Enhancing nursing care and confidence during bedside emergency laparotomies:

A role for in-situ simulation

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On my honor, I pledge that I have neither given nor received any unauthorized assistance on this paper. April 8, 2023. Jonathan Messing.

Abstract

Background and Purpose

Nurses are not routinely prepared to care for patients requiring emergency bedside laparotomies (BSL). An opportunity exists to enhance nursing role clarity, confidence, and knowledge of BSL. Simulation and microlearning offer two interventions that may better prepare nurses for surgical interventions at the bedside.

Methods

The project is a prospective pretest-posttest design using simulation and microlearning to promote role clarity, confidence, and knowledge among surgical trauma intensive care unit (ICU) nurses in a large academic medical center. Each hour-long session included a prebrief, 15-minute simulation, and debrief. Three weekly microlearning modules followed each simulation. Instruments measuring role ambiguity, confidence, and knowledge were administered before the simulation, after, and again at 30 days.

Results

Twenty-eight nurses completed the pretest-posttest design, with only 16 nurses completing the 30-day posttest. Median scores on role ambiguity improved by 1.00 with an interquartile range (IQR) of 1.13 from pretest to posttest (p-value < 0.001). From pretest-to-30-day posttest, the median score improved by 1.33 with an IQR of 1.5 (p-value < 0.001). Median knowledge scores improved by 4 with an IQR of 2 from pretest to posttest (p-value < 0.001). From pretest-to-30-day posttest, the median knowledge score improved by 3 with an IQR of 1.75 (p-value < 0.001). Median confidence scores improved by 0.08 with an IQR of 0.33 from pretest-to-posttest (p-value 0.009). From pretest-to-30-day posttest, the median confidence scores increased by 0.33 with an IQR of 0.54 (p-value 0.01). The Wilcoxon signed rank test was applied for statistical analysis.

Conclusion

Simulation and microlearning modules can clarify roles, promote confidence, and improve knowledge in surgical trauma ICU nurses.

Implications

More attention to the role of nursing in BSL improves the nursing experience during such high-stress events. This project may inform future studies that are multidisciplinary in design.

Keywords

Laparotomy, Bedside, Nursing, Confidence, Role Clarity

Introduction

Emergency bedside surgeries are high-risk, low-frequency events for which critical care nurses do not routinely receive training. Nurses regularly manage emergent situations in the intensive care unit (ICU) by adapting their skillset to the patient's needs, yet bedside surgeries evade their professional preparation and are not prominent in specialty certifications (Board Certification of Emergency Nursing, 2021; Certification Organization for the American Association of Critical Care Nurses, 2021). Several surgeries may occur under emergency conditions, with bedside laparotomies (BSL) representing one of the more invasive and team-driven interventions (Diaz et al., 2005). Drivers prompting surgical intervention at the bedside include intraabdominal sepsis, bowel ischemia, hemorrhage control, and abdominal compartment syndrome, to name a few. In addition, limited operating room (OR) availability, hemodynamic instability, risky travel to the OR, and advanced ventilator settings can force a surgical team to act within the confines of the ICU (Schreiber et al., 2014). An essential advantage to performing surgery in the ICU is prompt intervention but often at the cost of specialized OR nursing expertise and other OR resources.

Patients requiring BSL due to intrabdominal pathology represent a challenge to clinicians and face mortality rates of up to 90% (Martin et al., 2018). Facilitating successful outcomes is contingent upon a prepared team who receives "deliberate planning…and training" (Piper et al., 2013, p. 873). Critical care nurses cannot fully replicate the skillset of OR nurses, but training modalities such as in-situ simulation offer a strategy to better prepare nurses for BSL events. Simulation provides opportunities to improve competencies, critical thinking, and confidence (Al Gharibi Msn & Arulappan, 2020; Boling & Hardin-Pierce, 2016). Microlearning, a separate educational intervention, can reinforce knowledge and skills to further cement concepts, particularly among low-frequency events (De Gagne et al., 2019). Combining in-situ simulation and microlearning modules may limit the knowledge gap for critical care nurses encountering BSL while positively influencing role clarity and confidence.

