

Simulation-Based Training of Nurses in Critical and Emergency Care: A Literature Review

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Abstract

Introduction: Simulation-based education, which has the advantage of allowing easy verification of learning outcomes in the form of actions, has been suggested to improve the competency of learners by functioning as a bridge between didactic classroom instruction that mainly consists of lectures and clinical settings where it is difficult to anticipate critical events. Despite those advantages, scenario simulation as an efficient approach for nursing education has not gained sufficient acceptance. The aim of this article was to review the current body of literature regarding the effectiveness of simulation-based education in critical and emergency care nurses' education.

Methods: An inclusive literature search strategy was employed and carefully documented. It involved comparisons of subject heading, advanced and basic, keywords, index-and MeSH terms searches with appropriate permutations, done in association with a library information specialist. Study selection was performed in three stages to minimize the risk of errors and bias and ensure that all relevant studies were included. Data collection comprised baseline observations, initial postintervention observations. The findings of this review was summarized in a qualitative approach and not met-analysis was performed.

Results: Many studies showed mixed results for simulation effectiveness, and effect sizes were smaller for nurses than those recorded for students. Improvement in medication administration and review showing improvement in pediatric intensive care unit nurses' emergency technical and nontechnical team performance after simulation training. The quality of study reporting varied from 64% (good) to 81% (excellent) according to assessments made using the simulation-based training. Many reviewed studies suggest variable outcomes for qualified nurses compared with nursing students, and a need to seek additional contemporary evidence for simulation-based education CPD approaches.

Conclusions: The findings of this review suggest variable outcomes for qualified nurses compared with nursing students, and a need to seek additional contemporary evidence for simulation-based approaches. Education programs should be designed to measure longer term impact such as change in practice, effect on patient care, or organizational benefits, to justify the allocated resources.

Keywords: Intensive, Nurse, Simulation, Training, Effectiveness.

Introduction

Simulation-based training is recommended today as a method to make health-care professionals aware of and understand the importance of teamwork and the aspects of team performance [1]. Moreover, simulation is seen as an effective method for assessing the ongoing competence of critical care nurses. Teamwork consists of a number of elements such as supporting others, solving conflicts, exchanging information and coordinating activities, with one of the approaches used to minimize the effect of human error being to assist health-care teams in team performance training by increasing individuals' and teams' competencies in non-technical skills (NTS) [2]. With regard to cardiopulmonary resuscitation (CPR) situations, simulation-based research has demonstrated that an absence of leadership and task distribution was associated with poor interdisciplinary team performance [3].

Structuring work in health-care teams has been found to largely account for quality and safety improvements in patient care, and is shown as being crucial for patient safety in the intensive care unit (ICU). Failures in team processes such as communication, coordination or leadership have frequently been associated with patient safety incidents. Effective teamwork in emergency situations is expected, although teamwork is not often evaluated or discussed on a regular basis in clinical practice.

Nurses who work in different intensive care specialties with somewhat varied categories of critically ill patients are involved in emergency situations such as cardiac arrests in both real-and training situations. However, the CPR performing situations have been criticized for mainly focusing on the individual's technical skills and too little on the team's NTS performance [4]. There are few available studies that focus on ICU nurses' competence in emergencies team performance [5]. Simulation-based education, which has the advantage of allowing easy verification of learning outcomes in the form of actions, has been suggested to improve the competency of learners by functioning as a bridge between didactic classroom

instruction that mainly consists of lectures and clinical settings where it is difficult to anticipate critical events. Despite those advantages, scenario simulation as an efficient approach for nursing education has not gained sufficient acceptance [6]. Most nurses rely on skills demonstrated by mentors or those learned by trial and error, despite the fact that taking part in a formal program to enhance communication skills leads to an improvement in communication skills, while studies have demonstrated that patients desire good communication and that communication skills can be taught and retained [7]. Thus, communication approaches used by the medical team, including nurses, gain utmost importance. When working in community hospital nurseries, nurse practitioners are often the front line providers in discussing unexpected news with parents.

During a pandemic crisis, there is significant burden on physical and personnel resources required for patient care. Given the rapid onset of coronavirus disease 2019 (COVID-19), healthcare institutions were pressured to prepare a maximum workforce and bed capacity ; however, not all employed nurses had the training or skills to manage COVID-19 patients, especially those with critical disease progression [8].

