The Impact of Simulation-Based Training on the Self-Confidence of New Nurses in the Care of Acutely Deteriorating Patients and Activation of the Rapid Response Team

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Abstract

Background: New nurses report a sense of being unprepared and low levels of self-confidence. Simulation-based education is frequently used as a strategy to address this low level of confidence and to improve patient safety by providing high-fidelity training in a safe environment.

Purpose: The purpose of this DNP scholarly project was to assess if new nurses' participation in high-fidelity simulation-based training increased self-confidence and nurse-initiated activation of the Rapid Response Team (RRT) when caring for the deteriorating patient.

Methods: A quality improvement (QI) design using the FOCUS PDSA framework was the basis for implementation. The target population was new nurses on two units at a Level One Trauma Center. New nurses participated in a 70-minute high-fidelity simulation (HFS), developed and validated over 10 years through multiple PDSA cycles, of a deteriorating patient. Two measures were used in this project. The change in new nurse self-confidence was measured by Grundy's C-Scale, and the change in the percentage of staff-initiated RRT calls vs auto-triggered was calculated three months after simulation participation.

Results: Twelve nurses participated in the simulation. All showed an improvement in self-confidence from pre-simulation to immediately post-simulation measurement. Using a Wilcoxon signed-rank paired data test, participants' confidence scores on all five items of the C-scale showed a statistically significant improvement from pre- to immediately post-intervention as well as five months later. The difference in the percentage of staff-initiated RRT calls three months post-simulation was increased on Unit B, while Unit A showed a decline in staff-initiated RRT calls when compared to auto-triggered RRT calls.

Discussion: This QI project's simulation intervention was effective in increasing self-confidence scores between pre- and immediately post-intervention. Five months post-intervention, this increase was sustained. However, how this increased self-confidence by the new nurses was translated into practice when activating RRT calls cannot be interpreted by this data as many factors could have influenced RRT call patterns in the pre-and post-simulation period. Though a small test of change, the evidence in the literature review and these results do suggest that inclusion of HFS should be considered to be embedded into the existing Nurse Residency Program. This would allow an opportunity to use HFS to build self-confidence in the care of the deteriorating patient over time of a defined cohort of participants to evaluate the benefits of HFS on new-nurse self-confidence and activation of RRT in an academic medical center.

Keywords: self-confidence, new nurses, Rapid Response Team, deteriorating patient, high-fidelity simulation, nurse-initiated activation

Introduction and Background

Communication is an essential element of the teamwork needed in acute healthcare settings, yet poor communication among team members is one of the top causes of medical errors in the United States (Rice et al., 2016). The Joint Commission reports that communication failures have been implicated as the root cause of more than 70 percent of sentinel events (Dingley et al., 2008). A sentinel event is defined as a patient safety event that results in death, permanent harm, or severe temporary harm, with these events debilitating to both patients and healthcare providers involved in the event (The Joint Commission, 2021). One effective means to improve communication is by utilizing simulation (Ballangrud, Hall-Lord, Hedelin, et al., 2014).

The digital era has led to fewer opportunities for clinicians to interact face to face due to increased use of paging, phone updates, and text exchanges. This has led to increased clinician frustration, as well as difficulties establishing patient care priorities between team members (Walsh et al., 2017). The quality of multi-disciplinary communications may suffer as a result of electronic methods compared to face-to-face interaction. For example, electronic communication appears to negatively impact an individual’s ability to discuss differing positions and ideas related to a health-related scenario (Mascia et al., 2021).

Exacerbating the barriers to communication in complex healthcare systems, many institutions lack the ability to create a working culture where communication flows freely regardless of any existing authority gradient, a principle addressed in the seminal report by the Institute of Medicine (IOM), *To Err is Human: Building a Safer Health System* (Kohn et al., 2000). First popularized in the field of aviation, the term “authority gradient” implies that effective communication in stressful situations may not occur when there is a significant difference in the individuals' authority, experience, or perceived expertise (Cosby & Croskerry, 2004). When an actual or perceived authority gradient exists, a team member may not even attempt communication. In a narrative review on interprofessional communication in the operating room, Etherington et al. (2019) state that subordinate clinicians are often reluctant to speak up even when faced with a concern for a patient's deteriorating condition or in the instance of a safety concern.

Deficits in communication lead to poor patient outcomes, and that risk increases when there is a rapid deterioration in patient status (Wong et al., 2017). In a retrospective chart review of all ICU transfers from general internal medicine units in a Toronto hospital over a two-and-a-half-year period, Wong et al. (2017) analyzed all critical messages 48 hours prior to ICU transfer. The authors defined a critical message as any message that contained information that met the criteria for the rapid response team (RRT). The researchers evaluated these messages for RRT calling criteria, time to RRT activation, message quality, presence of vitals, and the quality and timeliness of physician response using dual-investigator coding to determine if the messages met the criteria for critical messaging. The researchers reported significant gaps in the quality of messages, quality of the physician responses, and delays in RRT activation.

A deteriorating patient, as defined by Jones et al. (2013) is one "who moves from one clinical state to a worse clinical state, which increases their individual risk of morbidity, including organ dysfunction, protracted hospital stay, disability, or death" (p. 1031). Clinical deterioration was defined by Sankey et al. (2016) as the presence of one or more abnormal vital sign indicators outside a specified range related to systolic blood pressure, respiratory rate, and heart rate.

Patients who are acutely deteriorating are at a heightened risk of complications. In a retrospective cohort study that analyzed data from 793 patients transferred from non-intensive care inpatient units to a medical intensive care unit in an urban, tertiary academic medical center, 64.6% of patients had delays in escalation (defined as greater than four hours between onset of clinical deterioration and transfer to an ICU), and mortality was significantly increased ($p<.05$) beginning at a “deterioration-to-door-time” of 12.1 hours after adjusting for age, gender, and severity of illness (Sankey et al., 2016). Complicating the management of the deteriorating patient, a lack of confidence can delay the recognition and intervention by clinicians that can negatively impact patient care (Crowe et al., 2018).

In response to the complexity of responding in a timely manner to the needs of the deteriorating patient and in recognition of the increasing complexity of team communication, ”Rapid Response Teams” (often called RRTs) have been established in most hospitals in the United States as a result of the 2008 Joint Commission National Patient Safety Goal (Agency for Healthcare Research and Quality, 2019). This requirement led hospitals to implement systems that enable healthcare staff members to directly request additional assistance from one or more specially trained individuals when a patient’s condition appears to be worsening. These teams typically consist of critical care nurses, respiratory therapists, and physicians (critical care or hospitalists) as backup. At the student’s practice site, the RRT team is called Medical Emergency Team (or “MET”) and responds to an average of 7,200 calls per year (600 per month) (J. Francis-Parr, personal communication, 2022). For consistency when discussing RRT implementation across multiple health systems, the term “RRT” will be used throughout this paper.

A meta-analysis of 15 studies conducted by Solomon et al (2016) revealed that implementation of RRTs is associated with both a reduction in hospital mortality as well as non-ICU cardiopulmonary arrests. Historically, some researchers have found that newer nurses may show hesitation regarding activating RRT calls and often require prompting from seasoned staff members to activate the call (Wynn et al., 2009).

New Nurses and Self-Confidence

Nurse theorist Patricia Benner (1982) used the Dreyfus Model of Skill Acquisition tool in her work on the stages of learning and career progression in nurses. Benner's novice to expert theory framed the progression of nurses through five levels of proficiency: novice, advanced beginner, competent, proficient, and finally, expert. Her theory describes the relationship between a nurse's experiential learning, theory-based learning, and their development of clinical knowledge and expertise.

Benner (1982) defines a "novice nurse" as a beginner with no experience who is taught general rules to guide action in respect to different attributes, which are "context-free" rules that do not allow the novice nurse to use any discretionary judgment. The advanced beginner is defined as a nurse who shows marginally acceptable performance who has coped with enough real-life situations to see recurrent meaningful situational components called "aspects."

Benner and colleagues (2009) point out that experience, when used in the context of the acquisition of expertise, is not simply the passage of time or the act of someone acquiring longevity in a field, but rather the individual's refinement of their preconceived notions and theories as they encounter actual practical situations. Utilizing Benner's theory, researchers such as McHugh and Lake (2010) and Ozdemir (2019) define the novice stage as beginning within the first year of a nursing student's education, while new graduates would actually fall within the advanced beginner stage.

Literature shows inconsistencies in the use of the term "novice nurse" from that defined by Benner, to include licensed nurses often classified as novices. A meta-analysis by Franklin and Lee (2014), pulling from Benner's work, defined novice nurses as individuals who lack real-world experience in their role, with practice characterized by rule-based thinking. A randomized control trial by Franklin et al. (2020) defined novice nurses as those within their first few years of independent practice. A qualitative study by Pinchera (2012) using phenomenological inquiry to explore the experience of newly licensed nurses used 18 months to define this transitional time frame. Presenting a process model of development of newly graduated nurses based on Benner's novice-to-expert skill acquisition, Bridges' theory of transition, and Kolb's experiential learning theory, Schoessler and Waldo (2006) described the first 18 months of practice of new graduate nurses as a period where they make the transition into advanced beginners and then into competent nurses. Schoessler and Waldo added that it is not until 12 to 18 months into new nurses' practice that they associate with the ability to be organized and confident that they can safely manage patient care. Due to these inconsistencies related to the term "novice nurse," this scholarly project will use the term "new nurse," defined as any RN within their first 18 months of practice.

Many new nurses report a sense of being unprepared for the expectations of their new roles (Brown et al., 2018). In a qualitative phenomenological research study aimed at gaining insight of newly licensed nurses, Brown et al. reported common words used by participants during their interviews to include "inadequate, intimidation, second-guessing, unprepared, and anxious" (p. 287) and that most participants stated their confidence varied from day to day. In addition, new nurses often report low levels of self-confidence associated with their limited practical knowledge and experience as one of their biggest challenges in their entry into the field, which may also lead to problems with their patient management (Zamanzadeh et al., 2014).

Although the term self-efficacy is often used interchangeably with self-confidence, some researchers differentiate between the two. One definition of self-efficacy is a strong sense of effectiveness where a person perceives that he or she is capable of performing in a certain manner to achieve goals (Franklin & Lee, 2014). Albert Bandura (1997), the father of social cognitive theory, defined self-efficacy as the belief that someone can achieve what he or she sets out to do. Though Bandura mostly focused on self-efficacy, he did write of self-confidence as well. According to the National Research Council (1994), Bandura's definition of self-confidence—firmness or strength of belief that does not specify its direction—related to his definition of self-efficacy, which is essentially "situationally specific self-confidence." Porter et al. (2013) define self-confidence as "the belief in one's abilities to accomplish a goal or task," adding that it is crucial to effective performance and that it underpins nurses' competence.