Background

Bedside laparotomies are reserved for the most critically ill patients or situations where access to the OR introduces additional risk. Tracking the frequency of these interventions can be challenging, but with advances in surgical critical care, the resources and skillsets to offer maximal intervention are increasing for patients who may require BSL. Each year, 900 million people suffer injuries requiring medical attention, and 4.4 million of them succumb to these injuries (Haagsma et al., 2016; World Health Organization, 2021, March 19). Non-traumatic surgical emergencies are another source of critically ill patients, carrying a 9.2% mortality rate globally (Sartelli et al., 2017). As modern medicine evolved to care for these patients, new techniques have emerged, particularly around the surgical abdomen. The 1980s introduced Damage Control Surgery (DCS) to address immediate threats to life, temporarily stabilize patients, and postpone definitive management (Cirocchi et al., 2013; Jensen & Cotton, 2017). The application of DCS means more critically ill patients present to the ICU with open abdomens or require BSL when hemodynamics and external constraints demand immediate intervention (Cirocchi et al., 2013; Fitzpatrick, 2017).

In recent years, tertiary and quaternary hospitals have started sharing their BSL experiences across the United States. Piper et al. (2013) observed how their single-center retrospective study demonstrated a greater than ten-fold increase in BSL and re-laparotomies over three years. Diaz et al. (2005) noted similar uptrends in BSL, prompting the protocolization of such surgeries. Both articles recognized critical care nurses as essential stakeholders due to their institutional knowledge and nursing expertise that surgical trainees do not possess. Despite recognizing that nurses are present and involved during BSL, ICU nurses receive little to no training on emergency surgeries. Promoting training and education clarifies the role of nursing and facilitates patients receiving optimal nursing care (Seam et al., 2019).

The nursing literature is not silent on the critical care nurse's role in perioperative skills. For example, surgical ICU nurses regularly manage the open abdomen, and the Trauma Certified Registered Nurse examination lists bedside thoracotomy as a testable task (Fitzpatrick, 2017; Board of Certification for Emergency Nursing, 2021). What is missing is how to prepare critical care nurses for emergency surgeries at the bedside.

At a level I trauma center in the mid-Atlantic United States, critical care nurses verbalize discomfort, a lack of role clarity, and stress when caring for patients during a BSL. The distress persists with or without OR team support but compounds when patient instability fails to align with OR team availability. In such situations, the critical care nurse applies their ICU skillset to an unfamiliar process with ill-defined nursing responsibilities. Offering in-situ simulation and microlearning modules for ICU nurses in BSL may clarify roles, promote confidence, and generate knowledge. At a minimum, nursing knowledge can progress from no preparation for BSL to the empowered nurse familiar with the indications, processes, and equipment.

Aims

1. Evaluate the nurse's perception of clinician roles during bedside surgery after a one-hour simulation training for bedside laparotomy and three subsequent short, asynchronous microlearning modules via Likert-style questions immediately before the simulation, immediately after, and one month later.
2. Evaluate the nurse's knowledge of surgical equipment after a one-hour simulation training for bedside laparotomy and three subsequent short, asynchronous microlearning modules via exam-style questions immediately before the simulation, immediately after, and one month later.

3. Measure nursing confidence after a one-hour simulation training for bedside laparotomy and three subsequent short, asynchronous microlearning modules via Likert-style questions immediately before the simulation, immediately after, and one month later.

Review of Literature

Simulation contributes to confidence, teamwork, communication, and new knowledge for surgical trauma nurses (Abelsson et al., 2018; La Cerra et al., 2019; Rice, 2016; Sovik-Correia & Whalen, 2016). Another advantage occurs when offering in-situ simulation (ISS) in the nurses' familiar work environment due to accessing regularly available resources, which can promote comfort (Kurup et al., 2017). When nurses care for simulated patients under what would typically be a high-stakes scenario but have the opportunity to learn from mistakes or through observing their colleagues, they gain confidence for future events (Abelsson et al., 2018; Sovik-Correia & Whalen, 2016). Knowledge acquisition can also increase, as supported by La Cerra et al.'s (2019) meta-analysis on simulation, comparing it to other modalities. In addition, through simulation, educators can target specific knowledge deficits to address patient populations and scenarios unique to the care setting (George & Quatrara, 2018; Sovik-Correia & Whalen, 2016).

