you to choose the best journal for your topic. You can learn about journals and their readers by reading the journal's aims and scope statement. I also recommend looking at the types of papers they publish. For example, if you completed a QI project, you would want to submit the manuscript to a journal that publishes QI papers. You will usually find the type of papers accepted in the journal's author guidelines. Some journal editors will respond to author inquiries. As the Editor-in-Chief of JEN, I welcome emails from prospective authors. If you send an inquiry to a journal editor, I recommend including a draft abstract and discussing why you think the manuscript is appropriate for their journal. This can save you a lot of time because the editor can let you know whether or not they are interested in your paper. Keep in mind that there are many reasons that an editor may not be interested in your paper or may reject it, including having already published significantly on the topic. The 2 most common reasons I reject papers are that they do not fit JEN's aims and scope or they do not add anything new or impactful for emergency nursing practice.

There are other less intimidating options for writing for publication. For example, if you have a story or an opinion to offer, consider writing a blog or submitting an op-ed. JEN has a blog called "On the Other Side of the Rails." It focuses on patient experiences in the emergency department, but we may be expanding the blog's scope in the future. The JEN blog is located midpage on our website. You can also write for specific columns or sections in journals. JEN has numerous specialty-related sections. The articles published in these sections can range from 4 to 10 pages depending on the topic and information. One of the advantages of writing for sections in JEN is that we have section editors who work with authors to refine papers before they are submitted for review. They serve as editors and mentors for aspiring authors. You can find a complete list of the sections in JEN within the Instructions for Authors at www.jenonline.org. The editors' names and email addresses

are available in these author guidelines. If you decide to write a section article, you will start by emailing the section editor.

Predatory Publishers

When writing for publication, be wary of "predatory" publishers and journals. Journals considered predatory often have several red flags for authors, but you need to know what to look for. These journals often publish poor-quality articles, lack transparency in their editorial processes, may be deceptive, and engage in unethical research and practices.[2] Editors and staff of predatory journals may make promises about short peer review times and the ability to fast-track papers. They often send aggressive and persuasive emails to potential authors offering the opportunity to be published quickly. There may be a lack of transparency about publishing practices, including hidden article-processing fees.[2] JEN does not have article-processing fees. We offer the opportunity to pay to have your article open access (freely available), but that is not required. Importantly, publishing in a predatory journal can negatively affect the potential impact of your article and, in academic settings, could affect your ability to achieve tenure and promotion.

I always recommend that authors verify that the journal they submit a manuscript to for review is reputable and indexed. Kearney and INANE Predatory Publishing Practices Collaborative[3] recommends some questions that authors should ask when evaluating the integrity of a journal. Who is the editor of the journal? Are they experts in the field, and is there a way to contact them? Does the journal describe a clear process for ensuring the quality of published content? For example, do they describe their peer review process, including reasonable submission-to-publication times? Does the journal have sound business practices that include transparency about article-processing charges and accurate impact factor scores?[3] If you plan to publish your manuscript in a nursing journal, I recommend you check the International Academy of Nursing Editors (INANE) journal directory. INANE maintains this directory to assist authors in identifying reputable journals in which to publish their work.[4] The directory includes only reputable journals that have been vetted for inclusion. It also includes the Editor-in-Chief's contact information.

Resources for Authors

The JEN editorial team and our publisher, Elsevier, offer several resources to support you in writing for publication. You can find our aims and scope statement on the JEN website to determine whether JEN is the best journal for your paper. You will also find detailed author guidelines. These should be closely followed. These resources are listed under the "Publish" link at the top of our webpage at www.jenonline.org. If you scroll to the middle of the page, you will find a webinar about navigating the publishing process. It is open access and may be shared broadly. This webinar is also available at no cost in ENA University.

Elsevier has several useful resources for authors. When you are ready to submit your manuscript for peer review, you will be directed to the Editorial Manager manuscript processing website by using the "submit" link. Once you create an account, you will see a box featuring several videos and resources that walk you through the submission process. In addition, Elsevier has a free e-learning platform called Elsevier Researchers Academy that offers several free videos from experts in the publishing world that can help you as an author. I think the modules are valuable for all authors, not just researchers. You can access the Elsevier Researcher Academy at https://researcheracademy.elsevier.com/. Another excellent resource for authors and peer reviewers is the free online Certified Peer Reviewer Course from Elsevier. I recommend that new and experienced authors complete this training. Authors will be able to learn what peer reviewers look for during review, which helps to demystify the publishing process and better prepare you for a successful publication. The Certified Peer Reviewer Course program is accessible at https://researcheracademy.elsevier.com/navigating-peer-review/certified-peer-reviewer-course.

JEN Mentoring Opportunities

This year, JEN editors will present on writing for publication at the Emergency Nursing 2024 Conference in Las Vegas, NV, September 4 to 7 (ena.org/event/2024/09/04/ena-annual-conferences/emergency-nursing-2024). In addition, we plan to host a publishing lounge at the conference where aspiring and experienced authors can speak one on one with editors and editorial board members about writing for publication. We encourage you to bring your ideas, papers, outlines, or anything you have questions about. Our editorial team will be there to offer advice and potential mentor opportunities. We hope you will visit us, even if you just want to say hello or offer feedback about JEN. As usual, our JEN booth will be in the Emergency Nurses Association Experience Hall, and we welcome you to visit with us there.

Conclusion

JEN is an international journal that publishes articles about emergency nursing in all settings, roles, and geographic regions. Our editorial team wants to read about your innovations, projects, research, and clinical work. We invite you to submit a paper to JEN, send an email inquiry, or visit us this September at the Emergency Nursing 2024 Conference so we can offer support and guidance on how to write for publication.

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LETTER TO THE EDITOR

Letters to the Editor are encouraged and may be submitted at jenonline.org where submission instructions can be found in the Author Instructions.

Self-Tracheostomy: Analysis of Google Trends

Dear Editor:

In late January 2024, a surge in Google Trends searches related to the term "tracheostomy" was observed in a small region of Central Italy (Figure). Google Trends is a Google analytics tool that enables the investigation of user search trends worldwide. Through this tool, one can identify the most searched keywords and popular topics within a specific time frame. Google Trends normalizes search data to facilitate comparison between terms. Search results are normalized based on the time and location of a query through the following procedure:

- Each data point is divided by the total searches in the geographic area and time interval it represents, to compare relative frequency. Without this normalization, geographic areas with higher search volumes would consistently rank higher.
- The numerical results are then scaled into a range from 0 to 100 based on the topic's proportion among all searches on all topics.[1]

For many years, the importance of search trends in understanding health phenomena has been the subject of study.[2] The surge in searches coincided with the publication of news regarding a case of self-inflicted tracheostomy in the city of Assisi, Umbria (Italy).[3] A 63-year-old man, experiencing an allergic reaction and sudden respiratory failure, reportedly performed a tracheotomy on himself using a box cutter. He then presented to the emergency department, where a cannula was inserted through the self-created opening, and was subsequently transferred to the intensive care unit without any complications.[3] Tracheostomy and cricothyrotomy are surgical interventions that carry potentially life-threatening complications and should only be performed by adequately trained health care professionals.[4] We identified only 1 scientific article addressing a similar case,[5] and we are unaware of whether similar situations have resulted in different outcomes. Depictions of such scenarios in fictional media, such as films,[6] may influence individuals, particularly those with a high degree of self-assurance but lacking proper training, to attempt emergency tracheotomies unnecessarily.

We concur with our colleagues[5] that documentaries and health programs should always caution viewers about the potential complications arising from these procedures when performed by unqualified personnel.

The spike in Google Trends searches for "tracheostomy" underscores the necessity for responsible public health messaging and educating the public about the risks of untrained and unsupervised medical procedures. Further research is warranted to investigate the long-term impact of media portrayals of such procedures and to develop effective strategies for mitigating potential risks.—*Gian Domenico Giusti, RN, CCRN, MSN, Azienda Ospedaliera di Perugia, Perugia, Italy; E-mail: giandomenico.giusti@unipg.it; and Nicola Ramacciati, RN, MSN, PhD, Department of Pharmacy, Health and Nutritional Sciences, University of Calabria, Rende (Cs), Italy.*

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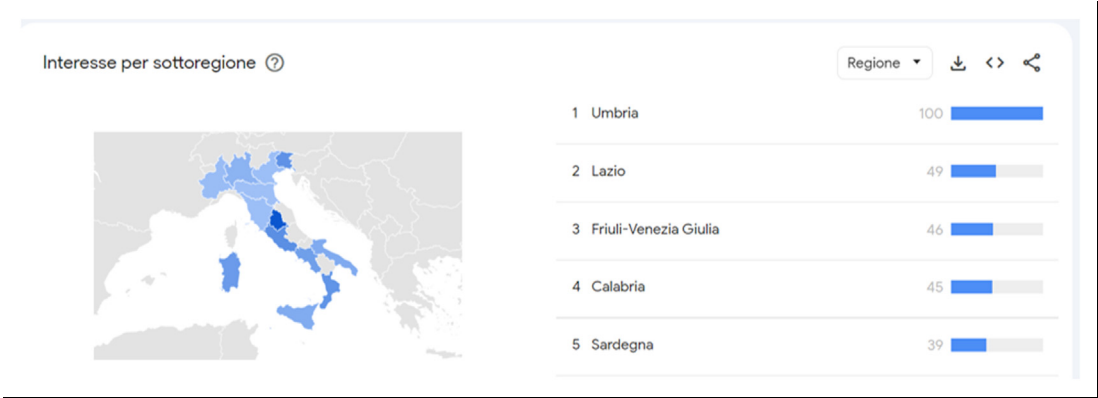
FIGURE

Google Trends research "tracheostomia" (January 20, 2024).

ACCESS TO QUALITY HEALTH CARE

EMERGENCY NURSES ASSOCIATION

Description

Access to quality health care continues to be a global issue. The World Health Organization (WHO) (WHO, 2020) defines quality of care as health services increasing the possibility that identified health outcomes are consistent with evidence-based knowledge, including health promotion, prevention, treatment, rehabilitation, and mitigation. Additionally, WHO identified specific outcomes to work toward the goal of primary care for all global inhabitants (WHO, 2019a). Emergency departments were originally designed for acute emergent visits but have become the safety net for those who lack access to quality health care. Access to quality health care in the future is not clear or certain. Currently, emergency departments around the world are the primary access points for many to receive health care (Udalova et al, 2022; WHO, n.d.-a; WHO, 2019b). The global increase in ED patient visits for preventable, low acuity, nonemergent conditions is due to numerous social determinants of health, including, but not limited to, economic, environmental, or social conditions (Riwitis & Navarroli, 2023; Udalova et al, 2023; WHO, n.d.-a).

As of 2020 in the United States, ED visits exceeded 131 million annually (Cairns & Kang, 2022). In 2018, a 10-year study completed by the Healthcare Cost and Utilization Project revealed an increase in ED visits for all age groups and, most notably, a 20% increase for the 45- to 65-year-old age group (Sun et al, 2018). Disparities in access to health care and costs continue to be debated. The Affordable Care Act (ACA) was signed into law in 2010 with the goal to improve access by making health care more affordable. According to the Kaiser Family Foundation (2023) the ACA Medicaid expansion extended coverage to adults by adding eligibility for those with incomes up to 138% of the federal poverty level. Additionally, states were given an enhanced federal matching rate to expand coverage, increasing coverage to adults in 40 states and Washington, DC (Kaiser Family Foundation, 2023).

Many low-, middle-, and high-income countries offer government-guaranteed health care, otherwise known as universal health care (UHC), offering access to some level of health care based on a government's legislation, regulation, and/or taxation. The countries that have a form of UHC coverage have emergency care visits that are often an entry point for patients because of cost and access barriers. In some of these countries, emergency services are utilized more because of ease of access and by people with lower income because services are not billed, nor do they require copayments (Eurofound, 2019). The management of these systems varies by country. There are some countries where the government manages the entire health care system, such as the National Health Service for countries of the United Kingdom (UK) (Vankar, 2023). Other countries, such as Canada, use taxation and a single payer system, even though each of the 13 Canadian provinces and territories determine the care delivered (Dhalla & Tepper, 2018; Tikkanen, 2019). Citizens of countries in the European Union (EU) make contributions through their employer to use private insurance companies that are government regulated (Tikkanen, 2019).

The barriers associated with access to quality health care are multi-modal, vary by country, and require different strategies to eliminate barriers and improve care. While providing quality health care has its challenges, it should include an ongoing patient-health care provider relationship, especially in areas such as behavioral/mental health and reproductive health. Caring for behavioral and mental health conditions such as substance use disorder requires a solid patient-health care provider relationship to manage ongoing care, including medications. Unfortunately, due to the typical cycle of addiction, with remissions and exacerbations, many patients find themselves in the emergency department either by choice or necessity. In the U.S., options for access to care for substance use disorder have been limited, carry a heavy cost burden, and are often not covered by insurance (U.S. Department of Health and Human Services [HHS], Office of the Surgeon General, 2016). In fact, the U.S. has one of the highest mental health burdens with a lower capacity to care for patients than ten other high-income countries (Tikkanen et al, 2020). According to Tikkanen et al (2020), a number of other high-income countries are removing cost barriers by operating specialty

clinics and waiving copayments for mental health care. While there are some cities and regions of the U.S. trying to improve mental health care, barriers remain. Patients around the world, particularly women, need quality reproductive health care. However, issues regarding a patient's right to choose are evident in many areas with laws restricting access to some reproductive health services.

Another example of barriers to access was highlighted during the global COVID-19 pandemic. Surge volumes from the pandemic created an even greater mismatch in supply and demand for care, with high patient volumes in emergency and inpatient settings and shortages of not only personnel but personal protective equipment (Centers for Disease Control and Prevention [CDC], 2023, July). Innovative strategies for addressing some of these barriers, such as outdoor and drive-through virus testing, outdoor health care provider visits at urgent care facilities, and expanded telehealth services, emerged during the COVID-19 pandemic. Emergency nurses were on the front lines of many of these creative solutions. However, many were disease-specific, and some were time-limited. Therefore, they are not a solution to the breadth and depth of problems limiting access to care.

Emergency Nurses Association Position

It is the position of the Emergency Nurses Association that:

1. All people have the right to equitable access to affordable, comprehensive, quality health care services for critical, acute, and chronic conditions, including mental health, substance use disorders, reproductive health, and gender-affirming care, regardless of socioeconomic status or geographical location.
2. Strategies involving all stakeholders are needed to support growing the health care provider workforce, including targeted funding for nursing education, including student loan forgiveness.
3. All health care providers be allowed to practice to the full extent of their educational preparation and scope of practice and receive equitable reimbursement for services provided.
4. Contributions to advocacy efforts on local, state, national and international level are aimed at improving access to affordable, comprehensive, high-quality health care for all.
5. Access to affordable, comprehensive, high-quality health care be expanded through prioritization, exploration, implementation, and reimbursement for use of emerging technologies, such as telemedicine.
6. Emergency nurses participate in the development and delivery of public information for preventive, community, and primary care resources to mitigate nonemergent use of emergency services.
7. Emergency nurses support confidentiality between patient and health care providers and delivery of evidence-based health care with patient safety as the highest priority.

Background

Access to affordable, comprehensive, and high-quality health care substantially affects a number of social determinants of health such as physical, social, and mental health outcomes (Agency for Healthcare Research, 2016; County Health Rankings & Roadmaps, n.d.; Healthy People 2030, n.d.-a, n.d.-b; Riwitis & Navarroli, 2023). Access to health care varies across the globe and is dependent upon several factors.

Health inequities are avoidable differences in health care, often related to social, economic, demographic, and geographic difference among populations (Riwitis & Navarroli, 2023). According to the Centers for Disease Control, Office of Health Equity (n.d.), health equity is achieved when people attain full health potential, regardless of other social determinants. Awareness of the concept of health equity is crucial for effective health care policymaking. While not all people need or desire the exact same type of health care access, the focus of health care policy should include the goal of addressing barriers to health care access including, but not limited to, gender-affirming care.

Ideally, individuals access the health care system through a primary care provider to receive comprehensive, affordable, community-based care (WHO, 2019a). Primary care providers offer a usual source of care, early detection and treatment of disease, chronic disease management, and preventive care (Healthy People 2030, n.d.-a). According to the CDC, in 2022 it was estimated that 87.6% of U.S. citizens over age 18 had a consistent source of care (CDC, National Center Health Statistics, n.d.-a, n.d.-b). Of those, 83.4% had a visit with their primary care provider on an annual basis (CDC, National Center for Health Statistics, n.d.-a; Schiller & Norris, 2023a). However, for many

individuals, the emergency department is a primary source for health care, as evidenced by nearly 29% of all emergency visits in the U.S. being for nonemergent triage levels four or five (Cairns & Kang, 2022; Udaloave et al, 2022).

The cost of health care or the ability to pay for care is a barrier to access for many. Globally, nearly 800 million people spend 10% of the household budget for health care, and of those nearly 100 million state that the cost of health care forces them into poverty (WHO, 2017). Many low-, middle-, and high-income countries rely on UHC to provide basic health care coverage to their citizens. A number of high-income countries guarantee government or public health coverage to all residents, with some countries such as France providing residents the option of purchasing private coverage (Gunja et al, 2023).

The U.S. enacted the ACA in 2010 to expand access to health care and in subsequent years has expanded coverage (KFF, 2023). Prior to the ACA, 16% of all people in the U.S. were uninsured (Cohen et al, 2011). However, Cohen et al (2019) found that after ACA 9.3% of all people were uninsured. Additionally, Cohen and Cha (2023) found that 8.4% of the population still remained uninsured in 2022. In the U.S., 6.1% of adults aged 18 and over failed to obtain medical care between January and December 2022 due to costs (Schiller & Norris, 2023a, 2023b). Additionally, higher out of pocket expenses may result in delays in accessing health care, further contributing to individuals seeking care in the emergency department.

Having health insurance or UHC facilitates access to primary care, specialists, and emergency care. However, it does not ensure access. Access to high-quality providers in close proximity is a crucial factor in health care access (County Health Rankings & Roadmaps, n.d.). Around the globe people who live in rural settings face unique challenges accessing health care services, such as limited facility or provider options and/or extensive travel to receive care. According to the World Health Organization (n.d.-b) nearly half of the world population live in rural or remote areas, with 4 out of 5 living in extreme poverty. An estimated 15% of the U.S. population live in rural areas and experience higher rates of death from five leading preventable causes including heart disease, cancer, unintentional injury, chronic lower respiratory disease, and stroke compared to the urban populace (CDC, 2023, April). Worldwide, rural areas also experience higher rates of illness and death due to poor access to health care, the

causes of which are difficult to quantify due to measurement difficulties but logically include geographic location, level of poverty, and availability of health care workers. Access to health care for those living in rural or remote areas continues to be a challenge, primarily due to a global shortage of health care workers (HCW). Regardless of a country's economic standing, shortages of health care workers still pose a significant issue because 75% of physicians and 65% of nurses globally work in urban areas, despite the fact that half of the world's population lives in rural areas (Makuku & Mosadeghrad, 2022). In fact, the World Health Organization (2021) estimates that there will be a shortage of 18 million HCWs by 2030, primarily in rural, low- and middle-income settings. The International Council of Nurses (n.d.) estimates, the world could see a shortfall of up to 13 million nurses. It is projected that by 2034, the U.S. will experience a shortage of between 37,800 and 124,000 physicians, with rural and other underserved areas experiencing the shortages more acutely (Association of American Medical Colleges [AAMC], 2021). The issue of HCW shortages creating lack of access to care is not isolated to one or two countries, but rather, it is an international issue of recruitment, migration, supply, and demand.

One solution to improving access to health care and combatting the looming shortages is to use nurse practitioners (NPs). The first U.S. NP program began in 1965 to address the limited access to care available to underserved pediatric patients in rural areas (McComiskey, 2018). Since the first U.S. programs began there has been a global increase in the use of NPs to provide care. In addition to the U.S., seven other countries, Australia, Canada, Finland, Ireland, the Netherlands, New Zealand, and the United Kingdom, utilize NPs to provide access to quality health care (Maier et al, 2018). According to the American Association of Nurse Practitioners (AANP; 2020), NPs provide quality care, treat patients in a variety of settings across the health spectrum, and improve access by serving underserved populations. In fact, a recent study revealed an increase of 43.2% of NPs practicing in rural areas from 17.6% in 2008 to 25.2% in 2016 (Barnes et al, 2018). As demand for health care access expands globally, it is important to understand that NPs are highly trained and able to provide a variety of services and are poised to fill the gap of access to care for underserved populations around the world (American Nurses Association, n.d.; Australian College of Nurse

Practitioners, n.d.). Despite the growing trend to utilize NPs to improve access to care, there are a number of barriers to their ability to practice in the U.S. and internationally. Depending on geographic location, the barriers, often based on country, state, or local laws, might include restrictions on prescribing authority, restrictions on practice, such as ordering diagnostics, or negative physician and administrator relations. Where autonomy or respect are not evident and NPs may be forced to relocate their practice (Beadnell, 2019; Scanlon et al, 2019; Schirle et al, 2020).

Access to evidence-based reproductive health care is a serious concern following the *Dobbs v Jackson Women's Health Organization* ruling by the Supreme Court on June 24th, 2022 (Coen-Sanchez et al, 2022; Schreiber et al, 2023). In the U.S., legislative control of abortion may now be determined at the state level, potentially resulting in a lack of patient access and treatment of medical reproductive emergencies (Harris, 2022; Vinekar et al, 2022). This leads to conflict between the requirements of the Emergency Medical Treatment and Labor Act (EMTALA) and state level decisions due to the uncertainty of the definition of "emergency" and the need to determine a clear threat to life (Rosenbaum et al, 2022). This uncertainty may result in a delay in the delivery of lifesaving care, potentially resulting in detrimental effects on the patient's clinical status (Schreiber et al, 2023). There are a number of areas of concern. First, there is the interference of the legislature in the patient-health care provider relationship wherein legislators without medical education and training are making decisions about health care situations without the experience or knowledge required to make informed decisions. There is also the requirement to anticipate and seek clarification during an emergency situation, removing patient and practitioner autonomy and increasing risk to the patient. In addition, practice variations throughout the country result in the availability of patient care being dependent on the services they can access, which often depends on where they reside.

In the complex health care environment, ensuring access to affordable, comprehensive, quality health care is a daunting task. The entire ED team has a part to play in advocating for policies to support advancing of education and development of staff roles to full scope of practice, removing barriers to access, and informing the public of resources for avoiding nonemergent use of the emergency department.

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SUBMANDIBULAR SIALOLITHIASIS MIMICKING LUDWIG'S ANGINA: A CASE REPORT AND BRIEF CLINICAL REVIEW

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Abstract

The "double tongue sign" is a characteristic finding in patients with Ludwig's angina, a potentially life-threatening infection due to airway compromise. Management primarily focuses on early airway protection and antibiotic administration. Submandibular sialolithiasis, on the other hand, could present with the double tongue sign without symptoms suggestive of airway involvement. Unlike Ludwig's angina, conservative treatment is usually the first-line approach for sialolithiasis. The importance of rapidly recognizing and distinguishing between the 2 conditions is emphasized through effective triage and risk stratification, particularly in rural areas where physicians are not readily available.

Introduction

Ludwig's angina is a severe, rapidly progressing gangrenous cellulitis affecting the sublingual, submandibular, and submental spaces.[1] The annual incidence was reported at 2% in patients with oral or dental infections.[2] Numerous etiologies are associated with the development of Ludwig's angina, with odontogenic infection accounting for the majority of cases.[3,4] Other risk factors include immunocompromise, malnutrition, diabetes, alcoholism, poor oral hygiene, and trauma.[3-5]

The diagnosis of Ludwig's angina is primarily based on clinical presentation. It commonly manifests with swelling and redness in the neck, along with a protruding or elevated tongue, and more advanced symptoms such as trismus, drooling, dysphagia, and tripod positioning suggestive of airway involvement.[1] Physical examinations reveal a tender, indurated submandibular area, along with lingual swelling.[6] The "double tongue sign" is a characteristic finding in Ludwig's angina, referring to an elevated or protruded tongue upwards due to the swelling and inflammation of the floor of the mouth.[7] Computed tomography (CT) is valuable in determining the extent and location of infection, boasting a sensitivity of 95% and a specificity of 80% when combined with clinical examination.[8]

Treatment involves emergent airway management (awake nasotracheal intubation when indicated prior to rapid surgical management or a surgical airway) and empirical antibiotic therapy.[9] Surgical incision and drainage are performed in cases of severe airway compromise.[10] Early recognition and treatment of Ludwig's angina are paramount due to its tendency to spread rapidly to surrounding tissues, potentially leading to airway compromise. The mortality rates is up to 50% if left untreated.[11] With prompt management, the mortality rate can be lowered to 4% to 8%.[12,13]

However, the similar clinical presentations can be linked to other medical conditions. The following case had the "double tongue sign," which initially was thought to indicate Ludwig's angina and later determined to be caused by submandibular sialolithiasis, a common cause of obstructive salivary gland disease. This case highlights the importance of early recognition of Ludwig's angina and its mimics. It also underscores the crucial role of emergency triage nurses in conducting comprehensive initial assessments, particularly in situations where emergency airway care is not immediately available.[14]

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Case presentation

A 30-year-old woman presented to the emergency department with progressive post-prandial pain over the floor of her mouth for the past 2 days. She did not experience fever, odynophagia, dysphagia, or dyspnea. Her medical history revealed mediastinal NK-T cell lymphoma with complete remission for 7 years. Upon physical examination, significant edema, erythema, and tenderness were noted in the floor of the mouth (Figure A). Her pain was rated as 3 on the Visual Analog Scale. The patient appeared afebrile, without trismus nor stridor identified on auscultation. No erythema was observed on her neck, and palpation of the neck revealed no lymphadenopathy, with unrestricted and pain-free neck movements. The initial differential diagnosis included Ludwig's angina, salivary gland disorder, sublingual hematoma, lymphadenitis, and recurrent lymphoma.

Diagnosis and Treatment

The laboratory revealed a normal white blood cell count (7.45 K/µL), normal creatinine level (0.7 mg/dL), normal sodium (138 mmol/L) and potassium level (4.6 mmol/L). A CT scan of the neck was arranged because of the suspicion of Ludwig's angina. The findings revealed no disruption of fat planes in the submandibular space, nor the presence of gas bubbles or fluid accumulation. Instead, the scan showed dilatation of the left submandibular duct (Figure B) and a
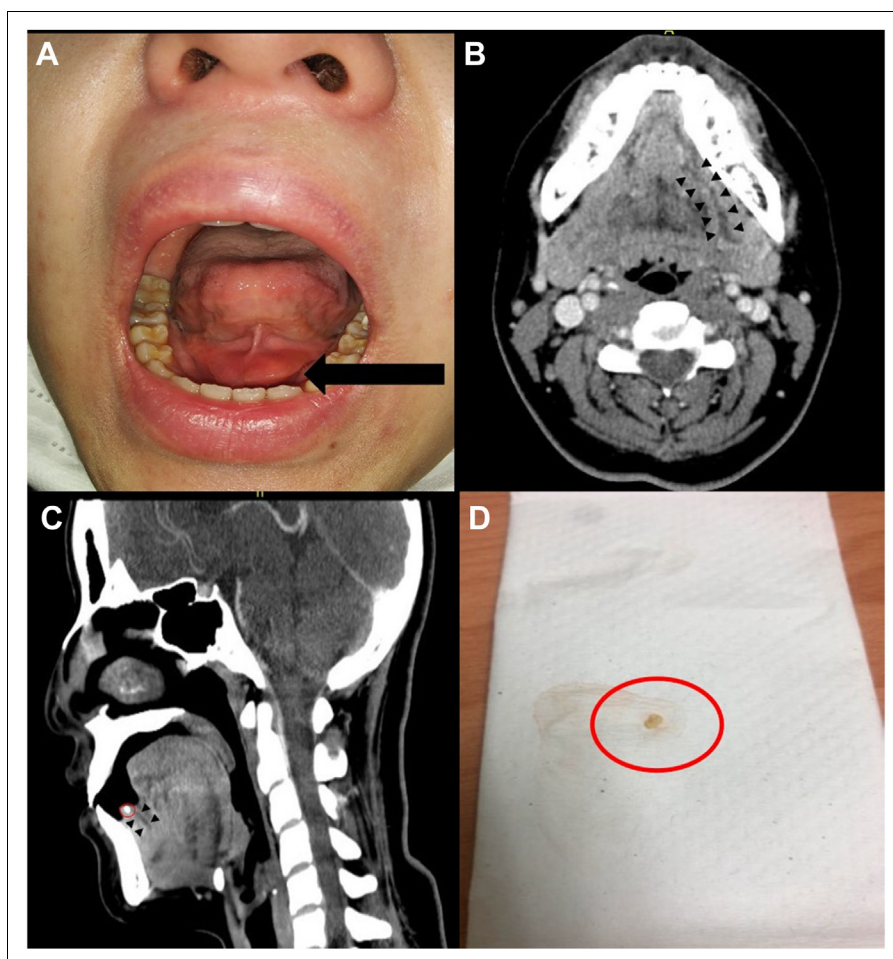
FIGURE

(A) Physical examination revealed marked edema and erythematous change of the submandibular space, contributing to the appearance of a second tongue (arrow). (B) Contrast-enhanced computed tomography revealed dilatation of the left submandibular duct (arrowheads). (C) A 4 mm-sized left submandibular sialolithiasis (arrow) was identified at the distal submandibular duct (arrowheads). (D) A 4 mm-sized submandibular stone was retrieved.

small calcified spot on the left anterior floor of the mouth at the distal part of the submandibular duct (Figure C). Left submandibular sialolithiasis was diagnosed and the laryngologist was consulted. A lithotomy was performed smoothly and a 4 mm stone was removed under local anesthesia (Figure D). The patient was discharged with oral antibiotics and analgesics. Her symptoms resolved during the outpatient follow-up.

Discussion

The "double tongue sign" refers to the elevation of the oropharyngeal floor caused by soft tissue swelling of the submandibular space, leading to the appearance of a second tongue. Differential diagnosis of the double tongue sign included angioedema, cellulitis, oropharyngeal carcinoma, lymphadenitis, peritonsillar abscess, sublingual hematoma, and salivary gland disorder.

The most common and severe cause of the double tongue sign arises from gangrenous cellulitis affecting the sublingual, submaxillary, and neck spaces, a condition known as Ludwig's angina.[15-17] Two-thirds of individuals with Ludwig's angina present with odontogenic infection simultaneously.[4,11] Immunocompromise, malnutrition, diabetes, alcoholism, obesity, poor oral hygiene and trauma are potential risk factors.[3-5,11,18] Streptococcal species, anaerobes (Fusobacterium species, Peptostreptococcus species, Actinomyces) were common microbes, however, concerns for methicillin-resistant staphylococcal aureus had been increasing recently.[19,20] For nurses encountering patients for the first time, the presence of advanced symptoms like trismus, drooling, dysphagia, and the tripod position may indicate the need for urgent airway management. It is imperative that such clinical observations be communicated to the physicians without delay. CT is the imaging of choice for evaluation of the extent of and for exclusion of this condition in early or unclear cases.[1] The typical findings on a contrast-enhanced CT scan for Ludwig's angina include increased attenuation and thickening of subcutaneous fat, disruption of fat planes in the submandibular space, and the presence of gas bubbles and fluid accumulation within soft tissues.[17]

Airway protection including elective awake tracheostomy, rapid sequence intubation-assisted endotracheal intubation, emergent cricothyroidotomy, early surgical decompression, and the use of broad-spectrum antibiotics are the components for successful treatment.[1,14,21-24] Early identification and mitigation of deleterious consequences demand special attention on patients exhibiting signs of mandibular molar infection, generalized malaise and toxic appearance, a muffled voice, a held-open mouth due to lingual edema, a double tongue sign and a "woody" induration accompanied by crepitus and erythema of the oral cavity's floor.[20,25] Outcomes for Ludwig's angina vary from full recovery to grave complications leading to airway obstruction, septic shock, or death.[1,21,26]

Submandibular sialolithiasis represents most (50%) obstructive salivary gland diseases.[27] Typically, the symptoms of sialolithiasis are oral pain and neck edema, while oral intake would significantly aggravate these symptoms. However, about one-third of these patients with submandibular sialolithiasis are painless, and 10% have pain without swelling.[28] The diagnostic imaging tools include sialography, ultrasonography (US), CT, and magnetic resonance imaging.[29] Ultrasound plays a crucial role for evaluation of the major salivary glands, exhibiting a high sensitivity of 90% and specificity of 97% for sialolithiasis.[30] CT is the most commonly used imaging of choice[29] for the evaluation of salivary gland stones and the severity of complications.[31]

In emergency departments, nurses play a crucial role in conducting initial assessments of patients during triage and in patient diversion, identifying the need for emergent physician evaluation for possible airway care in cases of Ludwig's angina. In rural areas where specialists are not readily available, nurses frequently serve as the primary health care providers, responsible for assessing patients and guiding them to the appropriate level of care.[32,33] Comprehensive history-taking and a detailed physical examination are essential, especially symptoms indicative of airway involvement, for distinguishing between the 2 conditions. In our case, although focal swelling and tenderness around the submandibular gland (the double tongue sign) mimicked Ludwig's angina, the patient lacked toxic appearance, redness and swelling in the neck, trismus, drooling, dysphagia, muffled voice, or tripod positioning. Additionally, CT scans revealed no soft tissue attenuation, gas, or fluid accumulation. Sialolithiasis was diagnosed, and her symptoms subsided following the retrieval of the stone.