One method that has been shown to increase self-confidence is simulation-based education (SBE). SBE is frequently used as a powerful tool to address patient safety and healthcare provider training by providing intensive, reproducible, and standardized training as well as assessment for both individuals and teams by focusing on practical experience and learning from participants' mistakes in a safe environment (Eyikara & Baykara, 2017). Features of SBE include its ability to allow participants to complement their traditional training through simulated care of patients without compromising patient safety.

Medical simulation training positively affects learning, knowledge, and skills, with transmissibility of these effects into clinical practice (Rayner & Wadhwa, 2020). The Agency for

Healthcare Research and Quality (2008), the federal agency charged with improving the quality and safely of America's healthcare system, lists benefits of simulation training as increased self-confidence, critical thinking, and communication skills. Simulation has also been found to be effective at increasing self-efficacy among novice nurses compared with traditional control groups (Franklin & Lee, 2014).

The use of simulation has grown in nursing and other healthcare disciplines. Standards were developed by the International Nursing Association for Clinical Simulation and Learning (INACSL). These standards are structured according to terminology, professional integrity of the participant, participant objectives, facilitation, facilitator, the debriefing process, and participant assessment and evaluation (Hayden et al., 2014). The National Council of State Boards of Nursing (NCSBN) base their best practices for simulation on the INACSL standards.

Project Purpose

In summary, new nurses provide care for patients as members of healthcare teams in complex settings in which communication barriers exist. Management of all patients and especially the deteriorating patient depends on optimal performance by nurses and all team members. Perceived or actual authority gradients affect the willingness of some team members to speak up, and new nurses may lack the experience and self-confidence necessary to manage deteriorating patients. Specifically, the organizational assessment of the DNP student's practice site revealed a lower than expected activation of the RRT and reported lack of self-confidence in new nurses to contact the RRT. Thus, since studies of simulation have shown to improve communication (Crowe et al., 2018; Rice et al., 2016), teamwork (Frengley et al., 2011), critical thinking (Kaddoura, 2010), and self-confidence in nurses (Ballangrud, Hall-Lord, Hedelin, et al., 2014; Crowe et al., 2018; Kaddoura, 2010; Liaw et al., 2014; Rice et al., 2016), the purpose of this DNP scholarly project was to assess if new nurses' participation in high-fidelity simulation-based training increased self-confidence and staff-initiated activation of the Rapid Response Team when caring for the deteriorating patient.

Review of Literature

A systematic literature review of academic journal articles published in English between January 2010 and March 2021 was conducted to answer the clinical practice question: Do novice nurses who have had simulation-based communications training compared to those without the enhanced training report more self-confidence and competence as well as collaborate more efficiently in recognizing, communicating, and responding to critical patient assessments?

Four databases were utilized for this search, including PubMed, Web of Science, Cumulative Index of Nursing and Allied Health Literature (CINAHL), and Cochrane Library.

An advanced search was conducted on the PubMed database utilizing the "all fields" filter. The keyword string used was *nurses AND simulation-based AND (critical care OR ICU OR intensive care units)* and resulted in 138 articles initially after narrowing to the stated time frame (2010 to 2021 publication date) and after excluding articles not published in English.

On the Web of Science database, the keyword string *nurses AND simulation-based AND (critical care OR ICU OR intensive care units)* was entered through a basic topic search. The search resulted in 135 articles initially after narrowing to the stated time frame (2010 to 2021 publication date) and after excluding articles not published in English.

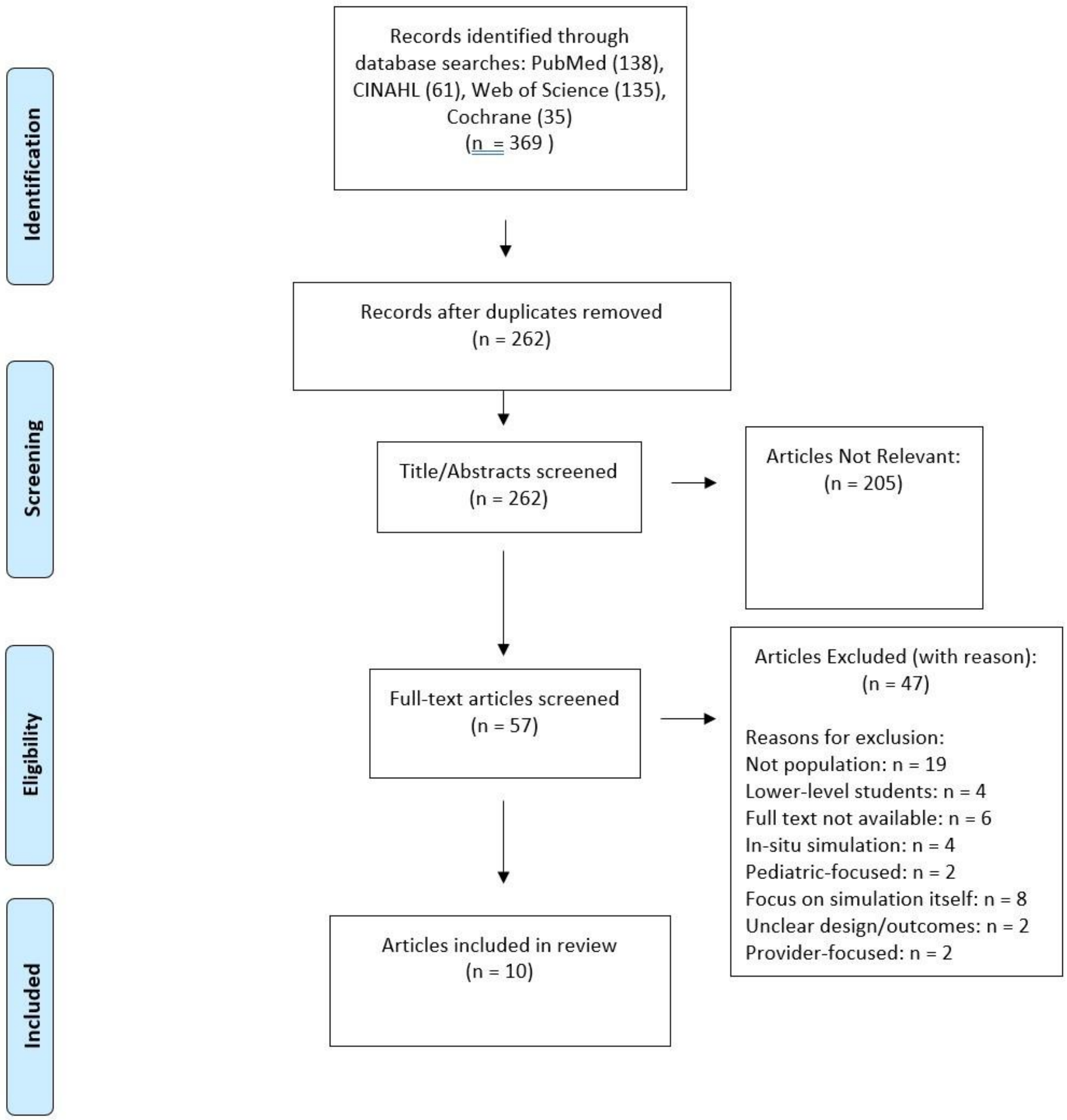
A stepwise search in CINAHL was performed to investigate the PICOT question using the advanced search option. The presets were set to edit the results to full text, published between January 2010 and March 2021, and English language but otherwise left in the default settings. *Nurses* was searched as a Keyword along with the MeSH heading option *Nurses* to reveal 76,734 results. When limited to academic articles only, this number was reduced to 61.

The keyword string utilized in an Advanced Search on the Cochrane Library was *nurses AND simulation-based AND (critical care OR ICU OR intensive care units)* with a custom range of publication years 2010-2021, which yielded 35 results.

A total of 369 articles were collected between the four databases. Reference management software was then utilized to remove duplicates, which resulted in a total of 262 articles. Based on a review of the titles and abstracts of the articles, 205 articles were removed due to lack of relevance: many were pediatric- or neonatal-focused; others focused on hospital capacity planning during a crisis; some aimed to improve guideline adherence in various hospital settings, while others took place in outpatient settings or did not involve simulation training. Of the remaining 57 articles, 47 articles were removed for the following reasons: focused on populations other than nurses (19); article focused on lower-level student nurses (4); no free access to the article (6); simulation setting in-situ (4); focus on pediatrics (2); focus on the simulation structure itself (8); article had unclear design or outcomes (2); article focused on providers (2). Figure 1 shows the search process, using a Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram. Ten sources were retained for final analysis.

Figure 1

Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) Flow Diagram for the Systematic Literature Search Process



Summary of Data and Thematic Analysis

Ten articles were retained for analysis following the systematic search of the four databases. The retained articles are presented in Table 1. A thematic analysis was then conducted from which three themes emerged: teamwork (including interdisciplinary teamwork) and communication and the ability to positively or negatively impact patient outcomes; the role of simulations in increasing self-confidence among participants; and the ability of simulation to build participants' critical thinking and competence (self-reported and/or measured as knowledge).

Teamwork and Communication

Effective communication is essential to patient safety, and failure to communicate effectively, especially when related to patient handoffs between clinicians, contributes to adverse patient outcomes (Liaw et al., 2014). The first theme—teamwork and communication (including interdisciplinary teams) and the related effects on patient outcomes—was shared among four of the articles.

In a qualitative descriptive study by Ballangrud, Hall-Lord, Persenius, et al. (2014), 18 registered nurses in seven intensive care units in a hospital trust in Norway attended a full day simulation-based team training (SBTT) program consisting of Crew Resource Management (CRM) training and high-fidelity patient scenarios. Individual interviews were conducted three to four weeks following the SBBT program; key elements that emerged from this study were the need for better clarity of team roles and that most nurses do not assume a leadership role in teams, thus inhibiting them from full participation in decision-making.

Simulation used in education improved nurses' communication skills, particularly when the scenario involved deteriorating patients (Crowe et al., 2018). Crowe et al. (2018) created a pre- and post-analytic design guided by the adult learning theory of constructivism and the theory of social constructivism to examine the effects generated by simulation as well as the longevity of these effects on nursing confidence and knowledge. One hundred and sixty-one nurses were recruited from various general medicine inpatient units in a large tertiary-level Canadian teaching hospital. Participants attended seven four-hour simulation education sessions over a three-week period and sat in on a one-hour didactic lecture on the principles of deteriorating patients, which included information on the assessment of the patient as well as communication strategies. The sample was predominantly female (84%), bachelor's prepared (63%), and with a mean years of nursing experience of 8.48. The investigators developed a 17-item questionnaire to measure the change in knowledge and found an overall improvement immediately post-intervention and at a three-month follow-up ($p < .001$).

In a pre-, post-test design with seven Bachelor of Science in Nursing (BSN) nurses, Rice et al. (2016) utilized a modified TeamSTEPPS program to improve knowledge, satisfaction, self-confidence and simulated team performance. Participants were initially observed in a simulation exercise for teamwork dynamics, followed by feedback on their performance where they were then given the opportunity for clarifications. Team training was then taught to the participants, followed by a post-training simulation exercise where the participants were observed for their teamwork dynamics. Perception of team structure and perception of communication scores improved, though there were declines in mean overall TeamSTEPPS Teamwork Attitudes Questionnaire scores (Rice et al., 2016).

