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## Research Article

# Nurse Educators' Perceptions of Using High-Fidelity Simulation in Teaching

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## Abstract

High-fidelity simulation in nursing refers to the use of computerized manikins to offer realistic hands-on training to nursing students. The problem addressed by this dissertation was resistance among some faculty to the use of new computerized simulation technology in the nursing curriculum. The research question for this case study investigated how faculty members can incorporate simulation into the curriculum and barriers faced in setting the stage for simulation experiences for their students. The goal of this applied dissertation study was to examine the perceptions of nurse educators regarding the benefits of and barriers to use of high-fidelity (computerized manikin) simulation with students in a university nursing program. Interviews were used in this qualitative case study to gather perceptions from educators in a university nursing program. The study was based on the qualitative research method with a case study design. The theoretical underpinnings for the study were concentrated within a constructivist framework. Twelve nursing educators were interviewed regarding their perceptions of the use of simulation in the nursing curriculum. The findings indicated that faculty believed the use of simulation to be beneficial to nursing students by increasing patient safety, improving students' critical thinking, improving learning outcomes, and increasing competency to transfer to clinical practice. Faculty recommended further training and technical support to maximize effective use of simulation.

**Keywords:** Learning Strategies; Nursing Education; Simulation; Staff Development; Teaching Styles

## Introduction

The problem addressed by this study was nurse educators' resistance to the use of computerized simulations. In nursing, use of technologically advanced, computerized manikins in high-fidelity simulation allows students the opportunity to practice skill development in a simulation before interacting with a real patient [1]. Decreased availability of clinical sites for students to practice clinical skills has brought increased pressure on institutions and nurse educators to find new ways of teaching nursing students skills to improve patient outcomes in the clinical setting. In addition, instructional technology has been incorporated in the nursing education curriculum [2,3,4]. Simulation technology has been implemented in most nursing programs to assist faculty in

training student nurses in the basic skills needed for practice in a safe environment without any real danger to patients [5].

According to researchers for the National Advisory Council on Nurse Education and Practice [6], the incorporation of such technology-based simulation in health care programs has been a challenge for educators. Some nurse educators are challenged by the transition from traditional methods of teaching pedagogy to the integration of technology into the curriculum. Nurse educators have expressed frustration in using this new teaching pedagogy, which could affect student learning outcomes [7]. A research study conducted by [8] showed that although faculty members believed the simulated learning would transfer with the students into the clinical setting, they also commented on the amount of extra time and resources needed to implement simulation. [9] found a lack of time, a lack of support resources, and lack of funding for support resources presented critical barriers to use of simulation

in nursing education. Regarding high-fidelity simulation, [10] noted, "Equipment is often purchased with the expectation that faculty will embrace the new technology, when the reality is that many faculties are not prepared for this type of teaching" (p. 70). The perceptions of nursing faculty can impact the effective use of technology within the nursing curriculum. This study was designed to determine nurse educators' perceptions of the effectiveness of high-fidelity simulation as a teaching tool as well as barriers to its use.

Literature is limited regarding educators' concerns in planning, implementing, and evaluating use of computerized manikins in the nursing curriculum. Further, the way in which nursing education is delivered to students is evolving, although educators are still responsible for producing educated, well-trained, and skilled nurses. Advances in technology uses, such as simulation, have been incorporated into nursing education; thus, leaders at educational institutions have chosen to integrate simulation as a teaching paradigm into their nursing curricula. The technique of using simulation has been recognized as an important component of a nursing program for training students in basic nursing skills and decision making [4,11]. Florida law allows up to 50% of a nursing program's clinical training to include clinical simulation. Because of the increased usage, the [12] created a checklist for use of simulation in nursing programs. Therefore, nursing educators need to incorporate current technology into their curriculum in order to meet the needs of the new generation. The interactive use of simulation assists the student to acquire skills that can be transferred into safe clinical practice.

## Phenomenon of Interest

### Simulators

Various types of simulators are used in the field of nursing education. A low-fidelity simulator, such as a foam intramuscular injection simulator, can be used to instruct nurses in psychomotor tasks. Low-fidelity simulators appear static and lack realism [13]. Moderate-fidelity simulators allow students to practice skills such as listening to breath sounds, detecting a heart murmur, and palpating pulses. They are more realistic than low-fidelity models but still lack certain characteristics; for instance, the manikin may show no chest movement while a student listens to breath sounds. High-fidelity simulators are computerized, full-body manikins that produce the most realistic patient interaction experiences. Manikin-based simulation (a human patient simulator) is the most recent model developed by Medical Education Technologies Incorporated (METI) and SimMan [14]. The METI high-fidelity models are used for physiological and pharmacological purposes, allowing the simulator to act like a live patient. Responses are verbalized to enhance communication with the learner during training. Vital signs are visible from the SimMan model, and pulmonary resuscitation, intubation, and chest tube placements are just some of the procedures students are able to practice within the

environment of nursing education with a high degree of realism to given scenarios [4].