Implications for Advance Practice

The strategy for treating sialolithiasis changes depending on the sialolith's location and size.[34,35] Usually, the primary management of sialolithiasis is done with conservative measures, especially a stone less than 5 mm in size and located in the distal duct.[35] This includes applying moist heat and gentle massage to the salivary gland, and staying well hydrated. Sour foods with citric essences

(ie, lemon drops) can help stimulate the salivary glands and promote salivary flow, enabling the passing of smaller stones.[34,36,37] Nonsteroidal anti-inflammatory drugs can reduce pain and swelling and an antibiotic may be prescribed if there is evidence of infection.[38] Steroids were not routinely recommended for use but showed some treatment effect with the combination of sialendoscopy with ductal dilation in some case reports.[39] Operative management should be considered when stones are inaccessible or larger in size, and options include sialendoscopy, laser lithotripsy, extracorporeal shockwave lithotripsy, transoral surgery, and submandibular gland adenectomy.[40] In our patient, a lithotomy was performed under local anesthesia. Moreover, reoccurrence rates of between 1% and 8.6% were reported with the presence of micro-calculi and debris within the gland or the lumen after the passing or retrieval of the stone.[41-44]

Conclusion

Awareness of symptoms suggestive of airway involvement, such as redness and swelling in the neck, trismus, drooling, dysphagia, muffled voice, or tripod positioning, along with the double tongue sign, underscores the importance of early recognition in patients with Ludwig's angina. Without symptoms of airway involvement, other causes of the double tongue sign should be considered, as in the case of our patient with sialolithiasis. CT is the imaging of choice for excluding Ludwig's angina and differentiating other etiologies resulting in the double tongue sign. Airway protection and administration of antibiotics are the mainstay treatments for Ludwig's angina. In contrast, sialolithiasis typically requires conservative management. Emergency nurses in triage can play a vital role in identifying cases requiring emergency airway care. Additionally, nurses in rural areas should be familiar with the symptoms of Ludwig's angina.

Author Disclosures

Conflicts of interest: none to report.

Data, Code, and Research Materials Availability

Ethical statement: All authors ensured that

1. This work adheres to all elements of Elsevier's Patient Consent policy
2. The patient provided the authors with written consent.

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CASE REVIEW

A Rare Cause of Coagulopathy in the Emergency Department: Cefoperazone Use

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Contribution to Emergency Nursing Practice

- Cefoperazone (CPZ) is an antibiotic widely used for moderate to severe infections, especially in countries where resources are difficult to access. This combination is among the top 10 antibiotics prescribed for hospital-acquired infections. Side effects of CPZ/sulbactam include coagulation disorders and associated bleeding, abdominal pain, and diarrhea.
- Coagulopathy caused by CPZ use can cause life-threatening, serious bleeding.
- Vitamin K is effective in the treatment of coagulopathy that develops due to CPZ use.

Abstract

Cefoperazone (CPZ) is an antibiotic widely used for moderate to severe infections, especially in countries where resources are difficult to access. This case report aimed to draw attention to coagulopathy, a potential side effect of CPZ. This side effect can cause high mortality and morbidity in patients. In the mechanism of CPZ causing coagulopathy, it is reported that effects such as binding to vitamin K, disrupting vitamin K metabolism, and preventing platelet aggregation are responsible. In this presentation, a case who came to the emergency department with the complaint of hematuria caused by coagulopathy after the use of CPZ-containing antibiotics (CPZ + sulbactam) is presented.

Key words: Cefoperazone; Vitamin K; Coagulopathy; Hematuria

Introduction

Cefoperazone (CPZ)/sulbactam combination is widely used by doctors worldwide, especially in countries where access to resources is difficult (China, India, Thailand, etc), in hospital-acquired and resistant infections. Reports on the use of CPZ combinations generally come from China, India, Thailand, and rarely, Turkey.[1] Side effects of CPZ/sulbactam include coagulation disorders and associated bleeding, abdominal pain, and diarrhea.[2] Although the frequency of coagulopathy caused by CPZ use is not clearly known, previous studies on intensive care patients have reported that it was seen at a rate of 26% and 34.5%.[3,4]

This case report aimed to draw attention to the fact that CPZ may cause coagulopathy, that it should be used with caution in patients at risk of bleeding, and the effectiveness of vitamin K in the treatment of coagulopathy caused by CPZ use.

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TABLE
3-day laboratory parameter changes of the patient

	First day	Second day	Third day
WBC (10^3/μL)	15.44	12.59	12.33
Platelet (10^3/μL)	119.0	119.0	138.0
Hemoglobin (g/dL)	9.5	8.6	8.6
Creatinine (mg/dL)	2.58	1.42	1.42
AST (U/L)	14.9	17.5	24.3
ALT (U/L)	1.7	2.6	3.5
T.bil. (mg/dL)	0.59	-	-
ALP (U/L)	62.0	-	54.1
GGT (U/L)	31.2	-	24.3
PT (s)	96.0	22.0	17.8
APTT (s)	52.0	29.0	26.4
INR	9.62	1.96	1.56

ALP, alkaline phosphatase; ALT, alanine transaminase; APTT, activated partial thromboplastin time; AST, aspartate aminotransferase; GGT, gamma-glutamyl transferase; INR, international normalized ratio; PT, prothrombin time; T.bil., total bilirubin; WBC, white blood cell.

Case Presentation

A 75-year-old female patient was admitted to the emergency department with complaints of moderate abdominal pain in bilateral lower quadrants and light red hematuria that had been going on for 3 to 4 days. The patient's vital signs were blood pressure of 218/94 mm Hg, heart rate of 74/minute, respiratory rate of 14/minute, and oxygen saturation of 97%. Review of systems and physical examination was unremarkable. In her laboratory parameters, kidney injury and delayed international normalized ratio (INR), prothrombin time (PT), and activated partial thromboplastin time (APTT) of unknown origin were detected. No liver or urogenital system pathology was detected in the abdominal ultrasonography. The patient did not have any history of anticoagulant drug use. In addition, the patient did not have a history of taking any supplements and/or natural foods that could cause coagulopathy. In the patient's history, it was learned that she was hospitalized 15 days ago caused by pneumonia and had a history of CPZ use for 10 days, and the patient's symptoms started 1 day after discharge. The patient's current clinical condition and laboratory parameters were evaluated as CPZ-induced coagulopathy, and the patient was treated with a single dose of intravenous 10 mg vitamin K1. After vitamin K1 treatment, the

INR value decreased to 1.56, PT 17.8 seconds, and APTT 26.4 seconds. The patient, whose clinical and laboratory findings returned to normal, was discharged with full recovery. The patient's laboratory parameters and 3-day changes are presented in the Table.

Discussion

CPZ is a third-generation cephalosporin with broad-spectrum antimicrobial activity against Gram-positive and Gram-negative organisms, including Enterobacterales, *Pseudomonas aeruginosa*, and Acinetobacter spp.[5] The CPZ/sulbactam combination has strong antibacterial effects and β-lactamase stability. Therefore, CPZ is widely used in the treatment of moderate to severe infections such as respiratory tract infections, cholecystitis, urinary tract infections, peritonitis, sepsis, skin and soft tissue infections, meningitis, bone and joint infections, pelvic inflammation, gonorrhea, endometritis, and other reproductive tract infections.[6]

It is thought that the coagulopathic effect of CPZ may be related to several mechanisms.[6-8] (1) It may be related to the presence of N-methylthiotetrazole side chain in CPZ, which has a molecular structure similar to glutamate. This structure binds competitively to vitamin K1 and glutamate carboxylase in liver microsomes. This situation affects the synthesis of vitamin K–dependent clotting factors II, VII, IX, and X, causing coagulation dysfunction in the body.[2] The carboxyl group in the 7C atom substituent of cephalosporin prevents platelet aggregation and causes bleeding[3] In addition, CPZ cannot be metabolized efficiently in the body, and more than 40% is excreted from the bile duct through the intestines. CPZ inhibits normal intestinal flora and vitamin K synthesis in the intestine, leading to vitamin K–dependent prothrombin hypoxemia. These effects result in coagulation dysfunction characterized by prolonged INR, PT, and APTT and a bleeding tendency.

Previous publications have reported that, although rare, coagulation disorders (PT/APTT/INR elevations) and associated bleeding with high mortality and morbidity may occur in patients using CPZ.[9-13] One of these is a case report that shows us that applying CPZ treatment to patients with a high risk of bleeding can be fatal. In this case report, a patient with acute ischemic cerebrovascular disease was admitted to the hospital. It was observed that the patient had an infarct area but no bleeding. The patient, whose routine blood tests and liver functions were normal at the time of admission, developed a lung infection during follow-up and CPZ treatment was started. Prolongation of PT and APTT was observed in the patient, who developed intracranial

hemorrhage during follow-up. Vitamin K1 treatment was administered, and CPZ was stopped. The patient died after the resuscitation attempt failed. It has been reported that the patient's clinical condition was caused by CPZ use.[10] There is another case of CPZ-induced coagulopathy manifesting as gastrointestinal bleeding.[11] Another case report is a 9-year-old child with Meckel's diverticulum who had massive CPZ-induced gastrointestinal bleeding on the fifth day after an operation.[12] Advanced age, duration of treatment, and total dose have been reported to be independent risk factors for CPZ-induced coagulopathy. In addition, the use of vitamin K along with CPZ treatment has been shown to reduce these risks. Therefore, if patients are to be given CPZ treatment, it is recommended to also give vitamin K treatment.[13]

In this case report, coagulopathy and hematuria were observed owing to CPZ use, and rapid improvement in clinical and laboratory findings was achieved with vitamin K treatment. No mortality or morbidity developed in this patient. However, it should not be forgotten that coagulopathy caused by CPZ use may also cause bleeding with high mortality and morbidity.

Implications for Emergency Nurses

In patients who present to the emergency department due to any bleeding (major or minor) and are found to have coagulopathy and INR elevation of unknown cause, recent infection and CPZ-use history should be questioned. If these patients have coagulopathy caused by CPZ use, intravenous vitamin K therapy should be considered.

Conclusion

Coagulopathy caused by CPZ use may cause minor bleeding, but it may also cause bleeding with high mortality and morbidity. For this reason, the use of CPZ should be avoided, especially in patients who are elderly, need to use it for a long time, and have a risk of bleeding. If CPZ will be used in these patients, although there are not enough studies, vitamin K treatment may be considered along with CPZ treatment.

Data, Code, and Research Materials Availability

This work adheres to all elements of Elsevier's Patient Consent policy.

Author Disclosures

Conflicts of interest: none to report.

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Translation of Research to Practice

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What if someone had published a paper on how to better care for your ED patients, but you never found out about it? The current time lag between when new knowledge (research) is generated and when it becomes bedside practice is currently 15 to 17 years.[1,2] While many factors contribute to the research-practice gap, the ability of clinical nurses to read research, synthesize findings, and apply those findings to their practice is critically underdeveloped, leaving nurses unable to use this important practice information with their patients. The translation of research findings into practice requires the collaborative efforts of everyone in the clinical setting.

One way to approach this issue is to use the Johns Hopkins Evidence-Based Practice (EBP) model for nurses and health care providers,[3] which describes a progression for developing and applying EBP. The model is circular in nature, with components of inquiry leading into the practice-reflection-learning-reflection cycle, which addresses a clinical question through the translation of the evidence into practice (Figure 1). This process facilitates the identification of best practices within the nursing unit to improve care related to the given clinical concern.[3] Initial curiosity or inquiry into improving patient care is vital in developing and applying EBP in the clinical setting of the emergency department; ultimately, as emergency nurses, we care about providing the best environment, practice considerations, and interventions based on current evidence to address patient problems encountered in the emergency department setting.

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When would you need evidence?

Consider this common situation: a patient has presented with a problem that is low volume and high stakes, and the process of caring for that patient was disorganized and chaotic. Despite the disorganized, chaotic care, no harm was caused to the patient. As the emergency nurse, you feel that there should be a better process for identifying and managing similar types of patients. While every action in nursing should be based on the evidence, it can be challenging to keep up with all of the latest research on every topic due to work demands and home-life balance.

Identifying the need for a particular line of evidence can occur while caring for individual patients in real-time or can occur through chart audits and the quality assurance/quality improvement processes. Other times that evidence may be needed are during the development and/or revisions of clinical pathways or policy and procedures. Clinical pathways, policies, and procedures should be based on the best evidence available at the time.[4] Let us use the example of a patient who presents several times over the course of a week with complications associated with substance use disorder (SUD). This patient has presented with an opioid overdose several times. Each time during the course of their care, the patient asks for help in abstaining. The process in your emergency department is to offer the patient a list of recovery clinics where they could be prescribed buprenorphine (Suboxone). The patient has a number of challenges that make it difficult to get to the clinics, including transportation issues. Is there a way to get this patient started on buprenorphine in the emergency department, get them started on their recovery journey, and keep them safe?

If emergency nurses are to use EBP to address clinical issues, then we must start by investigating what the evidence tells us about this type of clinical issue. This means searching the evidence, ie, published literature, to explore solutions that can make the care of this patient population more effective and safe, understand patient and family perspectives, acquire new ideas about upcoming technology, discontinue routine practices that are of no benefit, and find cost-effective practices solutions.[5] Additionally, the evidence can help us to develop quality assurance/quality improvement projects that measure meaningful benchmarks, help us meet professional standards for EBP, and satisfy
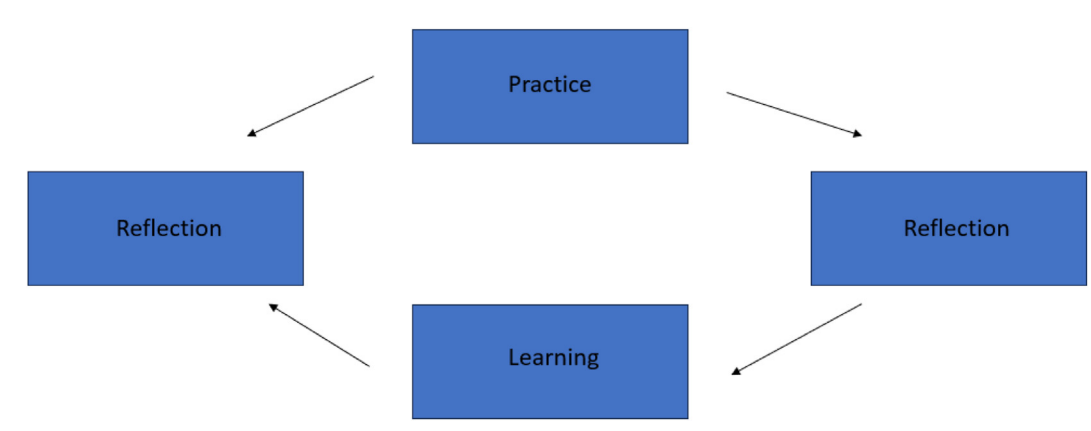
FIGURE

Visual representation of the practice-reflection-learning-reflection model. Modified from Johns Hopkins Evidence-Based Practice model for nurses and HCPs [3]

professional and personal interests.[5] The use of evidence to drive EBP when approaching patient care ideally facilitates optimal patient outcomes, provides consistent standardization of patient care, and improves cost-effectiveness of care for patients, thereby providing for a better quality of life for patients and increased satisfaction for the health care team.[3] To begin a search of the evidence, emergency nurses must develop a clear question about the health care issue that needs to be addressed and the ultimate outcome goal to be achieved.[6] This will help guide in searching the evidence.

How to perform a search?

Once the issue that needs to be addressed has been identified, the next step is to formulate a very clear question to guide the search. This question is often developed using the Population, Intervention, Comparison, Outcome (PICO) framework. Using the patient example previously described, you might develop a PICO question that looks something like this: In patients presenting to the emergency department who wish to begin recovery from opioid use (P), does initiating buprenorphine therapy in the emergency department (I), as compared to what we are doing right now, ie, referrals to recovery clinics, (C) result in reduced ED visits for patients with opioid overdoses (O)?

The development of the PICO question now guides you in determining what search terms can be entered into a database to address the issue, eg, SUD, ED-initiated buprenorphine, and outcomes. Results from searches will vary depending on locations in which health care

team members are affiliated, as different institutions have access to different databases. If you have a medical librarian or research librarian at your institution, this can be a great resource to help identify literature that can guide you to a workable answer to your question. If your search does not yield enough evidence, consider revising your search terms, eg, instead of SUD, try opioid addiction.

As you develop your search strategy, make sure to include appropriate keywords, Boolean operators, and filters to help focus your search. Often times, initial searches can result in hundreds to thousands of articles. Keywords can be identified by using the National Institute of Health's Medical Subjects Heading online vocabulary thesaurus (https://www.ncbi.nlm.nih.gov/mesh/) that identifies keywords used in PubMed to index articles. Boolean operators include words and symbols that are used to limit or expand a search like "AND" and "OR." Boolean operators often times must be entered in all caps in searches. Filters can also be used to limit search results by language, study type, and publication dates, to name a few. It is recommended to explore your search engines to identify all of the tools that are available to you. It is recommended when seeking current evidence to limit the search to the previous 5 years if there is a large amount of evidence available. Evidence is consistently evolving. What we used to do 10 years ago may be contradicted now as we investigate issues further. Remember, practice is not static. If you do not find much evidence within the previous 5 years, you can change the filters to look for literature published earlier. Limited evidence in a particular area means that more research needs to be conducted to address this

TABLE

Hierarchy of evidence table modified from Johns Hopkins Evidence Appraisal Tool[3]

Level I	• Systematic review of RCTs
	• RCTs
	• Explanatory mixed methods with Level I quantitative
Level II	• Quasi experimental study
	• Systematic review of RCTs and quasi experimental studies
	• Explanatory mixed methods with level II quantitative
Level III	• Non-experimental study
	• Systematic review of a combination of study designs
	• Qualitative study
	• Systematic review of qualitative studies
Level IV	• Clinical Practice Guidelines
	• Consensus opinion
Level V	• Expert opinion
	• Quality improvement projects
	• Case reports
	• Scoping reviews

RCT, randomized controlled trial.

gap in the literature. For the patient example we are using here, your search terms may look like this: recovery from opioid use; initiating buprenorphine therapy in the emergency departments; effectiveness of buprenorphine initiation in ED overdose; ED standard of care for opioid overdose recovery.

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Use of these search terms yielded about 129 papers for evaluation. A review of the title and abstract of each article from the search results can help to eliminate those studies that are not applicable to the problem you want to address, either because they do not include the relevant population, intervention, or outcomes you are evaluating, or because the article is not in a language that you can read, ie, English. After eliminating all non-relevant or non-applicable studies, critical appraisal of the usefulness of each paper will begin.

Key components

Critical appraisal of research begins with examining the type and quality of the research study. Here, you will be looking at the level of evidence, the design of the study, the sample size, the methods, how the study was conducted, and how the conclusions were derived from the results.

The level of evidence is determined by the type of study. Certain designs are considered more rigorous and thus provide a higher level of evidence. For example, evidence obtained from a randomized control trial or systematic review carries greater weight than case reports or expert opinion pieces (Table 1). The methods section of a study should be examined to ensure a sufficient sample was obtained from the appropriate population to answer the research question. Next, critique the methods utilized by the researchers to determine the fit into the desired clinical setting. The sample size should be adequate to achieve statistical power while being representative of the population being studied. The conclusions from a study should correspond with the results based on the research question and methods used. A more thorough discussion of this process can be found in the Understanding Research column article, Evaluating Evidence for Practice.[7] If you are unfamiliar with research, consult with colleagues who have expertise in this area to help you evaluate the evidence. The more practice you have doing this, the better you will become at evaluating the evidence.

Findings from all the evidence should be synthesized, often in a table matrix, to allow for ease of evaluation of the evidence. This can require clinical expertise to evaluate the evidence, interpret findings within clinical context, and build strategies for implementation in the clinical setting. Once the evidence has been evaluated, an implementation plan can be developed.[8] For the patient example we have been using, expect that along with the clinical nurse, key participants involved in the evaluation of the evidence and development of an intervention plan will include quality personnel, nurse managers, prescribing providers, and possibly social work or recovery coaches. Do not forget that a key component when developing an implementation plan is the patient; patient values and preferences must be acknowledged and incorporated into any implementation strategy.[8] It will be important to include methods to evaluate patient perceptions when developing the evaluation plan of the EBP intervention(s).

How do you know it works?

Any change to be implemented in patient care must have a method for monitoring and evaluating patient outcomes (ie, return visits for overdose) or the unit operations (additional

time to start the protocol). The ability to monitor the patient and unit outcomes allows for continued evaluation of the change process. It also helps to identify if any modifications need to be made to the process and/or what additional evidence is needed to improve the outcomes on the unit.

In conclusion, translating research into EBP is an iterative and dynamic process that demands a collaborative effort in reviewing evidence to improve nursing environments and patient outcomes. It requires institutional and individual commitment to ongoing learning and adaptation to ensure that patients receive the most effective and appropriate care based on the best available evidence.

Author Disclosures

Conflicts of interest: none to report.

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Submissions to this column are encouraged and may be sent to Lisa Wolf, PhD, RN, CEN, FAEN at: lwolf@ena.org.

A Direct Assessment of Noninvasive Continuous Blood Pressure Monitoring in the Emergency Department and Intensive Care Unit

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Contribution to Emergency Nursing Practice

- Vital sign monitoring is a key component for medical decision making in emergent and acute-care settings. Assessment of emerging technologies is needed to verify that measures provided by novel devices are within a comparable range of the "gold standard" devices currently used in treating clinical populations.
- This paper determined the usability and willingness of emergency and intensive care unit nurses to implement a continuous blood pressure monitoring device and directly compared the systolic blood pressure, diastolic blood pressure, and mean arterial pressure values with the "gold standards."
- The noninvasive continuous blood pressure monitoring device assessed did not meet the Association for the Advancement of Medical Instrumentation 2008 and 2019 consensus standards. Further development to mitigate movement artifact is needed for this population to be pragmatically applied in the emergent and acute-care settings.

Abstract

Introduction: Noninvasive continuous blood pressure monitoring has the potential to improve patient treatment in the hospital setting. Such noninvasive devices can be applied earlier in the treatment process to empower nurses and clinicians to react more quickly to patient deterioration with the added benefit of eliminating the risks associated with invasive monitoring. However, emerging technologies must be capable of reproducing current clinical measures for medical decision making.

Methods: This study aimed to determine the usability and willingness of nurses to implement a noninvasive continuous blood pressure monitoring device. The secondary aim directly compared the systolic blood pressure, diastolic blood pressure, and mean arterial pressure values recorded by the device (VitalStream; CareTaker Medical LLC, Charlottesville, VA) with the "gold standard" brachial cuff and arterial line measures recorded in the emergency department and intensive care unit settings.

Results: VitalStream was similarly received by nurses in the emergency department and intensive care setting, but ultimately had greater promotion from emergency nurses. Despite some statistical similarity between measurement methodologies, all direct comparisons were found to not meet the Association for the Advancement of Medical Instrumentation 2008 and Association for the Advancement of Medical Instrumentation / European Society of Hypertension / International Organization for Standardization 2019 consensus statement criteria for

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acceptable blood pressure measure differences between the VitalStream and "gold standard" clinical measures. In all instances, the standard deviation of the Bland-Altman bias exceeded 8 mm Hg with less than 85% of paired differences falling within 10 mm Hg of the "gold standard."

Discussion: Taken together, the tested device requires additional postprocessing for medical decision making in trauma or emergent care.

Key words: Noninvasive blood pressure; Arterial catheter; Pulse decomposition analysis; Critical care; Continuous monitoring; Trauma medicine

Introduction

Accurate and frequent vital sign monitoring is essential for treating injured and critically ill patients. Noninvasive blood pressures are commonly monitored in the emergency department by nursing staff with a cuff placed over the brachial artery of the upper arm using either auscultation or oscillometry.[1,2] These methods are currently the "gold standard" for noninvasive measures[3] with a recommended minimum of 5-minute rest before 3 blood pressure readings, 1 minute apart.[4] Although sphygmomanometers may seem simple in application, patient assessment and time are required in selecting the appropriate cuff size to ensure accurate readings.[4,5] The time-consuming nature of recording an accurate blood pressure measure in the emergency department highlights the utility of continuous measurements for patient assessment over time and clinical decision making.

Continuous blood pressure monitoring is possible with arterial catheterization but is often reserved for more severe conditions, such as patients admitted to the intensive care unit (ICU).[6] Arterial catheterization is invasive and carries a risk of infection, medical complications, and greater patient care costs.[7] This application also carries the burden of a nurse to prime the line correctly, zero the transducer, and maintain the transducer at the level of the right atrium for accurate readings. Furthermore, placement of arterial lines with arterial catheterization can be delayed during fast-paced trauma resuscitation owing to the priority of other lifesaving interventions.

VitalStream (CareTaker Medical LLC, Charlottesville, VA) is a Food and Drug Administration–cleared device that continuously monitors vital signs[8] with a low-pressure (35-45 mm Hg), pump-inflated finger cuff that pneumatically couples arterial pulsations via a pressure line to a custom-designed wrist-worn sensor. Central aortic blood pressure measures are quantified by applying pulse decomposition analysis[8] to the peripheral pulse patterns detected at the finger cuff. Systolic blood pressure (SBP), diastolic blood pressure (DBP), mean arterial pressure (MAP), and other vital signs are then reported with every heartbeat. An initial

calibration is required, which can be performed in either a "manual" or "automatic" setting. Manual calibration is performed by providing a blood pressure measurement external to the device,[9] such as conventional sphygmomanometer methodology, immediately before continuous blood pressure recording. Automatic calibration is achieved by the device ramping finger cuff pressure from 0 mm Hg, in steps of 10 mm Hg, until the common digital arteries are increasingly clamped and peak pulse signal is reached (*up to 250 mm Hg*).[10,11] The resulting pressure profile is used to calibrate the device with recalibration performed in user-defined intervals to ensure accurate readings for the given environment.

The VitalStream device differs from automatic upper arm blood pressure monitors in 2 critical ways: (1) VitalStream continuously records and reports vital sign measures for each heartbeat compared with the predetermined interval for automatic blood pressure monitors, typically in minutes; and (2) the use of the finger cuff does not directly apply external pressure to the brachial artery. Ultimately, the use of the device has the potential to eliminate the need for expensive and risky invasive monitoring and empower clinicians to react more quickly to patient deterioration.

With advances in continuous blood pressure monitoring technology, a universal standard for the validation of blood pressure measuring devices is required.[1,12-14] The Association for the Advancement of Medical Instrumentation (AAMI) guidelines (2008) recommend that the mean differences of the measures provided by the tested device be within 5 mm Hg of the gold standard blood pressure measures and have an SD of the difference no greater than 8 mm Hg.[3] In addition, a joint collaboration among AAMI, the European Society of Hypertension (ESH), and the International Organization for Standardization (ISO) (2019) provided a consensus statement that novel blood pressure devices must have an error of ≤10 mm Hg relative to conventional methodology in at least 85% of observations[13] to be considered acceptable for clinical use.

The purpose of this study is divided into 2 parts: (1) determine the usability and willingness of emergency and

TABLE 1
Descriptive statistics

Variable	Emergency department (n = 25; 13 women)	ICU (n = 25; 7 women)
Age (y)	57.0 (20.5)	63.0 (13.3)
	[48.3-65.6]	[57.6-68.3]
Height (m)	1.71 (11.1)	1.75 (0.09)
	[1.66-1.75]	[1.72-1.79]
Weight (kg)	83.9 (21.2)	91.0 (28.4)
	[74.9-92.8]	[79.5-102.5]
BMI	28.6 (6.2)	29.4 (8.1)
	[26.0-31.2]	[26.1-32.6]

BMI, body mass index; ICU, intensive care unit.
Data are presented as mean (SD) [95% CI].

ICU nurses to implement the VitalStream device for continuous blood pressure monitoring and (2) directly compare the SBP, DBP, and MAP values recorded by the VitalStream device with the brachial cuff and arterial line values recorded in the ED and ICU settings, respectively. These settings provide assessments of common, practical blood pressure measurements used for medical decision making in the hospital setting. These results will inform the ability to accurately monitor noninvasive continuous blood pressure using the VitalStream device for practical, pragmatic critical care medicine.

Methods

Institutional review board approval was obtained for this study (21-4444) and consisted of 2 patient populations at a level-1 trauma center: (1) patients admitted to the emergency department with moderate severity conditions and (2) patients admitted to the ICU with arterial lines placed to monitor rapid changes in vital signs. Emergency and ICU nurse usability was measured by the System Usability Scale (SUS)[15] with willingness of implementation quantified by the Net Promoter Score (NPS).[16] Direct comparisons of SBP, DBP, and MAP were performed between conventional blood pressure methods and beat-by-beat values recorded by the VitalStream device with accuracy assessed using the AAMI and AAMI/ESH/ISO consensus statement criteria. An informed consent was obtained from all subjects and all experiments were performed in accordance with relevant guidelines.

Before testing VitalStream in the emergency department and ICU, 13 emergency nurses and 12 ICU nurses were given a demonstration and introductory training using VitalStream by the same researcher. Training consisted of placing a finger cuff, demonstrating the calibration procedure, and monitoring continuous vital signs with the tablet and software interface for several minutes. Nurses were able to ask questions about the device and its use in the clinical setting during this time; no blood pressure measures were recorded from patients during the demonstration. After the demonstration and training, the nurses were asked to complete the 10-question SUS to quantify their perceived usability of the device within their respective hospital settings. Historical trends indicate that a SUS score of 68 approximates the 50th percentile of usability responses; values greater than 68 denote above-average usability. In addition, NPS response was measured by asking these nurses "From 0 to 10, how likely is it that you would recommend VitalStream to a friend or colleague?" The NPS formula ($NPS = \% \ Promoters - \% \ Detractors$) was used to further enhance NPS interpretation with *Promoters* defined as a response of 9 or 10 and *Detractors* defined as a response of 6 or below. NPS below 0 was deemed a poor promoter score with 0 to 30 indicating good, 30 to 70 as great, and 70 to 100 as excellent.

Twenty-five participants admitted to the emergency department (57.0 [20.5] years; range, 23-88; 13 women) (Table 1) were consented to participate in the study. Manual blood pressure cuff and auscultation methodology were used to record brachial artery blood pressure in the upper arm every 5 minutes for 1 hour by a research nurse. The VitalStream device was placed on the contralateral forearm with the finger cuff fitted over the intermediate phalange of the third digit to measure blood pressure values concurrently. Automatic calibration was performed every 7 minutes according to manufacturer recommendation in research settings. To address differences in blood pressure sampling frequency, continuous VitalStream values were matched to the manual blood pressure time scale. This was accomplished by random resampling with replacement (1000 iterations) from VitalStream blood pressure values the minute before each manual blood pressure measurement to generate a point estimate and empirical distribution of the sample mean.