Offering ISS to colleagues within their work environments permits nurses to practice teamwork. Opportunities to develop effective teams are widely recognized to improve outcomes in healthcare (Rosen et al., 2018). Sovik-Correia and Whalen (2016) comment on how deliberate attention must be given to teamwork and communication among members, which are often facilitated and practiced through simulation. Subsequent reflections on experiences through debriefings promote understanding and permit conversations that may not always occur during genuine emergencies (Abelsson et al., 2018; Rice, 2016; Sovik-Correia & Whalen, 2016). Additionally, the opportunity to practice communication skills can reduce or prevent errors (Abelsson et al., 2017; George & Quatrara, 2018; Rice, 2016; Rosqvist et al., 2019).

Bringing simulation to the nurses in their standard practice environment offers two more advantages of ISS. First, nurses do not have to travel to an unfamiliar space or leave the resources they rely upon during a resuscitation. George and Quatrara (2018) elaborate on this benefit by noting a reduction in total working hours for involved nurses. The simulation may fit in-between other work activities due to proximity. Abelsson et al. (2017) found that scheduling the ISS where the nurses work similarly offered a convenience factor. Actual patient care and other conflicting priorities may circumvent educational efforts. Reducing obstacles to education is a significant advantage of using ISS.

However, an isolated educational intervention may not sustain the newly acquired knowledge. Repetition through spaced education is one technique to prevent knowledge degradation for nurses (Scott et al., 2017). Microlearning, or “small lesson modules,” reinforces knowledge and skills around low-frequency events such as BSL (De Gagne et al., 2019). Short video follow-up units enable nurses to view the content when convenient and review the videos more often if necessary (Scott et al., 2017). Ongoing education that follows a live event has also demonstrated improvements in confidence and content retention (Shaw et al., 2011). Recognizing the challenges around education for low-frequency events supports applying multiple strategies for the intervention.

Translational Framework

The Knowledge To Action model (see Appendix) provides an iterative framework for addressing surgical critical care nurse roles during BSL, strengthened by the dual approach of creating knowledge and bringing it to action (Graham et al., 2006; Straus et al., 2011). The tool’s two strategies permit a “fluid and permeable” process for the knowledge creation phase and action cycle (Graham et al., 2006, p. 18). Through its application, one inquires upon available evidence, synthesizes, and ultimately refines what is discovered to meet the target audience. Meanwhile, the seven stages in the action cycle advance from problem identification to sustaining the new knowledge practice (White et al., 2021). The tool's flexibility permits a simplified means of applying research-backed or experiential knowledge to the identified problem (Graham et al., 2006, p. 18).

The framework offers an effective process for clarifying and supporting the nurse's role during BSL through the knowledge-creation phase and all seven steps of the action cycle. In the knowledge creation phase, the user collects evidence on the drivers for BSL, how in-situ simulation serves to train nurses, and techniques to reinforce concepts in follow-up modules. As the knowledge accumulates, it is tailored to meet the needs of the surgical trauma ICU nurses.

The action cycle begins with the identified problem of not training nurses to care for patients requiring BSL. Step two adapts knowledge by partnering with surgeons, educators, and leadership to develop content. Barriers are addressed in step three by offering multiple dates convenient for the nurses. The primary intervention occurs in step four with a short simulation involving a patient requiring bedside abdominal decompression. Debriefing explores the nurse's role in patient management, including dispersive pad placement, electrocautery set-up, surgical fire prevention, medication management, and monitoring. Since BSL events occur unpredictably, stage five's knowledge monitoring tracks nursing participation and comprehension of asynchronous short videos that follow. A pre-test, post-test, and 30-day study reflect step six's role in evaluating outcomes. The final stage of sustaining knowledge will occur through annual simulation and regular asynchronous videos.

Methods

Design and Setting

The project is a novel educational design using simulation and microlearning modules to explore nursing confidence, role clarity, and knowledge with prospective pretest-posttest measurement qualifying as human subject research. The project setting is an 18-bed surgical trauma ICU in a large academic level I trauma center within the mid-Atlantic United States. The ICU benefits from 24/7 trauma surgeon intensivist coverage and a cadre of surgical residents, emergency medicine residents, and nurse practitioners. Routine staffing follows a two-patient-to-one-nurse ratio, and a trauma activation responder nurse is present as permitted.