### Benefit: Safety

Safety is a primary benefit of computerized simulations. Nursing students' clinical experiences provide the opportunity to apply the knowledge they have acquired in the classroom through theory and practice. The Institute of Medicine (IOM) report in 2004 noted that 44,000 people die each year due to medical errors, and this number could now be even greater [15]. The IOM report was highlighted by the media and scrutinized by a large number of health care stakeholders. One recommendation from the IOM report was the use of simulation by students in health care establishments and teaching institutions. Simulation has received attention as a way of enhancing nursing students' competence upon entering the clinical area and dealing with real patients' clinical experiences. [16] noted simulation can "replicate clinical practices in a safe environment" stated, "Simulation with the use of human patient simulators has been proposed as one answer to patient safety". noted simulation is useful in practicing intravenous therapy and drug administration, skills frequently related to malpractice suits.

### Technological Change

Simulation has become an important aspect of training nurses and helping them understand the needs of their patients. Simulation can provide opportunities for students to gain understanding by allowing them to experience and function in an environment that mirrors real situations. Students may be assisted to understand problems that might arise during their careers so they can meet these challenges in a safe and effective manner. For this reason, medical education simulation-training strategies are viewed as effective and have been introduced to nursing faculty [8,17,18]. However, despite documented research of integration of technology in nursing curricula, nursing educators often are reluctant to adopt new technologies. [19] conducted an informal review with 20 nurse educators and reported that although 90% used high-fidelity simulation in the curriculum, only 35% felt sufficiently prepared in its use. Nursing education has faced many challenges, but one of the greatest changes is in technological advancement.

## Literature Review

### Definition of Simulation

Simulation in the area of medicine and nursing has become an important part of the education of students and practicing healthcare providers. According to the [20], simulation is recommended for the environment of nursing work, as it is believed to be a method to support nurses in ongoing acquisition of knowledge and skills. "Simulation," as discussed by [21], "is a technique—not a technology—to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate

substantial aspects of the real world in a fully interactive fashion” (p. i2). Simulators for nursing and training are not new; however, use of high-technology simulators is a recent development. In nursing education, information technology is referred to as nursing informatics, which is a term related to computer science [5] that integrates computer science, information science, and nursing science to help nurses manage and communicate in their practices. Through participation and interaction, use of simulators provides immediate feedback to the learners and affords them the opportunity to be taught and to practice skills in the collection, analyzing, and receiving of data and information [22]. Various types of simulators can be utilized in the field of nursing, and students can be taught using a variety of simulators.

### **Benefits to Use of Simulation in Nursing Training**

Simulation has demonstrated effectiveness in training practicing nurses for new procedures, communication processes, skills, and techniques [23]. High-fidelity simulation provides a suitable methodology for deliberately performing skills necessary to be an effective nurse. Benefits include improved knowledge and psychomotor skills, a learning environment safe for both students and patients, student motivation and confidence, transfer of knowledge to work with real patients, and caring behaviors and practices.

### **Knowledge and skills**

The importance of simulation lies in the opportunity for students to understand how to handle materials, how to safely handle chemicals, and how to attain certain skill levels prior to actual high-frequency or high-acuity situations. He further asserted that because of the shortages of nurses in many hospitals, the need for simulation in nursing has increased. Simulation, according to [24], motivates learners to work on their problem-solving skills, test hypotheses, gain experience in learning processes, construct schemas, and develop mental models they can manipulate in actual practice. [25] stated that simulations are used to help students understand what to do in real-life situations. Simulation allows learners to engage in repetitive practice. Proper use could reduce greatly the number of medical errors [26].