Twenty-five participants admitted to the ICU (63.0 [13.3 years]; range, 29-83; 7 women) (Table 1) were also consented to participate in the study. These participants had arterial lines placed, as part of their standard practice of care, to continuously monitor vital sign changes owing to their severity of illness. The VitalStream device was placed on the contralateral forearm with the finger
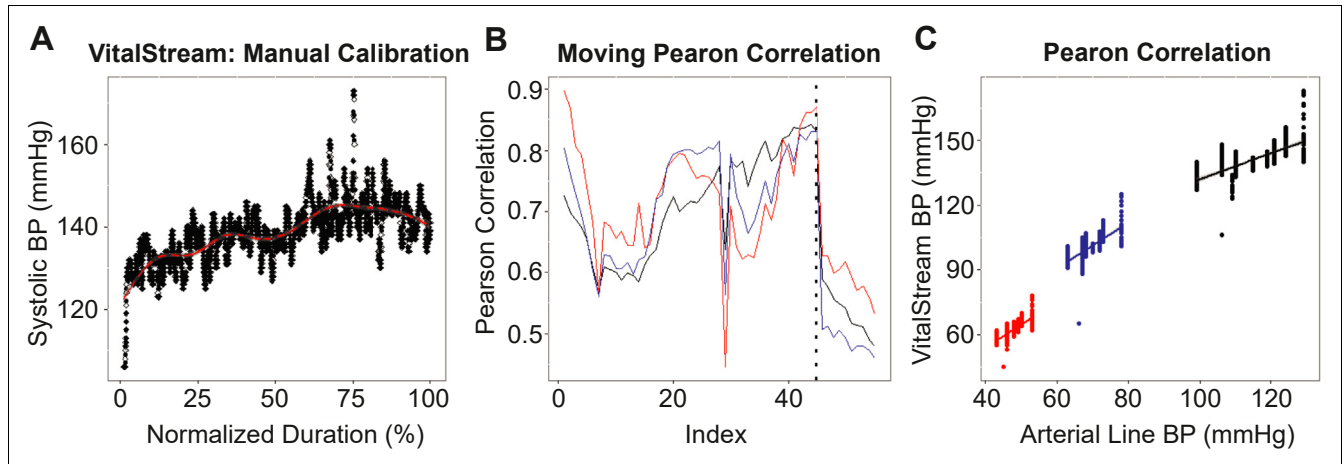
FIGURE 1

Representative data processing methodology for subject 4. (A) Resampled systolic blood pressure in 1-s increments. Closed boxes indicate original VitalStream data and open box represents resampled data; dashed red line denotes trend line. (B) Pearson correlation between 5-s moving window of VitalStream data for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue) and electronic health record arterial blood pressure values. Dotted vertical line indicates the index of the 5-s moving window with the greatest average Pearson correlation. (C) Plotted relation between arterial line blood pressure and calculated VitalStream blood pressure values for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue).

cuff fitted over the intermediate phalange of the third digit. Two 45-minute VitalStream sessions were recorded for each participant with calibration order (manual vs automatic calibration) randomized and counterbalanced. Manual calibration was performed only at the beginning of the 45-minute session with the arterial line blood pressure serving as the reference input value and no subsequent recalibration; automatic calibration was performed by the device at the start of the 45-minute session with automatic recalibration occurring every 7 minutes thereafter. Arterial line measures were stored in 1-minute intervals in the electronic health record and compared with the beat-by-beat measures of the VitalStream device. These electronic health record values comprised a median measure of a 5-second window from each preceding minute for respective SBP, DBP, and MAPs. To address the disparity in sampling frequency and align the time series, the beat-by-beat VitalStream values were interpolated with a spline filter to resample blood pressure values in 1-second intervals (Figure 1A). A 5-second window was moved in 1-second increments across each minute of the VitalStream recording duration to calculate median blood pressure values at the corresponding index for each minute (Figure 1B). The index of the 5-second window that corresponded to the greatest average Pearson correlation value (SBP, DBP, and MAP) between electronic health record values and the moving median values was identified and used for all 3 blood pressure measures (Figure 1C).

The Likert scale responses for the SUS questions were compared between the emergency and ICU nurses using the Mann-Whitney U test (Wilcoxon rank-sum test), with SUS scores and NPS responses compared using 2-sample t tests. Differences in SBP, DBP, and MAP were assessed using Bland-Altman analysis. This measure quantified the agreement between measurement techniques with the upper limit of agreement, bias, and lower limit of agreement reported (estimate [95% CI]) to provide the magnitude of the systemic difference and range of agreement between techniques. The conventional blood pressure methodologies were used as the reference with differences indicating the VitalStream device relative to manual sphygmomanometer and arterial line blood pressures, respectively. Values that exceeded AAMI suggested criteria (not within 5 [8] mm Hg) were deemed outside the acceptable range for clinical use. To verify Bland-Altman results, a bootstrapping procedure was used to construct an empirical distribution (2000 iterations) of the mean paired difference between the blood pressure measures, thereby making no assumptions about the distribution of these parameters (estimate (SD) [95% CI]). In all instances, the bias and paired difference were deemed statistically significant when the 95% CIs did not include zero; comparisons of differences and associations between ED and ICU settings and calibration methods were deemed significant when the 95% CIs of the point estimates were not overlapping. AAMI/ESH/ISO consensus statement criteria were also assessed by quantifying the paired differences between blood pressure methodologies as percent total observations ≤10 mm Hg; at least

TABLE 2
System Usability Scale responses

Emergency nurses (n = 13)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I think that I would like to use this system frequently.	NA	NA	3 (23%)	5 (38%)	5 (38%)
I found the system unnecessarily complex.	2 (15%)	6 (46%)	2 (15%)	2 (15%)	1 (8%)
I found the system was easy to use.	NA	1 (8%)	NA	8 (62%)	4 (31%)
I think that I would need the support of a technical person to be able to use this system.	2 (15%)	8 (62%)	2 (15%)	NA	1 (8%)
I found the various functions in the system were well integrated	NA	1 (8%)	1 (8%)	8 (62%)	3 (23%)
I thought there was too much inconsistency in this system.	NA	5 (39%)	4 (31%)	3 (23%)	1 (8%)
I would imagine that most people would learn to use this system very quickly.	NA	NA	1 (8%)	5 (38%)	7 (54%)
I found the system very awkward to use.	2 (15%)	7 (54%)	2 (15%)	1 (8%)	1 (8%)
I felt very confident using the system.	NA	1 (8%)	2 (15%)	8 (62%)	2 (15%)
I needed to learn a lot of things before I could get going with this system.	2 (15%)	8 (62%)	2 (15%)	NA	1 (8%)

Intensive care unit nurses (n = 12)	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
I think that I would like to use this system frequently.	NA	1 (8%)	2 (17%)	7 (58%)	2 (17%)
I found the system unnecessarily complex.	2 (17%)	8 (67%)	NA	2 (17%)	NA
I found the system was easy to use.	NA	NA	NA	10 (83%)	2 (17%)
I think that I would need the support of a technical person to be able to use this system.	3 (25%)	6 (50%)	3 (25%)	NA	NA
I found the various functions in the system were well integrated	NA	NA	1 (8%)	11 (92%)	NA
I thought there was too much inconsistency in this system.	NA	5 (42%)	4 (33%)	2 (17%)	1 (8%)
I would imagine that most people would learn to use this system very quickly.	NA	NA	NA	11 (92%)	1 (11%)
I found the system very awkward to use.	NA	11 (92%)	1 (8%)	NA	NA
I felt very confident using the system.	NA	2 (17%)	3 (25%)	7 (58%)	NA
I needed to learn a lot of things before I could get going with this system.	1 (8%)	6 (50%)	1 (8%)	4 (33%)	NA

NA, not available.

TABLE 3
Blood pressure differences
Bland-Altman analysis

Emergency department	Systolic blood pressure	Diastolic blood pressure	Mean arterial pressure
Upper limit of agreement	52.5 [47.8-57.1]	31.5 [28.4-34.6]	30.9 [27.4-34.4]
Bias	5.3 (24.1) [2.5-8.0]*	0.37 (15.90) [−1.44 to 2.17]	−4.6 (18.1) [−6.6 to −2.5]*
Lower limit of agreement	−41.9 [−46.6 to −37.3]	−30.8 [−33.9 to −27.7]	−40.0 [−43.5 to −36.5]
Paired difference (mm Hg)	5.3 [2.4-7.9]*	0.37 [−1.6 to 2.0]	−4.6 [−6.8 to −2.6]
Pearson correlation	0.25 [0.14-0.35]	0.27 [0.16-0.37]	0.29 [0.18-0.39]
Lin's concordance	0.39 [0.25-0.51]	0.39 [0.23-0.52]	0.41 [0.27-0.52]

Intensive care unit - manual calibration	Systolic blood pressure	Diastolic blood pressure	Mean arterial pressure
Upper limit of agreement	37.6 [35.6-39.6]	20.2 [19.2-21.3]	32.1 [30.6-33.7]
Bias	−0.61 (19.48) [−1.77 to 0.55]	−0.27 (10.45) [−0.89 to 0.36]	2.31 (15.2) [1.40-3.21]*
Lower limit of agreement	−38.8 [−40.8 to −36.8]	−20.6 [−21.8 to −19.7]	−37.5 [−29.1 to −26.0]
Paired difference (mm Hg)	−0.61 [−1.69 to 0.69]	−0.27 [−0.88 to 0.36]	2.31 [1.40-3.23]*
Pearson correlation	0.72 [0.69-0.75]	0.70 [0.67-0.73]	0.62 [0.58-0.66]
Lin's concordance	0.66 [0.63-0.69]	0.69 [0.66-0.71]	0.54 [0.50-0.57]

Intensive care unit - automatic calibration	Systolic blood pressure	Diastolic blood pressure	Mean arterial pressure
Upper limit of agreement	39.0 [36.6-41.3]	44.8 [43.2-46.4]	42.3 [40.6-44.0]
Bias	−7.4 (23.7) [−8.8 to −6.0]*	14.0 (15.7) [13.1-15.0]*	9.3 (16.8) [8.3-10.3]*
Lower level of agreement	−53.8 [−51.5 to −56.2]	−16.7 [−18.3 to −15.1]	−23.7 [−25.4 to −22.0]
Paired difference (mm Hg)	−7.4 [−8.8 to −6.1]*	14.0 [13.1-15.0]*	9.3 [8.3-10.2]*
Pearson correlation	0.37 [0.32-0.42]	0.19 [0.13-0.25]	0.28 [0.22-0.33]
Lin's concordance	0.34 [0.30-0.39]	0.11 [0.08-0.15]	0.21 [0.17-0.26]

Data are presented as mean (SD) [95% CI].
* Denotes a Bland-Altman bias or paired difference that is significantly different from 0 ($\alpha < 0.05$).

85% of observations were required to fall within 10 mm Hg of the "gold standard" for the VitalStream device to be acceptable for clinical use. In addition, Pearson correlation reported the strength of the linear association between testing modalities whereas Lin's concordance correlation coefficient reported the inter-rater reliability (estimate [95% CI]). Pearson correlation coefficients less than 0.8 were deemed moderate, 0.7 to 0.6 were fair, and less than 0.2 were poor linear associations.[17] Lin's concordance correlation coefficients less than 0.9 were deemed poor inter-rater reliability.[18] All statistical analyses were performed using R (R Core Team (2023). _R: A Language and Environment for Statistical Computing_. R Foundation for Statistical Computing, Vienna, Austria; version 3.3.1) with $\alpha < .05$ used to identify significant differences for statistical tests.

Results

VitalStream was similarly received by nurses in the emergency department and ICU; no statistical differences between Likert responses were identified for the 10 SUS questions (Q1, $P = .38$; Q2, $P = .48$; Q3, $P = .70$; Q4, $P = .74$; Q5, $P = .47$; Q6, $P = .84$; Q7, $P = .056$; Q8, $P = .63$; Q9, $P = .18$; Q10, $P = .30$) (Table 2) or SUS scores (difference $= −1.62$ [−8.07 to 11.30]; $P = .73$). Average SUS scores for the emergency department were 70.58 (14.18) [62.00-79.14] with 61.5% of nurses responding with a score ≥ 68 and an average score in the ICU of 68.96 (8.15) [63.78-74.14] with 50% of nurses responding with a score ≥ 68. Similarly, NPS responses
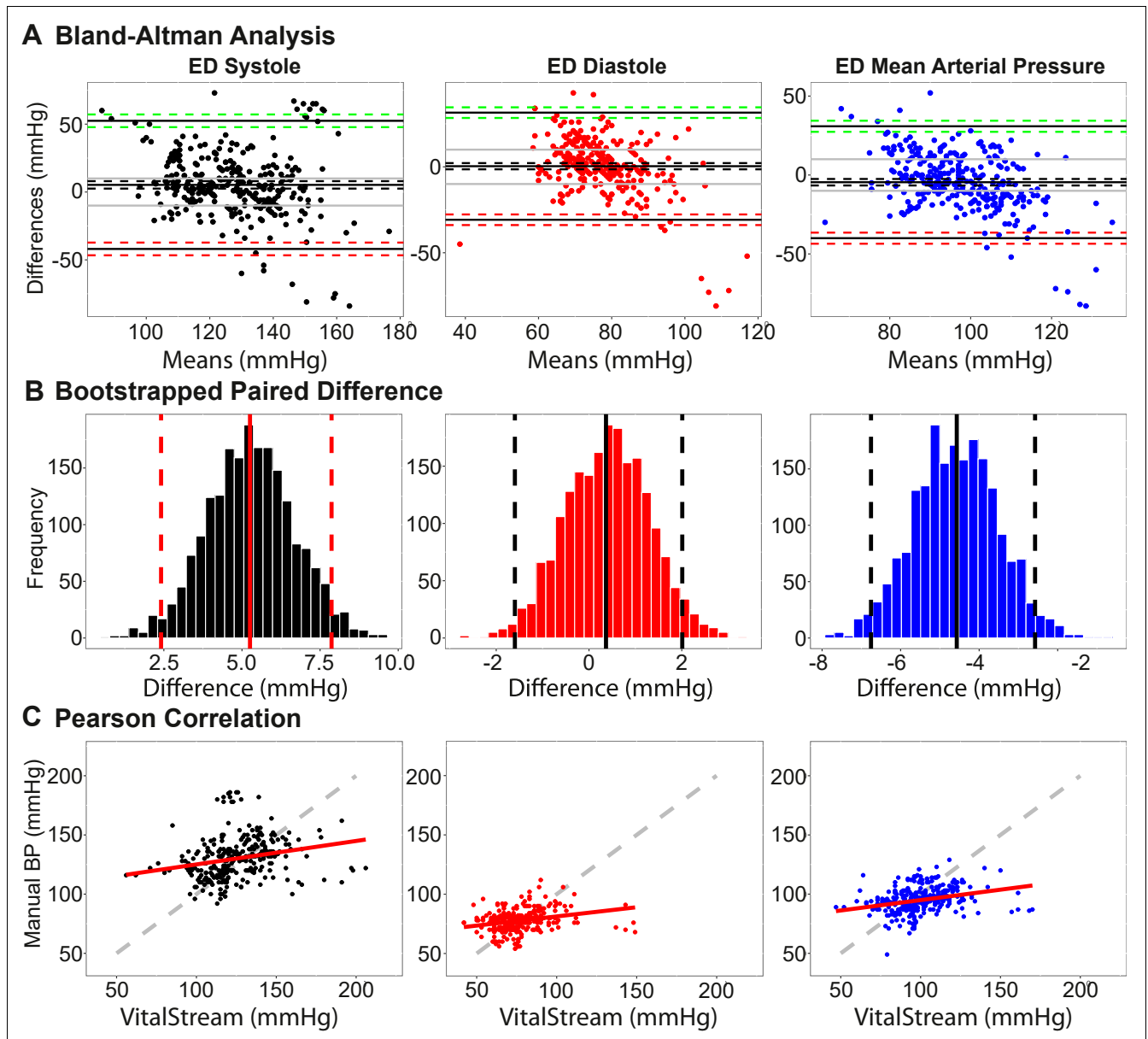
FIGURE 2

Blood pressure measurement comparison between conventional arm cuff methodology and VitalStream in the emergency department. (A) Bland-Altman results for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Horizontal black lines represent the upper limit of agreement, bias, and lower limit of agreement with dashed lines denoting the 95% CI of the estimate (green = upper, black = bias, and red = lower). Horizontal gray lines highlight 10 mm Hg and −10 mm Hg. (B) Bootstrapped paired difference for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Vertical solid line denotes median estimate of 2000 bootstrap replicates and dashed vertical lines indicate lower and upper bounds of the 95% CI. (C) Plotted association between the VitalStream device and conventional arm cuff measures for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Pearson correlation denoted by the red line with SE of the association in gray bounds. The gray dashed line denotes the 45° line of identity for a one-to-one association.
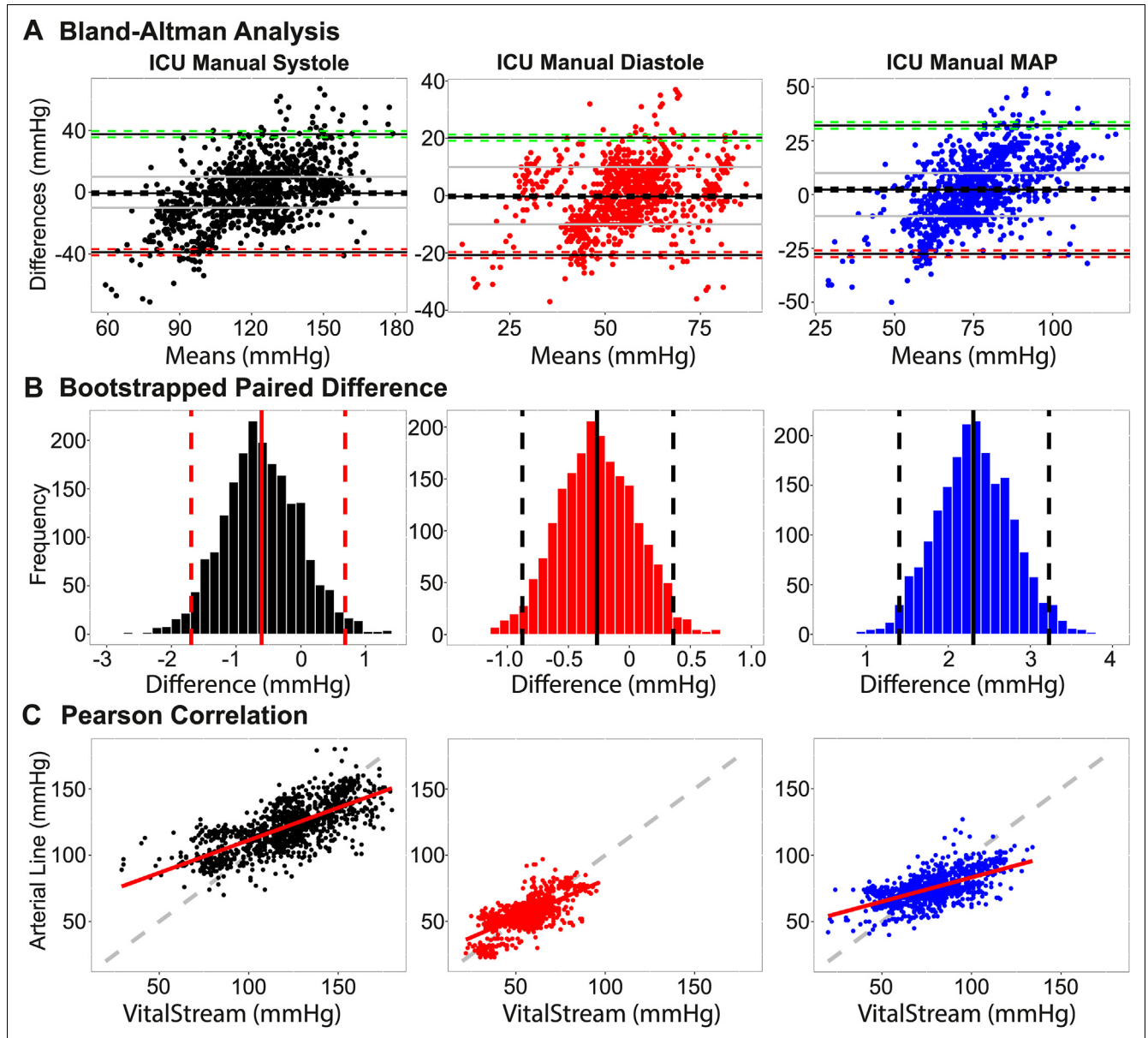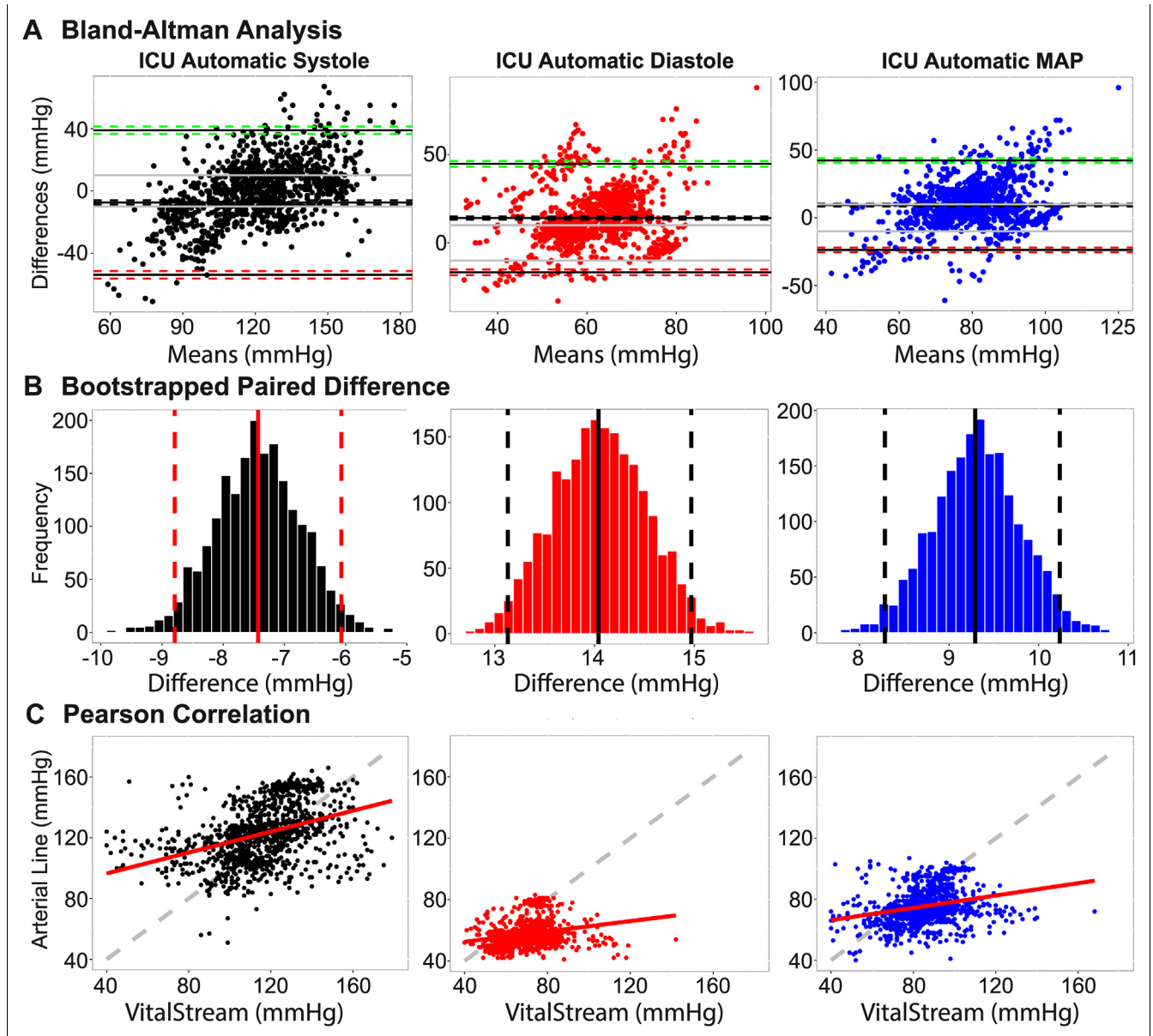
FIGURE 3

Blood pressure measurement comparison between arterial line and VitalStream device using the manual calibration mode in the intensive care unit. (A) Bland-Altman results for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Horizontal black lines represent the upper limit of agreement, bias, and lower limit of agreement with dashed lines denoting the 95% CI of the estimate (green = upper, black = bias, and red = lower). Horizontal gray lines highlight 10 mm Hg and −10 mm Hg. (B) Bootstrapped paired difference for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Vertical solid line denotes median estimate of 2000 bootstrap replicates and dashed vertical lines indicate lower and upper bounds of the 95% CI. (C) Plotted association between the VitalStream device and arterial line measures for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Pearson correlation denoted by the red line with SE of the association in gray bounds. The gray dashed line denotes the 45˚ line of identity for a one-to-one association.

FIGURE 4

Blood pressure measurement comparison between arterial line and VitalStream device using the automatic calibration mode in the intensive care unit (ICU). (A) Bland-Altman results for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Horizontal black lines represent the upper limit of agreement, bias, and lower limit of agreement with dashed lines denoting the 95% CI of the estimate (green = upper, black = bias, and red = lower). Horizontal gray lines highlight 10 mm Hg and −10 mm Hg. (B) Bootstrapped paired difference for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Vertical solid line denotes median estimate of 2000 bootstrap replicates and dashed vertical lines indicate lower and upper bounds of the 95% CI. (C) Plotted association between the VitalStream device and arterial line measures for systolic blood pressure (black), diastolic blood pressure (red), and mean arterial pressure (blue). Pearson correlation denoted by the red line with SE of the association in gray bounds. The gray dashed line denotes the 45 line of identity for a one-to-one association.

were comparable between emergency (7.38 (2.63) [5.79-8.97]) and ICU nurses (6.17 (1.94) [4.93-7.40]; difference = −1.22 [−0.71 to 3.15]; *P* = .20) but ultimately highlight poorer promotion among ICU nurses (ICU NPS = −42.7; poor promotion) than emergency nurses (ED NPS = 15.4; good promotion).

The Bland-Altman bias between blood pressure values recorded using the conventional manual sphygmomanometer and VitalStream in the emergency department was statistically different for SBP and MAP values (Table 3; Figure 2A). The VitalStream device reported an average SBP difference of 5.3 mm Hg greater than the conventional blood pressure cuff; alternatively, MAP was underestimated by 4.6 mm Hg. DBP was the only measure that did not significantly differ in the ED setting with a 0.37 mm Hg paired difference. However, the SD for all 3 measures exceeded 8 mm Hg indicating that AAMI 2008 criteria were not met in the ED setting. In addition, the Pearson correlations (Table 3; Figure 2B) were poor to fair and Lin's concordance associations (Table 3) were poor, and did not significantly differ among SBP, DBP, and MAP. Furthermore, AAMI/ESH/ISO consensus criteria were not met with differences in blood pressure between methodologies occurring within 10 mm Hg only 43.0% of the time for SBP, 59.0% of the time for DBP, and 43.7% of the time for MAP (n = 300) in the ED setting.

The Bland-Altman bias between blood pressure values recorded with an arterial line and the manually calibrated VitalStream device in the ICU was more similar than the values recorded in the emergency department (Table 3; Figure 3A). No significant differences were identified for the SBP (−0.61 [−1.69 to 0.69]) and DBP (−0.27 [−0.88 to 0.36]) whereas MAP recorded by VitalStream was 2.31 mm Hg greater than the arterial line. Despite all 3 measures falling within 5 mm Hg, the SDs of these differences all exceeded 8 mm Hg (Table 3). The Pearson correlation (Table 3; Figure 3B) and Lin's concordance associations between methodologies were significantly greater for manual calibration in the ICU than the emergency department, specifying a better association comparatively. However, only a moderate linear association and poor inter-rater reliability between methodologies were identified (Table 3). In addition, blood pressure measures reported by VitalStream did not meet AAMI/ESH/ISO consensus criteria relative to arterial line measures; manual calibration of VitalStream in the ICU yielded 43.7% of SBP, 71.4% of DBP, and 48.5% of MAP measures falling within 10 mm Hg relative to arterial line measures (n = 1084).

Comparisons between blood pressure values in the ICU using an arterial line and the automatically calibrated VitalStream device provided the largest difference between measures. The values reported by VitalStream were all significantly different than arterial line values with a discrepancy of −7.4 mm Hg for SBP, 14.0 mm Hg for DBP, and 9.3 mm Hg for the MAP (Table 3; Figure 4A). The magnitude of these discrepancies is further highlighted by all SDs of these differences exceeding 8 mm Hg (Table 3). Furthermore, the Pearson correlation (Table 3; Figure 4B) and Lin's concordance associations (Table 3) between methodologies were weak, demonstrating poor reliability using automatic calibration in the ICU setting. Finally, automatic calibration in the ICU found blood pressure methodology falling within 10 mm Hg 34.7% of the time for SBP, 42.2% of the time for DBP, and 48.2% of the time for MAP (n = 1121).

Discussion

This study quantified the perceived usability and willingness of emergency and ICU nurses to implement the VitalStream device for continuous blood pressure monitoring and directly compared blood pressure values recorded by the device with "gold standard" methodologies in the ED and ICU settings. The device usability was comparably perceived by the emergency and ICU nurses, but had lower net promotion among the ICU nursing cohort. Median SUS values (50th percentile) for emergency nurse responses were 72.5 (75% = 80.0; 25% = 65.0) and 68.75 for the ICU nurses (75% = 75.00; 25% = 64.38), which indicates that the 50th percentile response of the emergency nurses in this study was 4.5 points greater than historical trends whereas the ICU nurse responses were only 0.75 points greater. Taken together with the negative NPS for the ICU, nurses likely perceive a greater utility of the VitalStream device in the emergency department compared with the ICU setting. One explanation for the slight preference in the emergency department might be that early identification of patient changes using continuous blood pressure monitoring is more plausible and ultimately has a greater effect to identify critical patients sooner, whereas patients in the ICU have already been determined to need a greater level of care. Furthermore, arterial lines in the ICU provide easy access to test arterial blood gases and other laboratory tests.

Despite some statistical similarity between blood pressure measurement methodologies, all direct comparisons

between VitalStream and the "gold standard" measures were found to not meet AAMI and AAMI/ESH/ISO consensus criteria for acceptable blood pressure measure differences. These direct comparisons were made using Bland-Altman analysis, verified with a pairwise-difference bootstrapping procedure, and reported the percent observations within 10 mm Hg of the "gold standard" blood pressure measures. In addition, the associations and reliability between these measures were moderate to poor using Pearson correlation and Lin's concordance correlation coefficients. Ultimately, noninvasive continuous blood pressure monitoring does not meet suggested blood pressure criteria for practical, pragmatic trauma or emergent care in the ED or ICU setting.

Previously published comparisons with CareTaker blood pressure devices have met AAMI criteria.[8-11,19-21] For example, data from 24 adult patients requiring hemodynamic monitoring during major open abdominal surgery who were sedated under general anesthesia and tracheal intubation yielded a Bland-Altman bias (as measured by overall mean difference) of −0.57, −2.52, and 1.01 mm Hg for SBP, DBP, and MAPs, respectively with an SD of 7.34, 6.47, and 5.33 mm Hg ($P < .001$ for all comparisons).[11] Similarly, Kwon et al[10] recruited patients hospitalized in the University of Virginia surgical/trauma ICU who were monitored using radial intra-arterial catheters. The identified mean differences (SD) of the 2 BP measurements for SBP and DBP were −0.36 (7.57) and −2.11 (6.00) mm Hg, respectively.

The key difference between these published results and the results reported in this study is the amount of postprocessing and removal of movement artifact after data collection. Gratz et al[11] used a custom signal/noise factor to identify poor quality data sections, which were excluded. Similarly, Kwon et al[10] removed potential motion artifacts and segments with acute spontaneous deviation from baseline tracings and further used a custom signal/noise factor to identify poor quality data sections for exclusion of comparison. The results reported in this paper did not attempt to account for movement artifact with data postprocessing after device removal but instead emphasized a practical, applied approach. Furthermore, SDs from the beat-by-beat reported values would inherently have a smaller SD than the minute-by-minute fidelity reported in the ICU setting for this study. For example, Kwon et al[10] reported 87,757 data points for direct comparison relative to the 1084 and 1121 data points reported in the ICU setting for this study. Despite these differences in the total number of samples between studies, the AAMI/ESH/ISO

threshold of 85% of paired differences within 10 mm Hg between testing methodologies was not met for this study and suggests that increased sampling would not improve accuracy.

Limitations

Potential limitations of this study may include nongeneralizable usability results representative of a wide nursing population. Nurse responses were collected from 1 hospital and only gathered responses from the ED and ICU settings. Usability and promoter results may vary with more nurses sampled and likely differ across nursing systems and specialties. Other limitations may include improper finger cuff fitment, which may have skewed blood pressure values. This method is partly intrusive because of discomfort resulting from finger clamping[9] and may vary from person to person. Further limitations of this technology include time lag and decreased accuracy in low perfusion states, a patient population where accurately detected vital signs are often needed the most, which limits the practical implementation of the device in the critical care setting. However, all finger cuff placement was performed by the same research nurse in accordance with manufacturer-provided training. Practical application of the device in an ED or ICU setting would likely include less attention than was provided by the research nurse. In addition, the VitalStream device provided real-time feedback when cuff adjustment was needed with adjustments made according to manufacturer recommendations.

Although limited for beat-by-beat information, the device may have utility in trending data. Despite not being the focus of this study, further work on vital sign trends, including cardiac output, may have utility in certain situations such as fluid challenges used in current sepsis bundles and in stable critically ill patients when attempting to maximize ventricular load.

Implications for Emergency Nurses

Emergency nurses routinely obtain, or monitor, vital signs and are in the position to recognize changes in patient conditions that affect treatment options and patient outcomes. Accurate and reliable measures of noninvasive continuous blood pressure monitoring are needed if novel devices are to replace the current "gold standard" measures for use with clinical patients in the ED

and ICU settings. If such noninvasive tools are able to continuously monitor blood pressure accordingly, emergency nurses have a unique opportunity to better monitor rapid changes in patient condition earlier in treatment encounter. Despite such promise, pragmatic implementation of the VitalStream device in the ED and ICU setting is not yet recommended without postprocessing removal of movement artifact. Current "gold standard" measures of blood pressure monitoring are still the recommendation, although the VitalStream device has potential for monitoring cardiac output trends across time.