Sample

Approximately 80 registered nurses work in the ICU and qualify for inclusion in the study. Full-time, part-time, and per-diem nurses of all experience levels are included as long as the nurse identifies the surgical trauma ICU as their primary worksite. Float nurses are included if they work in the unit at least once per month. Travel nurses are excluded due to the transitory nature of their work. The Johns Hopkins University Project Ethical Review Committee and the project site's institutional review board (IRB) approved the human subjects research study under expedited review. Participant recruitment occurred through committee discussion, email, flyers, and social media. All participation was voluntary. Participants were given a research information sheet, and verbal consent was obtained. The IRB provided a waiver of documentation of consent.

Intervention

Participants attended one of seven available one-hour in-situ simulation sessions during September and October 2022. Simulations were offered mornings, afternoons, evenings, and weekends in the surgical trauma ICU to meet the demands of multiple schedules. A minimum of two and a maximum of six participants attended each simulation. Upon arrival, participants completed a pretest assessment that included basic demographics, baseline levels of role clarity, confidence during BSL, and a multiple-choice ten-item evaluation of the nurses' knowledge of surgical equipment. A five-minute pre-briefing oriented participants to the simulation environment, followed by a 15-minute simulation on BSL.

The simulation occurred in a vacant patient room to promote fidelity to standard ICU resources. The simulation would occur in an empty non-patient care space within the ICU when all patient rooms were occupied. Participants were given a vignette of a patient with severe pancreatitis developing abdominal compartment syndrome necessitating immediate bedside decompression. Based on group size, the roles of bedside nurse, first-assist, documenter, runner, medication administrator, and second-assist were assigned in this order. Each participant wore a label designating their part, with the project leader filling the role of a surgeon. The pre-briefing indicated that ICU nurses are unlikely to fulfill the role of first-assist, but for simulation purposes, the experience introduces greater familiarity with the equipment.

Participants verbalized, located, and identified anticipated materials, medications, patient positioning, and steps immediately preceding a BSL. An electrical surgical unit's settings were reviewed, and the patient was prepped and draped in the usual fashion. After a timeout, the manikin model permitted a simulated laparotomy and application of a temporary abdominal closure device using negative pressure wound therapy.

A debriefing using the Promoting Excellence and Reflective Learning in Simulation framework (Eppich & Cheng, 2015) immediately followed and consumed the remainder of the hour. The debriefing emphasized points around roles, safety, equipment, and process. The final few minutes reintroduced the posttest, containing a reassessment of the instruments measuring role clarity, confidence, and knowledge. After the one-hour simulation, participants received short (approximately five minutes) modules on BSL concepts weekly for three weeks. Each module was delivered via the 7Taps platform (7taps, 2022). Modules addressed clinician roles during a BSL, equipment and safety, and teamwork and communication techniques in that order. Participants viewed the modules on their phones or computer, with opportunities to view them more often if desired. Completing the simulation awarded the participants one continuing education hour independent of whether or not they completed the subsequent microlearning modules.

Data Collection and Measures

Data was collected using the Research Electronic Data Capture (REDCap)® platform at three-time points for each participant: before the start of the simulation exercise, immediately after the simulation, and again at 30 days. Participants completed the baseline pretest within the STICU on their smartphones. A self-generated identification number protected anonymity while allowing tracking of participants at each measurement point. Data was stored in the encrypted REDCap® platform until the data analysis phase, at which point it was downloaded, and the self-generated identification numbers could be converted to subject numbers. After this stage, data remained in a locked file on a locked and private computer.

Three instruments were used for data collection. The first instrument addressed role clarity and included six items from Rizzo et al.'s (1970) landmark publication on role conflict and ambiguity. Rizzo et al.'s instrument delivers a reliability score via Cronbach's alpha of 0.78-0.81 and was replicated to deliver a Cronbach alpha of 0.81 in a later study of Greek critical care nurses (Iliopoulou & While, 2010). The Confidence in Managing Challenging Situations (CMCS) Scale is a second instrument developed by Pauline Walsh and Patricia Owen (Walsh et al., 2021). The instrument includes 21 items divided into two sections: the first addressing professional standards and the second on challenging clinical situations. A Cronbach's alpha of 0.86 was calculated for the instrument after assessing 70 nursing students (Walsh et al., 2021). Only the 12 items of the CMCS, which addresses challenging clinical situations, were included in the project to reduce participant survey fatigue. Both the Rizzo and CMCS instruments qualify as ordinal levels of measurement. The final instrument, a ratio level, measures knowledge of surgical equipment necessary during BSL. A ten-item multiple choice assessment created by the primary author and reviewed by two independent trauma surgery subject matter experts offered face validity. Before completing the instruments, participants were instructed to respond in the context of their involvement in BSL.