### **Student Confidence and Motivation**

[27] piloted a descriptive study on the evaluation of nursing students' perceptions using human patient simulators as an instructional tool within the curriculum of an associate degree nursing program. Throughout Miller et al.'s study, faculty members were present, and they gave cues about the phases involved in learning each skill that took place at the end of simulation training. After the simulation, debriefing allowed students to work through any emotional reactions to mistakes and receive support from faculty. Students surveyed reported satisfaction using simulation as a learning tool. Miller et al. explained that because of the use

of a small sample (N = 43), more research was needed to replicate the findings. Students gained confidence in Miller et al.'s study by having the opportunity to make decisions and even mistakes in a safe environment. Reported simulation reduced anxiety among nursing students, which led to increased competence.

### **Transfer of Knowledge**

Information technology is now a vital part of nursing clinical practice that continues to change and have a lasting impact on nursing education. The goal of high-fidelity simulation is to assist students in developing skills that will transfer to their clinical practice. Mastrian et al. also said, “Technology as a teaching and learning tool is essential to build transferable knowledge for clinical application” (p. 22). The high-fidelity human-patient simulator has been favored tremendously since 2000, according to [10]; however, the underutilization of this innovative equipment has been minimally studied. [28] analyzed literature to strategize the integration of high-fidelity simulation effectively into the nursing education curriculum, highlighting facilitators and barriers to curricular change. The literature has not addressed the experiences of nursing faculty or perception of barriers and facilitators to the integration of high-fidelity simulation [28]. In short, many organizations have obligated funds for adopting high-fidelity human-patient simulation equipment, but very few have invested in suitable resources, time, or funds for educating personnel on how to use the equipment or network optimally with other organizations for the continued longevity of its use [9]. This lack of resources and support for personnel leads to faculty barriers in simulation use.

### **Best Practices in Simulation Use in Nursing Programs**

Observed a need for more research on best practices in the use of simulation in nursing education [27]. Reported that the goal of simulation training is to integrate training for the sole purposes of student knowledge [9,29,30], skills, and abilities. Personnel in health care industries can be more accepting of the use of technology and the necessity for simulation to play a significant role in solving health care challenges and to be accepted as a standard tool for its delivery to institutions [28] stated, “The purpose of integrating simulation into any curriculum is to provide students with beneficial learning experience that will assist in meeting course and program objectives while promoting safe patient care” (p. 321). In addition, the use of high-fidelity simulation gives student the opportunity to reach the highest level in skill and performance, helping them to prioritize care and develop critical thinking [28].

The review of the literature provided information that high-fidelity simulation is important to nursing, and a few studies indicated individual skills were transferred from the simulation context to the clinical context [31]. Georgetown University School of Nursing and Health Studies incorporated classroom,

technological, and clinical instruction into all four levels of their curriculum, and the essential teaching tool in clinical nursing courses is simulation [31]. A minimal amount of literature discussed how simulation was helpful in a laboratory setting, which expressed ambiguous results. As discussed throughout the study, further research is needed to explore this area more thoroughly in order to validate the literature.

### **Understand Andragogy**

Nurse educators and their students must agree cognitively and emotionally that each is an adult, and the pivotal educational approach is that adults learn differently than children. Conceptualized andragogy as the art and science of adult learning. Adults learn differently than children, and the assumptions of andragogy lie in experience, motivation, and interpretation. Suggested five assumptions that apply to adult learning, based on maturity as the key factor in the adult's learning experiences. five assumptions are (a) self-concept of the learner as he or she moves from dependence to independence and self-direction, (b) learner experience, (c) readiness to learn and accept the developmental tasks of social roles, (d) orientation to learning centered on immediacy and problem solving, and (e) motivation. Adults need to be involved in the planning and evaluation of their instruction, experience provides the basis for learning activities, the interest of learning has to be relevant and impactful, and the learning should be problem centered and not content oriented.

### **Use Evidence-Based Practice and Engage in Lifelong Learning**

Evidence-based practice is a concept initially popularized in the medical profession by [32] in his assertion of the importance of using reliable evidence from randomized control trials to guide medical practice. The IOM integrated the idea of evidence-based practice, now identified as a core competency, for the scope and standards of nursing practice [33]. Evidence-based practice is a part of teaching philosophy [30], focusing on the nature and importance of evidence-based practice in teaching philosophy statements, found that academic nurse educators were allowed to reflect on their teaching practices and validate their success in teaching. According to [34], the basic features of evidence-based practice involve problem solving and making clinical decisions using the best current evidence. Moreover, elements of a teaching philosophy statement may include the educator's values, beliefs, and actions in the educational process as well as the nature and roles of student-faculty interactions during the learning-and-teaching process [30]. [35] perceived that teaching philosophies also may allow the following: (a) a description of teaching methods, (b) an explanation of why the methods are used, (c) evaluation of the effectiveness of the pedagogy, and (d) a plan for modifications needed for future teaching activities.