Conclusions

The intent of this assessment was to determine the efficacy of VitalStream in a practical, critical care environment. In all instances, the SD of the blood pressure differences exceeded 8 mm Hg for SBP, DBP, and MAP. The reported differences in blood pressure measurements between methodologies are highlighted by the fact that all measurement differences did not meet AAMI or AAMI/ESH/ISO consensus criteria for recommended allowable differences in blood pressure methodologies. Future studies would benefit from addressing movement artifact as recorded by the devices and involve a more heterogeneous patient population in various clinical settings.

Author Disclosures

Conflicts of interest: none to report.

Acknowledgments

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Does Mixing Activated Charcoal With Cola Improve Tolerability Without Affecting Pharmacokinetics? A Randomized Controlled Crossover Trial

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Contribution to Emergency Nursing Practice

- Activated charcoal (AC) is an established, effective means of gastrointestinal decontamination. However, 1 limitation to its use is palatability of the activated charcoal for the patient, potentially limiting how quickly and how much, if any, is taken.
- Other studies have suggested that mixing activated charcoal with various substances improves the rating on various scales (taste, smell, etc). An important question is whether mixing the activated charcoal with other substances affects the ability of the activated charcoal to bind to xenobiotic in the gut. This small study suggests that the effectiveness of the activated charcoal remains even when mixed with regular cola.
- This study contributes to nursing practice by suggesting that asking the patient whether they would like to receive their charcoal mixed with cola or, perhaps, allowing them to sample both activated charcoal alone and with cola might allow for more successful administration without affecting its efficacy.

Abstract

Introduction: Activated charcoal is the most common form of gastrointestinal decontamination used for the poisoned patient. One limitation to its use is patient tolerability due to palatability. Some recommend mixing activated charcoal with cola to improve palatability. An important question is whether mixing activated charcoal with cola affects the ability of the activated charcoal to adsorb xenobiotic.

Methods: This was a prospective randomized controlled crossover trial. Five healthy adults aged 18 to 40 years were recruited. Participants received 45 mg/kg acetaminophen rounded down to the nearest whole tablet. One hour later, they were randomized to receive 50 g of an activated charcoal-water premixture alone or mixed with cola. Acetaminophen levels were collected. The area under the curve of acetaminophen concentrations over time was measured as a marker for degree of absorption. Participants also completed an appeal questionnaire in which they rated the activated charcoal preparations. Participants would then return after at least 7 days to repeat the study with the other activated charcoal preparation.

Results: Four male participants and 1 female participant were recruited. There was no statistical difference in preference score for activated charcoal alone versus the cola-activated charcoal mixture. There was no statistical difference in the area under the curve of acetaminophen concentrations over time between activated charcoal alone and the cola-activated charcoal mixture. Of note, the study is limited by the small sample size, limiting its statistical power.

Discussion: The absorption of acetaminophen in an overdose model is no different when participants received activated

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charcoal alone or a cola-activated charcoal mixture as suggested by area under the curve. In this small study, there was no difference in preference for activated charcoal alone or a cola-activated charcoal mixture across a range of palatability questions. On an individual level, some participants preferred the activated charcoal-cola mixture, and some preferred the activated charcoal alone.

Key words: Overdose; Toxicology; Gastrointestinal decontamination; Activated charcoal

Introduction

Activated charcoal (AC) is an established method of gastrointestinal decontamination in select poisoned patients. It works by adsorbing xenobiotic through intermolecular forces. The understanding of the use and limitations of AC continues to evolve. It is a rather common intervention, with 35,819 exposures reported to the National Poison Data System that received AC in 2021.[1]

The utility of AC has been and continues to be extensively studied. It has been shown to have not just a pharmacokinetic benefit in healthy volunteers but has also been shown to provide real patient-centered outcome benefits in various scenarios. A summary of these data is far beyond the scope of this paper, but the authors would refer the reader several detailed reviews.[2-4]

It is important to remember that earlier administration of AC improves its efficacy. In the past, a rather arbitrary time cutoff of 1 hour from time of ingestion was recommended as the maximum time at which AC could be of benefit.[3] However, this is an oversimplification. The question that must be asked is whether xenobiotic is present in the gastrointestinal tract that could be affected by the AC. For example, some studies in patients with actual acetaminophen overdose show benefit out to 4 hours after ingestion.[5,6] Extended-release preparations likely have a longer time course at which AC may be useful. Some drugs, such as aspirin, result in bezoar formation that delays absorption and thereby prolongs the time to adsorb to AC. Although the benefit for AC may exist beyond 1 hour, it is intuitive that the earliest administration possible would produce the best results.[3]

Due to the time-specific benefits of AC in the appropriate patient population, those who practice in the emergency department have attempted to identify ways to improve palatability of AC to improve rapid patient compliance with its administration. However, AC itself is black with a gritty texture, making it not particularly appealing for consumption. A recent systematic review by Canitrot et al[7] reviewed articles discussing methods of improving palatability of AC. Among all the studies cited, it was found that the addition of a favoring component generally enhanced palatability.[7-17] Among several studies, it was found that cola specifically improved palatability.[8,11,13] Although it may be beneficial to improve compliance of AC ingestion in patients, it is important to consider the possible effect of an additive on the ability of xenobiotic to adsorb to the AC. This had previously been studied with additives such as sorbitol, yogurt, bentonite, carboxymethylcellulose, chocolate syrup, starch, mineral oil, and jelly.[7,9,12,14-17]

We conducted a randomized controlled crossover study to compare the pharmacokinetics of AC compared with a cola-AC mixture in an acetaminophen overdose model and to investigate palatability of AC compared with a cola-AC mixture. It is hypothesized that there will be no difference in pharmacokinetics between the AC and cola-AC mixtures, but that the cola-AC mixture will be preferred on a palatability questionnaire.

Methods

This study was approved by the institutional review board and all subjects provided a documented consent to participate.

This study is registered on ClinicalTrials.gov under ID NCT06219967.

SAMPLE POPULATION

Healthy volunteers 18 to 40 years old were recruited from staff of an academic medical center. Inclusion criteria included no self-reported history of any hepatic, gastrointestinal, or renal disease and no self-reported history of alcohol or substance use disorder. Participants could not take any daily prescribed medications. Subjects were excluded if they were pregnant, were imprisoned, or had an allergy or intolerance to acetaminophen or gluten. Finally, participants had to weigh between 60 and 93 kg; 93 kg was set as the maximum weight to prevent any participant from exceeding 4000 mg of acetaminophen in a single dose.

STUDY DESIGN

Participants were randomized to begin in the control arm or the experiment (cola) arm via random number generator. After at least a 7-day washout period, they returned to complete

the alternate study arm. It has already been shown in healthy volunteer studies that AC given 1 hour after ingestion of acetaminophen reduces absorption of acetaminophen.[18,19] Therefore, a control arm without AC was not performed.

On study days, the participant would arrive at the clinical research unit of the medical university around 8 AM. The clinical research unit was staffed by registered nurses with at least 1 nurse assigned to each participant. Participants had been instructed to not use any products containing acetaminophen for 5 days before the study day and to not consume alcohol the day before study day. They were instructed to fast beginning at 4 AM the day of the study.

On arrival, any female participants completed a pregnancy test. If negative, they were allowed to proceed. All participants were weighed to calculate their acetaminophen dose. Participants were fed a light breakfast of 2 pieces of dry toast and 200 mL of water. A peripheral intravenous line was placed for blood draws. One hour after completion of the breakfast, 45 mg/kg of acetaminophen was given, rounded down to the nearest whole 325 mg tablet, along with 150 mL of water. One hour later, the participants would consume their assigned charcoal mixture of either 50 g Actidose-Aqua, charcoal-water slurry, totaling 240 mL, or the 50 g Actidose-Aqua plus 240 mL of a cola soft drink (Coca Cola), totaling 480 mL. Participants had access to water freely throughout the study period, but they could not eat. At completion of the study day, participants were reminded to not consume alcohol for the remainder of the day or the following day and to not consume acetaminophen for the remainder of the day or the next 5 days.

Immediately after the charcoal mixture was consumed, participants were asked to rate the appearance, smell, flavor, texture, and overall appeal of the mixture on a 0 to 10 ordinal scale, with a facial scale as a reference guide (Supplementary Appendix 1). A score of 0 was least favorable, and a score of 10 was most favorable.

SAMPLE ANALYSIS

Acetaminophen levels were drawn, with time 0 being defined as when the acetaminophen was taken. They were then drawn in the following time intervals: 0, 15, 30, 45, 60, 75, 90, 120, 180, and 240 minutes. Blood was allowed to sit for 30 minutes to clot and then spun at 3000 rpm for 15 minutes. As much serum as possible was removed and placed into aliquot tubes. Samples were immediately frozen at −20 °C until analysis. Samples were analyzed for acetaminophen concentration using a Sekisui Diagnostics Acetaminophen L3K Assay (Sekisui Diagnostics LLC) on an Abbott Alinity C analyzer (Abbott) within 45 days of collection. An additional 240-minute sample was taken to the hospital laboratory and run in real time to obtain a 4-hour level that could be plotted on the Rumack-Matthew nomogram to ensure no participant reached a treatable acetaminophen level in real time.

STATISTICS

Differences in all measures on the palatability questionnaire were analyzed using a paired-sample t test with 95% CIs.

To analyze differences in the pharmacokinetics between the study arms, the area under the curve (AUC), time to maximum concentration (Tmax), and maximum concentration (Cmax) were obtained. AUC is used as a marker of drug absorption and was calculated using the trapezoidal rule. A paired t test was performed for comparison with 95% CIs.

To compare the mg/kg dosing of acetaminophen for each arm of the study, a paired-sample t test was performed.

All analysis was conducted using IBM SPSS version 26 (IBM). The level of significance was set at a P value <.05.

Results

Five participants were recruited for the study, 1 female and 4 males (Table 1), over a 3-month period. This small sample size was selected due to limitations of available funding. There was no statistical difference in the mean acetaminophen dose received between the AC (mean 42.2 mg/kg, SD 1.89) and cola-AC mixture (mean 43.5 mg/kg, SD 1.66) (t(4) = 1.42, P = .23).

There was no statistical difference in rating of appearance, smell, flavor, texture, or overall appeal between the AC alone and the cola-AC mixture on a 1 to 10 scale (Table 2). There were no episodes of vomiting. Participants did not report any complaints associated with AC.

The results for the pharmacokinetics are presented in Table 3. There was no statistically significant difference in the mean AUC of the AC alone compared with the cola-AC mixture (Figure). There were no statistically significant differences in the mean Tmax or the Cmax between the AC alone and the cola-AC mixture. Of note, the mean Tmax was before (cola-AC) or around the time of (AC alone) charcoal administration.

In the Figure, the AC-cola curve seems to rise more rapidly than the AC alone curve. This difference may be caused by the small sample size, but it also may be caused

TABLE 1

Participant demographics and acetaminophen doses

Participant	Age/sex	AC acetaminophen dose	Cola-AC acetaminophen dose	
1	31/M	2925 mg, 41.4 mg/kg	3250 mg, 44.8 mg/kg	
2	36/F	2600 mg, 40.2 mg/kg	2600 mg, 40.8 mg/kg	
3	30/M	3250 mg, 43.2 mg/kg	3250 mg, 43.2 mg/kg	
4	35/M	3575 mg, 45.0 mg/kg	3575 mg, 44.0 mg/kg	
5	28/M	3575 mg, 41.3 mg/kg	3900 mg, 44.8 mg/kg	
	Mean mg/kg dose	42.2 mg/kg (SD = 1.89)	43.5 mg/kg (SD = 1.66)	$P = .23$

AC, activated charcoal; F, female; M, male.

by the higher (although not statistically significant) dose received by the AC-cola group than the AC alone (43.5 mg/kg compared with 42.2 mg/kg).

All these results must be taken in the context of the low power due to the small sample size.

Discussion

In this small, healthy volunteer study, there was no difference in absorption of acetaminophen when participants received AC alone or in a cola-AC mixture, as suggested by the AUC. This may be able to be extrapolated to other xenobiotics, but further studies would be useful. The results of this study must be taken in the context of the limited power due to the small sample size. However, similar studies have found similar results.

This study is very similar to 1 performed by Rangan et al.[20] In their study, healthy volunteers received AC followed by AC alone or a diet, caffeine-free cola-AC mixture. The AC or AC mixture was given 15 minutes after participants ingested an 80 mg/kg dose of acetaminophen.

They found no difference in the AUC between the AC alone or the diet, caffeine-free cola-AC mixture. Our study adds to the literature in several ways relative to the Rangan study. First, the Rangan study used diet, caffeine-free cola, whereas in this study regular cola is used. Although little difference would likely be expected, our study supports this assumption. Further in the authors' experience, most cola available in the emergency department is regular cola. Second, in the Rangan study, the AC or AC mixture was given within 15 minutes of the ingestion. In our study, the AC or cola-AC mixture was given 1 hour after the ingestion, more closely mimicking a real-world scenario. Finally, the similar results between the 2 studies support the reproducibility of the results.

With the palatability questionnaire, this study conflicts with the results of previous studies. In palatability studies done by Cheng et al,[8] Dagnone et al,[11] and Guenther et al,[13] cola-AC mixtures were superior to AC alone.[10,15] These studies all had much larger sample sizes than this small study. However, it may be worth noting that on an individual level not every patient will prefer the cola-AC mixture. It may be worth providing them a sample AC alone

TABLE 2

Comparison between AC alone and cola-AC mixture on palatability questionnaire

Category	AC mean (95% CI)	Cola-AC mean (95% CI)	*P* value
Appearance	2.8 (1.0-4.6)	4.6 (3.5-5.7)	.50
Smell	6.4 (3.0-9.8)	5.8 (2.7-8.9)	.93
Flavor	3.0 (0-6.3)	5.8 (4.2-7.4)	.36
Texture	2.8 (1.2-4.4)	4.4 (2.3-6.5)	.50
Overall appeal	3.2 (0-6.4)	4.4 (3.7-5.1)	.57

AC, activated charcoal.

TABLE 3

Pharmacokinetic data differences between AC alone and cola-AC

| Measurement	AC mean (95% CI)	Cola-AC mean (95% CI)	*P* value
AUC (mcg × min/mL)	3335 (2573-4098)	3566 (1390-5742)	.80
Tmax (min)	66 (56-76)	51 (30-72)	.19
Cmax (mcg/mL)	29 (20-37)	33 (7-59)	.66

AC, activated charcoal; AUC, area under the curve; Cmax, maximum concentration; Tmax, time to maximum concentration.

and AC with cola and asking them which they prefer to enhance patient cooperation with AC. Providing them a choice will also provide some patient autonomy in the decision-making process and may improve cooperativity with the treatment.

Although this study used only a narrow sample population (healthy adult volunteers), the results can likely be applied to other populations. First, other studies have looked at pediatric patients specifically and have found various additives improve palatability (including cola).[8,11,13] Other studies have shown chocolate milk to also be effective in the pediatric population.[8,13] Second, although the study used an acetaminophen model, there is no pharmacologic rationale that the same results would not be found with other xenobiotics, and it would be impossible to test all possible ingestion scenarios.

Limitations

There are several limitations to this study. First, as mentioned previously, the sample size is very small, limiting the strength of the results. Second, this was a healthy volunteer study, limiting its generalizability to real-world patients. Third, the study used an acetaminophen overdose model. Although the findings could likely be extrapolated to other xenobiotics, further research would be beneficial. Fourth, in the pharmacokinetics study, there were several data points that did not follow the expected path (ie, the concentration would drop and then go up again at the next blood draw). This was likely a laboratory error. However, even when data points were carried over in place of the suspected aberrant result, to overestimate the concentration, the results remained unchanged (data not indicated). Finally, in the
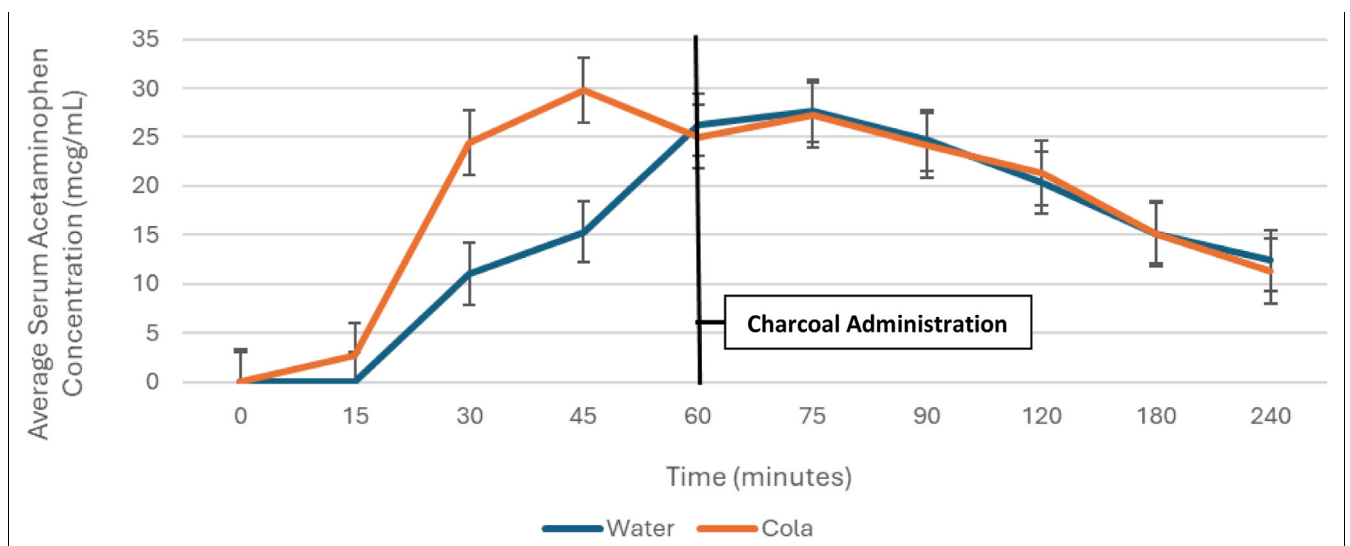
FIGURE

Acetaminophen concentration over time.

palatability questionnaire, the participants were not able to see their results from the previous study day. Given the time (days to weeks) between the study days, the participants may not have remembered how they ranked the previous sample, allowing for possible inaccurate comparisons. Perhaps a better method would have been to ask the participants at the conclusion of the study (after having received both preparations) which they preferred for each point on the questionnaire.

Implications for Emergency Nurses

The findings of this small study suggest that mixing AC with cola does not affect its ability to prevent absorption of xenobiotic. Contrary to other studies, this small study did not find a preference for the cola-AC mixture—although the sample size is prone to type II error. However, on the individual level, some participants in the study preferred the AC-cola mixture, and some preferred the AC alone. Emergency nurses may consider asking a patient whether they would like the AC mixed with cola or perhaps allowing them to sample both options to see which they prefer. The authors feel this may lead to better compliance with the dose of AC when administered in the emergency department.

Conclusion

The absorption of acetaminophen in an overdose model is no different when participants received AC alone or a cola-AC mixture as suggested by AUC. There is no difference in preference for AC alone or a cola-AC mixture across a range of palatability questions.

Author Disclosure

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2024.03.001.

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Ensuring Throughput: Development and Validation of Charge Nurse Competencies for United States Emergency Care Settings

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Contribution to Emergency Nursing Practice

- Literature on both the processes by which charge nurses are oriented to the role and on the specific training that enhances nursing performance and quality of patient care in the emergency care setting is notably sparse.
- This paper describes 9 core competencies for emergency charge nurses, the elements of those competencies, and teaching and evaluative modalities.
- These findings have the potential to support a standardized approach to emergency charge nurse training and evaluation that focuses on the complex interplay of communication skills, clinical decision making, and situational awareness to facilitate safe and effective nurse-patient assignment and ED throughput.

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Abstract

Introduction: Charge nurses are shift leaders whose role includes managing nursing resources and facilitating appropriate patient care; in emergency departments, the charge nurse role requires both clinical and leadership skills to facilitate the flow of patients, while ensuring patient and staff safety. Literature on orientation and specific training is notably sparse. This study aimed to evaluate the content and process of core competency training and identify evaluation and implementation strategies necessary to improve charge nurse performance in United States emergency departments.

Methods: A modified Delphi technique was used in phase 1 and a qualitative content analysis method was used in phase 2 to address specific aims of the study.

Results: In total, 427 emergency nurse managers, directors, educators, and charge nurses responded to the initial survey to identify elements, teaching modalities, and evaluative processes; 22 participated in 1 of 2 focus groups to provide further information about the pedagogical approaches to teaching emergency charge nurse competencies. The top 5 competencies were identified as patient flow management, communication, situational awareness, clinical decision making, and nurse-patient assignment, with understanding that each competency overlapped significantly with the others. Low-fidelity simulation and gamification were identified as a preferred method of both training and evaluation.

Discussion: These findings have the potential to support a standardized approach to emergency charge nurse training and evaluation focusing on communication skills, clinical decision making, and situational awareness to facilitate safe and effective nurse-patient assignment and emergency department throughput.

Key words: Charge nurse; Emergency nursing; Professional education; Descriptive exploratory methodology; Competencies

Introduction

Charge nurses (CNs) are shift leaders whose role includes managing nursing resources and facilitating appropriate patient care in a variety of health care settings, yet organizations pay little attention to the training of nurses who assume this role.[1-3] In emergency departments, the successful execution of the CN role requires both clinical and leadership skills to facilitate the flow of patients, while optimizing the use of resources to ensure patient and staff safety.[3,4]

Literature on both the processes by which CNs are oriented to the role and on the specific CN training that enhances nursing performance and quality of patient care in the emergency care setting is notably sparse. Findings from a recent study on the CN role in United States (US) emergency departments suggested that individuals who assumed the CN role received little to no standardized training other than briefly shadowing another CN.[5] Moreover, most participants (67.4%) reported that their emergency departments had no expectation for CN education or certification, and only half (50.1%) had an expectation for having previous experience working in the emergency department, which leads to significant, negative consequences for both nurses who assume the CN position and ED staff and patients.[5] This inadequate preparation can result in deficits in the confidence and leadership skills necessary for successful execution of the CN role[1-3] and the sociocultural dynamics of the work environment.[5,6]

Competencies for the CN role in areas outside the emergency department have been identified in the literature as including self-management, management of others, clinical competency, conceptual-cognitive competencies, professional-legal competency, communication, and team leadership[3] and logistical considerations that include shift planning, resource acquisition, management of patient flow and information flow, and securing patient care and treatment.[7] Wolf et al[5] added situational awareness, nurse-patient assignment (NPA), policy implementation, and social management of the unit to this list. However, the literature describing requisite core competencies for performing these key functions of the CN role in emergency care is scant, and we could find no literature on best practices for CN training and evaluation or recommendations on operationalizing that process. The purpose of this study was to fill that gap in the scientific nursing knowledge base.

SPECIFIC AIMS

This was a 2-phase, follow-up study based on recommendations of Wolf et al.[5] Authors identified core competencies consistent with the current CN role in US emergency de-

partments and recommended further research aimed at delineating competency requirements and evaluation methods. The aim of phase 1 was to evaluate the content and process of core competency training and identify evaluation strategies necessary to improve CN performance in US emergency departments. The aim of phase 2 was to develop methods to operationalize the implementation and evaluation of the CN core competencies.

Methods

A modified Delphi technique was used in phase 1 to establish competency elements and a qualitative content analysis method was used in phase 2 to establish the mechanics for competency training. This mixed methodology did not use qualitative data to explain the quantitative competency elements, but rather gave focus group participants greater room to describe competency training by not limiting them to the quantitative Delphi generated data. Before recruitment, institutional review board (IRB) review was obtained and the study was determined to be exempt from further IRB oversight (Advarra, Inc, IRB [Columbia, MD] # Pro00067903). The Strengthening the Reporting of Observational Studies in Epidemiology checklist was used in the reporting of this study.

PHASE 1

Design

A modified Delphi method was used to identify and evaluate CN core competencies for application in ED settings. Core competencies are most often developed via expert consensus and validated through large-scale surveys of professionals working in the relevant field. The Delphi method is recommended for use in the health care setting as a reliable means of determining consensus for a defined clinical problem.[8-10] We followed the 6-step process for the Delphi method, outlined by Belton et al,[11] that comprised 3 rounds of data collection with a diverse group of clinicians (CNs, staff nurses) and administrators (ED managers, nurse leaders) in emergency care.

A standard Delphi method practice is to conduct a pilot test to gain insight into a substantial range of viewpoints and salient issues from potential panelists before beginning the Delphi process.[12] This initial procedure is often conducted by distributing open-ended questionnaires to selected experts or panelists or by holding face-to-face workshops with a subset of panelists to shed light on important aspects of the topic.[11,12] We used previously published studies as our pilot process. These previously published studies first

identified[6] and then confirmed[13] the CN as holding a pivotal role in fostering or mitigating lateral violence in ED settings; the second sought to describe the role and responsibilities of the CN.[5] Results of those studies provided the initial data set of issues relevant to the clinical problem of emergency CN role preparation and competency surfacing (Figure 1).

Sample

Expert Recruitment. Expert criteria used in a modified Delphi method typically include participants who have academic expertise, professional experience/activity in the field of interest, membership in relevant organizations/ institutions, and "closeness" to the topic of interest. Including those who have closeness to the topic identifies not only traditional experts such as academics but also invested parties with "subjective closeness" to the issues.[11,12,14] In previous research,[5,6] the concept of "closeness" was incorporated by using a sampling strategy that included clinical emergency nurses that were and were not CNs.

For this study, the sample consisted of 3 invested groups as defined below. Participants were recruited via email sent to the membership of the Emergency Nurses Association (ENA). Inclusion criteria comprised nursing professionals who currently work in 1 of the following US ED roles:

- Group 1: Emergency nurses who work in the role of a full-time or part-time CN
- Group 2: Emergency nurses who work in the role of ED director/manager, assistant director, and chief nursing officer
- Group 3: Emergency nurses who work as full-time or part-time in the role of clinical, stretcher-side nurse

There were no exclusion criteria.

Data Collection

Generally, a modified Delphi method consists of 3 rounds of data collection. For this study, we used the findings from the previous study on the role of the emergency CN[5] as the starting point (first round of data: survey, n = 2579; focus group, n = 49). Two additional rounds of data (respondent, n = 427, n = 207) were collected from the same initial population of emergency nurses (members of the ENA). Because this study used a self-selecting sample, the presumption is that there is significant overlap in these 2 participant groups.

Research Instruments

Round 2 consisted of 2 components:

1) A demographic survey of individual (eg, age, gender, practice role, education) and institutional characteristics (eg, region, type, patient volume, CN training requirements) online via Qualtrics (Provo, UT)
2) A series of questions related to elements of the competency and training for and evaluation of the competency item

The competency categories (in no inherent order) were as follows[5]:

- Clinical decision making
- Clinical support of staff
- Communication with patients, providers, and staff (internal and external)
- NPA
- Patient flow management (inflow, throughput, outflow)
- Policy implementation
- Resource allotment
- Situational awareness of unit as a whole (eg, staff capacity, patient acuity, throughput challenges)
- Social management of the unit

The series of questions were:

- What are the elements of this competency? (open ended, descriptive)
- How important is this competency? (1-5 scale from *not important* to *very important*)
- How should the CN be trained in this competency? (in person, online, or hybrid)
- How should this competency be evaluated? (chart review, in person observation with rubric, test of knowledge, other)

In round 3, round 2 data were sent to all round 2 respondents, and they were asked to rank order the competency set in each operational area. The goal of round 3 was consensus agreement on the top 3 to 5 core competencies with the highest median scores (obtained in round 2) in each operational area.

Data Analysis

To be considered valid, competencies should be well defined, meaningful, supported by evidence linking them to patient outcomes, and measurable.[15,16] In this study, definition and meaning were established in round 1 through

confirmation of key functions of the role and the related competencies for both clinical and leadership skills derived by expert consensus. Round 2 was structured to facilitate comparison across sites by surveying a national sample of invested parties to rate the round 1 set of competencies according to elements of the competency, importance, training modality, and evaluation method. Round 3 rank ordered the competencies through prioritization and agreement by most participants who participated in round 2. Data were exported from Qualtrics to SPSS version 25.0 (Qualtrics, Provo, UT) for analysis. Descriptive statistics were performed on demographic survey results.

PHASE 2

Design

We used a qualitative approach within an implementation science framework and the language of the Expert Recommendations for Implementing Change[17] using focus group data to come to expert consensus on the implementation and blueprinting of CN competency training and evaluation. Focus groups were held to capture and share local (practice) knowledge about implementation and evaluation of CN competency training.

Sample

Participants were recruited via email from respondents to round 3 of data collection in phase 1.

Data Collection

Focus group methodology was used.[18] Each of 2 focus groups was conducted by members of the research team with expertise in focus group methodology (redacted) for approximately 1 hour via Zoom (Zoom Video Communications, San Jose, CA). The Zoom "waiting room" feature allowed for verification of participants before admission into the focus group sessions (Zoom Video Communications, Inc, n.d.). Participants were asked to identify themselves online using only their first names.

A semistructured interview guide was used, as follows:

1. How do ED administrators select candidates for the CN role?
2. What are the elements of training CNs in these identified competencies?

a. In particular, what are the most effective ways to train and mentor CNs to competency?
3. How do we evaluate CN for competency?
4. What are the obstacles and facilitators for widespread adoption and sustainability?
   a. Individual barriers and facilitators
   b. Institutional barriers and facilitators

Both focus groups were recorded and transcribed by Zoom software. Transcripts were reviewed by the research team and, along with field notes taken by the research team, served as the data set for this phase of the project.

Data Analysis

Mayring's 8-step process[19] was used to evaluate categories and themes. Each member of the research team analyzed the focus group transcripts individually and met to collectively come to agreement on categories, themes, and meanings within the implementation science framework.[17]

Rigor

Member checking took place at the end of each focus group session and after the research team agreed on major findings. Data saturation was discussed between focus groups and a determination was made after the second focus group that no further new data had emerged and that saturation had been reached. Transcripts were analyzed individually by members of the research team. Findings were reviewed by members of the research team not involved in the data collection and members of the education team for veracity and fittingness. Findings were shared with focus group participants for accuracy and to provide an opportunity for challenge or amendment; 9 of the 22 participants in this phase of the study responded. All those who responded confirmed the findings.

Results

The final sample for round 2 was 427 emergency nurses evenly divided between clinical nurses (33.0%), CNs (36.3%), and ED directors, managers, and administrators (30.7%) (see Table 1 for full demographic data of the sample). All competencies were rated as "*very important*" or "*important*" with all medians/means greater than 4.0 (Table 2).

Also in this round, participants were asked to list the competency components, training modalities, and

TABLE 1
Demographics of participants

Nurse demographics		**Primary practice setting demographics**	
Gender	(n = 427)	ED patient population	(n = 427)
Woman	85.9%	General ED	87.4%
Man	14.1%	Adult only	7.3%
		Pediatric only	5.4%
Age	(n = 427)	Facility type	(n = 427)
	Mean ± SD	Nongovernment, not-for-profit	76.6%
	48.1 ± 11.5	Investor-owned, for-profit	12.2%
		State or local government	5.9%
		Federal government/VA/military	5.4%
Race or ethnic group*	(n = 427)	Geographic location	(n = 427)
White	89.7%	Suburban	43.0%
African/African American/Black/ Afro-Caribbean	2.6%	Large urban	28.6%
Latinx/Chicanx/Hispanic	2.8%	Rural	28.1%
Multiracial/Biracial	1.6%	Small urban	20.6%
American Indian/Alaskan Native/ First Nations/Native American	1.6%		
East Asian/East Asian American	1.6%		
South Asian/South Asian American	0.9%		
Middle Eastern/Arab/North African	0.2%		
Native Hawaiian/Pacific Islander	0.2%		
Primary role in the ED	(n = 427)	Facility designation*	(n = 427)
Charge nurse (full or part time)	36.3%	Community hospital	67.9%
Staff nurse	33.0%	Academic medical center/teaching hospital	24.6%
ED manager/assistant ED manager or similar title	14.8%	Critical access hospital	22.7%
ED director/assistant ED director or similar title	13.1%	Free-standing ED	12.2%
Hospital administrator (eg, chief nursing officer, vice president or similar title)	2.8%		
Years of experience	(n = 427)	Number of ED beds	(n = 427)
	Mean ± SD		Mean ± SD
As a nurse in all areas	20.1 ± 12.8		36.2 ± 26
As an emergency nurse only	15.6 ± 10.3		
In current ED	9.0 ± 8.9		
In all other roles in emergency care, excluding nursing (eg, LVN, ED tech, EMS)	5.5 ± 9.6		

continued

TABLE 1
Continued

Nurse demographics		Primary practice setting demographics	
Highest educational degree obtained in nursing	(n = 427)	US state representation	50 states + DC
Bachelors	50.8%		
Masters	29.3%		
Associate	14.8%		
Doctorate	3.7%		
Nursing diploma	1.4%		

ED, emergency department; EMS, emergency medical services; LVN, licensed vocational nurse; US, United States; VA, Veterans Affairs.