Statistical Analysis

Twenty-eight nurses participated in the pretest-posttest design, with only 16 completing the 30-day posttest. Due to sample size, a Wilcoxon signed rank test is selected as a nonparametric test for the difference of averaged scores from pretest to posttest and from pretest to 30-day posttest. All participants were matched via unique identifiers to permit a paired analysis from pretest-to-posttest or pretest-to-30-day posttest. Each aim is measured at an alpha level of 0.05, a power of 0.8, and a medium effect size of 0.5. The median score of Rizzo et al.'s (1970) six-item role ambiguity scale is the dependent variable for measuring Aim One, assessing for improving role clarity from the pretest to each posttest. The Likert scale model offers seven options of ordinal data, from very false (1) to very true (7). A higher average indicates greater role clarity.

The median scores of a 10-item multiple-choice knowledge assessment are the dependent variable for Aim Two, assessing for improving knowledge. Scores reflect ratio data and may range from 0 to 10, with higher scores indicating greater knowledge. The median scores of the 12-item confidence in managing challenging situations scale (Walsh et al., 2021) are the dependent variable for Aim Three, assessing for improving confidence. The Likert scale model offers five options of ordinal data from no confidence (0) to high confidence (4). A higher average score indicates greater confidence. The p-values for each aim determine the statistical significance, and the median and interquartile ranges interpret the direction of the relationship. The Statistical Package for Social Sciences (SPSS) version 27 (IBM Corp., 2020) was used for data analysis.

Results

Twenty-eight nurses participated in the intervention, with 50% having less than two years of surgical trauma ICU experience. Half the nurses have five to ten years of overall nursing experience. All but four nurses indicate some experience with bedside surgeries. Nineteen nurses have never received training on bedside surgeries, and 17 nurses indicate no experience with ISS. Table 1 provides an overview of the sample.

Aim one addresses role clarity by measuring role ambiguity as a baseline, posttest, and 30-day posttest. Table 2 provides the Rizzo et al. (1970) role ambiguity scale median scores from pretest-to-posttest. The pretest revealed a median of 5.08 and an interquartile range (IQR) of 1.33, with a posttest median of 6.25 and IQR of 0.91. From the pre-to-posttest, the median score improved by 1.00 with an IQR of 1.13, which is statistically significant with a p-value of <0.001 on the Wilcoxon signed rank test. The 30-day posttest median was 6 with an IQR of 0.84, demonstrating an improved median score from the pretest-to-30-day posttest of 1.33 with an IQR of 1.5 (p-value < 0.001) on the Wilcoxon signed rank test (see Table 3).

Aim two addresses knowledge, which was assessed with a 10-item multiple-choice question set, yielding a median score of 6 on the pretest with an IQR of 2. The posttest median score was 10, with an IQR of 1 (see Table 2). From the pre-to-posttest, the median score improved by 4 with an IQR of 2, which is statistically significant with a p-value of <0.001 on the Wilcoxon signed rank test. The median score on the 30-day posttest was 9, with an IQR of 1. From the pre-to-30-day-posttest, the median score improved by 3 with an IQR of 1.75, which is statistically significant with a p-value of <0.001 on the Wilcoxon signed rank test (see Table 3).

Aim three addresses confidence using the CMCS scale on the pretest, demonstrating a median score of 2.88 with an IQR of 1. The median score on the posttest was 3.04, with an IQR of 1.08 (see Table 2). From the pre-to-posttest, the median score improved by 0.08 with an IQR of 0.33, which is statistically significant with a p-value of 0.009 on the Wilcoxon signed rank test. The 30-day posttest yielded a median score of 3.25 with an IQR of 0.79. From the pre-to-30-day-posttest, the median score improved by 0.33 with an IQR of 0.54, which is statistically significant with a p-value of 0.01 on the Wilcoxon signed rank test. Table 3 summarizes the statistical findings.