Frengley et al. (2011) conducted a quantitative study in New Zealand with 40 teams comprised of one doctor and three nurses on the effect of simulations on teamwork among multidisciplinary critical care teams. Each team participated in a 10-hour study day, first working through two pre-intervention assessment simulations, followed by presentations and discussions on human factors and crisis management. This was followed by two post-intervention assessment simulations. The simulations were recorded on video and independently rated by three blinded expert assessors using the standardized 23-item Teamwork Behavioral Rater tool, previously shown to have good reliability. The study demonstrated a significant improvement in scores for teamwork from pre- to post-intervention ($p \leq .002$).

Role of Simulation in Building Self-Confidence

The second theme—the effect of simulations on participants' self-confidence—was found in five of the 10 articles. Using a non-probability, exploratory descriptive design with a convenience sample of 10 new graduates in an intensive care unit of a major nonprofit teaching hospital, Kaddoura (2010) conducted semi-structured interviews to determine how new graduates viewed the effect of clinical simulation on self-confidence. Participants were all female and between 22 to 32 years of age. The intervention was a six-month critical care training program that included simulations for one eight-hour day every three weeks, receiving roughly eight days of simulation learning during their training. A qualitative content analysis of semi-structured interviews of the participants revealed that nurses' confidence increased in their ability to make better clinical decisions.

In a descriptive study, Ballangrud, Hall-Lord, Hedelin, et al. (2014) recruited 63 registered nurses (53 from intensive care units and 10 from a postgraduate education program) in one hospital trust in Norway for a simulation-based team-training program consisting of two half days per team based on the "Simulation Setting Model," which progresses the participants through a sequence beginning with an introduction to the setting, and then proceeding on to theory concept introduction, briefings on the simulator and upcoming scenario, progression into the simulation episodes themselves, and followed by a debriefing. Using the Self-Confidence in Learning Scale, they found significantly higher scores related to self-confidence in learning reported among the registered nurses with prior simulation experience compared to those without experience ($p < .01$).

Using a non-randomized presage-process-design along with the TeamSTEPPS (Team Strategies and Tools to Enhance Performance and Patient Safety) model, Liaw et al. (2014) reported on the effect of small-group, three-hour interprofessional simulations on self-confidence in 127 nursing and medical students. Both groups showed a statistically significant improvement on their post-test scores for self-confidence ($p < .001$) measured with the five-item confidence scale (C-scale) developed by Grundy (1993) to measure confidence levels related to a specific skills performance. The scale has since been shown to have high internal consistency and validity (Kolb, 1984). Liaw et al. postulated that the shared mental model of the communication techniques, the SBAR (“Situation, Background, Assessment, and Recommendation,” a communication tool used to increase handover quality and patient safety) (Müller et al., 2018) and Call-Out (a strategy to communicate treatment plan directed toward achieving goals) (Liaw et al., 2014) tools, and the impact of these tools on decision-making skills all enhanced participants’ confidence in communication.

Two of the previously mentioned studies also measured the effect of simulation on self-confidence. Crowe et al. (2018), using the 12-item “Clinical Decision-Making Self-Confidence Scale,” showed an overall improvement in 161 nurses’ confidence immediately following their intervention and at a three-month follow-up ($p < .001$). Rice et al. (2016) reported that the majority of the BSN nurses had improved self-confidence following the TeamSTEPPS program, measured with the Student Satisfaction and Self-Confidence in Learning survey.

Effect of Simulation on Critical Thinking and Competence

The third theme—the ability of simulation to build participants' critical thinking and competence—was found in five of the 10 articles. Critical thinking is defined as the mental process of active and skillful perception, analysis, synthesis, and evaluation of collected information through observation, experience, and communication that leads to a decision for action (Papathanasiou et al., 2014). One definition of competence with respect to nursing is a nurse's ability to effectively demonstrate a set of attributes—such as professional attitude, values, knowledge, and skills—and to fulfill his/her professional responsibility through practice (Fukada, 2018). In their legislative report aimed at highlighting the emerging prevalence around the world of the adoption of simulation-based educational approaches to improve patient safety and the quality of care at a national level, Alinier and Platt (2014) describe an evidence-based educational model used in simulation, FIRST2ACT—which focuses on early recognition of deterioration in patients—that leads to a substantial increase in the competence and knowledge of participants related to the assessment and medical management of deteriorating patients (Buykx et al., 2011). The report also discusses the emergence of more-realistic simulation technologies that the authors tie as a bridge to increased participant knowledge.

Delaney et al. (2015), in a multimodal design incorporating online interactive didactic presentations, video vignettes, and high-fidelity medical simulation scenarios with 82 critical care and emergency department nurses, reported higher competence using an amended Nurse Competence Scale—a 73-item scale to measure nurses' self-reported perceptions of competence across seven domains—on three sepsis-targeted statements ($p < .001$) as well as significant improvements in post-test knowledge scores ($p < .001$).

A non-randomized, quasi-experimental study by Chen et al. (2018) concluded that nursing education curricula that are simulation-based have been shown as crucial to the development of critical-thinking skills. In Chen et al.'s study, 39 third-year nursing students in China with the mean age of 20.2 years and predominantly female (74%) were separated into a control group and an experimental group. The control group participated in the traditional curriculum of 34 lecture hours and two skill-practice hours, while the experimental group participated in a simulation-based curriculum that included 18 lecture hours, six skill-practice hours, and 12 simulation hours. At the completion of the respective curricula, there was a significant decreased median time in seconds to the start of compressions and decreased time to defibrillation following a simulation-based emergency in the experimental group when compared to the control group ($p < .05$).

Two of the studies also measured simulation and its effect on critical thinking and competence. Using a 17-item questionnaire based on research and existing tools from Liaw et al. (2014) and Cooper et al. (2014), Crowe et al. (2018) showed significant improvements in participant knowledge immediately following their intervention ($p < .001$) as well as maintained at a three-month follow-up ($p < .001$). Kaddoura (2010) wrote that participants voiced that simulation helped them develop sound clinical decision-making skills to improve their patients' outcomes. Though their sample was smaller in size, it does prompt the conversation of whether further studies would yield the same results. Of note, Kaddoura wrote that few studies were found prior to their research that reported on the effect of role simulation education on critical thinking, particularly in newly graduated nurses.

Evaluation and Recommendation

The Johns Hopkins Nursing Evidence-based Practice Rating Scale rates strength of evidence based on the following (Newhouse et al., 2005):

- Level I: Experimental study/randomized controlled trial (RCT) or meta-analysis of RCT
- Level II: Quasi-experimental study
- Level III: Non-experimental study, qualitative study, or meta-synthesis
- Level IV: Opinion of nationally recognized experts based on research evidence or expert consensus panel (systematic review, clinical practice guidelines)
- Level V: Opinion of individual expert based on non-research evidence (includes case studies; literature review; organizational experience e.g., quality improvement and financial data; clinical expertise, or personal experience)

In this review of the literature, levels of evidence ranged from Level I (one article) to Level V (one article). The bulk of the articles were rated Level II (five articles), with three Level III studies and no Level IV articles. Level 1 evidence showed a significant improvement in teamwork scores following simulation (Frengley et al., 2011). Level II evidence supported simulation as a means to increase communication skills, teamwork, self-confidence, and critical thinking (Chen et al., 2018; Crowe et al., 2018; Delaney et al., 2015; Liaw et al., 2014; Rice et al., 2016). The Level III evidence focused mostly on perceptions and reactions to simulations (Alinier & Platt, 2014; Ballangrud, Hall-Lord, Hedelin, et al., 2014; Ballangrud, Hall-Lord, Persenius, et al., 2014). Level V evidence focused more on utilizing a non-threatening environment and utilizing feedback to foster critical thinking and leadership skills (Kaddoura, 2010).

A search of the grey literature was conducted to check for the existence of publication bias by searching the PICOT question in Google Scholar and examining the first 20 results. There was no evidence of publication bias, and findings were consistent with findings in this review.

The main strength of the reviewed evidence was the agreement among the authors that simulation can foster positive development of teamwork and communication skills (including in an interdisciplinary environment), help build self-confidence, and also help enhance critical thinking and expand knowledge base. A limitation was the number of studies using a qualitative design with very small sample sizes.

Another limitation of this literature search was that only one article was found with the highest levels of evidence, i.e. randomized control trials and systematic reviews of randomized control trials. However, there is evidence that the use of simulations can increase new nurses' critical-thinking skills, knowledge base, self-confidence and ability to work as a team (Crowe et al., 2018; Frengley et al., 2011; Liaw et al., 2014).

The purpose of this systematic review was to answer the question: Do novice nurses who have had simulation-based communications training compared to those without the enhanced training report more self-efficacy and competence as well as collaborate more efficiently in recognizing, communicating, and responding to critical patient assessments? The limited studies found suggest that simulation-based training can increase nurses' self-confidence and collaboration in scenarios involving critically ill patients, though no standard in the type, length, or frequency of simulation-based training programs or measurement tools was found.

Design and Methods

A quality improvement (QI) design was used to meet the purpose of this project, which was to assess if new nurses' participation in high-fidelity simulation-based training increases self-confidence and staff-initiated activation of the Rapid Response Team (RRT) when caring for the deteriorating patient.

The definitions of key elements of the project are:

Deteriorating Patient

a person who moves from one clinical state to a worse clinical state, which increases their individual risk of morbidity, including organ dysfunction, protracted hospital stay, disability, or death (Jones et al., 2013)

High-fidelity Simulation

representing things as they are to enhance believability, to include dimensions of conceptual fidelity, physical/environmental fidelity, and psychological fidelity (INACSL Standards Committee, 2016) in activities that mimic the reality of a clinical environment and are designed to demonstrate procedures, decision-making, and critical thinking through techniques such as role playing and the use of devices such as interactive videos or mannequins (Jeffries, 2005)

New Nurse

new graduate nurse within his/her first 18 months of practice

Self-confidence

the belief in one's abilities to accomplish a goal or task (Porter et al., 2013)

Implementation Framework

This quality improvement (QI) project used the FOCUS PDSA framework developed by Deming in 1993 (Moen & Norman, 2010). Though not originally designed specifically for healthcare, the model has since been used in a variety of healthcare settings. Nearly 20 years ago, Bader et al. (2003) used the model to apply severe traumatic brain injury guidelines to practice, while more recently, Hampton et al. (2014) used the model to guide antipsychotic medication management in a long-term care facility. This combined model as seen in Figure 2 was chosen since the finite steps allowed a systematic evaluation of the existing process at the practice site, as well as providing guidance for assembling the appropriate team before proceeding with the QI intervention.