### **Research Questions**

1. What are the perceptions of nurse educators regarding the benefits of high-fidelity simulation as a teaching strategy for nurse candidates in a university nursing program?
2. What are the perceptions of nurse educators regarding the barriers to the inclusion of high-fidelity simulation in the nursing curriculum of the university nursing program?
3. What recommendations can be made to maximize the use of high-fidelity simulation in a university nursing program?

### **Methodology Case Study Research Design**

The research design used in this study was a qualitative, exploratory case study. Case study methodology is an evolving qualitative epistemology that utilizes different methods. Case study is a methodology with strong philosophical underpinnings that provides a framework for research in real-life settings. Specified three key descriptions of qualitative case studies: heuristic, descriptive, and particularistic. The description of conducting a case study was further expanded as descriptive, exploratory, and explanatory. The exploratory methods seek to define the research question in order to develop a hypothesis. A descriptive case study seeks to describe the various characteristics of a phenomenological event in order to develop a hypothesis after collecting data. The explanatory method is utilized for "complex and multivariate theories".

### **Participants**

The target participants for this study were full-time nursing faculty at a university in Florida. The target population was 30, and the possible minimum sample size was five full-time faculty members who supervise students in theory and clinical analysis before and after the implementation of simulation training. The research study was conducted at an undergraduate nursing program that utilizes high-fidelity simulation in the curriculum. Prior to data collection, Nova Southeastern University Institutional Review Board approval was obtained. Participants were recruited as a purposeful sample of full-time nursing faculty at a nursing program in a South Florida university.

This researcher used a purposeful sampling method to obtain data from participants using high-fidelity simulation as an instructional method in their curriculum to teach nursing students. Using purposeful sampling is an acceptable method for this type of research; in order to obtain maximum information, qualitative researchers use the nonrandom approach of purposeful sampling to draw a sample of individuals. The inclusion criteria were as follows: (a) presently teaching full time at a university in school of nursing, (b) experience in teaching nursing students using high-fidelity simulation in the curriculum for at least 1 year, and (c) experience



and ability to compare student experiences and outcomes before and after the simulated experience. As long as the above criteria were met, the host university's Institutional Review Board would give the approval to conduct the research. The researcher obtained permission from the dean of the School of Nursing to conduct the research study.

The initial participant sample was targeted for 30 undergraduate nursing faculty to participate in face-to-face interviews. The researcher dedicated tremendous time and effort to find faculty who were willing to participate in the study. The researcher used e-mails and snowball sampling to recruit participants. After weeks of sending invites and waiting for return answers, 12 nursing faculty members who used high-fidelity simulation in their curriculum in the undergraduate nursing program responded. The faculty participants (N = 12) signed the Informed Consent Form and agreed to participate in the study. The sample size for qualitative research is basically less than that of quantitative methodology, because qualitative research is concerned more with meanings of the data. The sample size should be enough to ensure that the majority of the important perceptions regarding a phenomenon are uncovered. If the data become repetitive and too large, data collection and analysis becomes impractical for the qualitative researcher. The researcher noted that the point of saturation could be determined in the current study due to the repetition of the content and themes.

### **Data Analysis**

Interview data were transcribed. As explained, data analysis consists of reading the qualitative data transcriptions carefully to identify the general themes of the entire statement and look for all the meanings. Stated that data analysis could be structured in five-phased cycles: compiling, disassembling, reassembling, interpreting, and concluding. The data analysis began after each participant interview was completed and each participant had reviewed the transcript of the interview (member checking). In Phase 1, the data were transcribed. In Phase 2, formal coding was done to disassemble the data. This corresponds to open coding, in which data are broken apart and codes used to stand for chunks of data. Coding is the process of forming and sorting the data. Codes serve as a way to label, compile, and organize the data. They also allow the researcher to summarize and combine components of data. In linking data collection and interpreting the data, coding becomes the basis for developing the analysis. Reassembling was done in Phase 3. The various codes from Phase 2 were analyzed to determine overarching themes.

Although software is available for analysis, the analytic decision must be made by the researcher. In other words, the researcher must look at data searching for patterns, insights,

or concepts that are promising; themes emerge as the data are manipulated. "The researcher must exercise three precautions in analysis of the data: checking and rechecking the accuracy of the data, making the analysis complete and thorough, and acknowledging the unwanted biases imposed by one's own values" (p. 176). The data analysis was validated by the process of triangulation, which is a strong data collection practice. The strategy of triangulation allowed the researcher to converge all emerging findings from multiple data gatherings. Triangulation also promotes validity and reliability in qualitative research.