Discussion

Performing surgery at the bedside is not a new phenomenon in healthcare. The literature addressing it focuses on processes (Diaz et al., 2005) and outcomes (Martin et al., 2018; Schreiber et al., 2014) but with minimal mention of nursing's role. A surgeon may travel between multiple settings, including the OR, clinic, ICU, medical-surgical floor, emergency department, and others. On the other hand, nurses are often contained within a particular setting. When the issues of transcending settings emerge for a surgeon, it's easy to see how the medical literature may produce evidence and guidance on the topic. At the same time, a gap between the OR and critical care nursing worlds widens as both nursing specialties are positioned to address their role in bedside surgeries, but neither offers direction. Perhaps both specialties see a lack of jurisdiction or feel the irregularity of BSL is overshadowed by more prominent issues facing nursing. Despite the inattention to the critical care nurse's role in BSL, the fact remains that nurses are caring for these patients before, during, and after such extraordinary interventions.

Participating in an invasive procedure without adequate preparation introduces risk, distress, confusion, and other negative byproducts that education may mitigate. Critical care nurses within this ICU verbalize unfamiliarity with surgical equipment and roles, reporting no formal training regarding bedside surgeries. Experience comes with observing or participating in the inevitable BSL, which forms the context for future discussion and participation. When a bedside surgery concludes without formal debriefing, opportunities to explore indications, processes, outcomes, and deviations fade with either non-experts delivering expectations or observers arriving at their own conclusions. Furthermore, without defined roles, feedback to involved nurses is limited, and can risk worsening stress and confusion for future experiences.

Multiple avenues exist to address the gap around critical care nursing's preparation for bedside surgeries. Simulation's longstanding application in healthcare and microlearning's recent entry into the education scene offer complementary approaches to preparing nurses. A lack of preparation may negatively influence confidence in involvement, clarity around roles, and knowledge of commonly used surgical equipment. In this project, surgical trauma ICU nurses participating in a BSL simulation with subsequent microlearning modules demonstrated improvements in nursing confidence, role clarity, and knowledge up to 30 days after the initial simulation.

Knowing one's expectations for care involvement contributes to role clarity and can promote a shared mental model of practice. Cengiz et al. (2021) explore challenges around role clarity for clinical nurses, acknowledging that certain specialties or practices are not addressed in formal nursing education, thereby contributing to tension and dissatisfaction. When nurses face role ambiguity, several sequelae can affect the nurse and the organization, including stress, burnout, and turnover (Cengiz et al., 2021). Opportunities, such as the ISS and microlearning modules, promote clarity and can ameliorate the negative outcomes experienced by nurses when they are unsure of their responsibilities during bedside surgeries.

Confidence builds with experience and is tangential to role clarity. As this intervention demonstrates improvement in the CMCS scale, other studies have observed improvements in confidence when using simulation. Benjamin et al. (2018) observed benefits in stress reduction and confidence building after a series of three simulation exercises, and Boling and Hardin-Pierce (2016) similarly observed improvements in their study of new cardiothoracic ICU nurses.

Simulation and microlearning promote knowledge in nurses and other healthcare providers in multiple settings. George and Quatrara (2018) demonstrated knowledge score improvements after a simulation and one month later, whereas multiple other studies found benefits in nursing students (Lei et al., 2022). Microlearning, on the other hand, provides shorter educational modules that can be viewed anywhere and repeatedly. One study that used microlearning with medical students observed an advantage compared to an alternative online module of longer duration (Ichiuji et al., 2022). De Gagne et al. (2019) reviewed 17 articles, further supporting the efficacy of microlearning for both knowledge and confidence. Ultimately, the experience of using ISS and microlearning to promote confidence, knowledge, and role clarity of critical care nurses during BSL is congruent with other studies.

This intervention does have limitations. First, the pretest-posttest design was not randomized and included a sample of nurses from a single unit within a single hospital. Although the findings favor the local setting, they are not generalizable to the external environment. Second, the small sample size of 28 nurses is limiting, and only 57% of the nurses completed the 30-day posttest. Third, only the second half of the CMCS scale was completed by participants to reduce survey fatigue. The decision to use only part of the validated instrument may jeopardize the validity of its findings in isolation. Next, the Rizzo et al. (1970) role ambiguity scale has been a widely used and validated instrument, including in nursing, but is an imperfect tool for assessing a nurse's understanding of roles during a BSL. Furthermore, the 10-item knowledge assessment is not a standardized and validated tool but only received face validity from subject matter experts. Finally, performing the simulation without a surgeon or surgical team carries inherent limitations around fidelity to proper surgical intervention.