FOCUS Framework

The FOCUS framework was developed by the Hospital Corporation of America as an instrument to precede use of the PDSA/PDCA cycle (Batalden, 1992). FOCUS has been cited as an effective performance-improvement strategy (Saxena et al., 2004) and used commonly as a tool in QI projects (Maraiki et al., 2016). The FOCUS acronym stands for:

- **F**ind a process to improve
- **O**rganize a team that knows the process
- **C**larify current knowledge of the process
- **U**nderstand causes of process variation
- **S**elect the process improvement

Find a Process to Improve

According to Redick (1999), identifying clinical problems is easy, but pinpointing what the exact problem is often proves to be one of the largest challenges in the entire process. One advantage of the FOCUS framework is that refinement or fine-focusing of the problem is not necessary, and instead the problem is whatever is presented, whether based on “hard” or “soft” data (Redick, 1999). Sources of the problems listed as examples include results from staff or physician surveys, information from patient or staff complaints, Joint Commission standards (whether new or revised), and results of internal performance-improvement programs. The clinical area of focus of this scholarly project was to increase new nurse self-confidence in caring for the deteriorating patient and activation of RRT.

Organize a Team That Knows the Process

The second step in the FOCUS framework is organizing a multidisciplinary team of no more than 18 individuals to deal with the problem (Redick, 1999). The vital part of this step is including representation from each discipline involved within the process, choosing team members for their knowledge and experience rather than simply due to their job title.

Integral team members of this QI project included the co-director for the Center for Interprofessional Collaborations based in the School of Nursing, a clinical data research specialist, director of the School of Nursing's Simulation Learning Center, the nurse managers of the two intervention units of interest, and two RRT nurses. The advanced practice program director and faculty adviser, along with the co-director for the Center for Interprofessional Collaborations, acted as faculty consultants and project reviewers throughout the process. In addition, others in official and unofficial leadership positions on the units of interest—including the nurse manager for each of the two target units along with charge nurses —served as consultants throughout project development and implementation to improve simulation realism and recruitment.

Clarify Current Knowledge of the Process

Step three involves clarifying current knowledge, including asking the team what the ideal (or perfect) process would look like if it were to exist (Redick, 1999). Sources of information to define that ideal state could include national professional organization standards, policies and procedures; nursing and medical literature; governmental rules, regulations, and statutes; and expert opinions.

The process in this QI project was how new nurses develop the self-confidence to care for deteriorating patients and initiate or interact with RRT. Benner's theory of novice to expert explains that new nurses develop confidence by participating in real-life situations (Benner, 1982). Studies showed that HFS increases confidence immediately post-intervention and sustained one month later (Crowe et al., 2018; Rice et al., 2016). Organizational assessment of the student's practice site was congruent with Benner's theory and empiric studies. While serving for two years on one of the target units as a clinical instructor, the DNP student's observations and discussions with new nurses and with experienced nurses such as preceptors or charge nurses supported the concept that self-confidence in new nurses could benefit from a process improvement such as the use of high-fidelity simulations to provide a safe environment to build self-confidence in managing the complex or deteriorating patient.

New nurses' self-confidence in initiating RRT calls at the practice site was also examined. Focus meetings were held with RRT members to assess the process prior to implementation regarding RRT activation via auto-triggers as well as staff-initiated calls. Informal and formal meetings were held with unit leadership and bedside nurses (as well as during simulation dry-runs) to better understand criteria all unit nurses were instructed to use as thresholds for RRT activation. These criteria at the time of implementation included "hard" criteria (e.g. certain vital sign parameters such as a heart rate <40 or >150 or a respiratory rate <8 or >30) and "soft" criteria (e.g. changes in mental status, increased work of breathing by the patient, "gut feelings" by the nurse, etc.). This information was then used to help shape the design of the final simulation.

Understand Causes of Process Variation

Step four of the FOCUS framework is understanding the causes of variation. Redick (1999) writes that this step allows the group to focus and define (or redefine) the problem, in order to compare and contrast the ideal state with the current practice. Data should be collected during this phase through means such as visual observation, formal studies, reports, and surveys to identify the root cause of the problem.

During pre-implementation, new nurses and their charge nurses reported that process variation existed related to direct and indirect exposure to caring for decompensating patients. Often due merely to chance, some had direct care experience of these patients, while others did not. Based on their self-reporting, this impacted the new nurses' ability to build their self-confidence in these situations. Research shows that the quality of a preceptor as well as how invested he or she is in supporting a new nurse in their development varies greatly and that deficiencies in preceptor skills and/or efforts that they put into the process can impact the new nurse's ability to transition in their new role (Sanford & Tipton, 2016).

Prior to and during project implementation, nurses and leadership from the intervention units were asked to identify real or perceived barriers and facilitators to initiating RRT calls. RRT members provided clarification on the existing process of how their team is automatically triggered versus how they are activated directly by unit staff (covered in further detail later in this paper). They also identified ideal improvements they would like to see in the process and any suggestions they had toward simulation design. Design of the simulation focused on inclusion of elements most commonly encountered during actual deterioration scenarios and RRT activations (e.g. altered patient sensorium, hypotension, tachycardia, and hypoxia).

Select the Process Improvement

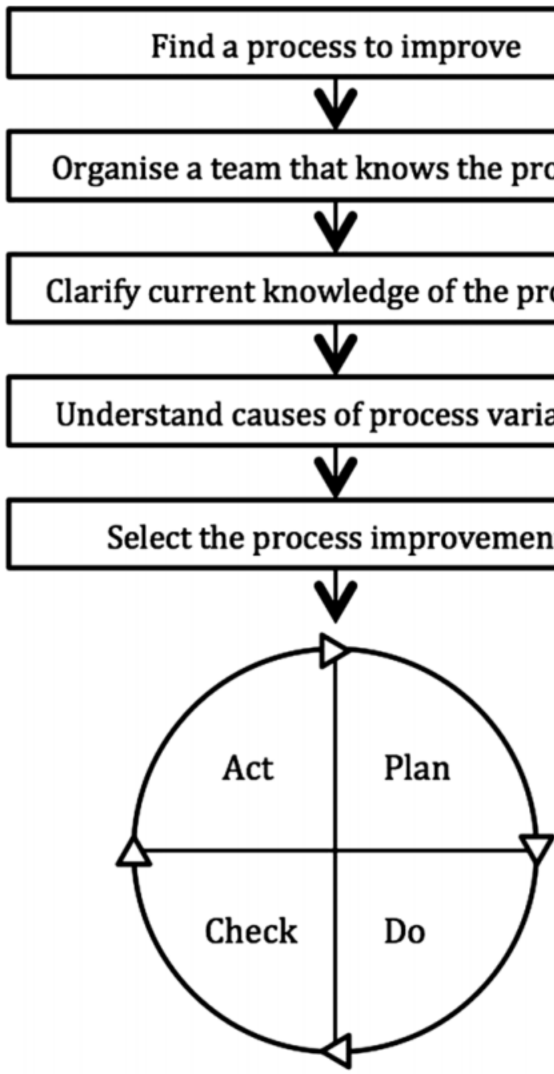
Step five involves selecting how to improve the process. Here, the team amplifies their analysis of the ideal versus current practice to identify the actual problem that needs to be remedied (Redick, 1999). The focus of improvement for this project was on improving new nurses' self-confidence through the use of HFS in the care of deteriorating patients and in activating RRT

PDSA Model

The PDSA model originally emerged based on Walter Shewhart and Edward Deming's work that laid out iterative processes in four stages: "Plan, Do, Study, Act" (PDSA) hence "PDSA," or sometimes "Plan, Do, Check, Act," hence "PDCA") (Taylor et al., 2014). This four-stage, cyclic learning approach allows the user(s) to adapt changes aimed at improvement. Over the years, PDSA has grown in its use in many healthcare improvement initiatives (Slootmans, 2018; Walley & Gowland, 2004).

Figure 2

FOCUS PDCA Model (Taylor et al., 2014)



Plan

A team comprised of this DNP student, the co-director for the Center for Interprofessional Collaboration (CIPC), the director of the simulation center of the School of Nursing, and a lead nurse from the RRT at the practice site modified a simulation in use at the time by the CIPC. This simulation was based on Kolb's Theory of Experiential Learning (1984).

In his theory, Kolb wrote that critical elements of the learning process include an emphasis on the process of adaptation and learning rather than on content or outcomes and that knowledge is a transformational process that is continuously created and recreated. The simulation had been used for more than 10 years and had gone through multiple PDSA cycles. The objectives and flow of the simulation were modified to meet the purpose of this QI project guided by the following updated standards from the INACSL Standards Committee (2016), which are aimed to help facilitate the effectiveness of simulation-based experiences:

- Perform a needs assessment to provide the foundational evidence of the need for a well-designed simulation-based experience.
- Construct measurable objectives.
- Structure the format of a simulation based on the purpose, theory, and modality for the simulation-based experience.
- Design a scenario or case to provide the context for the simulation-based experience.
- Use various types of fidelity to create the required perception of realism.
- Maintain a facilitative approach that is participant-centered and driven by the objectives, participant's knowledge or level of experience, and the expected outcomes.
- Begin simulation-based experiences with a pre-briefing.
- Follow simulation-based experiences with a debriefing and/or feedback session.
- Include an evaluation of the participant(s), facilitator(s), the simulation-based experience, the facility, and the support team.

- Provide preparation materials and resources to promote participants' ability to meet identified objectives and achieve expected outcomes of the simulation-based experience.
- Pilot test simulation-based experiences before full implementation

The INACSL Standards Committee (2016) discusses simulation fidelity in some detail, defining the term as "the ability to view or represent things as they are to enhance believability" (p. 542). Boling and Hardin-Pierce (2016) define "high-fidelity simulation" (HFS) as a specific form of simulation that uses lifelike manikins that are able to realistically reproduce physiological conditions of illness or injury and response to treatments and interventions. In addition to INACSL standards, other resources used during high-fidelity simulation design and implementation for this project included the NLN Jeffries Simulation Theory, which incorporates elements of physical and conceptual fidelity as parts of the simulation design (Jeffries et al., 2015). Based on the NLN Jeffries Simulation Theory concepts and the INACSL standards, the simulation design for this project used aspects designed to enhance realism such as utilizing an actual RRT nurse and provider as facilitators in the simulations, working IV pumps, real-time cardiac and vital sign monitors, and a scenario similar to one the two target units' nurses might encounter in real life.

This project was submitted to the Social and Behavioral Sciences IRB of the student's practice site for review. Though a QI framework was the design of this project, the proposal was deemed a research protocol (#4620, Appendix A) under the oversight of the IRB. IRB did require the proposed use of the Study Information Sheet (Appendix B) as the consenting procedure.