The researcher expected to use computer-assisted qualitative data analysis software to help code the narrative interview data, by identifying segments of useful information (i.e., themes) in open coding (also known as axial coding or analytical coding), as described. However, data were hand coded due to the limited number of participants, which made use of a qualitative software package unnecessary. Transcribed data were hand-coded to identify common themes and patterns as they emerged from the interview process. Hand-coding provided a rich description of interviews in alignment with the field notes. Codes are individual pieces of descriptive terminology that describe or represent a large piece of data.

### **Ethical Considerations**

The credibility and dependability of the study developed through the use of interviews conducted by the researcher. A statement regarding the protection of human participants was reviewed with each participant and included in the signed consent with an understanding of minimal risks or exposure to psychological or physical harm. Additionally, data were maintained as confidential at all times, with no identification of subjects. To protect the participants' identities, all written and computerized documents and audiotapes of the interviews received a code in order of the participants. The tapes are stored separately from the Informed Consent Forms. They do not contain names or identification information. The documents and tapes will be shredded and external drives and hard drives will be erased 5 years after completion of the dissertation.

### **Trustworthiness**

The criteria for establishing trustworthiness are credibility, transferability, and dependability. [34] explained, "Credibility is the confidence in the truth value of the data and interpretations of them" (p. 17). The trustworthiness of the data obtained was ensured by the use of audio recordings and the researcher's notes. Member checking was used to ensure accuracy of the transcribed data. "Validity and reliability of a study depend on the ethics of the investigator" (p. 228). Implementation of a strategy is essential to maintaining the validity and quality of a research study.

## Potential Research Bias

Due to her nursing background, the investigator acknowledged her personal viewpoints and beliefs regarding the positive impact of simulation in nursing education via the curriculum and suspended all personal judgment. All of her efforts were made by concentrating on the viewpoints of the participants. Also, the investigator utilized the method known as journaling before, during, and after the interviews. Prior to and concurrent with the data analysis, she reflected on personal experience and opinions about the phenomena under study and recorded this information in a journal. As noted, the researcher used epoche and bracketing to acknowledge and control for personal bias.

The initial participant sample was targeted for 30 undergraduate nursing faculty to participate in face-to-face interviews. Twelve nursing faculty members in the undergraduate nursing program who used high-fidelity simulation in their curriculum responded. The faculty participants signed the Informed Consent Form and agreed to participate in the study. Faculty participants answered the open-ended questions in the semistructured interview protocol related to the central research questions. Open-ended questions were used to encourage participants to develop and elaborate on their perceptions of using high-fidelity simulation in their curriculum. The qualitative data were analyzed to unearth the main themes that represented faculty perceptions of high-fidelity simulation and impact on student learning and the safe transfer into clinical practice. All respondents who met the minimum requirement of 1 year of teaching with high-fidelity simulation and were ready and able to participate during the data collection time frame were recruited for this study. Demographic information is shown in Table 1. All 12 participants had at least a master's degree. All taught in a 4-year undergraduate nursing program using high-fidelity simulation.

Category	n
Female	12
Age	
45–50	10
51–70	2
Years of experience with high-fidelity simulation	
3–5	5
6–8	7
Years of teaching experience	
1–5	3
6–10	4
11–25	5
Nursing education	
Master's in nursing	12
Critical care certification	3
Advanced registered nurse practitioner	4
Doctorate	5

**Table 1:** Faculty Participant Demographic Information (N = 12).

## Results for Research Question 1

What are the perceptions of nurse educators regarding the benefits of high-fidelity simulation as a teaching strategy for nurse candidates in a university nursing program? To answer Research Question 1, results are presented by interview question.

### Interview Question 2

Participants were asked to describe their vision of the ideal usage of simulation. All faculty replied that high-fidelity simulators help students in “patient assessment, monitoring vital signs,” and “cardiac revival/code situations.” Findings indicated that students could use all three types of simulators in different situations in practice, but high-fidelity simulation was deemed more suitable and provided far better training outcomes. Specific responses indicated that students can apply their knowledge in emergencies following use of high-fidelity simulation to better assess patient condition and respond appropriately. Faculty recognized that the skills students develop using high-fidelity simulation can be transferred to practice.