Despite the limitations, using simulation and microlearning modules to enhance nursing confidence, knowledge, and role clarity during BSL is promising. This intervention offers insight into the challenges nurses face when participating in bedside surgical procedures. Very little education or support is available to critical care nurses who may encounter a BSL during their careers. More research is needed, particularly that which includes higher-fidelity simulations and a multidisciplinary approach. The BSL experience will always include the surgeon and often surgical trainees, who can arguably benefit from ISS and microlearning for BSL as well. This center's early experience in providing BSL simulation and microlearning to critical care nurses is a first step to what can hopefully become more rigorous and meaningful training for all healthcare providers involved in bedside surgeries.

Conclusion

Bedside laparotomies are low-frequency, high-risk events with significant patient morbidity and mortality. Multiple drivers influence the need for BSL in the critical care environment, but few resources are available for the nurses involved in caring for these patients. In-situ simulation and microlearning modules offer two different and complementary approaches to preparing critical care nurses for BSL. A small group of nurses within a single surgical trauma ICU experienced statistically significant improvements in confidence, role clarity, and knowledge during a pretest-posttest evaluation using these modalities, with a sustained benefit at the 30-day mark. More research and interdisciplinary training are needed to determine the future of BSL preparation for critical care nurses. This intervention will hopefully encourage greater attention and effort in training those caring for patients during BSL.

Dissemination

The findings from this DNP project will be shared at the 2023 Johns Hopkins School of Nursing DNP Scholars Day. Findings will also be presented in the local institution's nursing research and evidence-based practice council in June 2023. Results will be provided to all key stakeholders locally, including the surgical trauma ICU leadership, trauma services leadership, simulation center leadership, and nursing leadership. A poster presentation will be submitted to the Society of Trauma Nurses 2024 conference, and a manuscript will be submitted to the Journal of Trauma Nursing.

Sustainability

Due to positive participant feedback, new nursing staff, and ongoing bedside surgeries, local nursing leadership has requested to resume BSL simulation and microlearning education. A request to expand the training to other ICUs has also been made. The current strategy is to transition training from the DNP student to the surgical trauma ICU educator. First, the educator requires additional experience and familiarity with the operative skillset. The vice president of surgery for nursing, the director of nursing professional practice, the OR educator, the director of trauma services, and the director of the surgical trauma ICU all support this plan. Meetings are scheduled with the medical director of trauma services to seek surgeon support. Once all stakeholders are engaged and approve the plan, the DNP student will facilitate cross-training in the OR with the surgical trauma ICU educator. The DNP student will begin transferring education content and orienting the educator to the simulation and microlearning materials after cross-training. The goal is to complete the cross-training in 2023. Due to interest from surgical residents, the DNP student will work with the trauma medical director to explore making future training more multidisciplinary.

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Tables

Table 1

Baseline Characteristics of STICU Nurse Participants

Demographic Characteristics	(N = 28)
Nursing Experience, n (%)	
1-2 years	2 (7.1)
2-5 years	10 (35.7)
5-10 years	14 (50)
>10 years	2 (7.1)
STICU Experience, n (%)	
<1 year	8 (28.6)
1-2 years	6 (21.4)
2-5 years	5 (17.9)
5-10 years	7 (25)
>10 years	2 (7.1)
Career Bedside Surgery Experience, n (%)	
0 surgeries	4 (14.3)
1-3 surgeries	11 (39.3)
4-6 surgeries	6 (21.4)
7-10 surgeries	3 (10.7)
11 or more surgeries	4 (14.3)
Previous Training Experience, n (%)	
Never	19 (67.9)
Once	7 (25)
Twice	2 (7.1)
In-Situ Simulation Experience, n (%)	
Never	17 (60.7)
Once	3 (10.7)
Twice	4 (14.3)
Three or More	4 (14.3)

Note. STICU = Surgical Trauma Intensive Care Unit.
Bedside surgeries exclude tracheostomies and gastrostomies.

