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Abstract

Simulation in education has been used at least since the time of World War II. Simulation in nursing education in the form of static manikins, role playing, CPR manikins, and other techniques has also been utilized as a teaching modality for quite some time. High-fidelity simulation is a relatively new area in nursing education and utilizes high technology simulation monitors and computers. This technology offers new avenues for teaching student nurses scenarios as well as critical thinking and reflection on lived experience and practice. However, the outcome research in the area of high-fidelity simulation in nursing education is limited at this time. This article focuses on the qualitative and quantitative research currently available in this area.

Keywords

Qualitative Research, Simulation, Simulation in Learning, Nursing Education, Reflection in Nursing Practice, and Nursing Teaching Modalities

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Simulation in Nursing Education: A Review of the Research

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Simulation in education has been used at least since the time of World War II. Simulation in nursing education in the form of static manikins, role playing, CPR manikins, and other techniques has also been utilized as a teaching modality for quite some time. High-fidelity simulation is a relatively new area in nursing education and utilizes high technology simulation monitors and computers. This technology offers new avenues for teaching student nurses scenarios as well as critical thinking and reflection on lived experience and practice. However, the outcome research in the area of high-fidelity simulation in nursing education is limited at this time. This article focuses on the qualitative and quantitative research currently available in this area. Key Words: Qualitative Research, Simulation, Simulation in Learning, Nursing Education, Reflection in Nursing Practice, and Nursing Teaching Modalities

In recent years, high-fidelity simulation in nursing education has become an increasingly popular educational tool. Is simulation a new technique? Does simulation have positive learning outcomes? Is there evidence-based research to substantiate the use of simulators in education and particularly in nursing education? This discussion will look at several studies and attempt to answer these questions.

According to Webster's (2003) to simulate is "to look or act like." In the broadest sense this would include not only mechanical simulators but also role playing, scenario settings, and case studies, to mention a few types of simulation. Using this definition we realize simulation in nursing education has been around a long time—whether it has involved using oranges to practice intramuscular and subcutaneous injections, learning CPR on a static manikin, inserting foley catheters in a manikin in a lab setting, or role playing major mental disorders and communication skills in mental health. These are all simulations in one form or another, and what they have in common is that they are done in an artificial situation so the student or staff member is later able to practice safely in the clinical setting.

Ward-Smith (2008) noted that the first documented use of higher level simulators was with pilots during World War II. They continue to be used today to train pilots in simulated situations such as loss of power, engine failures, and poor weather conditions. Safety is the reason behind using simulators in pilot training as well. In 2003 the Institute of Medicine adapted simulation as a teaching methodology to be used in programs in education (Ward-Smith).

In nursing, there is limited research on the effectiveness and outcomes when using simulators and simulations. In healthcare the emphasis is on giving accurate and safe care to patients, and simulators and simulations allow for the practice of this important goal in a less threatening environment. In 2003, the National League of Nurses (NLN)

endorsed the use of simulations in order to prepare students in critical thinking and self-reflection as well as preparing them for the complex clinical environment. In 2007, with a grant funded by the Laerdal Medical Corporation, the NLN began a three-year research study on the use of simulation in nursing education. The project, called the Simulation Innovation and Resource Center (SIRC), involved educators from the United States and also eight international educators from Australia, Canada, Chile, Japan, Norway, Scotland, and China (Hovancsek, Jeffries, Escudero, Foulds, Huseb, Iwamoto, et al., 2009). The goal of the project was to develop web-based courses that use high technology simulations. Out of this study came a resource center web site that assists educators with scenario design (<http://sirc.nln.org/>).

According to Hovancsek et al. (2009), patient safety has become a priority concern, and the use of simulators can prepare nurses for mock disasters that involve other professionals such as military, police, firefighter, paramedics, and physicians. Interdisciplinary mock drills are held to better prepare communities for disasters. The study found the demand for higher quality healthcare both nationally and internationally has increased and the use of simulation will improve health care (Hovancsek et al.).