* Percentages do not equal 100 given that multiple responses were allowed.

evaluation methods with many competencies noted by participants as requiring experience (Table 3). In particular, this included NPA, clinical decision making, situational awareness, clinical support of staff, and social management of the unit.

In round 3, participants (n = 207) were asked to rank order their top 5 competencies to arrive at consensus on the top 3 to 5 competencies on which to focus (Table 4). Patient flow management was ranked as a priority by 95% of respondents and had the lowest median score. Policy implementation and social management of the unit were the 2 lowest ranking competencies with only 9% and 7% of respondents ranking them in the top 5, respectively.

QUALITATIVE FINDINGS

The end point of qualitative content analysis generally is a structure of subcategories that support specific categories that then supports a specific theme, which is an essence that runs through the entire analytical structure.[20,21] As data were analyzed for this project, 3 categories emerged, but rather than independently supporting the theme, our participants indicated that the 3 categories occurred in a specific order. The analytic structure (Figure 2) begins with the category CN selection, which supports the second category throughput maintenance, which then reinforces the third theme structured training. Each of these 3 categories linearly

TABLE 2
Importance of competencies

Competency	Importance (n = 427)					
	Extremely important Rank = 5	Very important Rank = 4	Moderately important Rank = 3	Slightly important Rank = 2	Not important Rank = 1	Median of rank
	n (%)					
Communication	288 (67.4)	128 (30.0)	10 (2.3)	1 (0.2)	0 (0.0)	5.0
Clinical decision making	275 (64)	139 (32.6)	12 (2.8)	1 (0.2)	0 (0)	5.0
Patient flow management	274 (64.2)	136 (31.9)	15 (3.5)	2 (0.5)	0 (0.0)	5.0
Situational awareness	248 (58.1)	141 (33.0)	35 (8.2)	2 (0.5)	1 (0.2)	5.0
Clinical support of staff	223 (52.2)	164 (38.4)	39 (9.1)	0 (0.0)	1 (0.2)	5.0
Nurse-patient assignment (NPA)	210 (49.2)	159 (37.2)	50 (11.7)	5 (1.2)	3 (0.7)	4.0
Social management of the unit	198 (46.4)	157 (36.8)	66 (15.5)	6 (1.4)	0 (0.0)	4.0
Resource allotment	184 (43.1)	138 (32.3)	88 (20.6)	15 (3.5)	1 (0.2)	4.0
Policy implementation	176 (41.2)	128 (30.0)	99 (23.2)	22 (5.2)	2 (0.5)	4.0

TABLE 3
Competencies and components

Competency	Components	Training modality				Evaluation			
		In person	Hybrid	Online	Other	1:1 demonstration with rubric	Exam	Chart review	Other
Clinical decision making[*]	• Ability to prioritize • Clinical competence (triage, assessment, nursing process, ability to anticipate deterioration) • Critical thinking skills • Experience • Knowledge • Problem solving skills	42.0%	46.0%	8.0%	3.0%	57.0%	28.0%	5.0%	9.0%
Clinical support of staff[*]	• Clear lines of communication, culture of openness and support (nurses feel comfortable asking for help and offering help) • Clinical experience and expertise (able to step in and manage a critical/complex patient) • Rounding/assessment • Situational awareness with the goal of early clinical support intervention	55.0%	34.0%	8.4%	2.0%	73.0%	16.0%	2.5%	8.0%
Communication	• Clear and effective communication • Conflict resolution • Crucial conversations • Diplomacy • Emotional intelligence • Listening skills • Maintaining calm	48.0%	41.5%	7.0%	3.0%	80.0%	10.0%	0.0%	10.0%
Nurse-patient assignment[*]	• Experience as a bedside nurse to facilitate nurse-patient assignment • Matching patient acuity to nurse experience and skill level • Understanding acuity, patient load, and capacity when assigning patients	50.1%	35.6%	10.0%	3.0%	69.0%	16.2%	5.0%	10.0%

TABLE 3
Continued

Competency	Components	Training modality				Evaluation			
		In person	Hybrid	Online	Other	1:1 demonstration with rubric	Exam	Chart review	Other
Patient flow management	• Balancing acuity in assignments • Contingency planning • Coordination with care managers/bed managers • Criteria for admission and to what unit • Throughput (inflow, outflow) mechanics and logistics • Understanding common barriers and delays to Throughput/anticipating roadblocks • Understanding of triage/ESI	52.7%	40.0%	4.0%	3.0%	74.5%	7.5%	6.0%	12.0%
Policy implementation	• Consistent and fair application of policy • Knowledge base of policies (especially policies around high-risk/high litigation events)	50.0%	29.0%	19.0%	2.3%	59.7%	30.0%	4.0%	6.0%
Resource allotment	• Broad knowledge of what's available and from whom/where to get it • Delegation • Prioritization (matching resources to acuity needs)	40.0%	35.0%	21.5%	3.7%	57.0%	33.0%	1.8%	8.2%
Situational awareness*	• Active engagement • Anticipatory action • Awareness of patient status and nurse capacity • Flexibility of thought and action ("juggling")/multitasking	50.0%	34.0%	10.5%	5.4%	71.2%	16.1%	1.8%	10.0%

TABLE 3
Continued

Competency	Components	Training modality				Evaluation			
		In person	Hybrid	Online	Other	1:1 demonstration with rubric	Exam	Chart review	Other
Social management of the unit*	• Conflict resolution/ de-escalation • Early identification of conflict • Maintaining calm • Neutrality (not involved in gossip or social drama) • Self-regulation • Strong communication skills	45.0%	38.0%	13.5%	2.0%	71.0%	17.5%	1.0%	10.5%

ESI, Emergency Severity Index.
  * Requires experience.

supports a theme that runs through all 3 categories ensuring efficient flow. Sample quotes supporting subcategories and categories can be found in Supplementary Table 5.

CN SELECTION

Ensuring efficient flow begins with CN selection. Those ready for the CN role demonstrated strong teamwork skills and the ability to think systemically about the emergency department. NMF5 indicated, "...we really look at how they relate to other people...," and CNF13 affirmed, "Positive, supportive to their team members." Flow, noted by SNF19, is learned at triage by those in the role of preceptor, who have "... had to learn a lot of the things of like conflict resolution, good communication skills." CNF13 expanded on the importance of a CN's sense of flow by noting they must have a global knowledge of the department, "... and the ability to observe and see what's going on with the

TABLE 4
Charge nurse competencies round 3: ranking top 5 competencies

Round 3 data	Total respondents: 207						
					Quartiles		
Competency	n (%)	Min.	Max.	Median	25	50	75
Patient flow management	197 (95)	1	5	2.0	1.0	2.0	3.5
Communication	173 (84)	1	5	2.0	1.0	2.0	4.0
Situational awareness	162 (78)	1	5	2.0	1.0	2.0	4.0
Clinical decision making	127 (61)	1	5	3.0	2.0	3.0	4.0
Nurse-patient assignment	112 (54)	1	5	3.0	2.0	3.0	4.0
Clinical support of staff	127 (61)	1	5	4.0	3.0	4.0	5.0
Resource allotment	103 (50)	1	5	4.0	3.0	4.0	5.0
Policy implementation	19 (9)	2	5	5.0	3.0	5.0	5.0
Social management of the unit	15 (7)	3	5	5.0	4.0	5.0	5.0

Max., maximum; Min., minimum.

team members." Full quotes can be found in Supplementary Table 5.

THROUGHPUT MAINTENANCE

The CN is able to facilitate patient flow by either learning or building on natural attributes that lead to improved ED patient throughput. Throughput maintenance is not a skill by itself, but is the outcome of a complex but primary set of skills, as explained by CNM2: "But that involves so many different things... coordinating with the managers from the floor... knowing my staff, knowing what they can handle, who can do what? Knowing what you know, who can't do something." Our participants described several throughput attributes identified through the subcategories of communication, evaluation, troubleshooting categories, and situational awareness.

COMMUNICATION

Participant DNF1, summarized here, succinctly remarked that strong communication skills prevent vital messages from being lost in the busy ED environment that could delay care or cause staff to miss a critical aspect of patient care. Effective communication is collaborative and involves both ED and inpatient staffs. CNM6 discussed the vertical aspect of communication with the inpatient units: "We have a bed huddle like 3 times a day where the House Supervisor gets all the charge nurses from all the units involved, and they can talk mostly like...what's their bed availability...what's happening on their staffing lines..." Vertical communication supports horizontal (ED) communication, so that emergency nurses could understand, "... what's going on in the house and explain to them, you know, why things aren't moving as quickly as we want." (CNM2)

EVALUATION

CNs need to possess insight into their decisions to understand how to improve their thinking and decision-making processes that support throughput. When throughput does not go well, managers ask their CNs to reflect on what they did well and what could have gone better to prevent that issue from recurring: "And a lot of times they look back and go, Oh, my gosh! I probably should have known how to do that, and I just got so worried, or this trauma came in, and I didn't know how to manage it in that minute." (DNF1)

TROUBLESHOOTING STRATEGIES

The CN has to identify and deal with throughput issues inhibiting ED patient flow. One way to identify and deal with throughput issues is to round on nurses and providers, as CNF4 explains: "One thing I've taught my new charge nurses to do is you need to promote flow... Let's round with our nurses and be like...who are you stuck, giving sign out to your floor nurses (ie, waiting on an available floor nurse to whom to give report), 'cause I can escalate that to the charge nurses on the floor." CNM9 describes how multiple issues can occur at the same time, including professional issues such as insubordination: "You know a situation ...like some insubordination. There's like some big major conflict, or someone that you know, has some professional conduct issues. It really needs like that needs to be addressed in that moment." A final troubleshooting strategy is the "shuffle plan" to deal with unexpected surges in patient numbers, acuity, or a sudden slowdown in throughput: "Where are you gonna put your next really sick patient that you can't delay, but to...to...to play that out, and...and you can shuffle that." (NDM22)

SITUATIONAL AWARENESS

Situational awareness is the global understanding of the ED patient care environment: capabilities and patient capacity of each emergency nurse, acuity and patient volume of the emergency department (all horizontal knowledge), and knowledge of the inpatient facility (vertical knowledge). Regarding horizontal ED staff knowledge, NMF15 notes, "But the charge nurse really has to know a little bit more about the individual, so they can also help shift people around, move patients on teams to make sure that everybody's being taken care of and not overwhelmed." SNF10 discussed global ED knowledge as "triaging while charging," which: "... can help with doing that assignment and making sure that 1 person isn't getting slammed with a bunch of strokes, or STEMIs, or things like that." Knowing inpatient conditions can prevent the CN from creating an antagonistic relationship with unit nurses, managers, or house managers: "...mentoring people to understand the bigger picture, and to...understand why it is that the floor can't immediately drop everything and take a patient. And can understand how to work through those things without setting up an antagonistic relationship." (NDM21) Our participants reported that NPA was a complex, multifocal process in which CNs considered the characteristics and needs of patients and nurses on the unit as well as the unit environment as a whole. Participants suggested that NPA affects all elements of

throughput maintenance, but that NPA is predominantly an aspect of situational awareness.

STRUCTURED TRAINING

Structured training should build on a nurse's attributes and skills that contribute to throughput maintenance. Many of the participants indicated that formal toolkits, modules, or classes are important aspects of formal training: "So I think if it was a toolkit, yeah. And then you can pull things that fit your specific organization or your unit." (CNM6) Participants also shared specific content that either was a part of past training or needs to be a part of current CN training: "We took like an actual charge nurse class where they...talked about...communication,...workflow management, and like, bed management." (CNF14). Participants believed that training for most competencies should be in person or in a hybrid environment with the exception being policy implementation, which was identified as a competency that could be taught via online educational module. Our participants reported that a low-fidelity simulation preceded by didactic explanation of systems and roles was preferred, incorporating content on communication skills, troubleshooting strategies, deepening situational awareness, and deepening evaluation skills to improve throughput.

Participants discussed using tabletop exercises to teach situational awareness. Our participants reported that very simple, low-fidelity teaching strategies using cards or other props would give emergency CNs multiple opportunities to practice the decision-making process required across a variety of conditions. The "thinking aloud" process of such an exercise mitigates the problems of the situational awareness evaluation techniques described earlier, given that they provide a continuous flow of discussion with immediate opportunities for explication and correction. Additional suggestions included modules and shadowing on critical care units to better understand flow on the inpatient medical, surgical, telemetry, and critical care units. Summative evaluation of what was learned through training methods was similarly identified as necessitating in-person interaction and an important part of the training process currently missing from CN education. Participants continued with an explanation that a plan must be in place that will demonstrate to hospital administrators that there is adequate return on investment for CN training and evaluation: "If we're gonna raise good charge nurses, then we gotta invest in them and you gotta let the institution, you gotta sell that to the institution as well." (CNM6)

ENSURING EFFICIENT FLOW

Our participants provided a rich, detailed overview of their vision of a CN who facilitates efficient patient progress through the department. The CN was seen as the cornerstone of efficient flow, supporting or inhibiting timely movement to disposition. As CNF4, a CN noted, "One thing I've taught my new charge nurses...is...to promote flow...round with our doctors and say, 'Why, how can we make flow happen?... Or what can we do to make our people promote flow in the waiting room..." Throughput maintenance is defined with several subcategories that form a complex system of personal, relational, and knowledge-related characteristics. However, *ensuring efficient flow* is rooted in selecting a CN who has qualities that support patient flow.

Discussion

Published literature on development and implementation of emergency CN training and education is often focused on single-site programs using quality improvement–based program-evaluation methods with participant satisfaction as the primary outcome. Our study is unique in its use of qualitative research methods and the end product of a comprehensive programmatic approach to emergency CN role development. Previous research supports the steps in the emergency CN role development process. The 9 competencies identified in Wolf et al[5] were validated in this current study. Participants in this study rated all competencies as a minimum of 4 of 5 ("*important*" or "*very important*"), which is the usual cutoff to retain an item in a modified Delphi technique. The top 5 ranked competencies were patient flow management, clinical decision making, situational awareness, communication, and NPA.

The Delphi method and qualitative research methods have been used to develop training and educational curricula in nursing and other fields but rarely together as we did here. In particular, the use of a Delphi process in the development of curricula is supported in medical education,[22,23] family and community nurse education,[24] and nurse practitioner core competency development.[25] No previous use of this method to develop ED-specific CN education was found in the literature.

Participants in our study identified low-fidelity simulation as the primary pedagogical method to teach and evaluate emergency CN competency. Simulation has the benefit of being used as a formative and a summative process. Low-fidelity simulation has been shown to be effective in nurse training in childbirth emergencies[26] and is perceived as useful by nursing students.[27] Our participants
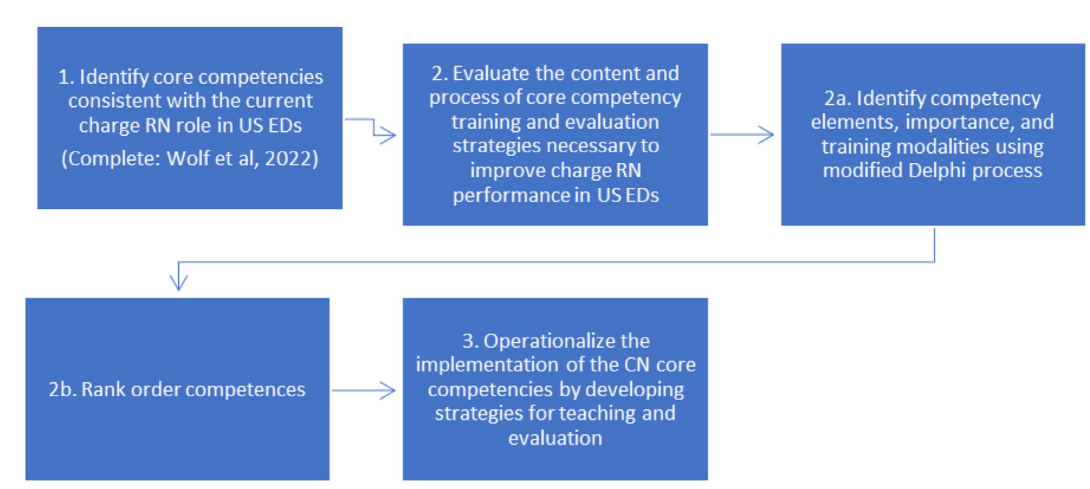
FIGURE 1

Description of study phases.

viewed the low-fidelity approach as a way to work through high-stakes situations in a way that maintained safety; the literature supports simulation in nursing education as a means to maintain psychological safety[28] while learning. Given that the literature related to CN training and evaluation is sparse, this study adds the modality of low-fidelity simulation as a preferred approach to high-stakes learning.

Previously published literature on the specific needs of CNs in the emergency department stands out by its conspicuous absence; this study adds to the scientific knowledge base by providing a comprehensive understanding of the competencies for emergency CNs, as well as possible pedagogical and evaluative processes to assess CN role competence.

Limitations

To the best of our knowledge, this is the first comprehensive study of emergency CN competencies in terms of teaching modalities, pedagogical strategies, and
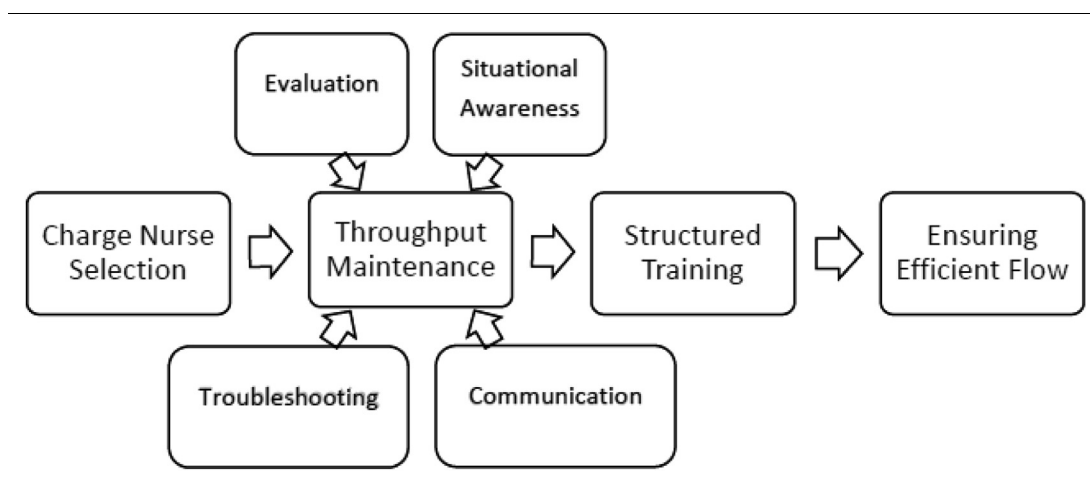
FIGURE 2

Structural framework derived from qualitative analysis.

evaluative processes. The study was conducted with a demographically representative national sample of emergency nurses engaged in the practice, management, or education of the nurse in the CN role, giving a broad view of necessary education and training for this very complex role. In particular, the mixed-methods approach offers a robust investigation into not just the "what" of educational and training needs, but also specific strategies, pedagogies, and training strategy facilitators and barriers.

Despite these strengths, there are some limitations of this study that need to be addressed. Even with a large and demographically representative sample, the data are self-reported. Our participants were a convenience sample drawn from ENA members, leading to potential for selection bias. In addition, those who voluntarily participated in a study about CNs may have different thoughts and feelings than nonresponders. A large and diverse survey sample and further corroboration from focus group findings allow some generalizability. However, given that both samples were recruited from the ENA member database, there may be response bias that does not reflect unknown differences between members and nonmembers. Because these findings result from a practice-area-specific sample, these findings may not be transferrable to nurses outside of the emergency department.

Implications for Emergency Nurses

These findings demonstrate that emergency CN competency is a developmental process that requires more than a single training program or educational event alone. Inputs from clinical staff nurses, department leaders, and educational specialists are needed to support a standardized approach to emergency CN role development that focuses on the complex interplay of communication skills, clinical decision making, and situational awareness to facilitate safe and effective ED throughput. Hospital and ED leaders and nursing professional development specialists can use these results to advocate for resources that lead to emergency CN training and evaluation program development. More research is needed to confirm that implementing this developmental program leads to or is associated with improved patient flow and other patient, nurse, and organizational outcomes. Finally, this novel program development method and framework can be used as a guide for future inquiry into other areas of nurse competency or to deepen and broaden the currently visible competencies.

Conclusion

These findings demonstrate that emergency CN competency is a developmental process that requires more than a single training program or educational event alone. Inputs from clinical staff nurses, department leaders, and educational specialists are needed to support a standardized approach to emergency CN role development that focuses on the complex interplay of communication skills, clinical decision making, and situational awareness to facilitate safe and effective ED throughput.

Data, Code, and Research Materials Availability

Ethical approval from Advarra, Inc, IRB (Columbia, MD) # Pro00067903.

Author Disclosures

Conflicts of interest: none to report.

Supplementary Data

Supplementary data related to this article can be found at https://doi.org/10.1016/j.jen.2024.02.009.

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Stroke Screening Process for Spanish-Speaking Patients

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Contribution to Emergency Nursing Practice

- Current English-language–based stroke screening tools may not represent best practice for Spanish-speaking patients. Emergency department staff should not delay a stroke evaluation and triage if translated screening tools are not readily available.
- This study found no differences in missed strokes, final diagnosis, or therapy for Spanish-speaking patients compared with non–Spanish-speaking patients.
- Based on our data from downstream analysis of stroke screening, improvements to the nursing triage process should be investigated for Spanish-speaking patients to avoid overtriaging.

Abstract

Introduction: The Balance Eyes Face Arms Speech Time stroke screening tool may have limitations for Spanish-speaking individuals. The purpose of this study is to identify potential screen failure events during evaluation for intervenable acute ischemic stroke events among Spanish-speaking patients.

Methods: This is a retrospective, observational, single-center study at an urban academic center during 2020. Patients with a positive stroke screen were stratified by Spanish or non-Spanish. We measured last known well, sensitivity, specificity, negative predictive value, and positive predictive value of the emergency department provider's decision to escalate to complete stroke evaluation with acute ischemic stroke as the outcome of interest.

Results: Among 796 patients (mean age of 52 years, 56% female, 37% Spanish speaking), 30% of patients with positive stroke screen were converted to complete stroke evaluation. For provider escalation to complete stroke evaluation for the outcome of acute ischemic stroke events, prevalence was 13%, sensitivity 81%, positive predictive value 22%, and negative predictive value 97% for the overall sample. Spanish-speaking patients were less likely to progress from screening to complete stroke evaluation (25.8% vs 32.8%; 95% for difference CI, 0.57-13.5). Importantly, there was no difference in rate of acute ischemic stroke between Spanish- and non–Spanish-speaking patients.

Discussion: Over 1 year, with 796 patients triggered at triage by Balance Eyes Face Arms Speech Time for positive stroke screens, only 13% resulted in an acute ischemic stroke. Spanish-speaking patients were less likely to progress from screening to complete stroke evaluation, but the rate of acute ischemic stroke was not different by language.

Key words: Stroke screening; Language; Spanish; Triage

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Introduction

Emergency departments have increasingly relied on nurse-driven stroke screening and treatment protocols for patients who arrive with symptoms of potential intervenable acute ischemic stroke (AIS).[1] The heavy dependence on patient-clinician communication of symptoms, timing, and history creates a possible barrier for non–Englishspeaking patients. Most emergency departments use stroke screening tools to identify patients at risk of AIS. A positive screen may then trigger a complete stroke evaluation by a physician (MD) or advanced practice provider (APP) who adjudicate the need to escalate care. This process may look slightly different in different hospitals,[2] but early, on-arrival, on-demand screening for AIS has become the norm in the United

States.[3] The phrase "time is brain" reminds staff of the need for rapid assessment to deploy time dependent therapy, meet hospital quality measurement expectations, and optimize patient outcomes.[4]

The on-demand nature of this rapid screening and the expectation of a near-zero-miss rate for AIS screening is challenging.[5,6] In response, emergency nurses, APPs, and physicians are often called away from other tasks to do stroke evaluations.[7] The goal of high sensitivity screening tools is to catch all possible strokes and avoid missed strokes. In the emergency department, language discordance among patients, families, and health care practitioners may result in variance in care.[8]

Stroke can have a lasting effect on quality of life and mortality, so many interventions have been explored to improve prehospital and triage stroke screening.[3-5,9] However, stroke screening tools designed to avoid false negatives may result in a high false positive screening rate.[10] Moreover, the screen is just the first step. Escalation for further workup is often determined by a provider who, in turn, relies on communication to obtain a history, description of symptoms, and instructions to patients for the examination, to decide which patients require an additional workup. Complete stroke evaluation consists of neurology consult, neuroimaging, and consideration for reperfusion therapy. The triage process benefits from situationally important content.[11] Words at triage such as "numbness" and "weakness" are used when considering stroke and may not translate equally to other languages.[12,13] Even within the Spanish language, dialect differences may exist when describing stroke.[14] We will explore potential variance by analyzing the conversion from initial stroke screen to complete stroke evaluation stratified by language. We hypothesize that language discordance at triage and concern for missing a stroke may lead to overtriaging, which leads to lower rates of actual AIS diagnosis in Spanish-speaking patients.

Research exploring disparity within the burden of cerebral ischemic disease tends to focus on constructs such as race and ethnicity, but not on the relationship between language and stroke screening processes or outcomes.[15-18] This need is apparent when considering that within ethnicity categories such as Hispanic or Latino, the subpopulation of patients who prefer Spanish are especially affected by barriers to health care access and preventive care compared with others.[19] Limited English proficiency may even be a more significant risk factor for poor health than low health literacy.[16]

The purpose of this study is to explore whether the use of the current ED stroke evaluation process results in similar conversion from stroke screen to complete stroke evaluation based on language preference. In addition, we report the diagnostic performance of the ED complete stroke evaluation among Spanish-speaking patients and the total sample of ED AIS evaluations for the outcome of AIS, which is ischemic stroke within 4.5 hours of symptom onset.

Methods

This is a retrospective cohort study of patients identified by documentation in the electronic medical record (EMR) as having undergone a nurse-initiated stroke screening evaluation in 2020, at a large urban county hospital. This study evaluates the quality of our process through a convenience sample over 1 year. At this site, the screening process uses the Balance Eyes Face Arms Speech Time (BEFAST) tool, called a "Code Fast." When positive, Code Fast prompts an immediate evaluation by clinical teams who then may or may not convert this screen to a complete stroke evaluation. If the patient has a complete stroke evaluation, neurology is called, the patient gets a computed tomography (CT) scan, and thrombolysis is considered. This study was approved by our institutional review board.

Our EMR search inclusion criteria required an encounter with a documented Code Fast activation by a nurse. These are searchable discrete events coded in our EMR. This was encounter-level data, given that some patients may have had several Code Fast encounters. Given that our focus is on initial communication through screening with the BEFAST, we excluded patients transferred from an urgent care center after being seen by a provider and patients activated by emergency medical services (EMS) for complete stroke evaluation in the field. However, we did include patients who arrived by EMS but were not activated as a potential stroke because the emergency nurse was still the first point of contact for the stroke screening process.

Standard care is such that patients are asked for their primary language and the language they prefer to use to discuss their health care as part of registration. This is stored in the EMR, and for this study, we used language preferred to discuss health care for our language variable. Patients speaking a language other than Spanish or English were included under "other languages." Spanish translators are available in person during the Code Fast screening and, if care progresses, during further complete stroke evaluation as well. In the event that an in-person translator is not available, online translation is also available throughout all phases of care.

The EMR was used to identify patients and populate a data set of essential discrete elements such as demographics, text reports of imaging, and timing of care events. For other data such as last known well (LKW), ED documentation of

National Institutes of Health Stroke Scale, final diagnosis, treatment, and treatment complications, hand review of every encounter was done. LKW was partitioned into 3 categories: less than 4.5 hours, 4.5 to 24 hours, and more than 24 hours before arrival based on the neurologist note in the EMR or ED provider assessment if the patient was not seen by a neurologist. Unknown LKW was coded as greater than 24 hours. CT and magnetic resonance imaging (MRI) readings were abstracted and categorized as ischemic stroke, hemorrhagic stroke, normal, chronic/old stroke, and abnormal/not acute stroke. Clear alternative non-AIS diagnoses included chronic ischemic changes, parenchymal loss, previous neurocysticercosis, subdural hematoma, brain metastasis, primary brain cancer, brain edema, or intracranial malformations. Therapies included aspirin, antiplatelets, thrombolytics, and catheter-based thrombectomy ordered during patients' ED phase of care or subsequent inpatient care.

We measured the conversion rate from Code Fast (using BEFAST evaluation at triage by nursing) to full ED complete stroke evaluation. This conversion rate was calculated as the number of patients who received a complete stroke evaluation divided by the total number of Code Fast activations.

Final diagnosis consists of what is included as final diagnosis in the EMR as per the emergency department's or admission team's records. Diagnosis of stroke was confirmed by all imaging: CT, CT head and neck angiography, CT perfusion, MRI, MRI angiography, MRI head, and neck angiography, as well as the neurologist's note. Only AIS was considered in our primary outcome.

Proportions and differences in proportions between groups were calculated and described with 95% CIs. Analysis was conducted to determine whether language is related to conversion rate of triage stroke screening and then whether there is a difference in sensitivity, positive predictive value (PPV), and negative predictive value (NPV) from complete stroke evaluation to AIS diagnosis.

Results

The 796 encounters were analyzed, all of which had a nurse-initiated Code Fast evaluation. Of these, mean age was 51.6 years (range, 17-94; SD, 15.1) and 56% were female. Spanish was the preferred language for 37.1% of the group. Overall, 12.6% of patients arrived by ambulance. Descriptive statistics and comorbidities related to stroke are presented in Table 1. The duration of stroke symptoms

TABLE 1

Demographics of the sample separated by Spanish and non-Spanish

Demographic	Prefer Spanish (n = 296)		Not prefer Spanish (n = 500)		Difference	95% CI
	n	%	n	%		
Males	125	42.23%	232	46.4%	−0.04	−2.8 to 11.5
Hispanic ethnicity	291	98.31%	156	31.2%	0.67	−71.42 to −62.79
Black or African American	2	0.68%	225	45.0%	−0.44	39.86-48.78
White Non-Hispanic	3	1.01%	105	21.0%	−0.20	16.23-23.73
Arrived by EMS	19	6.42%	81	16.2%	−0.10	5.51-14.05
Comprehensive stroke evaluation	76	25.68%	164	32.8%	−0.07	0.67-13.58
Diabetes	125	42.23%	130	26.0%	0.16	−23.04 to −9.41
Hypertension	159	53.72%	284	56.8%	−0.03	−4.07 to 10.23
Previous CVA	41	13.85%	120	24.0%	−0.10	4.72-15.58
Received thrombolytics	2	0.68%	11	2.2%	−0.02	−0.06 to 3.11
Received thrombectomy	4	1.35%	6	1.2%	0.00	−1.78 to 1.47
Admitted from ED	73	24.66%	160	32.0%	−0.07	0.95-13.73
Discharged from ED	201	67.91%	299	59.8%	0.08	−14.94 to −1.27
Admitted to ICU from ED	21	7.09%	38	7.6%	−0.01	−3.23 to 4.24
Confirmed stroke	51	17.23%	97	19.4%	−0.02	−3.69 to 6.86
Diagnosis of AIIS	37	12.50%	69	13.8%	−0.01	−1.7 to 0.9

AIIS, acute intervenable ischemic stroke; CVA, cerebral vascular accident; ED, emergency department; EMS, emergency medical services; ICU, intensive care unit.

TABLE 2
Demographics by LKW category

Category	% Spanish	Median age	Median NIHSS	Comprehensive stroke evaluation	Acute ischemic stroke	Median LKW
LKW ≤4.5 h (n = 326)	26.54%	51	1	26.16%	32	1.9 (0.13-4.43)
LKW >4.5 but <24 h (n = 436)	33.33%	51	1	39.87%	67	11.9 (4.6-23.7)
LKW ≥24 h (n = 24)	3.02%	57	2	3.77%	7	—

AIIS, acute intervenable ischemic stroke; IQR, interquartile range; LKW, last known well; NIHSS, National Institutes of Health Stroke Scale.
Demographics by LKW category. Includes proportion of patients preferring Spanish, median age, proportion of patients who moved on to comprehensive stroke evaluation, and incidence of AIIS in each category. Median LKW and IQR are provided. Category 3 had several unknown LKW, so no median LKW is provided.

varied with an overall sample median LKW of 6.9 hours (25th to 75th percentile; 2.1-14.8 hours); 40.9% presented with a LKW of ≤4.5 hours, 54.3% had a LKW of >4.5 but <24 hours, and 4.78% had LKW of ≥24 hours or unknown LKW (Table 2).