All 12 faculty participants stated that the use of high-fidelity simulation provided a nonthreatening, safe environment for student learning. Undergraduate students can learn the basic nursing process safely through simulation. The high-fidelity simulation allows them continuous repetition to improve skill sets. Students often make mistakes, especially in medication administration; using simulation rather than working with a real patient, no one is harmed, and the student can correct the mistake without feeling afraid or intimidated. Participant 1 stated, “You can control the scenario and the response from the patient, thereby allowing student reaction.” Participant 4 stated, “Students feel less intimidated knowing it is a practice environment.” Participant 7 stated, “I observed the difference in my students' skills in the clinical site after recurring practice in the simulation lab.”

### Interview Question 3

What are the benefits of high-fidelity simulation? The faculty responses included the safe learning environment for the student to practice nursing skills and better assessment and taking of vital signs. Students could practice emergency situations, such as a cardiac arrest scenario, having the patient deteriorate and then calling a code blue. Simulation helped students in changing dressings; administering IV, intramuscular, subcutaneous, and oral medications; inserting and removing IVs; inserting Foley catheters; and watching a birth. The biggest perception of faculty was improvement of student skills in using high-fidelity simulation along with the improvement of critical thinking. The four major themes reported by the majority of educators were patient safety and safe learning environment, noted by all 12 faculty; helping

students acquire and retain knowledge (n = 10); increasing students' competency skills (n = 11); and building students' self-confidence (n = 11). The faculty's perceptions were that the safety of patient comes first, and students can use simulation to practice nursing skills in a safe environment. The student can make mistakes and learn to correct the mistake, which results in safety for the student and patient in the clinical practice area.

#### Interview Question 4

Is the knowledge gained from the students' experiences through high-fidelity simulations transferred to the clinical setting? Participants responded that knowledge did transfer to the clinical setting, citing enhanced teamwork and collaboration; increased competency, skills, and self-confidence; and improved critical thinking, communication skills, and decision making. Several common themes emerged from the participants' narrative data: (a) improved critical thinking (n = 12), (b) increased student confidence (n = 6), (c) increased competence (n = 6), (d) fine tuning of skills, (e) and better understanding of nursing concepts. Participant 2 stated, "Schools choose simulators to improve students' technical and nursing skills." Participant 9 stated, "I observe self-improvement of my student in the clinical area after using simulators in the lab." Participant 3 responded, "I see improved teamwork and collaboration." The faculty perceived improvement in the students while working with classmates, but noted that students did not like the methods used to evaluate and critique, such as being watched through a window by the nursing faculty member.

#### Summary-I

The thematic analysis of the 12 nurse faculty interviews revealed several emerging categories. Results for Research Question 1 are shown in Table 2, 3.

Theme	Subthemes or description
Reasons to implement high-fidelity simulation	<ul style="list-style-type: none"> <li>Lack of clinical practice sites</li> <li>Recognition from the board of nursing for simulation use in the nursing curriculum</li> </ul>
Learning outcomes: simulation as an effective teaching pedagogy	<ul style="list-style-type: none"> <li>Patient assessment</li> <li>Hands-on practice of basic skills</li> <li>Knowledge</li> <li>Emergency scenarios</li> <li>Transfer of knowledge to practice</li> </ul>
Patient safety	
Nonthreatening, safe learning environment	<ul style="list-style-type: none"> <li>Safe place to learn from mistakes</li> </ul>
Student self-confidence	

Teamwork and collaboration	<ul style="list-style-type: none"> <li>Transfer of knowledge to practice</li> <li>Communication</li> <li>Time management</li> </ul>
Critical thinking skills	
Debriefing	<ul style="list-style-type: none"> <li>Watching videos of simulations immediately afterwards to discuss options and mistakes gives meaning to the simulation.</li> <li>Positive and nonthreatening</li> <li>Builds confidence</li> <li>Allows for skill mastery</li> <li>Links behaviors to team collaboration</li> </ul>
Simulation effective as an evaluation tool	<ul style="list-style-type: none"> <li>Decreases student anxiety in transition to practice</li> <li>Use of simulation must be meaningful</li> <li>Process allows evaluation of student care for patient, knowledge gain, teamwork and collaboration, quality improvement, safety, and professionalism.</li> </ul>

**Table 2:** Themes for Research Question 1: Perceptions of Nurse Educators Regarding the Benefits of High-Fidelity Simulation as a Teaching Strategy.