Outcome Measures

Self-confidence

As part of the planning phase, two tools were selected to measure the outcomes of this intervention. The first outcome measure was the change in new nurse self-confidence as measured by Grundy's C-Scale (1993). Originally developed by O'Neill in 1985 as a tool to measure levels of confidence in baccalaureate nursing students who performed dressing changes, Grundy modified the five-item confidence scale for use in the measurement of confidence relating to any psychomotor skill. The scale's five items focus on the respondent's self-evaluation of his/her ability to perform a task correctly, without hesitation, competently as viewed by an observer, their sense of self-confidence while doing so, and their satisfaction with their performance. Subsequently, the C-scale has been utilized in studies of nurses' knowledge and confidence on delirium recognition (Choi et al., 2020), midwifery students' self-confidence in postpartum hemorrhage management (Kordi et al., 2015), nurses' self-confidence following mock codes in a neonatal ICU (O'Quinn, 2018), and student nurses' as well as newly licensed nurses' overall self-confidence (Barber, 2016; Carter, 2019; Hamilton, 2020; Richey, 2019). This scale has mostly been used in education related to health professionals. The C-Scale has strong psychometrics after 30 years of use in research studies with an internal consistency of .84 to .93 (Grundy, 1993). Grundy supported the construct, content, and concurrent validity of the C-Scale through correlation with two other existing measures of confidence that she developed (a confidence visual analogue scale and also a confidence verbal descriptor scale). The length of time between pre- and post-intervention assessment with the C-Scale varied among studies, with Richey, Hamilton, and Barber measuring their post-intervention C-Scales immediately following their intervention, while Carter measured post-intervention one week later, and Hamilton measured self-confidence with the C-Scale immediately post-intervention and one month later.

RRT Calls

The second outcome measure of this QI project was the change in the percentage of total RRT calls that were staff-initiated vs auto-triggered post-simulation participation. The number and percentage of staff-initiated calls and auto-triggered were analyzed for the time periods of three months pre and post-intervention. The number of staff-initiated and auto-triggered RRT calls was provided by the RRT database committee chair in the form of a spreadsheet broken down for the two intervention units and time frames. Staff-initiated calls are defined by the practice site as any RRT activation by any staff member via text, phone, or in-person. Auto-triggered RRT calls are defined by the practice site as any call activated by automatic activation based on data within the Electronic Health Record.

Setting and Target Population

The doctoral student's practice site is a Magnet-recognized Level 1 Trauma Center in the mid-Atlantic states that employs more than 2,500 nurses and 780 resident physicians and fellows (UVA Health, 2021). The hospital treats more than 26,000 patients per year. The facility utilizes an American Association of Colleges of Nursing-based Nurse Residency Program, a one-year residency curriculum that supports new graduate registered nurses (RNs) during their transition from student to professional nurse, with emphasis on critical thinking skills through reflection and interaction with their colleagues (American Association of Colleges of Nursing, 2021).

This QI study was conducted on two inpatient units at the practice site. The units, Unit A and Unit B, were chosen because of the prevalence of new nurses, as defined by 18 months or less of practice as a RN, and the volume of Rapid Response Team (RRT) calls. Unit A is an acute care medical-surgical unit of 28 beds specializing in the post-operative care of patients undergoing general, colorectal, and bariatric surgery. At the time of this project, Unit A employed 38 nurses of which six or 16% were new nurses. Nurse-patient ratios are 1:4, or 1:5 with a free-floating charge nurse. The unit's current annual turnover rate is 15.7%. New nurses on the unit complete a year-long Nurse Residency Program (NRP) as well as a 16-week orientation.

Unit B has 17 beds, and the population consists of donor and recipient patients undergoing kidney, pancreas, and liver transplants. At the time of project implementation, Unit B employed a total of 27 nurses of which 12 or 44% were new nurses (T. Wear, personal communication, 2021). The annual turnover rate for Unit B is 16%. In addition to completing the hospital's year-long NRP program, new nurses on this unit complete a 16-week orientation to include orientation to the unit's IMU patients and associated procedures. Additional unit demographics for Unit A and Unit B are presented in Table 2.

Table 2

Unit Demographics

	Census	**# Nurses**	**0-2 years**	**>2-5 years**	**>5-10 years**	**>10 years**	**Turnover Rate**	**Orientation Length**	**Nurse/Pt. Ratio**
Unit A	28 beds	38	7 (18.42%)	9 (23.68%)	7 (18.42%)	15 (39.47%)	15.70%	16 weeks	1:4/1:5
Unit B	17 beds	27	12 (44.44%)	5 (18.52%)	5 (18.52%)	5 (18.52%)	16.00%	16 weeks	1:3 (IMU) 1:4 (Acute)

During the three months prior to project implementation, Unit A had a total of 114 RRT calls, and Unit B had a total of 38 RRT calls on its acute care beds and 10 on its IMU beds. On Unit A, 24 of the total calls (21%) were auto-triggered. The remaining 90 (78.95%) were staff-initiated. On Unit B, 24 of the total RRT calls on their acute care patients (63.16%) and five of the calls on their IMU patients (50.00%) were auto-triggered rather than staff-initiated (N=14, 36.84%; N=5, 50.00%, respectively). The number of staff-initiated vs auto-triggered RRT calls was provided by the RRT database committee chair

The RRT data for Unit B is separated out according to acute care versus intermediate care unit (IMU) beds. Though both populations on Unit B share the same physical location, same manager, and the same nurses (with new nurses on unit B starting to care for IMU patients between four to six weeks after orientation), the data was separated for two reasons. The first factor was the IMU patient acuity that drives lower nurse-patient ratios. These patients have higher acuity and therefore receive more frequent vital signs and assessments than patients on the acute unit, so significant change in patient status may be noticed sooner. The second reason was a nurse-related factor. Nurses working on the IMU receive additional training specific to care of more complex patients. This additional training might increase their assessment skills and confidence in acting on signs of patient deterioration. Therefore, the data from this IMU population was recorded separately.

The practice site employs a RRT of experienced critical care nurses who cover all of the non-ICU units and can be called if patients are deteriorating or display an acute change in clinical status. RRT activation can be auto-triggered through Electronic Health Record (EHR) algorithms or staff-triggered by nurses and other staff directly. Units A and B utilize two auto-triggers: a Febrile Neutropenic Best Practice Alert (BPA). This alert is triggered by any single temperature ≥ 38 °C and an absolute neutrophil count <1.0 x 10^9/L). A Systemic Inflammatory Response Syndrome (SIRS) BPA is triggered when the patient meets all of the following criteria: temperature < 36 or >38.3 °C, heart rate >90, respiratory rate >20 or PaCO2 <32mmHg, and a white blood cell count >12K, <4K, or >10% bands). Prior to this project, Unit B had also begun piloting an additional auto-trigger of a single systolic blood pressure of > 220 or <80.

The practice site tracks the frequency of RRT alerts on every inpatient unit. During the three months immediately prior to implementation of this project, Unit A averaged 38 RRT calls per month, with 78.95% of those calls staff-initiated and 21.05% auto-triggered through the EHR (G. Paquin, personal communication, 2021). During that same time period, Unit B averaged 16 RRT calls per month (an average of 3.33 calls for the unit's IMU patients and 12.67 for its acute care patients), with 50.00% of the RRT calls staff-initiated and 50.00% auto-triggered for the IMU patients, and 36.84% staff-initiated and 63.16% auto-triggered for the acute care-level patients. Of their RRT calls during this time, Unit B's additional auto-trigger accounted for 50% of the unit's total RRT activations and 83% of its total auto-triggers.

Do

Nurses were recruited for the project simulation through communication with the unit managers, flyers placed on the unit, and word-of-mouth requests starting three months in advance of the simulations. Nurse managers from both units agreed to allow their participating staff paid time during the simulations. Light refreshments were offered to increase participation.

All new nurses on Unit A and Unit B were invited to participate. The goal was 100% participation. Initially, nine simulation sessions were planned over the course of one week with each participant scheduled to attend only one simulation. Due to staffing issues and some nurses' inability to leave their home units, multiple participants had to reschedule or cancel their simulations. Participants were encouraged to sign up for a time slot outside of their regular work day/night shift to avoid staffing conflicts. However, most participants preferred to attend during a scheduled work shift. Despite several sessions having been scheduled later in the afternoon so that participants working night shift could either attend before work or participate on their day off, several nurses currently on a night-shift schedule either declined to participate or had difficulty finding a time slot in the original schedule that worked for them.

The INACSL Standards Committee (2016) does not specify a recommended simulation length, stating only that scenarios can vary in length and complexity depending on the objectives. There are also differing opinions regarding the ideal length of a simulation debrief. In a systematic review of debriefing in simulation-based learning for health professionals, Levett-Jones and Lapkin (2012) suggest the debrief should take as long as three times the length of the simulation itself, while a systematic review of 18 studies (with 14 of those 18 reporting debrief length) by Lee et al. (2020) had debriefs ranging from 20 to 80 minutes.

Based on guidance from local simulation experts in the School of Nursing and School of Medicine as well as the amount of time participants could realistically be expected to attend based on current staffing issues, the entire simulation lasted 70 minutes including a pre-brief, simulation lab orientation, the HFS, and debrief. The pre-brief was 20 minutes in length. Upon arrival, each participant was given a Study Information Sheet that included the purpose/objectives and description of the intervention and asked to complete a Demographic Data sheet (Appendix C). Participants completed the pre-simulation C-Scale tool (Appendix D), which was then followed by an interactive discussion about their prior knowledge and experience with RRT while facilitators educated the participants on and reinforced the importance of timely assessment, intervention, and escalation of care. Participants were given a five- to 10-minute orientation to the simulation lab and allowed to ask any clarifying questions.

The high-fidelity simulation lasted approximately 20 minutes and was broken down into three phases run without pause:

Phase I:

- Nurse 1 (participant) receives report over the phone from the Emergency Department Nurse (facilitator). Patient then arrives from the Emergency Department, and Nurse 1 performs assessment on the patient.
- Nurse 2 (second participant, when applicable) enters room minutes later for shift change, where they receive handover of care from Nurse 1.
- Before Nurse 1 can leave the room, patient's status begins to deteriorate. All nurses present care for the patient accordingly, paging the provider as appropriate (where participants are soon after told via phone there will be a delay in the provider's response) and calling to activate RRT (who then arrives shortly afterward)

Phase 2:

- RRT nurse arrives (facilitator). Participants provide SBAR to RRT nurse. The combined team continues to care for the patient while awaiting the provider.

Phase 3:

- Provider arrives (facilitator in the role of a nurse practitioner). Participants provide SBAR to the provider.
- At direction of the provider, the team provides additional therapies.
- Team prepares patient for transport to ICU.

- Simulation ends when RRT nurse and provider assume care of patient

Following the simulation, participants engaged in a 30-minute debrief/instructional session that highlighted self-confidence in the nurses' ability to recognize deteriorating patients, intervene in these situations, and appropriately reach out to RRT and/or provider. An additional focus was the opportunity to strengthen the nurses' communication skills, in a simulated setting. to help them more effectively relay critical information. Participants were asked to share what worked well and what did not and for overall feedback on the experience. Finally, participants completed the post-simulation C-Scale tool (Appendix E). Participants were contacted five months after the intervention and asked to complete the post-simulation C-Scale again. This additional measure was added to the original plan to measure if the change in self-confidence was sustained. Also, each participant was asked about any RRT activations they had been involved with during that time period.