Overall, 75% of National Institutes of Health Stroke Scale scores were less than or equal to 3. With respect to outcomes, 30.2% progressed to complete stroke evaluation, and overall 13.3% had a diagnosis of AIS; 7.4% were admitted to an intensive care unit setting and 1% died during the hospitalization. Patients who preferred to speak Spanish were less likely to arrive via ambulance (6.4% vs 16.2%; 95% CI for difference in proportions, 5.5-14.0). They were less likely to progress to complete stroke evaluation (25.8% vs 32.8%; 95% CI, 0.57-13.5). Despite this differential rate of progressing from Code Fast to complete stroke evaluation, Spanish speakers were not more likely to have an ultimate diagnosis of intervenable AIS (12.5% of Spanish speakers vs 13.8% of non–Spanish speakers; 95% CI, –3.6 to –6.1). Of note, Spanish preference patients had a median LKW time of 7.48 compared with 6.2 hours for non-Spanish preference patients (Mann-Whitney U test for difference of medians, $P = .086$).

Exploratory analyses were performed to describe the accuracy of emergency MDs in escalating from Code Fast to complete stroke evaluation with respect to the outcome of final diagnosis of AIS for patients all presenting within 4.5 hours of LKW. Considering the ED providers' decision to escalate to complete stroke evaluation as a "test," the pretest probability of AIS in this subsample of LKW <4.5 hours was 9.8% (95% CI, 6.8-13.6). The sensitivity of providers conversion to complete stroke evaluation was 81.2% (95% CI, 63.6-92.8); specificity was 68.9% (95% CI, 63.3-74.2). NPV was 97.1% (95% CI, 93.8-98.9) and PPV was 22.2% (95% CI, 15.1-30.8).

Performing the same analysis but focused only on Spanish-speaking patients arriving to the hospital with a LKW less than 4.5 hours, the prevalence of the outcome of AIS was 7% (95% CI, 3-13) and the sensitivity of providers conversion of Code Fast to complete stroke evaluation was 100% (95% CI, 63-100). The PPV was 22.9% (95% CI, 10-40) and the NPV was 100% (95% CI, 95-100). Compared with patients who do not speak Spanish arriving to the hospital with a last LKW less than 4.5 hours, the prevalence of disease was 11% (95% CI, 7-16), the sensitivity was 75% (95% CI, 53-90), and the specificity was 65% (95% CI, 58-72). The NPV was 95% (95% CI, 90-98) and the PPV was 22.0% (95% CI, 13-32).

There was no difference in the use of chemical or mechanical thrombectomy based on language. It is important to note that of 796 evaluated patients, with 240 progressing to complete stroke evaluations where thrombolytic therapy could have been considered, only a total of 13 people got thrombolytics and 10 had a thrombectomy. Therefore, this rate of reperfusion effort was 2.9% (95% CI, 1.8-4.3). Notably, Bell's palsy as a final diagnosis represented 9.42% of our sample, and 3.3% of patients who received a complete stroke evaluation.

Discussion

Our findings suggest that, in this sample, there was some difference when examining the experience of Spanish-speaking patients compared with non–Spanish-speaking patients. In particular, Spanish speakers were less likely to arrive by EMS and more likely to have a longer LKW duration with a median that was an entire hour longer than non–Spanish speakers, which is consistent with previous work.[12,18] We also found that Spanish-speaking patients were less likely to be subsequently converted by the emergency MD to complete stroke evaluation. In short, this means that the ED providers were less likely to think that the history and examination were consistent with an acute

stroke in the intervenable time window for reperfusion. However, reassuringly, there was not a disproportionate rate of false negatives or missed strokes for Spanish-speaking patients who presented within an intervenable window of LKW. One explanation for this observation might be that nurses here had a lower threshold to initiate the process of a Code Fast evaluation among primarily Spanish speakers, but that providers are appropriately not escalating many of these to complete stroke evaluation. This suggests that a detailed history and physical examination are appropriately used to assess stroke symptoms regardless of language.[20] Therefore, when investigating possible differential process steps through a health equity lens, differences may be seen, but that when important clinical patient outcomes are the focus, differences may not be revealed. Of course, none of this can be known with certainty and our work is not powered to detect perhaps smaller differences in other stroke etiologies.

This work must be done within the context of language to ensure process improvements are appropriate for all. The finding here that Spanish speakers may be more reluctant or unable to use EMS for these symptoms is of note and should also inform unique messaging on prehospital stroke recognition for these patients. Language-specific intervention is especially imperative given that previous attempts at increasing stroke knowledge in minoritized groups have not always led to significant outcome improvement.[17] Providing education to the nursing, APP, and MD clinicians has been shown to improve AIS management.[21] For this reason, it is important to find ways to optimize prehospital care and reduce treatment delay. Alternative prehospital stroke education tools such as "RAPIDO"[22,23] and "AHORA"[24] that are based on BEFAST have been created specifically for Spanish-speaking patients. The RAPIDO mnemonic starts with more qualifying adjectives than AHORA, which makes it less similar to BEFAST.[22,24] AHORA was developed in Polk County, Florida, and has been shown to have a correlation coefficient of 1 to BEFAST.[25] In addition, in 1 study, 300 middle-aged, Spanish-speaking Americans said that they thought AHORA was easy to understand, learn, and teach to others.[25]

There was no difference in the use of thrombolytics or thrombectomy based on language in our study, which is consistent with other studies evaluating differences by preferred language.[26] However, some studies using ethnicity instead of language have found that Hispanics were less likely to receive thrombolytics or neurology consultations.[15,27] However, it is important to note the low rate of efforts at reperfusion overall (2.9%) and realize that our sample is not sufficiently powered to detect a possible small difference in this by language. Clearly, the 75th percentile of LKW for the whole sample of 14.8 hours means that many of these patients are delayed in recognizing potential stroke symptoms and seeking care. EMS dispatch for stroke has been shown to vary by race, ethnicity, and sex.[12,28] Prehospital identification of stroke in Hispanics is lower than the general population, and Hispanics are less likely to use EMS for stroke symptoms, which supports our findings.[12,28] Furthermore, patient knowledge of stroke symptoms is suboptimal and terminology used may vary and be ambiguous.[12,28] This suggests that recognition of stroke and indication to come to the hospital is different in various populations, which can increase the LKW time of the patient and affect the ability to give thrombolytic therapy.

Limitations

This report is from a single center and may not be reflective of patients' experiences elsewhere. Our institution is a safety net public hospital where more than a third of all rapid ED patients screened for possible stroke reported preferring Spanish language for discussion of their health care. However, it should be noted that documented preference is not equivalent to fluency or ability to speak a language. In addition, this report is in some ways a reflection of our tiered escalation process that places a premium on rapid identification and nonmisidentification of any possible acute intervenable stroke with low threshold for immediate imaging and neurology evaluation. Therefore, some of our observations are unique to our process findings and may not be the same in other systems. However, this approach is quite common and has been recommended by the American Heart Association/American Stroke Association.[29]

As a maximally conservative approach, we adjudicated unknown LKW times as >24 hours and this may affect the results. However, when these 10 data entries were removed from Table 3, there was no change in the result. It is also possible with any retrospective study that some variables could have been misclassified. Due to nonspecific words in the radiology and neurology notes, specifically "acute/subacute," the categories of stroke may have some inaccuracy. Owing to sample size, we were not able to do an analysis on other languages and focused only on Spanish. This sample was obtained in 2020 during the pandemic, so hesitation in coming to the hospital could affect the LKW time, use of masks could have affected visual and spoken communication, and concern about coronavirus disease as a prothrombotic trigger for acute stroke and less typical stroke presentations in patients with coronavirus disease[30] during this time could have resulted in a lower threshold for nurses to trigger the stroke screening process.

TABLE 3

Two-by-two table of AIIS and comprehensive stroke evaluation (comprehensive stroke evaluation) separated by LKW category

Sample	Acute ischemic stroke	Comprehensive stroke evaluation	No comprehensive stroke evaluation	PPV	NPV
Entire sample	Positive	62	44	0.58	0.75
	Negative	178	511		
≤4.5 h	Positive	26	6	4.33	0.69
	Negative	91	202		
4.5-24 h	Positive	32	35	0.48	0.5
	Negative	282	282		
>24 h	Positive	4	3	0.57	0.87
	Negative	4	27		
>24 h without unknowns	Positive	4	3	0.5	0.9
	Negative	4	27		

LKW, last known well; NPV, negative predictive value; PPV, positive predictive value.

PPV and NPV are given by LKW category. >24 hours without unknowns refers to LKW greater than 24 hours excluding LKW when the patient LKW was unknown, meaning found down or not able to provide LKW.

Implications for Emergency Nurses

There is still significant work to be done in the prehospital and ED setting to increase the proportion of true acute stroke patients arriving within an intervenable window. Although the goal of nursing triage is to identify every stroke quickly, improvements could be made to reduce the proportion of unnecessary stroke evaluations if existing screens tend to overtriage Spanish-speaking patients. By examining downstream outcomes from 1 nursing triage approach, we suggest Spanish-speaking patients with stroke symptoms may be more likely to screen positive even when they have a lower likelihood of an AIS event. This may further be influenced by prearrival status (eg, longer LKW times) in which the triage process is not at fault.

There were additional findings that provide context to the conversation from stroke screen to complete evaluation. A final ED diagnosis of Bell's palsy represented 10% of Code Fast activations and 3% of complete stroke evaluations, which may represent a future direction of research and quality improvement. Although our data do not represent the true incidence of Bell's palsy at our institution, it does represent a large portion of patients who were activated for acute ED providers who did not move onto complete stroke evaluation. It is possible that further nurse triage screening such use of the "RAPIDO"[22] and "AHORA"[24] may become a future quality improvement project to address this group of patients.

Conclusion

In this study, there was no clinical difference in ability to detect AIS among Spanish- versus non–Spanish-speaking patients, but this study underlines the importance of further investigation into timely hospital arrival and the potential for refinement of the screening process to enhance specificity. Overall, efforts to improve stroke outcomes for both Spanish-speaking and non–Spanish-speaking patients will still need to focus on education so that they can recognize and act on early stroke symptoms.

Author Disclosures

Conflicts of interest: none to report.

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Availability of Certified Sexual Assault Nurse Examiners in Appalachian States

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Contribution to Emergency Nursing Practice

- Sexual assault nurse examiners play crucial roles in caring for sexual assault survivors. Previous research indicates that nurses may face barriers to sexual assault nurse examiner certification in rural areas, potentially indicating a need for greater support for sexual assault nurse examiners.
- This paper contributes sexual assault nurse examiner availability by both Appalachian status and rurality in the 13 states comprising the Appalachian region of the United States.
- In the 13 Appalachian states, there are significantly fewer sexual assault nurse examiners per 100,000 residents in rural counties than in urban counties. Sexual assault nurse examiners in these areas may face greater challenges, such as burnout, than their urban counterparts. Therefore, it is imperative that emergency nurses advocate for targeted sexual assault nurse examiner training and funding for competitive salaries for sexual assault nurse examiners in rural areas of Appalachian states.

Abstract

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Introduction: Sexual assault nurse examiners are crucial care providers in cases of sexual assault. However, it is not clear whether sexual assault nurse examiner availability differs throughout the 13 states that comprise the Appalachian region of the United States. Therefore, this cross-sectional analysis identified sexual assault nurse examiner availability in 13 states and determined differences in availability by both county-level Appalachian status and county-level rurality status.

Methods: Data were downloaded from 2 public sexual assault nurse examiner registries for the included 13 states. Descriptive statistics of sexual assault nurse examiner certification type and availability by state were calculated. In addition, bivariate analyses of sexual assault nurse examiner availability by rurality and by Appalachian status were performed using 2-sample z-tests for equality of proportions.

Results: State-level sexual assault nurse examiner availability ranged from 0.34 to 0.86 sexual assault nurse examiners per 100,000 residents. Sexual assault nurse examiner availability in these 13 states did not differ by Appalachian status. However, rural areas had significantly lower sexual assault nurse examiner availability than urban areas in these 13 states.

Discussion: These data support previous literature on the need for stronger sexual assault nurse examiner programs in rural areas in the United States. Future research should take sexual assault prevalence into account to determine whether local sexual assault nurse examiner access needs, as well as appropriate support for sexual assault nurse examiners, are being met throughout Appalachian states.

Key words: Sexual assault nurse examiners; Sexual assault; Appalachia; Rural; Access to care

Introduction

SEXUAL ASSAULT

Every 68 seconds, someone in the United States is sexually assaulted, and within their lifetime, 1 of every 6 women will experience an attempted or completed rape.[1,2] The decades of research on sexual assault (SA) depict varied negative

outcomes for survivors, from severe psychopathologic impacts to financial stress.[3,4] For example, SA has been associated with an increased risk for suicidal ideation and attempt.[3,5] Beyond the emotional toll of SA, SA is also costly to survivors. Although many policies are in place to reduce this financial burden on survivors of SA, privately insured survivors pay on average almost $1000 out of pocket.[4,6]

SA IN RURAL AND APPALACHIAN REGIONS

The Appalachian region is defined as a geographically and culturally rich area of 423 counties across 13 states in the eastern United States, following the Appalachian Mountain range.[7] In addition to the strengths of Appalachia, it is important to characterize its history and vulnerabilities to SA such as economic depression, exploitation, generational poverty, and substance use disorder.[8] The Centers for Disease Control and Prevention state that drug and alcohol use, poverty, violent behaviors, childhood abuse, and involvement with a violent intimate partner are all risk factors for SA.[9] Unfortunately, these experiences are common among many Appalachian households. According to the Appalachian Regional Commission (ARC), nearly 20% of Appalachians live in poverty, and substance overdose deaths were 72% higher in Appalachia than the rest of the nation.[10,11] In 1 Appalachian state, Ohio, SA cases were linked to the ongoing opioid epidemic.[12] In addition, Appalachia contains 3 of the 10 states with the highest rates of human trafficking in the United States.[13] Familial sex trafficking, a common form of human trafficking in rural Appalachia, includes repeated SA and exploitation and is often motivated by drugs, poverty, and basic needs.[13-15] In addition to sexual violence, residents of Appalachian counties have more than 20% higher risk of hospitalization for intimate partner violence than residents of non-Appalachian counties.[16]

Within Appalachia, nearly 2.5 million residents live in rural areas.[11] A growing body of literature indicates that SA may be more prevalent in rural than urban areas. For example, the 2019 federal crime statistics shows that rates of rape and murder are higher in nonurban areas.[17] In Kentucky, an Appalachian state, rural SA survivors differ significantly from urban SA survivors in terms of age, race, and gender, suggesting that even within Appalachian states, different care needs for SA survivors may be present.[18]

SA NURSE EXAMINERS

One way to offset the impacts of SA is through SA nurse examiner (SANE) programs. SANEs, sometimes referred to as forensic nurse examiners, SA examiners, SA forensic examiners, or SA medical forensic examiners, depending on their employment context, are nurses with additional training in holistically caring for SA survivors.[19] Practicing SANEs are generally found either in unscheduled care settings such as emergency departments, maintaining usual employment as an emergency nurse and using SANE credentials when required, or as on-call nurses serving multiple care settings.[20,21] Certification as a SANE through the International Association of Forensic Nurses (IAFN) requires previous registered nurse training as a prerequisite and includes specific SANE course of study, clinical education and preceptorship, and a board certification process.[22] Before receiving the approximately 40 hours of SANE training, it is preferred that registered nurses have more than 2 years of experience in an area that uses advanced physical assessment skills, such as emergency nursing or maternal and child health.[22] The certification process follows the IAFN SANE Education Guidelines and the individual's state or community requirements. Once trained and having obtained the required clinical practice, SANEs are eligible to take board certification exams for SANE-adult/adolescent (SANE-A) certification, SANE-pediatric/adolescent (SANE-P) certification, or both.

SANE programs first began in the 1970s, when nurses recognized a lack of needed and specialized care for SA patients in emergency departments.[19] These patients often have different needs from typical ED patients, such as sexually transmitted infection and pregnancy concerns.[19] Availability of SANEs has benefited survivors' psychological well-being by ensuring safety, respect, and support and has increased the provision of timely prophylaxis and emergency contraception.[23,24] In addition, SANEs provide trauma-informed, culturally competent, and age-appropriate treatment and are prepared to testify in court as expert witnesses on SA cases.[19] The evidence collected by SANEs is of higher quality and, when used to prosecute perpetrators, has led to more just outcomes.[25,26] Funding for SANE training often comes from federal or state grants designed to improve SANE availability.[27,28] However, recent literature indicates that the demand for SANE availability—particularly in rural areas—has not yet been met.[27,29,30]

It is known that SANEs are generally less common in rural areas of individual states than urban areas in the United States.[31] However, comparisons of SANE availability between states have not yet been widely conducted. Furthermore, it is not clear whether or not SANE availability specifically in the 13 states comprising Appalachia differs by Appalachian status or rurality. Therefore, the purpose of this analysis was to identify SANE availability throughout these 13 states, as well as determine whether or not Appalachian or rural differences were present.

Methods

RESEARCH DESIGN

This analysis used a cross-sectional design, as per previous literature.[20] The cross-sectional design is used to answer the analysis' 2 research questions based on the most current data available: (1) In the 13 Appalachian states, does SANE availability differ by rurality? and (2) In the 13 Appalachian states, does SANE availability differ by Appalachian status?

DATA SOURCES

Certification data for individual certified SANE-As and SANE-Ps were downloaded from public IAFN registries on July 20, 2023, for each of the 13 states wholly or partially in the Appalachian region.[32,33] These 2 IAFN registries are comprehensive, comprising all current certified SANEs, and are updated daily. Furthermore, these 2 IAFN registries are freely available on the internet. Certification data, including SANE name, certification date, expiration date, city, state, and county, were copied from these registries to create a list of all SANEs currently certified on that date. In total, this yielded 832 SANEs. Data entry errors, such as missing information and identifying the country as "United States Minor Outlying Islands" rather than "United States" when a United States city and state were listed, were identified by manual review of each SANE certification entry. Removal of 4 SANEs owing to data entry errors and removing duplicate entries for SANEs who had both SANE-A and SANE-P certifications yielded a total of 637 individual SANEs.

The city listed for each SANE was then collapsed up into the county level or, in the case of Maryland and Virginia, county equivalents. Rurality for each county was determined using 2023 Rural-Urban Continuum Codes (RUCCs).[34] Counties with RUCC codes 1 to 3 were designated "urban," whereas those with RUCC codes 4 to 9 were designated "rural," as commonly used in other analyses with dichotomous rurality.[35,36] Appalachian status was determined using the full list of counties and independent cities deemed "Appalachian" and served by ARC.[7] Those included in the list were designated "Appalachian," and those that were not were designated "non-Appalachian." In the case of Virginia, independent cities deemed "Appalachian" were merged with the appropriate adjacent county, as per the same ARC documentation.[7] SANE availability was analyzed per 100,000 residents, given that this denominator is commonly used for SA prevalence statistics.[37] The 2022 county-level population estimates were obtained from the United States Census Bureau.[38]

DATA COLLECTION

Data used in this analysis were publicly available secondary data.[7,32-34,38] SANE registries are updated daily by the IAFN based on new and expired certification dates.[32,33] Census data used to weight analyses by population were collected by the United States Census Bureau as part of the decennial census.[38]

DATA ANALYSIS

The analysis included descriptive summary statistics of county and SANE characteristics, as well as bivariate analyses. Bivariate analyses consisted of 2-sample z-tests for equality of proportions for SANE availability by (1) rurality at the county level and (2) Appalachian status of the county level. Proportions consisted of SANEs available per population. Analyses were conducted in R (The R Foundation; version 4.3.1).[39] All data used in this analysis were publicly available.[7,32-34,38] This study was determined to not be Human Subjects Research by the East Tennessee State University Institutional Review Board.

Results

Of the 1090 counties or county equivalents (hereafter referred to as "counties") in the 13 Appalachian states overall, 590 (54%) were designated rural, and 423 (39%) were designated Appalachian (Table 1). In addition, 271 of all counties (25%) were both rural and Appalachian.

SANE characteristics by state are presented in Table 2. Overall, most SANEs were SANE-As (n = 389, 61%), followed by dually certified SANEs (n = 190, 30%) and SANE-Ps (n = 58, 9%).

Overall SANEs per 100,000 residents by Appalachian status and rurality are presented in Table 3. Among the 13 Appalachian states, Mississippi had the lowest overall SANE availability (0.34 SANEs/100,000 residents), whereas Virgina had the highest (0.86 SANEs/100,000 residents). There was no statistically significant difference between Appalachian SANE availability (0.63 SANEs/100,000 residents) and non-Appalachian SANE availability (0.58 SANEs/100,000 residents) in the 13 Appalachian states at the $\alpha = 0.05$ level (df = 1, $P = .41$). Rural SANE availability (0.46 SANEs/100,000 residents) was significantly lower than urban SANE availability (0.62 SANEs/100,000 residents) in the 13 Appalachian states at the $\alpha = 0.05$ level (df = 1, $P = .027$).

TABLE 1
Descriptive statistics of counties and county equivalents in the 13 Appalachian states

State	Counties, n	Appalachian counties, n (%)	Rural counties, n (%)	Rural Appalachian counties, n (%)
Alabama	67	37 (55)	36 (54)	17 (25)
Georgia	159	37 (23)	85 (53)	16 (10)
Kentucky	120	54 (45)	81 (68)	48 (40)
Maryland	24	3 (13)	7 (29)	2 (8)
Mississippi	82	24 (29)	62 (76)	22 (27)
New York	62	14 (23)	25 (40)	9 (15)
North Carolina	100	31 (31)	55 (55)	20 (20)
Ohio	88	32 (36)	47 (53)	21 (24)
Pennsylvania	67	52 (78)	34 (51)	34 (51)
South Carolina	46	7 (15)	20 (43)	2 (4)
Tennessee	95	52 (55)	51 (54)	28 (30)
Virginia	125	25 (20)	47 (38)	17 (14)
West Virginia	55	55 (100)	35 (64)	35 (64)
All Appalachian states	1090	423 (39)	585 (54)	271 (25)

Discussion

LOWER SANE AVAILABILITY IN RURAL AREAS

Within the 13 Appalachian states, SANE availability is similar between Appalachian and non-Appalachian counties and lower in rural counties than urban counties. This supports previous research on rural SANE availability in Appalachian states and further provides a comparison of availability between states.[20,27,40] In addition, beyond providing an overview of SANE availability throughout a multistate region, this analysis provides nuance to the landscape of SANEs in Appalachia. Supports for SANE programs may be most needed in rural areas of these states, regardless of Appalachian status. Finally, this analysis uses the updated 2023 RUCCs to determine county rurality. These differ significantly from the 2013 codes and are more appropriate to the SANE availability and population estimates used in this study.[34]

However, there is currently no published threshold for appropriate SANE availability, in terms of either overall population or SA prevalence. Even if a threshold were available for comparison, this analysis was unable to weight SANE availability by county-level SA prevalence, given that not every Appalachian state had these data readily and publicly available. This same issue was identified by Thiede and Miyamoto.[20] Future research should be conducted to determine appropriate SANE-to-population ratio thresholds and incorporate SA prevalence data to truly determine whether or not SANE access needs are being met.

Limitations

This analysis has several important limitations. First, it is unclear whether the self-reported city listed in the online registry for each SANE is the place of work or place of residence, potentially contributing to under- or overestimation of SANE availability in each county. Second, owing to overall low SANE availability, it was not possible to conduct a more granular analysis between rural and nonrural or Appalachian and non-Appalachian regions within individual states. For the same reason, it was also not possible to examine differences among SANE-A, SANE-P, and dually certified SANE availability. Third, this analysis does not account for local health care landscapes throughout these 13 states, including service use patterns that cross county or even state borders to access SANE resources. Future research should use more advanced geographic methods to more accurately analyze SANE availability. Fourth, although the dichotomous categorization of rurality was necessary for analysis owing to low SANE availability, this may obscure heterogeneity within rural areas.

TABLE 2

Descriptive statistics of SANEs by SANE certification type in the 13 Appalachian states

State	SANEs, n	SANE-As, n (%)	SANE-Ps, n (%)	Dually certified SANEs, n (%)
Alabama	35	21 (60)	2 (6)	12 (34)
Georgia	44	23 (52)	6 (14)	15 (34)
Kentucky	18	17 (94)	0 (0)	1 (6)
Maryland	36	25 (69)	1 (3)	10 (28)
Mississippi	10	5 (50)	4 (40)	1 (10)
New York	68	36 (53)	6 (9)	26 (39)
North Carolina	80	47 (59)	7 (9)	26 (33)
Ohio	88	60 (68)	10 (11)	18 (20)
Pennsylvania	83	51 (61)	3 (4)	29 (35)
South Carolina	43	27 (63)	3 (7)	13 (30)
Tennessee	50	37 (74)	7 (14)	6 (12)
Virginia	75	38 (51)	7 (9)	30 (40)
West Virginia	7	2 (29)	2 (29)	3 (43)
All Appalachian states	637	389 (61)	58 (9)	190 (30)

SANE, sexual assault nurse examiner; SANE-A, SANE-adult/adolescent; SANE-P, SANE-pediatric/adolescent.

TABLE 3

SANE availability per 100,000 residents in the 13 Appalachian states by Appalachian status and rurality

State	Overall SANE availability (/100,000 residents)	Appalachian SANE availability (/100,000 residents)	Non-Appalachian SANE availability (/100,000 residents)	Rural SANE availability (/100,000 residents)	Urban SANE availability (/100,000 residents)
Alabama	0.69	0.64	0.78	0.36	0.78
Georgia	0.40	0.46	0.38	0.44	0.40
Kentucky	0.40	0	0.54	0.06	0.61
Maryland	0.58	0.40	0.59	0.73	0.58
Mississippi	0.34	0.16	0.39	0.13	0.55
New York	0.35	0.29	0.35	0.58	0.33
North Carolina	0.75	0.73	0.75	0.36	0.84
Ohio	0.75	0.36	0.83	0.80	0.74
Pennsylvania	0.64	0.67	0.62	0.51	0.66
South Carolina	0.81	1.29	0.64	0.14	0.92
Tennessee	0.71	0.92	0.55	0.60	0.74
Virginia	0.86	1.50	0.80	0.84	0.87
West Virginia	0.39	0.39	–	0.58	0.28
All Appalachian states	0.59	0.63	0.58	0.46	0.62
Significance testing (α = 0.05)	df = 1, P = .41			df = 1, P = .027	

SANE, sexual assault nurse examiner.

Implications for Emergency Nurses

Although more research is needed to determine whether or not this SANE availability is appropriate in these 13 states, it is clear from the existing body of research that challenges for rural SANEs are common. Rural geography may present additional challenges for both SANEs and patients seeking care for SA, such as risk of burnout and increased travel and wait time, respectively.[40-42] Furthermore, living in small rural communities with complicated relationship dynamics may affect people's desire to seek or provide care.[27] This has important legal implications, considering SANEs testify in court on behalf of the survivor and the evidence collected. Therefore, it is imperative that emergency nurses advocate for funding and infrastructure to support SANE training and staffing in rural areas of Appalachian states. In addition, emergency nurses should advocate for funding for competitive SANE salaries in rural areas of Appalachian states to both hire and retain SANEs. Finally, emergency nurses should advocate for appropriate support for SANEs in rural areas of Appalachian states to reduce factors associated with leaving the profession, such as burnout.

Conclusion

Rural counties within the 13 Appalachian states have lower SANE availability than the region's urban counties. Future research is necessary to determine the appropriate threshold for SANE availability. In the meantime, greater support for SANEs in rural areas in Appalachian states may be warranted. This may include additional recruitment to bolster the SANE workforce, as well as greater financial incentives for SANEs to enter and remain in the workforce in this crucial role. SANE training programs are already a limited resource, and without further funding and focused funding on areas such as rural counties in Appalachian states, disparities in access and care will remain.

Author Disclosures

Conflicts of interest: none to report.

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Closing the Educational Gap on Human Trafficking: There's No Better Time Than Now!

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Contribution to Emergency Nursing Practice

- Human trafficking claims more than 25 million victims globally and trending to surpass drug trafficking. The geopolitical environment and unintended consequences of coronavirus disease 2019 may worsen this public health crisis. More than half of human trafficking victims seek health care services during captivity, yet health care providers are lacking in the knowledge and skills to identify and rescue victims.
- This study identified a notable increase in nurses' knowledge and confidence in human trafficking after educational intervention.
- Research demonstrates the need for mandated, consistent, and sustainable education for both health care providers who intersect daily with human trafficking victims and other disciplines who have a stake in creating a systems approach to change.

Abstract

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Introduction: Human trafficking is a heinous crime and violation of human rights affecting between 25 and 27 million adults and children globally each year. Current immigration and refugee policy could exacerbate the human trafficking public health crisis. Health care providers working in emergency department and urgent care settings interact with human trafficking victims and provide life-changing care. Research identifies a significant need for coordinated, consistent, and standardized education on human trafficking. The purpose of this study was to determine the effectiveness of online educational training in human trafficking on the knowledge and self-confidence of registered nurses and nurse practitioners working in the emergency department and urgent care settings in New York.

Methods: An asynchronous, online education module was designed for emergency department and urgent care registered nurses and nurse practitioners to address key components of human trafficking identification, assessment, and treatment. Using a 1-group pretest/posttest design, participants completed an existing published survey tool before and 6 weeks after education.

Results: Findings revealed statistically significant improvement ($P < .05$) in knowledge and confidence regarding components of identifying, assessing, and treating victims of human trafficking. Data demonstrated 63.8% of participants had never received human trafficking training, and 80% reported no history of contact with patients known or suspected of being trafficked.

Discussion: Results in this study demonstrate the need for increased standardized education regarding HT for frontline health care workers.

Key words: Human trafficking; Sex trafficking; Labor trafficking; Education; Emergency departments; Urgent care

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Introduction

Historically, *trafficking* was synonymous with illegal drug or arms smuggling.[1,2] Over the past 2 decades, *human* has been added to trafficking to reflect the worsening public health

and human rights crisis. Human trafficking (HT), which has been termed "modern-day slavery," involves the exploitation of humans by force or coercion to perform labor or sexual related work.[3-7] Traffickers may be drawn to HT instead of drug trafficking or arms trade because the profits from exploiting 1 human can be continuous unlike the 1-time sale of drugs or arms.[8,9]

The geopolitical environment has opened avenues for massive influxes of illegal trade across our borders.[10] As immigration and refugee policies continue to undergo reform, HT has potential to remain an outcome of migration and relocation, making individuals vulnerable to the enticement of traffickers.[10] The United States is a top destination for importing HT victims from other countries, with a significant percentage of victims coming from within the states.[1]

The coronavirus disease 2019 (COVID-19) pandemic exacerbated circumstances in which HT thrives: homelessness, child maltreatment, and online exploitation.[11] With emergency departments burdened from the pandemic and its sequelae, delays in seeking health care for trafficked youth have created missed opportunities to rescue victims.[11]

BACKGROUND

Statistics

HT numbers have surpassed illegal drug and arms trade. To date, the estimated impact on pediatric and adult lives globally is 25 to 27 million.[2,12] Since 2018, annual reported trafficking cases to the National Human Trafficking Hotline have doubled in the continental United States and territories compared with 2014, when data recording on HT (Polaris Project 2023 hosts the largest national database on human trafficking, based on statistics from the National Human Trafficking Hotline) was established.[13] Due to the clandestine nature of HT, these numbers are mere underestimates.[14]

In 2021, phone calls related to forms of HT demonstrated the following: (1) 72% of calls for sex trafficking, (2) 10% for labor trafficking, (3) 3% for a combination of sex and labor trafficking, and (4) 15% were unspecified.[13] The top 5 sex trafficking venues remain consistent and include (1) pornography, (2) illicit massage/spa business, (3) escort services, (4) resident based commercial sex, and (5) personal servitude.[13]

Victim Sequelae

HT can have devastating and long-lasting health-related effects on a victim including (1) headaches, (2) malnutrition, (3) human immunodeficiency virus, (4) human papilloma virus related cancers, (5) other sexually transmitted diseases, (6) sterility, (7) hepatitis C, (8) abortions (either voluntary or forced), (9) respiratory issues, (10) physical injuries (fractures, branding, strangulation, and burns), (11) chronic pain, (12) depression, (13) suicidal ideation, (14) substance abuse/dependence, (15) post-traumatic stress disorder and anxiety, and (16) sleep deprivation.[8,15-17]

Societal effects can be severe, long-lasting, and costly, particularly within the health care and justice systems.[17,18] Victims may end up with serious mental illness, drug addiction, and permanent physical injuries that require extensive care coordination.[17] The complex nature of trafficking and the lack of standard regulations protecting victims can be burdensome to the justice system.[17]

Risk Factors

A myriad of individual, community, and societal risk factors are associated with the recruitment of HT victims, including (1) history of maltreatment and/or family dysfunction; (2) mental health and substance use disorders; (3) lesbian, gay, bisexual, transgender, queer, questioning, intersex, asexual status; (4) homeless, runaway, or "throw-away" status; (5) migrant/refugee status; (6) high-risk behaviors; (7) family poverty/unemployment; (8) limited awareness of HT in the community and health care setting; (9) community dysfunction (crime, poverty, lack of resources, political corruption); (10) corrosive social/cultural values (gender-based discrimination and violence, and sexualization of children); and (11) limited evidence-based prevention strategies.[18]

The Problem

Traffickers look upon their victims as *product*; ensuring functional health of their victim adds to their product value.[9] Traffickers use hospitals and clinics to address victim illness and injury, yet trafficking victims are reticent to self-identify due to an array of complex factors.[9] An estimated 67% to 87% of HT victims intersect with health care providers (HCPs) at some point during their captivity, with 56% seeking ED or urgent care (UC) services and 57.1% seeking treatment at clinics or Planned Parenthood facilities.[1,13] Of HT victims who sought health care services, 90% were asked at least 1 question from a HCP that identified them as being trafficked; however, opportunity was missed 56% of the time in providing a life-changing intervention.[1] HCPs encounter HT victims during their captivity, but are ill equipped to perform accurate assessments and identify red flags.[19-23] This places health care

system frontline providers, such as emergency and UC nurses, in pivotal positions for identification and rescue.