Lasater (2007) points out that the nursing shortage has resulted in a more diverse group of students being interested in nursing. At a time when there is a critical need for nurses, nursing education faces a critical shortage in nursing faculty. In spite of the inconsistent practice experiences students receive, the demand is present for a higher level of knowledge upon entering the professional work arena. In order to study simulation and clinical judgment, Lasater conducted an exploratory study that looked at four dimensions of clinical judgment development and the interaction between them. The four dimensions studied were:

- Students' self-report of confidence in their clinical judgment skills
- Students' aptitude for critical thinking
- Qualitative observations of students' clinical judgment skill during simulation
- Students' experience followed through a focus group

Lasater (2007) used Benner's 1996 definition of clinical judgment to define clinical judgment in the study. This definition defines clinical judgment as the way nurses come to understand problems or concerns of patients. Lasater points out that experiential learning such as simulation allows the student to experience both the good and the bad aspects of working with patients as a nurse. The simulated experience is not just a flat experience but rather one rich with dimension. Participating in the study was a group of 48 junior students taking Adult I nursing. The students were divided into groups of 12 which came to lab one day each week, replacing a clinical day. A nursing faculty facilitator began each session with some amount of pre-teaching on the topic of the scenario. For the individual scenarios three students participated at a time. One student played the role of the primary nurse; this student was ultimately responsible for interventions and delegation regarding the patient. After each scenario there was a debriefing session with the students. Of the 48 students in the study, 39 of them were observed and became candidates for a later focus group. Out of the 39 students eligible

to participate in the focus group 15 chose to do so. Of these 15 all were nontraditional students.

The focus group analysis was retrospective and held in the lab to facilitate memory. Focus groups were taped to improve data collection. Lasater (2007) found both strengths and weaknesses with the outcomes. Some of the strengths mentioned by the students were that simulation served as a bridge to bring the information from the classroom and the psychomotor skills learned in lab together. The reaction of the students was favorable to the realism of the scenario, and they felt the simulation was a superior method to just reading about a particular disease or condition. Also mentioned by the students was the depth of the experience. While participating in a clinical rotation as a student they may never see a particular type of patient, whereas with simulation many things become possible. Students stated they now realized the gravity of what could happen in a real clinical setting when a patient is not doing well, and they felt the simulation experience will make them more aware when checking allergies and administering medications. When students were asked about the limitations of the experience several things were mentioned. One of the limitations mentioned was the inability of "sim man" to express nonverbal communication such as grimaces. Some physical signs such as change in color and swelling are also not possible. Another limitation to the simulators is that some assessments are not possible, such as neurological assessments and assessment of reflexes. Some members of the focus group mentioned they felt stupid talking to a manikin and this caused some anxiety which they were able to overcome.

When working in teams, as occurred in this study, students learn to rely on one another as fellow team members and to collaborate with one another. Lasater (2007) states debriefing is one of the more important components of the experience. Reflection during debriefing allows the student to critically think through the lived experience. Although simulated experience will never be exactly the same as patient care, it allows the student to experience a critical event before they are responsible for one in a working environment.

In a larger qualitative study, Larew, Sessans, Spunt, Foster, and Covington (2005) used Benner's theory to institute a simulation module into the curriculum of the University of Maryland Baltimore School of Nursing. In this study 190 adult health nursing students participated. The goal of the study was to develop protocol which would enhance the learning of novice nursing students. Benner's theory predicts that nurses with more experience will identify problems with fewer, more subtle cues. The design of the study centered on common postoperative complications and the cues which are seen in postoperative patients. Escalating prompts were used in the scenarios. The baseline cues were provided in the medical record and a taped end of shift report. Students collected assessment data at the bedside. Prompts continue from vague to specific. Some students were able to respond to the vague prompts of the medical history and the report. Less experienced students required more specific, serious prompts as Benner's theory predicted. The researchers presented students with one problem at a time rather than having multiple complications occurring at one time. Each student required a varying amount of time to assess the situation, process information, and organize. According to Larew et al., a strict time schedule would not be beneficial to the

novice student, but students with successful outcomes showed improved levels of self confidence.

Smith and Roehrs (2009) did a study involving high-fidelity simulation in which they looked at the correlation of nursing student satisfaction and self-confidence. The researchers found few studies that identify factor outcomes when using simulation. They also noted that of these studies, the sample sizes were small and the instruments used were limited. Smith and Roehrs used the Nursing Education Simulation Framework, which was developed by Jeffries in 2007, as the theoretical framework guiding the study. The Jeffries model framework consists of five major areas of concentration: teacher factors, student factors, educational practices, design factors, and outcomes. With a sample size of 68 students the researchers looked at two outcomes of the model: student satisfaction and self-confidence. In addition, the study looked at two other areas described in the model. These were student demographic characteristics and simulation design characteristics. The researchers used the additional characteristics to determine if there was a correlation between design characteristics and demographic characteristics in regards to reports of satisfaction and self-confidence.