Study

The Study stage is where the user determines if the change was successful. Here, the user evaluates the data collected to determine if the plan is actually working (Christoff, 2018). The user then compares the data to predictions as well as to data collected from previous performances and then discusses any learnings made throughout the process.

In this project, there were two main outcomes assessed after the nurses participated in the HFS. The first was the pre-and post-simulation difference in self-confidence as measured by the C-Scale. This difference was tested using the Wilcoxon signed-rank paired data. The second outcome, the percent of change in staff-initiated RRT calls on Unit A and Unit B pre- and post-intervention, was analyzed with descriptive statistics.

Results

A total of 12 new nurses participated in the HFS. From Unit A, four of the six (66.7%) new nurses participated in the simulation. From Unit B, eight of 12 (66.7%) new nurses participated. The participants were predominantly female (91.67%), with a mean age of 28.50 years. Educational level was split evenly in the 12 participants between associate's degrees and bachelor's degrees in nursing. However, the four nurses from Unit A all had associate's degrees, while Unit B had two nurses (25%) with associate's degrees and six of the eight (75%) with bachelor's degrees. The 12 participants averaged 7.92 months' experience as a registered nurse, with Unit A and Unit B's average at 6.50 and 8.63 months, respectively. Only one of the 12 nurses had experience on another unit.

Prior to the intervention, 10 of the 12 participants had previously participated in an RRT activation. Seven of the 12 participants (58.33%) had personally activated RRT. Eight of the 12 (66.67%) had been involved in an RRT call initiated by another staff member. Two of the participants had never participated in an RRT in any capacity.

C-Scale Results

Pre- and post-intervention self-confidence scores from the 12 participants were measured with the C-Scale on the day of simulation. In addition, five-month post-intervention self-confidence scores were obtained. Pre- and post-simulation C-Scale scores were analyzed utilizing a two-tailed Wilcoxon signed-rank paired data test to measure improvement in new nurse self-confidence. This test was chosen rather than a paired *t*-test because Likert scale-type questions with self-reported answers ranging from "1" to "5" qualify as ordinal data that typically do not satisfy requirements for a parametric test (Harris et al., 2008). In addition, with the smaller number of total participants (12), the paired *t*-test's assumption of normal distribution was not met, while this assumption does not apply with the Wilcoxon Signed Rank test (Whitley

& Ball, 2002). The data from this intervention did meet the assumptions for the Wilcoxon Signed Rank test: dependent variable measured at ordinal or continuous level, independent variable consist of two categorical matched pairs, and the distribution of the differences between the two related groups is symmetrical in shape (Laerd Statistics, 2018).

RRT calls on Unit A and Unit B were compared using descriptive statistics between two time points—the three-month period immediately preceding the HFS compared to the three-month period following the last simulation. As shown in Table 3, all five items of the C-Scale measuring the participants' perceptions of their abilities to care for a deteriorating patient and appropriately activate and interact with the Rapid Response Team showed an improvement from pre- to immediately post-intervention. Eleven of the 12 participants completed the five-month post-intervention C-Scale. The C-scale results for the 11 participants for all three time points is shown in Table 3.

Table 3

C-Scale Results Pre-, Immediately Post-, and Five Months Post-Intervention

C-Scale Item	Pre-intervention (N=12)	Immediately Post-intervention (N-12)	Five Months Post-intervention (N=11)	Pre- to Immediately Post z	Pre- to Immediately Post *p*-value
#1	2.67	3.5	3.73	-2.67	< .01
#2	2.5	3.5	3.55	-2.93	< .01
#3	2.25	3.25	3.64	-2.8	< .01
#4	2.75	3.42	3.64	-2.37	< .05
#5	2.67	3.58	3.64	-2.67	< .01

Item #1: "I am certain that my performance is correct"
Item #2: "I feel that I perform the task without hesitation"
Item #3: "My performance would convince an observer that I'm competent at this task"
Item #4: "I feel sure of myself as I perform the task"
item #5: "I feel satisfied with my performance"

RRT Calls Results

Table 4 shows the difference between staff-initiated RRT calls by unit pre- and post-intervention. In the three-month pre-intervention time period, Unit A had a total of 114 RRT calls, of which 90 (78.95%) were staff-initiated. Unit B in the same time period had a total of 38 RRT calls on its acute care beds—of which 14 (36.84%) were staff-initiated—and 10 calls in the IMU, with five of those (50.00%) staff-initiated. During the three months after the new nurses participated in the simulations of deteriorating patients, Unit A had 50 of its 78 RRT calls staff-initiated (64.10%), while Unit B had 18 of its 40 (45.00%) for its acute care beds, and seven of its 11 (63.64%) for its IMU beds. There was a decrease in Unit A's staff-initiated calls from the three months immediately pre-intervention to the three months post-intervention and an increase in Unit B's percentages for both its acute care beds as well as its IMU beds.

Table 4

Difference Between Staff initiated RRT Calls by Unit Pre and Post-intervention

	Total RRT Calls Pre-	**Pre-intervention Frequency(%)**	**Total RRT Calls Post-**	**Post-intervention Frequency(%)**
Unit A	114	90 (78.95%)	78	50 (64.10%)
Unit B Acute	38	14 (36.84%)	40	18 (45.00%)
Unit B IMU	35	5 (50.00%)	11	7 (63.64%)

Post-simulation data was collected via a text survey on 11 of the 12 participants regarding their individual experience with RRT activation in the three months post-intervention. (One participant was no longer working in a setting where an RRT was utilized.) During that time, nine of 11 participants (81.81%) had initiated an RRT call on a patient they were directly caring for, and seven (63.64%) had encouraged another team member to activate an RRT call on a deteriorating patient.

Act

Finally, the Act stage has the user identify any necessary adaptations as well as the next steps necessary to lead into a new PDSA cycle (Taylor et al., 2014). The user determines if the intervention is to be adopted, adapted, or abandoned after looking at the data evaluation from the Study stage (Christoff, 2018). Future problem-solving steps are identified, including further testing, implementation strategies on a larger scale, and/or discarding the plan altogether and switching to a different plan as appropriate.

As part of an ongoing PDSA cycle, two additional simulation days were added during implementation. In total, eight simulations were offered over two weeks, which allowed four of the participants to reschedule at various times due to last-minute staffing difficulties. No alterations were made to the HFS or the total time required of the participants.

If new nurse self-confidence and frequency of RRT requests increased following the intervention, recommendations would be made that additional nursing staff on the units of interest attend similar simulations, along with exploration into the possibility of broadening the reach of the intervention to other units within the hospital.

Discussion

The purpose of this DNP scholarly project was to assess if new nurses' participation in high-fidelity simulation-based training increased self-confidence and staff-initiated activation of the Rapid Response Team (RRT) when caring for the deteriorating patient. Similar to the sustained self-confidence found by Crowe et al. (2018) and Hamilton (2020), new nurses showed increased self-confidence immediately post-simulation and sustained levels of self-confidence five months later. However, no statistically significant positive impact on the percentage of staff-initiated calls on Unit A or Unit B was found.

Twelve new nurses completed the HFS and showed an increase in self-confidence similar to reported studies (Ballangrud, Hall-Lord, Hedelin, et al., 2014; Crowe et al., 2018; Kaddoura, 2010; Liaw et al., 2014; Rice et al., 2016). This increased self-confidence was sustained in the 11 responding participants five months after the intervention.

The purpose of this project was also to assess if participation in HFS increased staff-initiated RRT calls by new nurses on the target units. The ultimate goal of a quality improvement project is to positively impact an existing process rather than obtaining statistical significance. However, statistical significance in a quality improvement project can serve as a quantifiable measure of whether the implemented intervention was effective (Baghi et al., 2007; McQuillan et al., 2016). Although the percentage of staff-initiated calls did increase on the acute care and IMU units of Unit B, this change was not statistically significant. As previously noted, the percentage of staff-initiated calls on Unit A decreased from pre- to post-intervention.

Interpretation

QI projects are typically aimed to improve a process to impact better outcomes. Thus, the aim is to include all nurses to achieve those preferred outcomes. While it was the aim of this project to include all new nurses on Unit A and Unit B, only 12 of the 16 eligible new nurses between the two units (66.7%) did participate.

Since low self-confidence is common in new nurses (Brown & Curtis, 2014; Schoessler & Waldo, 2006; Zamanzadeh et al., 2014), this project's original population of interest was all new nurses at the practice site. The preferred method to access these new nurses was through the Nurse Residency Program (NRP). However, the NRP was offered virtually during COVID-19 and could not incorporate the HFS as designed for this project. Therefore, the doctoral student focused on Unit A and Unit B based on familiarity with the units' patient populations, leadership, RRT processes, and staffing.

There were several barriers to implementing this quality improvement project. First, staffing issues on Unit A and Unit B made it difficult for new nurses to leave their unit to complete the HFS. The nurse participants were encouraged to participate by their nurse managers—including being allowed to be on the clock during the simulation whether it was a regular work day or coming in in on a day off—but staffing and acuity did impact participation. In addition, the HFS was held in the SON, a 10-minute each-way walk from the units and the nurse's assigned patient load. This led to rescheduling and some no shows and was a barrier to 100% participation. Though not measured, nursing in the time of the COVID-19 pandemic has added a work related stress factor. COVID-19 required a diversion of resources and led to work-related stress during the pandemic conditions. This might have influenced whether the nurses were willing to participate in this or any additional project outside their normal and heavy patient load.

Although numerous external factors affect RRT activation as well as the percentage of staff-initiated RRT, this QI project aimed to assess if simulation participation would increase the percentage of staff-initiated calls. As noted, Unit B showed a slight increase in the percentage of staff-initiated calls whereas Unit A showed a decrease. Several factors may explain these findings. First, on Unit A as compared to Unit B, the auto-trigger RRT criteria are more restrictive. This could explain the higher baseline number of staff-initiated RRT calls on Unit A. Second, two of the six new nurses on Unit A and four of the 12 on Unit B did not participate in the simulation. Thus, their practice with initiating RRT is reflected in the totals. Third, both units have a large number of experienced nurses (Unit A 32/38; Unit B 15/27) who were not the focus of the simulation and who also activate RRT calls. Because there are so many factors that can potentially influence RRT calls on these two units, and actually on any inpatient unit, and because only 12 new nurses out of 18 completed the HFS, no conclusion can be drawn about the impact of this intervention on the RRT data from Unit A and Unit B.

Multiple system factors may also partially explain the percentage of staff-initiated RRT calls and the level of new nurse self-confidence pre- and post-HFS, including the impacts of COVID policies and burnout; nurse exhaustion; and the relationship between medical and surgical provider teams and nursing staff. A number of staff nurses left during the pre- and post-intervention time periods which may also have affected outcomes.