Multiple attempts at formalizing HT training for HCPs date back to 2002.[14,20,24] Despite the availability of national initiatives and resources ('*Stop, Observe, Ask, and Respond* [SOAR]' – developed by the Administration for Children and Families; '*Health, Education, Advocacy, Linkage* [HEAL]' toolkit; '*Physicians Against the Trafficking of Humans* [PATH]'; and the *National Human Trafficking Resource Center* [NHTRC]),[18,24] there is minimal standard for application to practice of initiatives, education, or guidelines within the contiguous United States and Alaska, Hawaii, and the territory of Puerto Rico.[25] Only 1% of the nation's hospitals have policies and procedures set in place for treating victims of HT.[20] Without proper training and education of HCPs, victims remain victims.[17,21,26] This makes every health care encounter vital to rescue.

Successful completion of online and face-to-face HT education increases provider knowledge, self-confidence, and self-efficacy in victim identification, in the ED setting.[20,22,27-29] Having the self-confidence and self-efficacy to identify and act on behalf of an HT victim supports the power that HT education and training can do for this specialized subset of patients.[3]

There remains a significant gap in standardized and coordinated educational training across the United States for HCPs on identification, rescue, and trauma-informed, patient-centered care for HT victims.[19-21,24,30] This gap in formal education and training in HT identification and effective intervention requires action.

Purpose

The purpose of this study was to determine the effectiveness of online educational training in HT on *knowledge* and *self-confidence* of RNs and NPs working in ED and UC settings in New York.

Methods

PARTICIPANTS

The New York State Education Department Office of the Professions (NYSED-OP) provided a listserv for all licensed registered nurses (RNs) and nurse practitioners (NPs) in the state. RNs and NPs actively licensed in New York State working in ED and UC settings were eligible to participate in this study. Inclusion criteria included a registered email address and an associated NYSED-OP professional code, as follows: "registered professional nurse" (code 22), "nurse practitioner

in adult health" (code 30), "nurse practitioner in community health" (code 32), "nurse practitioner in family health" (code 33), "nurse practitioner obstetrics/gynecology" (code 36), "nurse practitioner in pediatrics" (code 38), "nurse practitioner in perinatology" (code 39), "nurse practitioner in psychiatry" (code 40), "nurse practitioner in women's health" (code 42), and "nurse practitioner in acute care" (code 43). An invitation to participate in the study was sent that included a request for self-validation of current professional role and practice setting. Formal consent was implied upon entry into the preintervention part of the study.

SETTING

The study took place in a virtual, asynchronous (Asynchronous refers to self-paced learning and interactions with the educational setting, within a given timeframe; synchronous sessions are provided in real time where participants complete lessons and activities in sync with one another.) environment using an easy-to-navigate website. The website was developed by the primary author (Online website can be accessed at the following URL: hteducation.us.) and incorporated content supported by seminal research.[20]

TOOLS/MEASURES

A 1-group pretest/posttest design was used to address the purpose of this study. The PROTECT survey (Figure 1) served as the instrument of measurement. As a validated and reliable survey tool, it was used to assess perceived and actual knowledge and self-confidence.[3] Permission was granted for its use under Creative Commons Licensing.[31] Minor editing to improve relevance to this study included an interchange in wording: (1) common language in the original survey, *providers,* was changed to *health care providers*; (2) words in question 19, *United Kingdom statistics*, were changed to *global statistics* (see Figure 1).

Psychometric analyses assessed internal construct reliability and consistency of subscales. Perceived knowledge of HT, actual knowledge of HT, and responding to HT demonstrated a Cronbach's $\alpha = 0.93$ (95% confidence interval [CI], 0.92-0.94), 0.63 (95% CI, 0.59-0.66), and 0.64 (95% CI, 0.60-0.68), respectively.[3]

The survey breaks down into 6 sections that include 3 subscales: (1) background information, (2) previous training and response to HT, (3) perceived knowledge of HT subscale, (4) actual knowledge of HT subscale, (5) confidence in responding to HT subscale, and (6) interest level in HT training.[3] For this study, participants completed

PROTECT: Provider Responses, Treatment and Care for Trafficked People

We would like to know about your experiences, knowledge, and opinions about human trafficking. Please answer the following questions, which will help us to understand your training needs. The survey is voluntary and should take approximately 10 minutes. This is not an exam; please record your first, instinctive answer.

	Background information
1	**Gender:** Female □ Male □ **Age (years):** _____ **Ethnicity:** White □ Mixed/Multiple ethnic groups □ Asian/Asian British □ Black/African/Caribbean □ Other (please specify):_____
2	**Health care provider (HCP) role (e.g, registered nurse, nurse practitioner)** _____ **Years of qualification:**_____ **Clinical setting/specialty (e.g, emergency department, urgent care)** _____
	Training
3a	**Have you ever received training on human trafficking (HT) within your HCP role?** Yes □ (please answer below) No □ (please go to Q4) **If yes:** Approximately how much training have you received? _____ (hours) or (days) _____ Who provided the training on human trafficking? _____ How long ago did you last receive this training (years)? _____
3b	**Which of the following areas were covered during the training on human trafficking?** (Mark as many as apply) General information: definitions and case studies □ Care approaches □ Why people are trafficked, types of trafficking □ Local or international legislation on HT □ Health problems associated with trafficking □ Other (please specify) _____ Indicators of human trafficking □ Making referrals, giving information on national/local services □
4	**Have you ever received training on violence against women within your HCP role?** Yes □ No □
5	**Have you ever received training on working with vulnerable migrants (e.g, asylum seekers, refugees) within your HCP role?** Yes □ No □
6	**Have you ever been in contact with a patient whom you knew or suspected had been trafficked?** Yes □ No □ (If no, go to Q7) **If yes, why did you know or suspect that the patient(s) had been trafficked?** Disclosure by patient □ Disclosure by another professional □ Patient displayed signs that indicated they had been trafficked □ Other (please specify) _____
7	**In your opinion, what are the three most important signs or indications that suggest a patient may have been trafficked?**	1)_____ 2)_____ 3)_____
8	**Do you have any data source within your healthcare system/organization that would allow the identification of the number of suspected cases of trafficking seen within your organization/healthcare system?** Yes □ No □ (if no, go to next section) **If yes, please name your organization/system and the relevant data source:** _____

FIGURE 1
PROTECT survey.

Please indicate how much you feel you know about the following:		Very Little	A Little	Some	Quite a bit	A lot
9	Your role in identifying and responding to human trafficking					
10	Indicators of human trafficking					
11	What questions to ask to identify potential cases of human trafficking					
12	What to say/not say to a patient who has experienced human trafficking					
13	Health problems commonly experienced by people who have been trafficked					
14	How to document human trafficking in a medical record					
15	Assessing danger for a patient who may have been trafficked					
16	Local and/or national support services for people who have been trafficked					
17	Local and/or national policies on responding to human trafficking					

Please answer True or False if you think you know the answer		True		False		Don't Know
18	The definition of human trafficking is restricted to women and girls who have been forced into prostitution					
19	Each year, more than 20 million adults and children are trafficked globally					
20	The majority of women who are trafficked for prostitution were sex workers before being trafficked					
21	Children who are working for relatives in domestic situations cannot really be considered "trafficked"					
22	Trafficking is associated with post-traumatic symptoms					
23	Trafficking is associated with chronic headaches					
24	There are usually evident signs that a person is in a trafficking situation					
25	People who are being exploited often have difficulty reporting these situations to outsiders, especially professionals					
26	Health practitioners shout **not** ask trafficked people about violence that they might have suffered, as it is too traumatic for them					
27	Calling the police if I suspect a patient has been trafficked could put the patient in more danger					

28 | **Which of the following health problems are NOT likely to be related to situations of human trafficking?** (please check all that apply)

Depression ☐   Hypothermia or dehydration ☐
Chemical burns and pesticide poisoning ☐   Sexually Transmitted Infections ☐
Memory problems ☐   Headaches ☐
Coronary heart disease ☐   Post-traumatic stress disorder ☐
Diabetes ☐

Please indicate how much you agree with the following:		Strongly Disagree	Disagree	Neither	Agree	Strongly Agree
29	It is very unlikely that I will ever encounter a trafficked person in my HCP role					
30	My workplace allows me enough time to ask about trafficking if I suspected a person might have been trafficked					
31	I would be comfortable asking a person if they were in danger from an employer					
32	Asking about experiences of exploitative situations is offensive to most patients					

FIGURE 1

continued

33	A patient's friend can interpret for him or her if I think that a person has been trafficked					
34	Healthcare workers have a responsibility to respond to suspected cases of human trafficking					
35	I am aware of the precautions I need to take to protect my safety when caring for trafficked people					
36	I do not have sufficient training to assist individuals in situations of human trafficking					
37	I should call the police immediately if I suspect that a person has been trafficked					
38	I am confident I can document human trafficking accurately and confidentially					
39	I am confident I can make appropriate referrals for <u>women</u> who have been trafficked or exploited					
40	I am confident I can make the appropriate referrals for <u>men</u> who have been trafficked or exploited					
41	I am confident I can make the appropriate referrals for <u>children</u> who have been trafficked or exploited					
Interest						
42	On a scale of 1 to 5, where 1 is "not at all" and 5 is "very", how interested are you in learning about providing care in cases of human trafficking?	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐
43	Which do you think would be the most useful format for you to receive information or training on caring for people who may have been trafficked: Online information and training (live), facilitated, at set times ☐ Online information and training (recorded), self-directed, to watch/listen anytime ☐ Two-hour training session (facilitated) ☐ Half-day training session ☐ Full day training session ☐					
	OPTIONAL: We are very interested in learning about any experience you may have had with any trafficking cases. Please, if you are willing, can you either write about your experience here or offer your contact details so we can get in touch with you to learn about these experiences?					

FIGURE 1
continued

sections 1 to 6 in the preintervention period and sections 3, 4, and 5 in the postintervention period.

The postintervention survey was sent out 6 weeks after completion of the online educational module. The time lapse between the pre- and postintervention surveys offered time for participants to apply their knowledge to practice, reducing the risk of immediacy effect, common in 1-group pretest/posttest designs.[32]

INTERVENTION

The online education module was developed based on current evidence and national guidelines.[17,19-21,26,29] It contained access for remote login and asynchronous training. After completion of the preintervention survey, participants were routed to an education module, consisting of a PowerPoint presentation (Microsoft) with knowledge
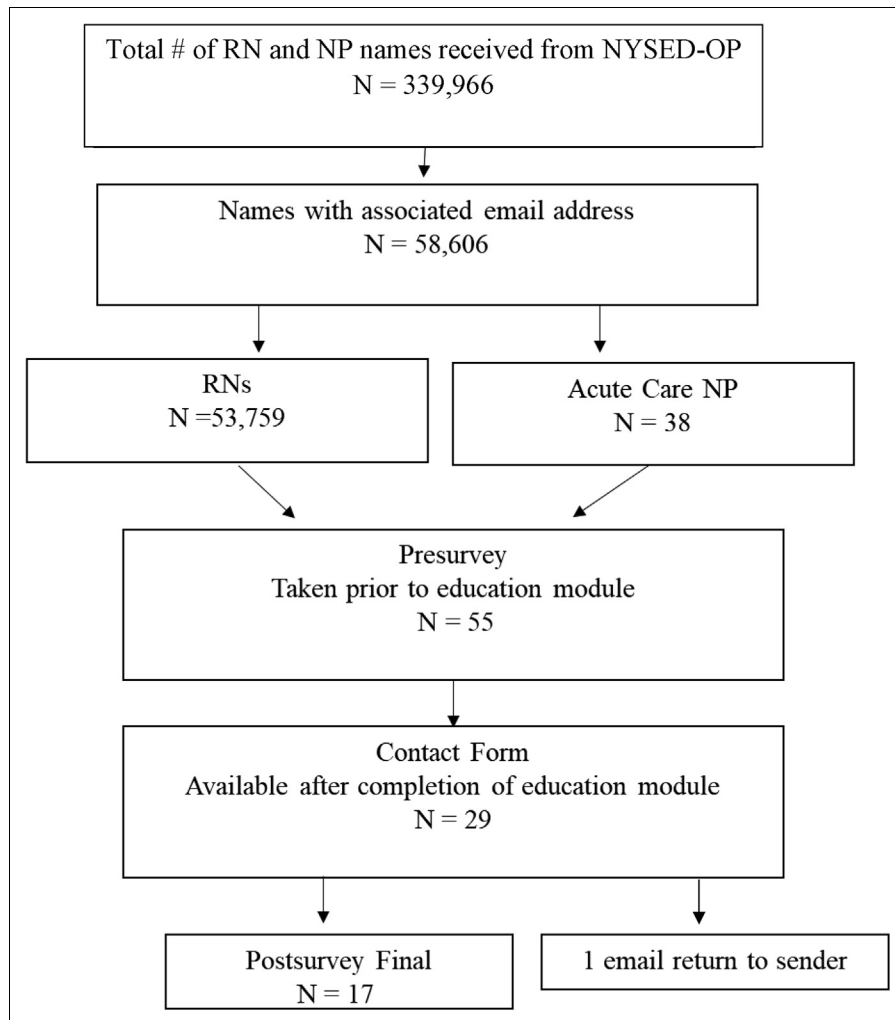
FIGURE 2

RNs and NPs enrolled in study. NP, nurse practitioner; NYSED-OP, New York State Education Department-Office of the Professions; RN, registered nurse.

checks throughout the didactic information, followed by 2 case studies. The PowerPoint presentation (Microsoft) defined HT and provided an overview of types of HT, statistics, at-risk populations, potential red flags, common health issues, screening questions, various treatment options, and referral services. HT identification guidelines and resources were embedded within the website for optional access.

DATA COLLECTION

Data collection by the principal investigator took place from January 2020 to April 2020. Business emails were the mode of recruitment. Data for the preintervention surveys were collected through a Google form (Google) embedded into the website. All data collected was de-identified, exported to Excel (Microsoft), coded, and uploaded for data analysis using IBM's Statistical Package for the Social Sciences (SPSS) version 25 (IBM).

DATA ANALYSIS

Descriptive analysis from data in sections 1 and 2 included (1) frequency and valid percent of gender, HCP role, ethnicity, and practice setting; (2) minimum, maximum, mean, and standard deviation of age and years in practice; and (3) frequency and valid percent of previous training in the subject matter of HT.

TABLE 1
Sample characteristics

	Frequency*	Valid percent	Min	Max	M	SD
Gender, race, role, and practice setting						
Gender						
Male	4	7.3				
Female	51	92.7				
Ethnicity						
White	40	72.7				
Asian/Asian British	2	3.6				
Black/African/Caribbean	8	14.5				
Hispanic	2	3.6				
Latina	1	1.8				
Middle East	1	1.8				
Mixed/multiple	1	1.8				
HCP role						
RN	39	70.9				
NP	15	27.3				
Undeclared	1	1.8				
Clinical setting						
ED	30	54.5				
UC	12	21.8				
Undeclared	13	26.3				
Age and years in practice						
Age†			26	85	50.94	12.22
Years of qualification‡			1	56	23.35	13.40

ED, emergency department; HCP, health care provider; M, mean; Max, maximum; Min, minimum; NP, nurse practitioner; RN, registered nurse; SD, standard deviation; UC, urgent care.
Age of participants and years of qualification in practice as a licensed professional.
  * n = 55.
  † n = 53.
  ‡ n = 55.

The Wilcoxon signed-rank test was used to compare data in sections 3, 4, and 5 between pre- and postintervention results. Statistical significance was evaluated using the exact test (2-tailed) analysis chosen based on characteristics of data, small sample size, and regression of participants from pre- to postsurvey.

HUMAN SUBJECTS CONSIDERATION

Institutional review board approval was obtained through Sacred Heart University, IRB#191028G (Primary author was doctoral candidate at Sacred Heart University at time of data collection.) Ethical considerations included securing participant information and data privacy.

Results

SAMPLE CHARACTERISTICS

A total of 339,966 names were received from the NYSED-OP with 58,606 having an associated email address. Filtering by professional code included RNs and acute care NPs, resulting in 53,797 email addresses; of these, 55 participants responded and completed the preintervention survey. Of the 55 participants, 29 (52.7%) completed the education module and left their contact information for future correspondence regarding the follow-up postintervention survey. The postintervention survey was sent out to 29 participants, of whom 17 participants (58.6%) responded. Figure 2 displays the participants recruited for this study, by profession.

TABLE 2

Previous training in human trafficking and vulnerable populations

Question	Answer	Frequency*	Percentage
(3a) Have you ever received training on HT within your HCP role?	Yes	19	35.4
	No	35	63.6
(4) Have you ever received training on violence against women within your HCP role?	Yes	34	61.8
	No	19	35.4
(5) Have you ever received training on working with vulnerable migrants (eg, asylum seekers, refugees) within your HCP role?	Yes	9	16.4
	No	46	83.6
(6) Have you ever been in contact with a patient whom you knew or suspected had been trafficked?	Yes	8	14.5
	No	44	80
(8) Do you have any data source within your health care system/organization that would allow the identification of the number of suspected cases of trafficking seen within your organization/health care system?	Yes	5	9.1
	No	49	89.1

HCP, health care provider; HT, human trafficking.
Collected only in the preintervention survey.
  * n = 54.

SAMPLE BACKGROUND CHARACTERISTICS

The sample (n = 17) was predominantly white, female, and RNs working in the ED setting, with the second largest group representing Black/African/Caribbean, male, and NPs working in the UC setting. The mean age of participants was 50.94 years and mean number of years in practice was 23.35 (Table 1).

A third of participants revealed previous exposure and training to HT and vulnerable populations. Fifteen percent had known contact with a HT victim and less than 10% had received previous training working with vulnerable migrants within their professional role. Most participants (61.8%) had previous training on violence against women. Most participants did not have a data source (Data source infers a process for reporting HT case numbers.) within their organization to allow for identification of suspected HT victims (Table 2).

PERCEIVED KNOWLEDGE SUBSCALE

Section 3 (Questions 9-17)

Perceived knowledge was obtained through the following prompt: *Determining how much you feel you know about the following.* This segment of the survey was based on a Likert scale ranging from 1 to 5, with 1 being "very little" and 5 be-

ing "a lot" of knowledge about the given topics. Of 9 statements posed, 1 (question 15) demonstrated a statistically significant change ($z = -2.08$ $P = .04$): *Assessing the danger for a patient who may have been trafficked* (Table 3).

ACTUAL KNOWLEDGE SUBSCALE

Section 4 (Questions 18-28)

Actual knowledge was determined with the following prompt: *Please answer True or False if you think you know the answer.* This segment of the survey (questions 18-27) was based on a scale of 1 to 3 with 1 being "true," 2 being "false," and 3 being "don't know" answers. Of the 10 True or False statements offered, 6 demonstrated statistically significant changes before to after intervention. The checklist of health problems (question 28) revealed no significant differences from pre - to postintervention survey (Table 3).

CONFIDENCE SUBSCALE

Section 5 (Questions 29-41)

Confidence in responding to HT was determined from the following prompt: *Please indicate how much you agree with the following.* This segment of the survey included items

TABLE 3

Mean scores and significance of perceived and actual knowledge on human trafficking

Mean scores and significance of perceived knowledge on human trafficking

Question	Survey*	M	SD	z	P value[†]
(9) Your role in identifying and responding to HT	PRE	2.42	1.23	−.06	.95
	POST	3.06	1.30		
(10) Indicators of HT	PRE	2.29	1.12	−1.22	.26
	POST	3.18	1.19		
(11) What questions to ask to identify	PRE	2.16	1.09	−1.38	.18
	POST	3.18	1.19		
potential cases of HT					
(12) What to say/not say to a patient who has experienced HT	PRE	2.16	1.09	−1.65	.11
	POST	3.24	1.25		
(13) Health problems commonly experienced by people who have been trafficked	PRE	2.53	1.14	−1.91	.07
	POST	3.29	1.05		
(14) How to document HT in a medical record	PRE	1.87	1.12	−.80	.46
	POST	2.47	1.23		
(15) Assessing danger for a patient who may have been trafficked	PRE	2.15	1.11	−2.08	.04
	POST	3.24	1.15		
(16) Local and/or national support services for people who have been trafficked	PRE	1.96	1.07	−1.56	.12
	POST	3.06	1.35		
(17) Local and/or national policies on responding to HT	PRE[‡]	1.78	1.00	−1.39	.19
	POST	2.76	1.15		

Mean scores and significance of actual knowledge on human trafficking

Question	Survey*	M	SD	z	P value[†]
(18) The definition of HT is restricted to women and girls who have been forced into prostitution (False)	PRE	1.25	.62	−3.00	<.01[†]
	POST	2	.00		
(19) Each year, more than 20 million adults and children are trafficked globally (True)	PRE	2.25	.48	−3.34	<.01[†]
	POST	1.18	.53		
(20) The majority of women who are trafficked for prostitution were sex workers before being trafficked (False)	PRE	1.40	.78	−.36	.84
	POST	1.76	.56		
(21) Children who are working for relatives in domestic situations cannot really be considered "trafficked" (False)	PRE	1.31	.72	−2.00	.08
	POST	2.00	.00		
(22) Trafficking is associated with post-traumatic symptoms (True)	PRE[‡]	2.09	.40	−3.50	<.01[†]
	POST	1.12	.49		
(23) Trafficking is associated with chronic headaches (True)	PRE	2.38	.56	−3.39	<.01[†]
	POST	1.24	.66		
(24) There are usually evident signs that a person is in a trafficking situation (False)	PRE	1.69	.84	−1.81	.12
	POST	2.06	.56		
(25) People who are being exploited often have difficulty reporting these situations to outsiders, especially professionals (True)	PRE	2.09	.29	−3.95	<.01[†]
	POST	1.00	.00		

TABLE 3
Continued

Mean scores and significance of perceived knowledge on human trafficking

Question	Survey*	M	SD	z	P value†
(26) HCPs should not ask trafficked people about violence that they might have suffered, as it is too traumatic for them (False)	PRE POST	1.45 2.06	.84 .43	−2.40	.02†
(27) Calling the police if I suspect a patient has been trafficked could put the patient in more danger (True)	PRE§ POST	1.67 1.41	.48 .80	−1.41	.29
F1 Depression is not likely to be related to situations of HT (False)	PRE POST	.02 .00	.13 .00	.00	1.00
F2 Chemical burns and pesticide poisoning are not likely to be related to situations of HT (False)	PRE POST	.20 .06	.40 .24	−1.63	.22
F3 Memory problems are not likely to be related to situations of HT (False)	PRE POST	.05 .00	.23 .00	.00	1.00
F4 Coronary heart disease is not likely to be related to situations of HT (True)	PRE POST	.71 .76	.46 .44	.00	1.00
F5 Diabetes is not likely to be related to situations of HT (True)	PRE POST	.73 .88	.45 .33	−.82	.69
F6 Hypothermia or dehydration are not likely to be related to situations of HT (False)	PRE POST	.05 .00	.23 .00	−1.00	1.00
F7 Sexually transmitted diseases are not likely to be related to situations of HT (False)	PRE POST	.02 .00	.13 .00	.00	1.00
F8 Headaches are not likely to be related to situations of HT (False)	PRE POST	.05 .00	.23 .00	−1.00	1.00
F9 Post-traumatic stress disorder is not likely to be related to situations of HT (False)	PRE POST	.04 .00	.19 .00	.00	1.00

HT, human trafficking; M, mean; PRE, presurvey; POST, postsurvey; SD, standard deviation.
F1 to F9 were checkbox responses.
* Presurvey, n = 55; postsurvey, n = 17.
† P value is exact (2-tailed) test; P ≤ .05 is considered significant.
‡ Presurvey, n = 54; 1 omitted response.
§ Presurvey, n = 39; 16 omitted responses.

scored using a Likert scale ranging 1 to 5 with 1 being "strongly disagree" and 5 being "strongly agree." Of the 13 items in this subscale, 4 items demonstrated a statistically significant change before and after intervention, namely, item 32 ($z = -2.36$, $P = .020$), item 36 ($z = -2.28$, $P = .02$), item 37 ($z = -2.28$, $P = .04$), and item 41 ($z = -1.87$, $P = .05$) (see Table 4).

Discussion

Innovative web-based educational strategies have been identified as a potential solution to address the educational gap in HT, a shift away from the face-to-face didactic style lectures.[24]

This study examined knowledge and self-confidence levels in frontline HCPs after the provision of online education on HT that allowed for asynchronous participation, ease, utility, and accessibility.

The web-based education module focused on the definition, types of HT, at-risk populations, potential red flags, common health issues, HCP role/responsibilities, assessment, and current available resources. The module concluded with 2 case studies depicting real-life scenarios with victims of HT as the patient of interest.

The 1-group pre-/postsurvey design demonstrated a 30% completion rate for the postsurvey. Participants represented RNs and NPs with a substantial number of years' experience in the field. This brought a seasoned perspective

TABLE 4

Mean scores and significance of confidence to respond to human trafficking

Question	Survey*	M	SD	z	P value
(29) It is very unlikely that I will ever encounter a trafficked person in my HCP role.	PRE POST[†]	1.91 1.69	.89 .95	−.27	.85
(30) My workplace allows me enough time to ask about trafficking if I suspected a person might have been trafficked.	PRE POST	3.25 3.65	1.08 1.00	−.82	.46
(31) I would be comfortable asking a person if they were in danger from an employer.	PRE POST	3.69 4.06	.90 .56	−1.29	.31
(32) Asking about experiences of exploitative situations is offensive to most patients.	PRE POST	2.60 2.06	.97 .97	−2.36	.02[‡]
(33) A patient's friend can interpret for him or her if I think that a person has been trafficked.	PRE POST	2.00 1.41	.98 .51	−1.98	.08
(34) Health care workers have a responsibility to respond to suspected cases of HT.	PRE POST	4.44 4.76	.76 .44	−2.11	.06
(35) I am aware of the precautions I need to take to protect my safety when caring for trafficked people.	PRE POST	2.96 3.53	1.07 1.01	−.92	.38
(36) I do not have sufficient training to assist individuals in situations of HT.	PRE POST	3.89 2.71	1.01 1.26	−2.28	.02[‡]
(37) I should call the police immediately if I suspect that a person has been trafficked.	PRE POST	3.15 2.24	.95 .90	−2.09	.04[‡]
(38) I am confident I can document HT accurately and confidentially.	PRE POST	2.49 3.18	1.10 1.43	−.44	.70
(39) I am confident I can make appropriate referrals for <u>women</u> who have been trafficked or exploited.	PRE POST	2.73 3.53	1.16 .94	−1.22	.26
(40) I am confident I can make the appropriate referrals for <u>men</u> who have been trafficked or exploited.	PRE POST	2.62 3.41	1.15 1.06	−1.21	.28
(41) I am confident I can make the appropriate referrals for <u>children</u> who have been trafficked or exploited.	PRE POST	2.80 3.76	1.33 1.09	−1.87	.05[‡]

HCP, health care provider; HT, human trafficking; M, mean; PRE, presurvey; POST, postsurvey; SD, standard deviation.

* Presurvey, n = 55; postsurvey, n = 17.

[†] Postsurvey, n = 16; 1 omitted response.

[‡] *P* value ≤ .05 is considered significant.

to the study yet highlighted the paucity of HT education even for the most experienced nurses. With most falling between 10 and 25 years' experience, it was surmised that participants had the skill set required to provide this specialized care but lacked the knowledge for clinical application. The data support the lack of experience, training, and/or knowledge that exists in identifying trafficked individuals.

KNOWLEDGE

The purpose of the study was to investigate the efficacy of online educational training in HT on 2 variables: knowledge, and self-confidence. As a result of online HT education, there was a notable shift in participants' knowledge on the ability to assess for danger in patients who may have been trafficked. The statistically significant knowledge shift occurred in the understanding that HT is not restricted to women and girls in prostitution and is associated with post-traumatic stress disorder and chronic headaches, and the understanding of global statistics of HT. Furthermore, a statistically significant increase in knowledge ($P < .5$) occurred in understanding that HT victims often have difficulty reporting their situation to professionals and HCPs have a responsibility to pose questions about violence. The findings from this study also indicate that a gap in knowledge remains in the areas of identifying, interacting with, questioning, and documenting care of the HT victim.

SELF-CONFIDENCE

There was a statistically significant increase in participants' confidence in asking patients about experiences of exploitative situations, assisting HT victims, procedures to follow in notifying authorities, and appropriate referrals of children who have been trafficked. However, the findings demonstrate a lack of confidence remains surrounding awareness of precautions to take as a HCP to protect personal safety, medical-record documentation, and referrals.

Strengths and Limitations

STRENGTHS

The priority groups for this study were emergency and UC RNs and NPs who were the most likely to intersect with HT victims in the health care setting. The accessibility and consideration for time constraints were supported with an asynchronous educational platform. The PROTECT survey used in the study is a valid, reliable tool. Results from this study provided further evidence of the tool's validity in assessing knowledge and confidence in HCPs surrounding HT.

The education module demonstrated efficacy as a tool to support knowledge acquisition on HT global statistics, the association of HT with labor and sexual exploitation, physical and behavioral sequelae, difficulties HT victims have in reporting, and the need to ask HT victims about their circumstances. Efficacy of the educational module was further demonstrated for HCPs self-confidence in general assistance and in the area of reporting procedures to authorities.

Asynchronous learning methods benefit working professionals by providing flexibility to engage in learning when it is most convenient for their schedule and individual learning preferences. Virtual access creates accessibility ease and can overcome time and attention barriers that may be present in a traditional brick and mortar location.

LIMITATIONS

Several limitations included inherent challenges with 1-group pre-/posttest designs, nonparametric analysis, small sample size and composition, reporting bias, technology, and the emergence of severe acute respiratory syndrome coronavirus 2 during data collection. Time between pretest and posttest can be associated with variables that negatively pose effects on results: naturally occurring events, testing effects, and perspective changes in participants. Due to the anonymous collection of the survey, individual participant survey scores were unable to be matched before and after intervention. Participants determined whether follow-up contact could be made, leading to a digression in participants from 54 in the presurvey phase to 17 participants in the postsurvey phase, an attrition rate of 68.5%.

The preponderance of RNs versus NPs in the sample size may have affected data findings. A larger percentage of NPs in the study may have strengthened the results due to an expectation of advanced assessment skills. All data were self-reported and thus subject to reporting bias. Self-reporting in research may not always be rooted in the actual self, but rather what a respondent aspires to be or one's self-view.[33] In this study, self-reporting related to current and previous practice settings had the potential to be inaccurate and thus influence the question-answering process.[33]

This study was conducted in the virtual environment. The ability to control or predict the functionality of technology may have influenced participation in any portion of the study. It was not ascertained whether participants sought

the optional educational links of the website. If accessed during the study period, data of this type may have provided enhanced learning.

The emergence of the severe acute respiratory syndrome coronavirus 2 pandemic during data collection in Spring 2020 affected the number of participants that completed the pre and post surveys. New York was an epicenter during March to May 2020,[34] where health care settings for this study, emergency departments and UC centers, were inundated with COVID-19 patients. Frontline staff worked extended hours and safety for HCPs from exposure may have been a factor in the reduction of participants for postsurvey data. Follow-up data collection for a third of the participants fell during the period from late February to early March of 2020, the time of the exponential increase in COVID-19 cases, overwhelming hospital systems.

Implications for Emergency Nurses

HT is a global population health issue that generates more than 30 billion dollars per year for the perpetrators of these crimes, with significant prevalence within the United States.[21] Immigration reform legislators and policy makers should consider the impact of policy change on this human rights violation.[10] COVID-19 and its unintended consequences and sequelae amplified the incidence of HT, including the impact on vulnerable populations at risk of HT and exploitation.[11]

HT victims are brought to ED and UC settings when health care needs arise; providing a crucial cross point between captivity and potential rescue is vital. HCPs are in a prime position to identify HT victims. With this positioning comes the essential responsibility to be knowledgeable about HT victim identification and how best to provide safe, effective care and referral.