Even in time-pressured situations, it is important to assess key clinical skills and scope of service considering that in critical care units the case acuity and complexity levels are higher than any other healthcare units, presenting the need for highly specialized and subspecialized nurses. Simulation-based education (SBE) has potential to help manage quick, focused upskilling training, which helps to improve patient care and safety by decreasing practice errors and risk of contamination [9]. However, there is currently a lack of knowledge about the effectiveness of simulation-based education in critical care nurses' education. The aim of this article was to review the current body of literature regarding the effectiveness

of simulation-based education in critical and emergency care nurses' education.

Methods

An inclusive literature search strategy was employed and carefully documented. It involved comparisons of subject heading, advanced and basic, keywords, index- and MeSH terms searches with appropriate permutations, done in association with a library information specialist. The search include terms of "nurse", "intensive", "simulation", "critical", "training". Study selection process was carried out by two researchers independently. Study selection was performed in three stages to minimize the risk of errors and bias and ensure that all relevant studies were included. In the third stage, the full texts of studies that appeared to meet the inclusion criteria were obtained for detailed assessment against the inclusion criteria. Relevant studies were assessed for methodological validity by two reviewers independently prior to inclusion in the review. The included article described a single-center, parallel, controlled, prospective study conducted in adult critical care and intensive care units. Data collection comprised baseline observations, initial postintervention observations. The findings of this review was summarized in a qualitative approach and not met-analysis was performed.

Results and discussion

Many studies showed mixed results for simulation effectiveness, and effect sizes were smaller for nurses than those recorded for students [10]. Improvement in medication administration and review showing improvement in pediatric intensive care unit nurses' emergency technical and nontechnical team performance after simulation training. Excluded on the basis of concept were studies of program development, faculty training, debriefing, and learning theory. For face-to-face SBE, the study samples ranged from eight to 270 (mean 44.2), while a study of Web based simulation sampled 1,229 nurses [11]. The quality of study reporting varied from 64% (good) to 81% (excellent) according to assessments made using

the simulation Research Evaluation Rubric. There appeared to be three distinct groups of nurses who completed SBE. Although a number of studies reported on education for acute care clinical nurses, training was also provided for qualified nurses who were undertaking an in-house training course in preparation for more advanced nursing (such as in critical care, intensive care, or cardiothoracic surgical care). Their training program was conducted over a period for the purpose of ensuring key clinical skills. The study designs commonly presented low levels of research evidence. In training courses SBE was a proportion of the part-time education curriculum over a six-or 12 week period [12].

Furthermore, many reviewed studies suggest variable outcomes for qualified nurses compared with nursing students, and a need to seek additional contemporary evidence for simulation-based education CPD approaches [13]. The research questions to be answered are as follows: Simulation-based education has a positive impact on nurses' knowledge/skills, as clinicians and as team members. Education programs should be designed to measure longer term impact such as change in practice, effect on patient care, or organizational benefits, to justify the allocated resources. This selective approach was deemed necessary as the study resources were limited and other "simulation" journals have a broader medical professional focus which was not the focus of this study.

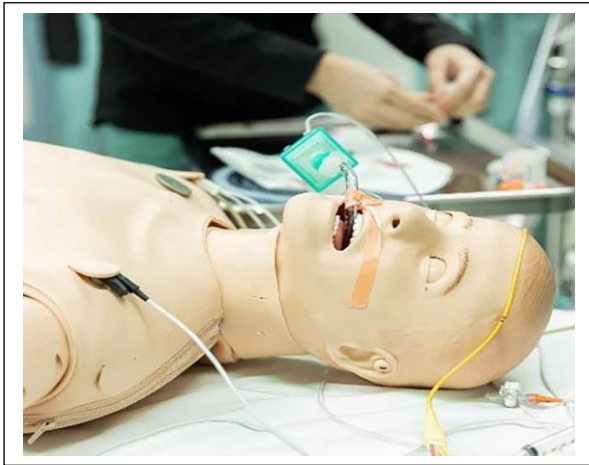
Overall, the nonexperimental designs without a comparison group indicated that the focus of training was on immediate outcomes for a single group of learners, rather than consideration of longer term impact such as a change in workplace practices. As scenario topics were often unique, a scenario would be developed by education staff using simulation development guidelines and input from clinical experts [14]. In seeking an association between change in clinical behavior and patient outcomes found no association between nurses accuracy and pediatric intensive care unit transfer rates. The impact of training for emergency trauma team management but training had little impact on patient care indicators,