There may be other factors that influenced the RRT results. The auto-triggered RRT activation is hard-wired in the EHR, so it does not depend on nurses' self-confidence in activating RRT. However, auto-triggered RRT activation does depend on the entry of vital signs by a staff member—either the RN or patient care technician (PCT). In the event a vital sign is entered into the EHR by a PCT, the nurse may or may not be aware of the vital sign, but the auto-trigger would be activated despite that, and the auto-trigger would therefore come sooner than a staff-initiated call. All auto-triggered calls are based either wholly or at least in part on patients' vital signs since some auto-triggers also incorporate lab values. Those vital signs are either entered manually by a staff member , or the vital signs are validated by a nurse after they automatically transfer over to the EHR. In either scenario, a staff member is aware of the vital signs before they are entered into the EHR. In these cases, if the staff member were to start the process of an RRT activation earlier and not wait for the vitals to be entered into the system to then auto-trigger an RRT, precious moments could be saved, which, as mentioned earlier in the research by Sankey (2016), reduces patient mortality.

Evaluation of the QI Process and Design

There were a number of facilitators and barriers to implementing this QI design on Unit A and Unit B worthy of discussion. Facilitators to this QI project included the strong relationship between the doctoral student and the nurse managers of Unit A and Unit B built over two years in the role of clinical faculty as well as strong relationships with the SON. The student developed a good working relationship with members of the hospital's RRT that enhanced simulation design and data collection.

Barriers to the QI project included an unexpectedly low percentage of new nurses on Unit A. Though initially the doctoral student planned to conduct the project on Unit A only, an additional unit was chosen where a similar relationship existed with unit management. The second unit had a relatively smaller percentage of new nurses compared to the first unit, further limiting the potential impact of the intervention. A second barrier was the lack of nearby parking. In addition, some participants felt unwilling or unable to attend a simulation during work hours and would therefore be required to use their personal time. This was a barrier to attending the simulation. Short-staffing also served as a barrier. During intervention, nurses were typically working with fewer nurses per shift and/or higher nurse-to-patient ratios, making it difficult for nurses to step away to participate.

Time burden of participation in the simulation with both on-duty and off-duty participants served as an additional barrier. Many participants indicated they wished they had time to run through the simulation more than once, which was not feasible with working staff. Continuation of this project in the future could consider shortening the simulation to increase participation, though this had been considered pre-intervention and comes with barriers of its own since most participants expressed wanting additional simulation time rather than less.

The ideal location of the simulation was a room on Unit A or Unit B so nurses could be close to their patient assignment. Ideally, the simulation would have been set up somewhere in the medical center to make it easier for nurses to participate. However, the hospital was near or at capacity during most of implementation, so guaranteeing that a room would be available on a scheduled date would have likely proved impossible. While using an actual hospital room would have added to the overall realism of the simulation, it would have necessitated observers/project facilitators standing in the corner of the room to observe, whereas the simulation center allowed for observation through one-way mirrors and via video camera and microphones. In addition, using actual patient rooms would have removed the advantage of the simulation center's built-in microphone and video cameras for review by the facilitators afterward.

Finally, the INASCL standards do not make a specific recommendation regarding the number of participants in a simulation at the same time. In order to facilitate maximum involvement during the simulation by each participant, the initial plan for this intervention included only one participant at a time in a simulation. However, after consideration of staffing and work time issues, the simulation was changed to also allow participants to work together in a simulation when necessary. Anecdotally after the intervention, participants gave feedback that they felt they were able to work collaboratively and build upon each other's strengths as well as help fill in the gap with each other's weaknesses.

Conclusion

This project's simulation intervention was effective in increasing self-confidence scores between pre- and immediately post-simulation. Five months post-intervention, this increase was sustained. However, how this increased self-confidence by the new nurses was translated into practice when activating RRT calls cannot be interpreted by this data as many factors could have influenced RRT call patterns. The evaluation of the QI design itself showed several facilitators and many barriers to conducting a similar project. The impact of nurse staffing and the COVID-19 pandemic were significant. The continued use of HFS, consistent with reports in the literature (Boling & Hardin-Pierce, 2016; Delaney et al., 2015) and the results of this project do support continued use of HFS with new nurses. Though a small test of change, given the results and the positive implication of the simulation, embedding HFS in the NRP should be considered. This would allow for 15 new nurses per month to receive simulation-based practice in caring for complex patients and activating RRT. Regarding sustainability of the program, with 15 new nurses entering the NRP each month, roughly eight simulations could be run monthly using four facilitators/simulation staff, completing all simulations within the four-hour NRP block. This would allow a relatively inexpensive opportunity with minimal time required for continued evaluation over time of a defined cohort of participants to evaluate the benefits of HFS on new-nurse self-confidence and activation of RRT in an academic medical center.

In summary, implementation of high-fidelity simulation on a larger scale with new nurses in a NRP would provide a relatively low-risk, low-cost, high-yield process that would likely positively impact the self-confidence of new nurses. At the same time, this investment could arguably simultaneously contribute to better patient outcomes by enhancing the new nurses' capabilities in caring for deteriorating patients and activating the rapid response team.

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Table 1

Summary of Literature Review

Study Citation (Author; Year)	Purpose	Study Design	Sample	*N*	Variables (Independent; Dependent)	Findings	Theme
Alinier, G., & Platt, A. (2014)	to highlight the emerging prevalence around the world of the adoption of simulation-based educational approaches to improve patient safety and the quality of care at a national level	legislative report	n/a	n/a	n/a; n/a	it is not about investing more in educational resources and technology, but making better use of them by adopting sound educational principles, collaborating with others, and ensuring a quality control process (including making training compulsory and ensuring the right people facilitate the training)	3
Ballangrud, R., Hall-Lord, M. L., Hedelin, B., & Persenius, M. (2014)	to implement a simulation-based team training program and to investigate IVU nurses' evaluations used for team training	questionnaire evaluation design	RNs	63	simulation-based team training program	The study indicates a positive reception of a simulation-based program with regard to team training in emergency situations in an intensive care unit.	1

Study Citation (Author; Year)	Purpose	Study Design	Sample	*N*	Variables (Independent; Dependent)	Findings	Theme
Ballangrud, R., Hall-Lord, M. L., Persenius, M., & Hedelin, B. (2014)	to describe intensive care nurses' perceptions of simulation-based team training for building patient safety in the ICU.	qualitative descriptive design	RNs working in seven ICUs in Norway	18	n/a; n/a	One main category emerged to illuminate the intensive care nurse perception: ''training increases awareness of clinical practice and acknowledges the importance of structured work in teams.'' Three generic categories were found: ''realistic training contributes to safe care,'' ''reflection and openness motivates learning'' and ''finding a common understanding of team performance.''	1, 2
Chen, J., Yang, J., Hu, F., Yu, S.-H., Yang, B.-X., Liu, Q., & Zhu, X.-P. (2018)	to evaluate the impact of a standardized simulation-based emergency and intensive care nursing curriculum on nursing students' response time in a resuscitation simulation.	two-group, non-randomized quasi-experimental design	third-year nursing students in the Emergency and Intensive Care course	39	high-technology, simulation-based emergency and intensive care nursing curriculum; response time in a resuscitation simulation	decreased median seconds to start compressions and defibrillation at the end of the course, compared with compressions vs. at the beginning of the course	3

Study Citation (Author; Year)	Purpose	Study Design	Sample	*N*	Variables (Independent; Dependent)	Findings	Theme
Crowe, S., Ewart, L., & Derman, S. (2018)	to address gaps in the literature by examining the effect and sustainment of simulation education on nursing confidence and knowledge in post-licensure nurses on general medical units, as well as to examine the trends in relation to the recognition of patient deterioration	pre- and post-analytic design	nurses from various medical inpatient unites	161	education sessions in the simulation center on the principles of the deteriorating patient including assessment, signs of deterioration, communication and case studies; Self-confidence and nursing knowledge	An overall improvement in confidence was measured immediately post and maintained at the 3 -follow up.	1, 2, 3

Study Citation (Author; Year)	Purpose	Study Design	Sample	*N*	Variables (Independent; Dependent)	Findings	Theme
Delaney, M. M., Friedman, M. I., Dolansky, M. A., & Fitzpatrick, J. J. (2015)	to determine the influence of a specially designed sepsis education program on nurses' perceived ability to identify early, intervene, and care for patients with sepsis.	multimodal design incorporating online interactive didactic presentations, video vignettes, pre- and postknowledge tests, and high-fidelity medical simulation scenarios	critical care and emergency department nurses (in a 1-year critical care nurse training program)	82	sepsis educational program (including a high-fidelity medical simulation along with PPT with voiceover); knowledge scores and self-assessed competence scores	No improvement in the overall self-assessed competence scores was found; however, self-perceived frequency of use of competence behaviors improved. Participants felt more competent on three sepsis-targeted statements, and posttest knowledge scores showed significant improvement.	3

Study Citation (Author; Year)	Purpose	Study Design	Sample	*n*	Variables (Independent; Dependent)	Findings	Theme
Frengley, R. W., Weller, J. M., Torrie, J., Dzendrowskyj, P., Yee, B., Paul, A. M., Shulruf, B., & Henderson, K. M. (2011)	to evaluate the effect of a simulation-based intervention to improve teamwork behaviors in established critical care unit teams and compare the relative effectiveness of case-based learning and simulation-based learning	self-controlled randomized crossover study with blinded assessors	40 teams of doctors nurses from nine different critical care units in eight hospitals	160	case-based learning vs. simulation-based learning; Overall teamwork behavior, leadership and team coordination, verbalizing situational information, mutual performance monitoring	demonstrated a significant improvement in scores for teamwork from pre- to post-intervention simulations	1

Study Citation (Author; Year)	Purpose	Study Design	Sample	*n*	Variables (Independent; Dependent)	Findings	Theme
Kaddoura MA. (2010)	The study attempted to answer the following research question: “How do new graduate nurses characterize the role of clinical simulation in influencing the critical thinking, learning, and confidence of new critical care nurses during their critical care nursing training?”	exploratory descriptive design	convenience nonprobability sample of 10 new graduate nurses from the intensive care unit of the study hospital	10	n/a; n/a	the clinical simulation teaching strategy used in the critical care training was vital in promoting critical thinking skills in new graduate nurses. Key themes emerged: Just-in-time learning of cognitive and psychomotor skills; fostering critical thinking and leadership skills through feedback on simulation; safety in a nonthreatening learning environment	2, 3

Study Citation (Author; Year)	Purpose	Study Design	Sample	*n*	Variables (Independent; Dependent)	Findings	Theme
Liaw, S. Y., Zhou, W. T., Lau, T. C., Siau, C., & Chan, S. W.-C. (2014)	to describe the development, implementation and evaluation of simulation-based interprofessional educational program for improving medical and nursing students' communication skills in caring of a patient with physiological deterioration	presage-process-product model	medical and nursing students	127	3-hour small-group interprofessional learning with simulation scenarios; students' self-confidence in interprofessional communication and perception in interprofessional learning	Simulation-based interprofessional education has better prepared the medical and nursing students in communicating with one another in providing safe care for deteriorating patient. Both medicine and nursing groups demonstrated a significant improvement on post-test score from pre-test score for self-confidence and perception with no significant differences detected between the two groups.	1, 2