Health outcomes of HT victims can be devastating, including infections, disease, mental illness, chronic health issues, debility, and, in some cases, death.[15] The financial burden generated by the long-term sequelae of HT is significant. Isolation, fear, and terror prevail in the HT victim and are used as mechanisms through which traffickers maintain control and dominance over their victims, which is needed to continue the trafficking and reaping of profit.

A call to action to address the multiple facets of HT is needed. The public health crisis of violence against women must include victims of HT, where women are the predominant gender. Rescuing HT victims should be as critical as rescuing victims of domestic violence. Recent literature analyzing and defining foundational concepts such as

trauma-informed nursing care,[35] trauma-informed nursing education,[36] and trauma-informed care in special populations[29,37] can support and extend work designed to fill clinical gaps that exist in HT care. Moving away from the historically stated goals of rescue and disclosure[29] to a trauma-informed approach can support future nursing research on the theoretical underpinnings and best practices in the detection, care, and support of HT victims.

RECOMMENDATIONS

New and innovative technology-driven measures are being taken in all facets of life. Asynchronous education in the online setting has been found effective, with sustainable and reproducible outcomes in health care education programs. Educational modules, like the 1 used in this study with web-based electronic delivery, should further be explored to support increases in knowledge and confidence in HT care.

Although generalization of findings is limited because of the small sample size and design, this study and methodology warrants further examination aimed at replication in larger samples that encompass broader geographic areas. Further work examining efficacy by educational module element can support the parsing out of learning needs/content domains to tailor interventions by level of profession (RN vs NP), professional domain (nurses vs physicians), setting type (UC vs emergency department), and geographic area (rural vs urban).

Providing mandatory education to key stakeholders in local communities highlights the critical importance of training *across* disciplines: local police departments, politicians, social workers, behavioral health professionals, faith-based community leaders, and those stakeholders working with school-aged and adolescent populations. To enact true change, a systems approach to HT education has the potential to start a key conversation about this public health crisis that offers minimal randomized controlled research, poorly funded state initiatives, and uncoordinated education. In the present political climate, there is no better time than now to address violence against vulnerable populations through sound education on HT for those HCPs on the frontlines caring for victims.

Conclusion

Although emergency departments and UCs are ideal environments to identify HT victims and initiate intervention, there is a paucity of national standards available to support interventions. This educational gap creates a local, regional, and national

failure to identify, rescue, and provide trauma-informed care to the tens of thousands of HT victims in the United States.

HT is a growing concern both nationally and globally. The need for standardized education and training for providers on HT is established.[4,20-22,24,26,27,29] Efforts to heighten awareness and spur interest for this public health crisis are essential for the health care community with an emphasis on frontline workers.

Author Disclosures

Acknowledgments

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Implementing a Screening Tool and Referral Process for Substance Use Disorders in the Emergency Department: A Quality Improvement Project

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Abstract

Introduction: Substance misuse in the United States has continuously proven to be a public health issue. The impact of substance use disorder and the injury and illness it produces creates challenges in the public health sector. This quality improvement project aimed to increase screening and referral rates in a rural emergency department.

Methods: The CAGE-AID screening tool was implemented into the triage process in the Meditech Expanse system; 1077 patients were included in this quality improvement project. This initiative used Plan-Do-Study-Act cycles, collecting data weekly.

Results: There were 1077 patients available for the new screening process. This included 468 males (43.5%) and 609 females (56.5%). Of the 1077 patients, all (100%) were screened with the leading question. All patients (100%) were subsequently screened with the 4-item CAGE-AID tool if they answered "yes" to the leading question. Of these patients, 962 screened negative (89.3%) and 115 screened positive (10.7%). For those 115 positive screens, 63 denied referrals (54.8%) and 52 (45.2%) accepted referral. Of those 52 who accepted referral, 9 (17.3%) scheduled themselves for a follow-up appointment within 30 days of the new process going live.

Conclusion: It is possible for substance use disorder screening and referral to be implemented in every emergency department across the nation and beyond to help identify patients struggling with substance misuse and refer them to the appropriate treatment upon discharge. Substance use disorder screening and referral are an evidence-based method, and sufficient evidence supports the current practice of emergency departments implementing routine substance use disorder screening and referral as standard of care.

Key words: Emergency department; Screening; Referral; Addiction; Substance use; Triage

Introduction

Substance use is the leading cause of injury-related death that is preventable in the United States.[1,2] ED visits for drug overdoses were up 45% in 2020 compared with

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2019, with specifically opioid overdoses up 29% during this time frame.[3] On average there are 261 deaths per day relating to drinking too much alcohol, with more than half of these deaths being related to drinking too much over time.[4,5] According to the Substance Abuse and Mental Health Services Administration 2019 National Survey on drug use and health, more than 60% of those 12 years and older used a substance (alcohol, marijuana, illicit substance) in the past month. Substance use may be underreported despite its clinical significance owing to the time constraints.[6,7] An estimated 1 in 5 children grows up in a home where a parent misuses drugs or alcohol, which has long-lasting effects on the child's quality of life and overall mental health.[8] The estimated annual cost for emergency departments and inpatient admissions associated with substance misuse amounts to an estimated $13 billion and continues to rise.[9,10] The high expenses owing to substance

misuse include medical care, costs related to crime, lost employment, social and familial damage, injuries, and deaths.[11]

In Southwest Missouri in 2019, an estimated 5163 patients were treated and discharged from the emergency department for substance use disorder (SUD)-related concerns.[12] In 2022, Greene County and Polk County saw an estimated 137 drug overdose related deaths and 631 drug overdose inpatient visits.[12] At Citizens Memorial Hospital in Bolivar, Missouri, there have been an estimated 208 visits to the emergency department for SUDs related injury and illness in 2021.

Patients at risk of overdose and death frequently use the emergency department, and implementing an intervention at this point could be an effective strategy to prevent overdose.[13] In 1 study, 95% of those with SUD did not feel they needed treatment.[14] Barriers to care for those who do want to engage in treatment include transportation, restrictive policies, work issues, mental health problems, inability to find a local provider, long wait times, and lack of connection between emergency care and outpatient treatment.[11,13] In response, emergency departments in the United States have devised innovative ways to help patients with SUDs, initiate treatment, and refer them to treatment upon discharge.[15]

RATIONALE

Evidence reflects that SUDs can be reliably identified through validated screening tools, such as the CAGE-AID[16] questionnaire, which can be applied in a variety of different settings.[8] Patients frequently come to the emergency department in need of care, which provides a unique opportunity to identify and refer patients with substance misuse.[17] Emergency nurses can help save lives by identifying and referring patients to local providers who are adequately trained and equipped to treat SUDs. Considering the evidence on the magnitude of this clinical problem, implementing a form of screening, brief intervention, and referral to treatment in the emergency department is a viable option to help contribute to a solution.

The purpose of this project was to increase patient screening for SUDs and improve referrals to local treatment. The goal benchmarks of this 30-day project were to ask 75% of patients the single leading question in triage, 75% of patients would be subsequently screened after answering "yes" to the leading question, 20% of patients who screened positive would be referred, and 10% of patients who were referred would make an appointment within 30 days.

This is the first step in fixing the local problem in Bolivar, Missouri, to help reduce the number of deaths and disabilities related to SUD. Before the intervention was implemented, the emergency department in Bolivar was not performing any screening or referrals for patients with substance use problems. There were patients presenting to the emergency department for a primary or secondary diagnosis of SUD and only being referred to primary care providers who were not specialized in substance use treatment. If the patients did not have a primary care doctor, no referrals or resources were provided. The vicious cycle of these patients falling through the cracks of the health care system continued.

Methods

CONTEXT

This project took place in the emergency department at Citizens Memorial Hospital in Bolivar, Missouri. The emergency department is in a rural area and is the only emergency department within 30 miles of the nearest level 1 trauma center for 3 surrounding counties. There are approximately 1500 patients on average seen per month in this emergency department, with a predominantly white population. The ED staffing consists of 23 registered nurses, 5 ED physicians, and 8 patient care technicians.

INSTRUMENT

The CAGE-AID was implemented into the triage process of the Meditech Expanse system. The CAGE-AID is a brief and reliable instrument that focuses on lifetime substance use. This questionnaire has a sensitivity of 79% and specificity of 77% when 1 or more "yes" responses are recorded.[16,18] When there are 2 or more "yes" responses, sensitivity is 70% and specificity rises to 85%.[16,18] Although it is not a diagnostic instrument, it can help indicate whether a substance use problem exists. The CAGE-AID was chosen over other screening tools because it is collectively reliable and very brief, with only 4 "yes" or "no" questions. Many screening tools focus solely on opioids, other drugs, or alcohol, whereas the CAGE-AID screens for all substances. The briefness of the CAGE-AID was also appealing for the ED setting, given that it could be completed by the triage nurses in less than one minute.

The questions on the CAGE-AID screening tool include "Have you ever felt you should cut down on your drinking or drug use?" "Have people annoyed you

by criticizing your drinking or drug use?" "Have you ever felt bad or guilty about your drinking or drug use?" and "Have you ever had a drink or used drugs first thing in the morning to steady your nerves or get rid of a hangover?"[16,17] Responses on the CAGE-AID are scored 0 for "no" or 1 for "yes," with a maximum score of 4. The higher the score, the higher the risk of a substance use problem. A score of 2 or greater is considered clinically significant and subsequently classifies patients as having a positive screen. Some research shows that a score of 1 is clinically significant.

INTERVENTION

Every patient who enters the emergency department is subsequently triaged by a nurse. As part of the new quality improvement (QI) process, if the patient was between 18 and 65 years old, awake, and able to answer questions, they met criteria to be asked a leading question, "Do you use drugs or alcohol?" If the patient answered yes, the CAGE-AID was subsequently implemented. If they were not able to answer questions owing to their condition, such as being a level 1 trauma, the leading question was bypassed. If a patient screened positive for being at risk of SUDs and agreed to receive resources, the nursing staff gave the patient information about the hospital-affiliated addiction clinic and the physician added this as an official referral in their discharge paperwork.

STUDY OF THE INTERVENTION

This QI project used Plan-Do-Study-Act cycles, collecting data weekly. A retrospective review was done on all medical records of patients triaged in the emergency department for the 30-day evaluation window. After the new practice change went live, every week there was a chart review to collect the gender and the screening results of the patients for data collection. There was a review with the addiction clinic's staff to see whether patients were making new appointments from their ED referrals.

MEASURES

The total number of eligible patients, the number of patients asked the leading question, and the number of patients screened and subsequently referred were extracted from the electronic medical record. Descriptive data included participant gender only. The number of appointments made was collected from the electronic medical record.

ANALYSIS

To calculate the screening rate, the raw number of patients available for the leading question was divided by the number of patients subsequently screened positive. To calculate the accepted referral percentage rate, the raw number of patients who screened positive was divided by the number of patients who accepted a referral to the outpatient clinic. To calculate the percentage rate of follow-ups scheduled, the raw number of patients who accepted referral was divided by the number of patients who scheduled themselves at the outpatient clinic by the 30-day mark. Data were aggregated by sex (male and female patients). Individual patient data were not collected. Descriptive statistics (n, %) were computed using IBM SPSS version 29 (IBM Corp, Armonk, NY) and presented using a table and bar graph.

Results

There were 1077 patients seen in triage who met the criteria for the new screening and referral process. This included 468 males (43.5%) and 609 females (56.5%). Of the 1077 patients, all (100%) were screened with the leading question. This was possible owing to implementing the leading question as a mandatory part of triage in the Meditech Expanse computer system. All patients (100%) were subsequently screened with the 4 CAGE-AID questions if they answered "yes" to the leading question. Of those, 962 screened negative (89.3%) and 115 screened positive (10.7%). For those 115 positive screens, 63 denied referrals (54.8%) and 52 (45.2%) accepted referral. Of those 52 who accepted referral, 9 (17.3%) scheduled themselves for a follow-up appointment within 30 days of the new process going live. These results are presented in a bar chart (Figure) and a table (Table). There were no changes in flow as reported by the triage nursing staff. The screening tool took less than a minute for most patients, thereby not increasing triage times by a notable amount.

Discussion

The current project sought to improve referral rates by screening patients for substance misuse in the emergency department. All benchmark goals of this project were met. This project had a significant impact on the facility because of the clear gap it helped fill for identifying and referring this patient population to proper treatment. This intervention raised awareness within the community of the clinic's existence, given that many patients had not heard of it. The ED
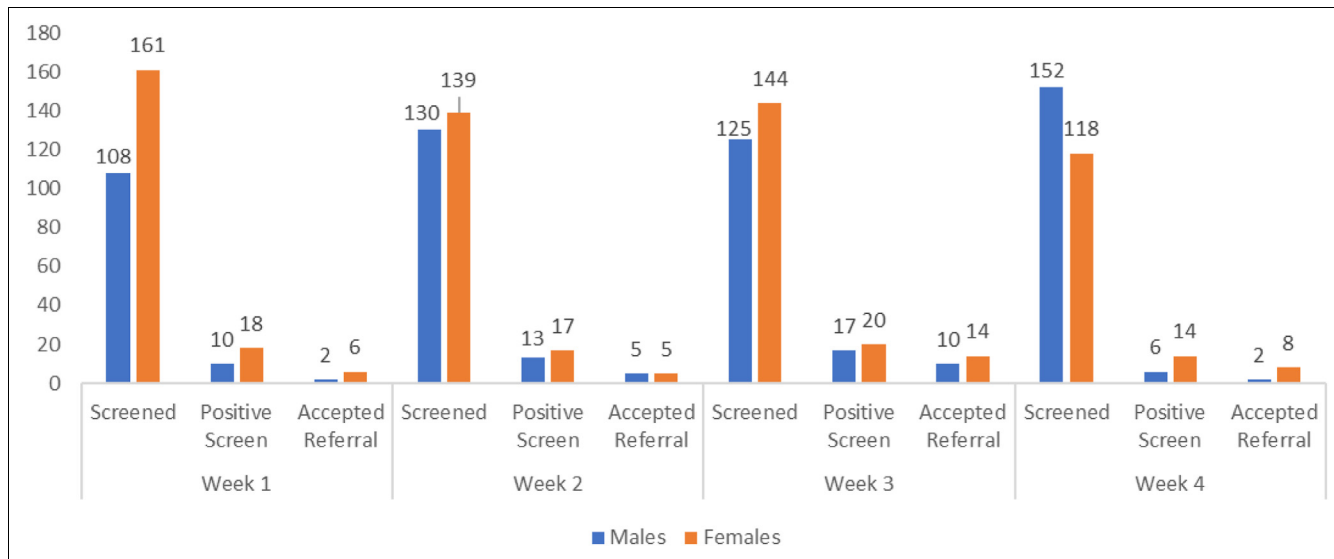
FIGURE

SUD screening and referral. SUD, substance use disorder.

directors decided to keep this process in place permanently to continue pressing toward the goal of decreasing injuries, deaths, and the financial burden on the community. This intervention led to more efficient throughput and can help prevent future use of emergency services.

Other QI projects have sought to implement screening tools in various health care settings; however, most used different screening tools and did not refer to a hospital-affiliated clinic.[2,7,18-22] The other studies that took place in emergency departments implemented buprenorphine initiation or peer recovery coaching and used the screening tools DAST-10 or AUDIT-C.[2,7,19,20] Staff in other emergency departments can adapt and build on this project to begin the process of identifying patients for substance misuse, connect those who want it to proper treatment, and start to lessen the profound impact this chronic illness has on America. Although clinical examination and patient history are the gold standards for diagnosing SUDs in the emergency department, a screening tool can be effective in helping identify patients at risk and, if the patient is willing, refer them to proper treatment up on discharge. Emergency departments are in a strategic position to identify and connect patients to treatment, and it is imperative to have a streamlined process in place to do so.

INTERPRETATION

The patients who accepted the referral had to make the addiction clinic appointment completely on their own. It may have been helpful if there was a follow-up phone call from social work the week after discharge or the ED front desk was able to make the appointment for them when the patient was checking out of the emergency department. The follow-up rates could have been higher had this been the case. Offering an outpatient referral seems to be a plausible first step in getting patients the treatment they need. Once this has been established, more robust interventions, such

TABLE

Referrals and follow-ups

Category	Accepted referrals					Made a follow-up appointment
	Week 1	Week 2	Week 3	Week 4	Total	n (%)
Males	2	5	10	2	19	6 of 19 (31.9)
Females	6	5	14	8	33	3 of 33 (9.1)

as initiating buprenorphine in the emergency department for opioid dependence and direct transfer to inpatient facilities, can be implemented to help reduce illicit drug use. Evidence has shown patients with SUDs often refuse treatment; therefore, this project had a modest aim of 10% of patients making an appointment with the clinic. Although this might be considered an optimistic goal, nursing staff participating were dedicated to educating patients who were open to resources about the importance of outpatient treatment. In addition, the screening alone may have a positive effect on helping patients realize they may be at risk. This no cost intervention of emergency nurses screening and showing concern for patients who screen positive may have a positive influence on the patient's trajectory toward recovery.

Limitations

The answers to the screening tool were dependent on the honesty of respondents. The screening tool is limited to ages 18 to 65 years. This project was done at a single site and was limited to a specific geographic location; therefore, results are not generalizable. However, as a QI project, it could be transferable and adapted to similar settings. The project period was more than 30 days; therefore, information is limited on long-term engagement in treatment.

Implications for Emergency Nurses

The intervention used in this initiative can be scaled and replicated in all emergency departments throughout the country to help identify patients who are at risk of SUDs. This intervention should be added to the important role of emergency nurses because it is a quick and efficient way that can help contribute to a solution to the substance use crisis. This intervention helps the substance misuse problem because it is the first step in identifying patients with SUDs and connecting emergency care with outpatient treatment. As the number of injuries and deaths caused by SUDs continues to rise, emergency nurses have a clear opportunity to swiftly screen and refer to treatment, which is an important harm reduction step to reduce the burden and loss of life associated with SUDs.

Conclusion

It is possible for SUDs screening and referral to be implemented in every emergency department across the nation and beyond to help identify patients struggling with substance misuse and refer them to the appropriate treatment upon discharge. This intervention is scalable and replicable and can be applied to all emergency departments. SUD screening and referral are an evidence-based intervention, and sufficient evidence supports the current practice of emergency departments beginning to implement routine screening and referral to resources as standards of care. This QI project screened more than 1000 patients, and more than 100 could have been referred to treatment for SUDs. It is highly unlikely that the screening and referrals would have taken place in the absence of this project. Screening and referral for SUDs to identify patients and link them to treatment should be considered as part of a large initiative in the public health sector. It is possible that implementing these streamlined efforts can begin to get more patients linked to treatment for hazardous alcohol and drug use and in turn have wide-scale, positive implications on the nation's health and wellness. Providing several interventions for patients in the emergency department may be beneficial for their engagement in substance misuse treatment during their visit and subsequent discharge.

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ENA Clinical Practice Guideline Synopsis: Intimate Partner Violence Screening

Clinical Question

For adult (18 years and older) ED patients, how effective is screening and/or intervention for intimate partner violence (IPV)?

Problem

IPV is a serious public health concern that can result in numerous long-term negative physical and psychological effects. According to the Centers for Disease Control and Prevention (CDC), IPV encompasses physical violence, sexual violence, stalking, or psychological harm by a current or former partner or spouse (CDC, 2021). They further describe IPV as behaviors that occur within an intimate relationship that cause physical, psychological, or sexual harm to those within the relationship (CDC, 2022b). IPV is now recognized as a global health and societal issue (WHO, 2021). Examples of IPV acts include physical violence (eg, hitting, slapping, kicking, beating), sexual violence (eg, forced/coerced sexual activity), psychological abuse (eg, insults, belittling, intimidation, humiliation, harmful threats, threats to take away children), and controlling behaviors (eg, isolating from friends and family, stalking, restricting access to resources such as finances, employment, education, or medical care) (CDC, 2022a). IPV may be directed toward people from all genders, sexual orientation, socioeconomic, religious, and cultural groups (CDC, 2022a; WHO, 2021). Despite substantial evidence of heterogeneity among victims of IPV, most studies investigating screening and interventions focus on women (Ahmad et al, 2017; Nelson et al, 2012). Facilitating disclosure of IPV from those who have experienced it requires careful attention among health care providers because an inability to recognize IPV may result in inadequate and/or inappropriate health interventions (Svavarsdóttir and Orlygsdóttir, 2015).

Nurses practicing in emergency departments are expected to recognize, assess, and intervene when patients present with suspected IPV (Nielson, 2018). Olive (2016) asserts that the identification of IPV by health care providers validates the client's experience and begins the process toward intervention. Routine IPV screening is recommended by the American College of Obstetricians and Gynecologists, the American Medical Association, the American Nurses Association, the Emergency Nurses Association, the International Association of Forensic Nurses, The Joint Commission, and the United States Preventive Services Task Force (ACOG, 2022; AMA, 2019; ANA, 2000; ENA and IAFN, 2018; TJC, 2022; USPSTF, 2018). In the past, there have been concerns that IPV screening could cause harm to individuals being screened. In 2013, Taft et al concluded that IPV screening does not seem to cause harm and may encourage survivors to disclose or recognize the abuse. Although debate still exists about the utility of screening alone, there is emerging research that focuses on referral and/or brief intervention as a mechanism to decrease further exposure to IPV. Emergency clinicians wishing to incorporate IPV screening in their routines should have access to information to help them make evidence-informed decisions. This clinical practice guideline focuses on the effectiveness of screening for IPV in the emergency department and the implementation of appropriate interventions.

Recommendations

	Decision Options/Interventions and Level of Recommendation	
Screening	The following screening tools can be used in clinical settings, including emergency departments (Arkins et al., 2016; Feltner et al., 2018; MacMillan et al., 2009; Mills et al., 2006; Nelson et al., 2012; Paranjape & Liebschutz, 2003; Rabin et al., 2009; Svavarsdóttir, 2010): • Abuse Assessment Screen (AAS) • Humiliation, Afraid, Rape, and Kick (HARK) • Hurt, Insult, Threaten, and Scream (HITS) • Partner Violence Screen (PVS) • Ongoing Abuse Screen (OAS) • Ongoing Violence Assessment tool (OVAT) • Slapped, Things, and Threaten (STaT) • Woman Abuse Screening Tool (WAST)	A
	IPV screening efforts may increase the identification of IPV survivors, but the screening does not reduce the rate of IPV (Feltner et al., 2018; Nelson et al., 2012; O'Doherty et al., 2015).	A
	Computerized screening is a safe, efficient, and effective way to screen for IPV in the ED (Ahmad et al., 2009; Ahmad et al., 2017; Choo et al., 2015; Choo et al., 2016; Houry et al., 2008; Hussain et al., 2015; Klevens et al., 2012; Renker 2008; Rickert et al., 2009; Trautman et al., 2007).	B
	Education and experience are necessary for healthcare providers to feel comfortable screening for IPV in healthcare settings (Al-Natour et al., 2016; Gutmanis et al., 2007; Husso et al., 2012).	B
	Without personnel and systems support, healthcare workers will face barriers to IPV screening (Alvarez et al., 2017; Beynon et al., 2012; Hugl-Wajek et al., 2012).	B
Interventions	A multifaceted approach to IPV in the ED, including screening, referrals, and interventions are necessary for an effective IPV program (Brignone & Gomez, 2022; Clark et al., 2019; Feder et al., 2011; Halliwell et al., 2019; Iverson et al., 2018; McFarlane et al., 2006; O'Campo et al., 2011; Power et al., 2011; Wolff et al., 2017).	A
	Safety decision aids may be useful to help survivors plan to leave an abusive relationship, but evidence is lacking regarding their efficacy in reducing IPV exposure, depression, and PTSD (Glass et al., 2017; Koziol-McLain et al., 2018).	INE
	Further research is needed to determine the efficacy of interventions such as motivational interviewing (Rhodes et al., 2015), empowerment programs (Cripe et al., 2010), and free access to printed IPV resources (Clark et al., 2019; Edwardsen & Morse, 2006; Klevens et al., 2012; McFarlane et al., 2006).	INE

Level A	Based on consistent and good quality of evidence; has relevance and applicability to emergency nursing practice.
Level B	There are some minor inconsistencies in the quality of evidence; has relevance and applicability to emergency nursing practice.
Level C	There is limited or low-quality patient-oriented evidence; has relevance and applicability to emergency nursing practice.
NR	Not recommended based upon current evidence.
IE	Insufficient evidence upon which to make a recommendation.
NE	No evidence upon which to make a recommendation.

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EMERGENCY NURSING REVIEW QUESTIONS: JULY 2024

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

QUESTIONS

1. Which of the following statements most accurately describes the pathophysiology of diabetes insipidus?
   A. Diabetes insipidus is caused by a deficiency of insulin, which leads to elevated blood glucose levels and ketone formation.
   B. Diabetes insipidus results from chronic inflammation of the pancreas, which leads to impaired insulin secretion and elevated blood sugar levels.
   C. Diabetes insipidus is an autoimmune process that targets the thyroid gland, leading to a reduced production of thyroid hormones
   D. Diabetes insipidus results from inadequate production or impaired functioning of antidiuretic hormone (ADH), causing excessive urination and dilute urine.

2. A patient presents to the emergency department with a complaint of generalized weakness. The patient describes current medications as metFORMIN (Glucophage), lovastatin (Mevacor), and dilTIAZem (Cardizem). The patient also reports taking a multidose vitamin daily and St. Johns wort as a mood enhancer. The patient's

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fingerstick glucose is 340 mg/dl and the heart rate is 130 beats per minute, and irregular. Based on this history and presentation, the nurse would suspect:
   A. A drug interaction with the metFORMIN (Glucophage) and lovastatin (Mevacor).
   B. Decreased drug effect due to the St. John's wort.
   C. An increase in blood sugar secondary to the dilTIAZem (Cardizem).
   D. Angioedema from the medication combinations.
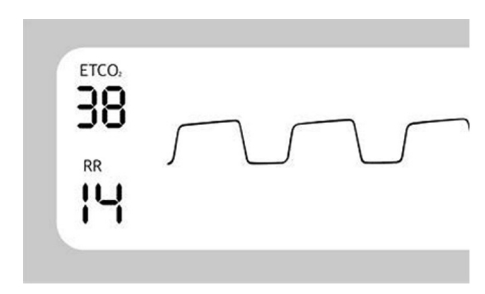
3. A patient is connected to a side stream capnograph monitor with oxygen administration at 4 liters. How would you interpret the following capnograph monitor reading?
   A. Normal End tidal CO_2 (carbon dioxide)
   B. Elevated End tidal CO_2
   C. Decreased End Tidal CO_2
   D. Normal oxygen saturation level

4. A patient is diagnosed with Syndrome of Inappropriate ADH (SIADH) and is brought to the emergency department 2 days after hospital discharge. The patient states he is getting worse. Which of the following statements would the nurse reference when caring for this patient?
   A. SIADH is caused by an autoimmune condition targeting the adrenal glands, resulting in impaired production of aldosterone.
   B. SIADH develops due to an excessive secretion of ADH from the posterior pituitary gland.

    C. SIADH is caused by a deficiency of ADH, leading to water retention and decreased osmolality.

    D. SIADH develops due to insulin resistance, hyperglycemia, and extracellular fluid movement.

5. A 55-year-old male patient presents to the emergency department with difficulty breathing. The patient describes a history of chronic obstructive pulmonary disease (COPD). A baseline complete blood count is drawn. Which of the following results would be expected with the history of COPD?

    A. Red blood cell count of 14.6×10^6/uL

    B. Hemoglobin of 14.4 gm/dl

    C. Hematocrit of 41.7%

    D. Platelet count of 50×10^3/uL

6. A 32-year-old male patient with blunt force abdominal trauma is resuscitated following a motor vehicle crash, required several units of blood, and developed a coagulopathy. While he is being held in the emergency department for in-house placement, the emergency nurse knows to monitor him for risk of the following:

    A. Rhabdomyolysis

    B. Fat embolism

    C. Hypothermia

    D. Alkalosis

7. A 15-year-old male is brought to triage by his parents. He is on crutches following a football injury 6 weeks prior and has a cast on his lower left leg. After eliciting a short history of the injury and symptoms, the triage nurse determines he may have compartment syndrome. His symptoms most likely are:

    A. Warm and red discolored skin

    B. Aching and heaviness when walking

    C. Throbbing and cramping

    D. Tightness, tingling and burning

ANSWERS

1. Correct Answer: D

Diabetes insipidus results from either inadequate production of ADH or decreased functioning of ADH within the collecting ducts and distal convoluted tubules of the nephron. Impaired ADH function results in excessive urine output and dilute urine, often accompanied by serum hypernatremia and increased serum osmolality (D). Diabetes mellitus is described as a deficiency of insulin or the development of insulin resistance, which leads to elevated blood glucose levels and potentially ketone formation (A). Diabetes insipidus is not associated with type one diabetes mellitus. It is a separate condition related to dysfunction of ADH and has no connection to the pancreas or insulin functioning (B). Diabetes insipidus does not involve the thyroid function. An example of an autoimmune process targeting the thyroid gland would be Hashimoto's thyroiditis (C)[1]

2. Correct Answer: B

St. Johns wort is an herbal supplement and interacts with many types of medications. It can speed up the processes that cause a drug to convert to inactive substances, leading to a decrease in drug levels in the patient. St. John's wort could cause all 3 of these medications listed to have a decreased effect, causing elevated blood sugar and heart rate (B). MetFORMIN (Glucophage) is a biguanide used to manage type 2 diabetes and lower blood sugar. Lovastatin (Mevacor) is a statin used to lower triglycerides and cholesterol. The medications are frequently prescribed together for diabetes and hypercholesteremia (A). DilTIAZem (Cardizem) is a calcium channel blocker used to control heart rate, frequently with atrial fibrillation (C). Angioedema is a swelling or edema over the body, especially in the neck and throat, from an allergic response to various medications, shellfish, nuts, or latex, to name a few. The described symptoms would not be suspect of angioedema (D).[2,3]

3. Correct Answer: A

End tidal carbon dioxide monitoring is frequently used with intubated patients or non-intubated patients with respiratory compromise. The measurement captures the partial pressure or maximal concentration of carbon dioxide (CO_2) at the end of an exhaled breath. Main stream or side stream carbon dioxide capture may be used and displayed on a monitor. The normal end tidal carbon dioxide ($EtCO_2$) value is 35 to 45 mm Hg (A). A displayed value of 38 mm Hg would be considered a normal value (B), (C). The oxygen saturation level is not displayed on the monitor; only the respiratory rate and capnograph, show normal respirations.[4,5]

4. Correct Answer: B

SIADH develops from excessive secretion of ADH from the posterior pituitary or from other sources such as small cell lung cancers, head and neck cancers, or central nervous

system cancers (B). SIADH is not a disorder of adrenal gland dysfunction (A). SIADH is characterized by an excess of ADH, not a deficiency (C). SIADH is not associated with insulin resistance or hyperglycemia.[6]

5. Correct Answer: A

Erythrocytosis, or an increase in red blood cells, can occur as a result of the body producing more red cells in an attempt to compensate for the decreasing level of oxygen in the blood with COPD. A red blood cell level of 14.6×10^6 u/L would be considered elevated, with a normal value of 4.35 to 5.65×10^6 u/L for men (A). Hemoglobin and hematocrit levels would usually be elevated in patients with COPD. Normal hemoglobin for a male is 12.1 to 17.4 g/dl. Normal hematocrit for a male is 36% to 52 %. Both of the listed values are normal (B), (C). The platelet count is typically elevated in patients with COPD. A normal platelet count is 134 to 365×10^3 μ/L. The listed value is low (D). An expected CBC result for a patient with COPD typically displays an elevation in red blood cells, hemoglobin, hematocrit, and platelet count in the body's attempt to compensate for low oxygen levels.[4]

6. Correct Answer: C

Hypothermia is significantly linked with both early and late mortality in the trauma patient. One of the most serious complications of trauma is the deadly triad of coagulopathy, hypothermia, and acidosis (C). Rhabdomyolysis usually develops after crush injuries and burns (A). Fat embolism usually develops after trauma to and/or manipulation of long bones (B). Traumatic hemorrhage can result in metabolic acidosis, a byproduct of hypoperfusion, not alkalosis (D).[7]

7. Answer: D.

Compartment syndrome is the result of swelling or bleeding within a compartment. The covering fascia does not stretch leading to increased pressure and possible disruption of blood flow to the capillaries, nerves, and muscles in the compartment. Compartment pressure of 10 to 12 mm Hg is in the normal range. When pressure is elevated to 20 to 30 mm Hg, symptoms may develop. These include: pain out of proportion to the injury and burning, tightness, numbness and tingling (D). Warm and red discolored skin is usually the result of infection or cellulitis (A). Aching and heaviness when walking is usually indicative of peripheral artery disease (B). Throbbing and cramping with swollen ankles and feet are often signs of varicose veins (C).[8,9]

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