Theme	Subthemes or description
Costs	<ul style="list-style-type: none"> <li>Cost of simulators</li> <li>Cost to train staff</li> </ul>
Lack of ongoing faculty training	<ul style="list-style-type: none"> <li>Need faculty buy-in</li> <li>Faculty intimidated by new technology</li> <li>Difficulty developing scenarios</li> </ul>
Need technical support	<ul style="list-style-type: none"> <li>Equipment repairs</li> </ul>
Time consuming	
Rapid changes in technology	<ul style="list-style-type: none"> <li>New equipment</li> </ul>

**Table 3:** Themes for Research Question 2: Perceptions of Nurse Educators Regarding Barriers to the Inclusion of High-Fidelity Simulation in the Curriculum.

One of the main challenges for nursing schools is how to prepare nurse educators for this paradigm shift from clinical to simulated instruction. The educators need to have a wide understanding of types of simulators that are available, which best meet the needs of their learners, the scope of their use, and the degree of realism.

## Summary-II

According to the overall perception of faculty, how can simulation improve? Most agreed that simulation training is the ideal when combined with the actual clinical experience of nursing students. Simulation thereby enhances the understanding of learning content and practical skills when integrated into the curriculum as a teaching pedagogy. Simulation training and clinical experience improve the active learning experience; the simulation enables long-term retention of learning content. Debriefing immediately after the simulation leads to deeper understanding for students. The thematic analysis of the 12 nurse faculty interviews revealed several emerging categories. Results for Research Question 3 are shown in Table 4.

Theme	Subthemes or description
Faculty training	<ul style="list-style-type: none"> <li>• More realistic simulations of patient reactions</li> <li>• Orientation to the simulators</li> <li>• Regular in-services</li> <li>• Nursing educators' attitudes toward new technology</li> </ul>
Endorsement for improving patient safety	<ul style="list-style-type: none"> <li>• Support of administration</li> </ul>
Fewer students in clinical group	

**Table 4:** Themes for Research Question 3: Recommendations to Maximize the Use and Benefits of High-Fidelity Simulation in a University Nursing Program.

## Summary-III

The purpose of this qualitative exploratory case study was to obtain nurse educators' perceptions of integrating the use of high-fidelity simulation into the curriculum. The researcher used field notes in combination with reflection, observations, and other data as well as interview data collected from all participants during this research study. The researcher's field notes were a guide in helping this researcher to identify main themes, concepts, issues, and questions that arose during the interview process of the data collection. Chapter 4 presented the perceptions of 12 full-time faculty teaching in a 4-year undergraduate nursing program in Florida and using high-fidelity simulation in the curriculum to teach nursing students. The age range was 36-70, and all were female. Five of the participants had a doctoral degree, and all had been teaching for longer than 1 year.

Faculty expressed their perception on the use of high-fidelity simulation and how it helps in the transfer of knowledge for the student into clinical practice. The majority of the faculty agreed

that high-fidelity simulation provides a safe, nonthreatening learning environment for nursing students. Simulation provides a place of safety for the student to practice skills, develop critical thinking, and become competent clinicians. Faculty explained that students can make mistakes during a simulated scenario and learn from these mistakes, without harm to a real patient. One of the critical issues in the clinical area today is decreasing the number of medical errors and mistakes that cause patients harm. The use of high-fidelity simulation also helps students learn to communicate with team members, alleviates anxiety, and built student confidence. These benefits transfer into a safe clinical practice. Faculty also expressed their perceptions of barriers faced in the integration of simulation in the curriculum. Barriers included lack of ongoing faculty training, need for technical support, costs, and rapid changes in technology.

## Research Question 1 Findings

What are the perceptions of nurse educators regarding the benefits of high-fidelity simulation as a teaching strategy for nurse candidates in a university nursing program? In defining the word perception, theorized that attitudes have affective, cognitive, and behavioral domains, which together determine the individual's assessment of an object. The major component, therefore, of perception is the cognitive domain of attitude construct and the impact on behavioral decision making in regards to an external object such as high-fidelity human simulators. Clarified the meaning of perceptions as attitudes that "reflect evaluations of objects on a dimension ranging from positive to negative" (p. 79), and this perception can be wide ranging. The emerging themes in relation to Research Question 1 are discussed in detail in this section.