Study Citation (Author; Year)	Purpose	Study Design	Sample	*n*	Variables (Independent; Dependent)	Findings	Theme
Rice, Y., DeLetter, M., Fryman, L., Parrish, E., Velotta, C., & Talley, C. (2016)	hypothesized that this program would improve knowledge, satisfaction, self-confidence, and simulated team performance.	pre-, post-test design	BSN nurses, 21 years of age, less than 2 years of intensive care unit and nursing experience.	7	modified TeamSTEPPS system; attitudes and perceptions with TeamSTEPPS Teamwork Attitudes Questionnaire	Simulation-based team training improved teamwork attitudes, perceptions, and performance. Team communication demonstrated significant improvement in 2 of the 3 instruments. Most participants agreed or strongly agreed that they were satisfied with simulation and had gained self-confidence.	1, 2, 3

Appendix A

Institutional Review Board for SOCIAL & BEHAVIORAL SCIENCES
UNIVERSITY of VIRGINIA

Office of the Vice President for Research

Human Research Protection Program

Institutional Review Board for the Social and Behavioral Sciences

IRB-SBS Chair: Moon, Tonya

IRB-SBS Director: Blackwood, Bronwyn

Protocol Number (4620) Approval Certificate

The UVA IRB-SBS reviewed "The Impact of Simulation-Based Training on the Self-Confidence of New Nurses in the Care of Acutely Deteriorating Patients and Activation of the Medical Emergency Team " and determined that the protocol met the qualifications for approval as described in 45 CFR 46.

Principal Investigator: Lambert, Carl

Faculty Sponsor: Wiencek, Clareen

Protocol Number: 4620

Protocol Title: The Impact of Simulation-Based Training on the Self-Confidence of New Nurses in the Care of Acutely Deteriorating Patients and Activation of the Medical Emergency Team

Is this research funded? No

Review category: Expedited Review

7. Research on individual or group characteristics or behavior or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies

Review Type:

Modifications: No
Continuation: No
Unexpected Adverse Events: No

Approval Date: 2021-08-24

As indicated in the Principal Investigator, Faculty Sponsor, and Department Chair Assurances as part of the IRB requirements for approval, the PI has ultimate responsibility for the conduct of the study, the ethical performance of the project, the protection of the rights and welfare of human subjects, and strict adherence to any stipulations imposed by the IRB-SBS.

The PI and research team will comply with all UVA policies and procedures, as well as with all applicable Federal, State, and local laws regarding the protection of human subjects in research, including, but not limited to, the following:

1. That no participants will be recruited or data accessed under the protocol until the Investigator has received this approval certificate.
2. That no participants will be recruited or entered under the protocol until all researchers for the project including the Faculty Sponsor have completed their human investigation research ethics educational requirement (CITI training is required every 3 years for UVA researchers). The PI ensures that all personnel performing the project are qualified, appropriately trained, and will adhere to the provisions of the approved protocol.
3. That any modifications of the protocol or consent form will not be implemented without prior written approval from the IRB-SBS Chair or designee except when necessary to eliminate immediate hazards to the participants.
4. That any deviation from the protocol and/or consent form that is serious, unexpected and related to the study or a death occurring during the study will be reported promptly to the SBS Review Board in writing.
5. That all protocol forms for continuations of this protocol will be completed and returned within the time limit stated on the renewal notification letter.
6. That all participants will be recruited and consented as stated in the protocol approved or exempted by the IRB-SBS board. If written consent is required, all participants will be consented by signing a copy of the consent form unless this requirement is waived by the board.
7. That the IRB-SBS office will be notified within 30 days of a change in the Principal Investigator for the study.
8. That the IRB-SBS office will be notified when the active study is complete.
9. The SBS Review Board reserves the right to suspend and/or terminate this study at any time if, in its opinion, (1) the risks of further research are prohibitive, or (2) the above agreement is breached.

Date this Protocol Approval Certificate was generated: 2022-04-10

Appendix B

Study Information Sheet

Please read this study information sheet carefully before you decide to participate in the study.

Purpose of the research study: The purpose of this DNP scholarly project is to assess if new nurses' participation in high-fidelity simulation-based training increases self-confidence and nurse-initiated activation of the Medical Emergency Team when caring for the deteriorating patient.

What you will do in the study: You will be participating in groups of one to three in a high-fidelity simulation where you will be asked to recognize a deteriorating patient, care for that patient as a response, and escalate care of that patient to a licensed independent practitioner and member of MET (Medical Emergency Team). The simulation will be preceded by an approximately 20-minute pre-briefing and introduction to the simulation lab, followed by the simulation itself (roughly 20 minutes) and then finally a 20-minute debriefing where we will discuss learnings, challenges and elements you can take forward to better your care. Simulations may be recorded using video and audio, though these recordings will be viewed solely within the project team and not shared with anyone outside of that time, as well as the recordings destroyed no later than six months following your simulation. In addition, you will be asked to complete a short five-question survey before and after the simulation that helps assess your level of self-confidence in caring for a deteriorating patient and activating MET.

Time required: The study will require about one hour of your time.

Risks: There are no anticipated risks in this study.

Benefits: There are no direct benefits to you for participating in this research study. The study may help us understand better how to better help nurses recognize and care for deteriorating patients as well as activate and interact with the Medical Emergency Team (MET).

Confidentiality:

Data not linked to identifying information:

The information that you give in the study will be handled confidentially. Because of the nature of the data, it may be possible to deduce your identity; however, there will be no attempt to do so and your data will be reported in a way that will not identify you.

Voluntary participation: Your participation in the study is completely voluntary. Your decision to participate will have no effect on job performance evaluation.

Right to withdraw from the study: You have the right to withdraw from the study at any time without penalty. If a participant should decide to withdraw for any reason, any recording of his or her performance will be deleted.

How to withdraw from the study:

If you want to withdraw from the study, tell the researcher and leave the room. Withdrawing will not affect your experience as a employee. You will still receive full hourly payment per your unit manager for your time spent participating. In the project.

Payment: Per your unit manager, you will receive your normal hourly wage for the time spent during participation (approximately one hour).

Using data beyond this study: A paired t-test will be carried out to compare pre- and post-C-Scale scores from five-item surveys completed by participants before and after the simulation to measure for any change in new nurse self-confidence.

The researcher would like to make the information collected in this study available to other researchers after the study is completed through possible publication. The researcher will remove any identifying information (such as your name, contact information, etc.) connected to the information you provide. The other researchers will not have access to your name and other information that could potentially identify you nor will they attempt to identify you.
The data you provide in this study will be retained in a secure manner by the researcher for one year and then destroyed.

If you have questions about the study, contact:

DNP Student: Carl Lambert
University of Virginia School of Nursing
225 Jeanette Lancaster Way
Charlottesville, Virginia 22903
540-419-3033
cvl4nd@virginia.edu
Faculty Advisor: Clareen Wiencek.
University of Virginia School of Nursing
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Charlottesville, Virginia 22903
(434) 982-2890
caw2pa@virginia.edu

To obtain more information about the study, ask questions about the research procedures, express concerns about your participation, or report illness, injury or other problems, please contact:

Tonya R. Moon, Ph.D.
Chair, Institutional Review Board for the Social and Behavioral Sciences
One Morton Dr Suite 500
University of Virginia, P.O. Box 800392
Charlottesville, VA 22908-0392
Telephone: (434) 924-5999
Email: irbsbshelp@virginia.edu
Website: https://research.virginia.edu/irb-sbs
Website for Research Participants: https://research.virginia.edu/research-participants
UVA IRB-SBS # 4620

You may keep this copy for your records.

Appendix C

Date: ___________________ Time: __________________

Demographic data. (Please do **not** include your name anywhere on this document.)

Participant ID# (last four digits of your cell number): __________

Age: __________

Gender: _________

Experience in months/years as nurse: ____________

Current unit (e.g. 5C, 4C): ___________

Experience in months/years on current unit: __________

Education (e.g. Associates, BSN, MSN): ___________

Clinically relevant certifications: _________________________________

Have you ever personally *activated* a MET call on a patient you were caring for?

(please circle one) Yes No

Have you ever had *anyone else (charge nurse, LIP, etc.) activate* a MET call on a patient you were caring for?

(please circle one) Yes No

Have you evet had a MET call auto-triggered on a patient you were caring for?

(please circle one) Yes No

Have you ever *participated* in a MET call for a patient you were *not directly caring for*?

(please circle one) Yes No

Appendix D

C-Scale (*Pre*-simulation)

Participant ID# (last four digits of your cell number): __________

Directions: Circle the number which best describes **how you perceive your current ability to care for a deteriorating patient and appropriately activate and interact with the Medical Emergency Team (MET)**. (NOTE: Make sure that the circle encloses just ONE number.)

1. I am certain that my performance is correct:

1	2	3	4	5
not at all certain	certain for only a few steps	fairly certain for a good number of steps	certain for almost all steps	absolutely certain for all steps

2. I feel that I perform the task without hesitation:

1	2	3	4	5
I have much hesitation	a fair amount of hesitation	a good part of it without hesitation	almost completely without hesitation	absolutely no hesitation

3. My performance would convince an observer that I'm competent at this task:

1	2	3	4	5
not at all	agree, a little	for much of it	for almost all of it	for absolutely all of it

4. I feel sure of myself as I perform the task:

1	2	3	4	5
not at all	very little	for much of it	for almost all of it	for absolutely all of it

5. I feel satisfied with my performance:

1	2	3	4	5
not at all	very little	for much of it	for almost all of it	absolutely satisfied with all of it

Appendix E

C-Scale (*Post*-simulation)

Participant ID# (last four digits of your cell number): __________

Directions: Circle the number which best describes **how you perceive your current ability to care for a deteriorating patient and appropriately activate and interact with the Medical Emergency Team (MET)**. (NOTE: Make sure that the circle encloses just ONE number.)

1. I am certain that my performance is correct:

1	2	3	4	5
not at all certain	certain for only a few steps	fairly certain for a good number of steps	certain for almost all steps	absolutely certain for all steps

2. I feel that I perform the task without hesitation:

1	2	3	4	5
I have much hesitation	a fair amount of hesitation	a good part of it without hesitation	almost completely without hesitation	absolutely no hesitation

3. My performance would convince an observer that I'm competent at this task:

1	2	3	4	5
not at all	agree, a little	for much of it	for almost all of it	for absolutely all of it

4. I feel sure of myself as I perform the task:

1	2	3	4	5
not at all	very little	for much of it	for almost all of it	for absolutely all of it

5. I feel satisfied with my performance:

1	2	3	4	5
not at all	very little	for much of it	for almost all of it	absolutely satisfied with all of it