although time to ultrasonography was improved. In intensive care, the implementation of an evidence-based team training system has exhibited improvements in observed team performance and interviews with staff indicated the implementation to be effective [15]. In interviews with ICU personnel after the implementation of a SBBT program regarding interdisciplinary teamwork found that training had increased their awareness of the importance of effective communication for patient safety. In a randomized clinical trial, among the participants, their average working experience as a nurse was 4.5 years and only 26.4% had completed advanced ICU training [16]. A descriptive qualitative study, the authors described that SBTT could contribute to managing stress both in emergencies and in their daily work in the ICU since the same feelings of stress were recognized during simulation-based situations [17].

Although positive experiences among participants with regard to training in a simulation laboratory were expressed in their own unit with physicians as a part of the team was thought to provide an even greater degree of realism and transferability. The debriefing with open group discussions and reflections concerning the team performance during the simulation scenarios was experienced as positive. An awareness of the use of human resources, responsibilities and team communication was experienced to be improved through training using simulation [18]. The nurses expressed that they had limited knowledge of structured teamwork prior to the SBTT, and in clinical practice they experienced an unsystematic approach to teamwork that was dependent on the nurse's or physician's competence, as well as whether the team had experience in working together. Having knowledge of structured and clear communication with regard to leadership was emphasized by the participants, in addition to having a follower in a team requiring training to communicate observations in a satisfactory manner [17]. Another study found that nurses' and physicians' mean self-efficacy scores improved, and nurse assistants' perceived quality of collaboration and communication with physician specialists improved after training. nurse assistants' perception of the SAQ factors teamwork climate, safety climate and working conditions were more

positive after the project as well as nurses' perception of safety climate. The number of nurses quitting their job and nurse assistants' time on sick leave was reduced in comparison to the control ICU during the study period. nurse assistants were replaced by nurses, which decreased the patient/nurse ratio to one patient per nurse during the daytime and one to two patients during evening and night shifts. Corresponding data for nurse assistants were 0% and 6%. In the control ICU 7-14% of the nurses left their job each year and 4-27% of the nurse assistants over the same 5-year period. No significant change for nurse assistants was observed. Nurses in the intervention ICU were on sick leave 6-9% of the working time each year during the fiscal years 2006-10, while nurse assistants were on sick leave 12-29% of the working time. Corresponding data for the control ICU were 5-9% sick leave for nurses and 8-11% for nurse assistants [19].

The perception of safety differed between professions before training. Nurses' and physicians' mean self-efficacy scores improved, and nurse assistants' perceived quality of collaboration and communication with physician specialists improved after training. nurse assistants' perception of the SAQ factors teamwork climate, safety climate and working conditions were more positive after the project as well as nurses' perception of safety climate. The number of nurses quitting their job and nurse assistants' time on sick leave was reduced in comparison to the control ICU during the study period [19]. The principles for training teams to cope with stressful situations and error management were developed by the airline industry and transferred to health care and adapted the use of human patient simulators into the CRM program [20]. During pandemic crisis, it is important to have focused education that is prioritized based on the needs of the patient and organization. Clinical education during COVID-19 must be planned in a way that lowers the risk of disease transmission, particularly in small group training, while also acknowledging clinical-related stress and fears [21]. Learners and educators must be careful not to become complacent in protecting themselves from the virus when outside the clinical arena. The expansion process placed clinical leaders under significant staffing and resource management challenges.



Conclusions

Th findings of this review suggest variable outcomes for qualified nurses compared with nursing students, and a need to seek additional contemporary evidence for simulation-based approaches. Education programs should be designed to measure longer term impact such as change in practice, effect on patient care, or organizational benefits, to justify the allocated resources. Overall, the use in most studies of nonexperimental designs without a comparison group indicated that the focus of training was on immediate outcomes for a single group of learners, rather than consideration of longer term impact such as a change in workplace practices. Furthermore, scenario simulation is potentially useful not only for upgrading individual nurses' technical skills but also for improving teamwork when providing health care to patients. Therefore, efforts should be made to hasten the propagation of simulation-based education. For this purpose, more opportunities should be given to nurses and academic educators to verify the efficacy of scenario simulation by themselves.

Conflict of interests

The authors declared no conflict of interests.

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