Table 2
Descriptive Data for Outcome Variables

Variable Stage	Participants	Median	IQR
Role Ambiguity			
Pretest	28	5.08	1.33
Posttest	28	6.25	0.91
Posttest at 30d	16	6	0.84
Knowledge Assessment			
Pretest	28	6	2
Posttest	28	10	1
Posttest at 30d	16	9	1
CMCS Scale			
Pretest	28	2.88	1
Posttest	28	3.04	1.08
Posttest at 30d	16	3.25	0.79

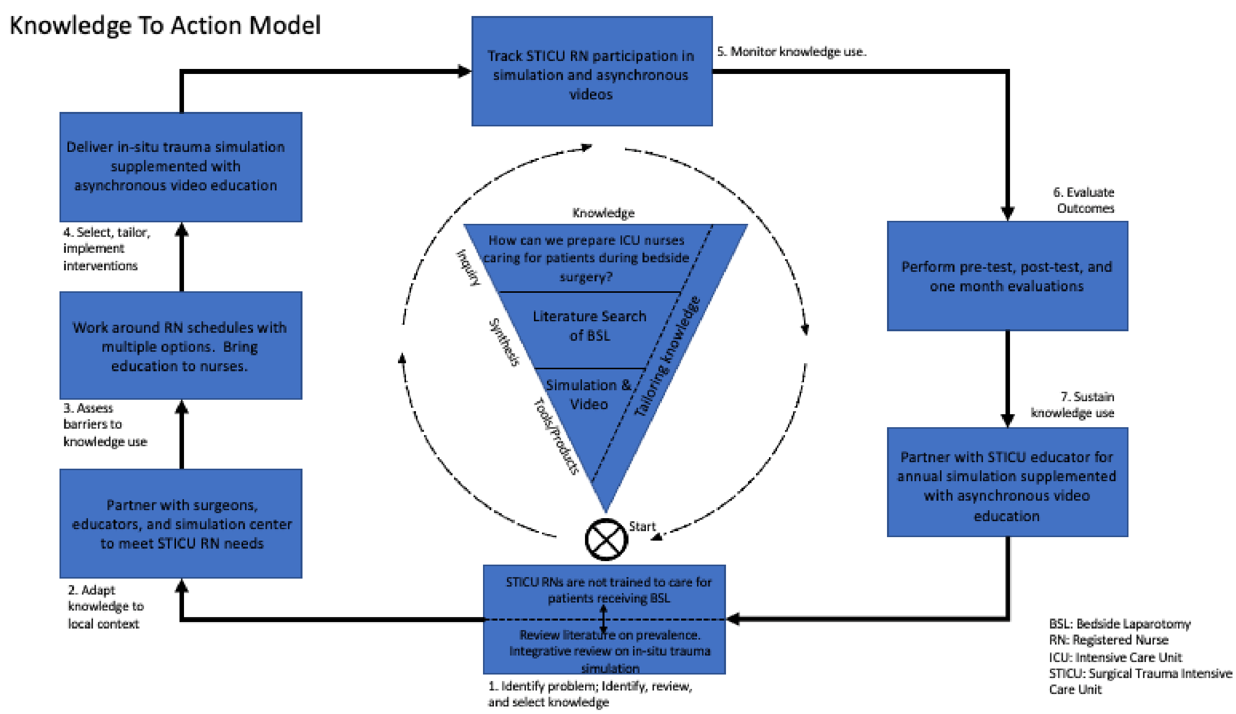
Notes. CMCS = confidence in managing challenging clinical situations. d = days. IQR = interquartile range.

Table 3
Difference of Scores by Wilcoxon Signed Rank Test

Variable	Median	IQR	p-value
Role Ambiguity			
Pretest-Posttest	1	1.13	<0.001
Pretest-30d-Posttest	1.33	1.5	<0.001
Knowledge Assessment			
Pretest-Posttest	4	2	<0.001
Pretest-30d-Posttest	3	1.75	<0.001
CMCS Scale			
Pretest-Posttest	0.08	0.33	0.009
Pretest-30d-Posttest	0.33	0.54	0.01

Notes. CMCS = confidence in managing challenging clinical situations. d = days. IQR = interquartile range.

Appendix



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