The study was conducted using junior students in their first medical/surgical class. Students worked in groups of four with two students being observers and two students being nursing personnel. The scenario involved an elderly patient with a respiratory disorder who was going into respiratory distress. The exercise was completed both when the students gave the appropriate medications and completed appropriate interventions or when twenty minutes had elapsed. Immediately after participation in the scenario students completed the instruments used in the study. The two instruments used by Smith and Roehrs (2009) were developed by the National League of Nursing (NLN). The instruments were the Student Satisfaction and Self Confidence in Learning Scale and the Simulation and Design Scale. Both scales are self-report, five point Likert scales. The data was tabulated using descriptive statistical analysis, and additional correlational studies were completed using Spearman's rho and multiple linear regression.

A multiple linear regression analysis was conducted because there was no strong correlation between any of the design characteristics and the outcomes. Smith and Roehrs (2009) found from the multiple linear regression analysis that the variance could be explained by the five design characteristics. The key finding of this project, according to the researchers, is that the design of simulation experiences is a significant factor in the outcomes for teaching modalities using simulation, and they caution educators to carefully choose their design for the desired outcome (Smith & Roehrs).

As part of the scenario, Smith and Roehrs (2009) had a debriefing or reflective portion immediately following the lived experience which allowed the student to reflect back on their experience and practice. According to Ireland (2008) evidence-based practice begins with the posing of a question and continues with the reflective thinking after the activity. Ireland states this reflection accommodates and may even invite uncertainty and surprise. Students using reflective thinking after having any lived experience, whether clinical or simulated, should result in better critical thinking, a more satisfied nurse, and in the long run better patient care.

Ying (2009) conducted a similar study to that of Smith and Roehrs (2009), in which first year nursing students took part in a case scenario that involved a respiratory patient who was admitted for a pleural effusion. In the scenario, the patient was

scheduled to have a thoracentesis but on rounds is noted to be breathless. The student has received report from the prior nurse and is to work through this process from report to interventions and outcomes. Ying believes placing students in scenarios based on real life situations enables them to both perceive the relevance of the clinical setting and to effectively manage it.

As much as it would seem that high-fidelity simulators have found their place in nursing education there is a void of concrete research in this area. Many of the studies appear to be little more than an opinion poll without the rigor of a full-fledged qualitative study. Not all educators are in favor of the simulators and identify the need for much more research in this area. Schiavenato (2009) reports simulation is limited and restrictive. The author suggests that merely accepting high-fidelity simulators as the next wave of nursing education is unwise and calls for further research in the area; in addition, she calls for theory that will answer the questions regarding why educators should use this teaching modality. Schiavenato does not necessarily disagree with the concept and use of the human simulator and acknowledges that we have used simulation for years in the form of role playing and other clinical lab scenarios, but she calls for further research in the area to support the use of simulation.

Some advantages to simulated learning are: the ability to experience a crisis situation before it occurs in the clinical setting; the ability to evaluate and reflect on the activities in a non-threatening arena; and the predictability of being able to artificially create situations which may never occur in any other way. Simulations also assist with the already overcrowded, hard-to-get clinical sites and many state boards of nursing now allow some simulation experiences as clinical time. According to Jeffries (2009), a few states now allow up to 25 percent of real clinical time to be accounted for with the use of simulation. Jeffries predicts that as more evidence is produced and best practices are developed, the use of the high fidelity simulators as well as much higher tech simulators will occur. Much of this research will come from students working on master's degrees, PhDs, and other advanced degrees currently.

The disadvantages to simulation learning are: the lack of supporting theory and evidence-based research supporting the use of simulation; and the time-consuming nature of creating scenarios, setting up the lab, and planning for role plays for already overwhelmed instructors. Clearly, there is much more research to be done in the area of simulation, particularly high-fidelity simulation. In order that our simulators do not become high-priced bed occupants in our nursing labs, the need for further study in this areas is needed.

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