## Debriefing

The nursing faculty perceived that debriefing was one of the most critical steps in doing the simulation. Upon completion of the simulation, students can reflect on their performance, learn, and correct the mistakes they made. Debriefing is a crucial step in the simulation experience. The process allows the student to gain insight into the simulation experience. The nurse educator can analyze students' performance and give constructive criticism. The student can communicate and collaborate with the educator. Debriefing provides the opportunity for the educator to guide the student and provide feedback on the area needing improvement, and students can progress on an individual basis.

In addition, debriefing allows students to reflect on their actions and experiences during simulation. Students and nurse educators can identify areas that are needed for further review and direct students toward resources based on their individual needs so they can improve. Debriefing also promotes understanding of learning and incorporation of theory into practice. The INASCL Board of Directors (2013) confirmed that debriefing is among



the best practices when using simulation in a nursing program. These best practices include terminology, professional integrity of the participant, participant objectives, facilitation, facilitator, the debriefing process, and participant assessment and evaluation.

### **Safety**

All of the nurse educators reported using simulation for teaching students patient assessment such as vital signs. Medication administration was also cited by all participants as one of the biggest safety benefits of student repetitive practice with simulation. The student is allowed to make mistakes and learn from them. With real patients, the wrong medication or wrong dose can have catastrophic consequences. In the simulation, students can learn the medications, doses, and classification along with the six rights of administering medication to the patient. The AACN (2012) reported that 48,000 to 98,000 patients die each year due to preventable errors and lack of competent care from health workers in the United States. Compliance with state and nationally mandated regulations regarding safety is expected of all nurses in providing safe and efficient care to the patient. Nurse competency must be properly evaluated. Once assessed, proper techniques must be put in place to educate nurses to develop competent skills to attain positive patient outcomes (Parker & Myrick, 2010).

### **Competency (Learning Outcomes)**

Another benefit of high-fidelity simulation faculty observed was increasing student competency and skills. Proposed that competency could be voiced as "behaviors that an individual needs to demonstrate or they may be expressed as minimum standards of . . . performance" (p. 2). Stated that competency, or the lack of it, is interconnected with the safety of patients. The [20] described a direct connection of competency of nurses to medical errors, defined as "the failure to complete a planned action as intended or the use of a wrong plan to achieve an aim" (p. 1). The repetition of skills during simulation exposes nursing students to many similar scenarios so the student can gain and retain knowledge. Suggested it is beneficial for nursing faculty to integrate technology within the nursing curriculum to promote student learning and engage the student in the learning process. The National Council of State Boards of Nursing conducted a clinical study to investigate the use of simulation in nursing education. The researchers found that all the students, upon graduation, reported extreme increases in clinical competence, critical thinking, and readiness for practice. Agreed that their study provided enough evidence to recommend substituting up to 50% of traditional clinical practice with simulation. Similarly, in the current study, nursing faculty voiced that the use of simulation in the clinical environment is a useful pedagogy in improving student competency and learning outcomes.

### **Critical Thinking**

The nursing faculty expressed their perception that high-fidelity simulation enhanced students' critical thinking. Students can practice in an environment where mistakes result in no actual patient injury, allowing the nursing students to adjust treatment and critical thinking through the scenario, ultimately leading to safe patient outcomes in the real patient environment.

The call for skilled professional nurses is steadily increasing. The role of nursing programs is to prepare nursing students to develop critical thinking skills so they can assess a patient, problem solve, and appropriately address the health care needs of the patient. Simulations in the nursing curriculum can safely recreate the clinical experience and assist educators in preparing future nurses. Reported that critical thinking is a critical competency for nurses, but nursing education lacked a clear description and assessment of critical thinking. For many years critical thinking was labeled as one of the distinctive characteristics of the professional nurse. Stressed the persistent need for critical thinking in the nursing profession, described as making decisions based on evidence. Critical thinking is required when analyzing patient data to establish care based on priority; such critical thinking is built on acquired knowledge and a holistic view of the patient's situation. Although high-fidelity simulation is being used widely in health care education, evidence is still ambiguous regarding its effectiveness in teaching critical thinking skills to undergraduate nursing students. However, in the current study, faculty asserted that students having long and continuous exposure to high-fidelity simulation developed and improved their critical thinking skills.

### **Teamwork and Collaboration**

Eleven of the 12 faculty members perceived that simulation is beneficial to nursing students in facilitating teamwork and collaboration. Agreed that using simulation as a training method in nursing education will have an effect on behaviors, increase knowledge and skills, and result in good patient outcomes. The NLN acknowledged that nurses are a vital part of the health care delivery team. Nurses are charged to deliver team-driven care. The NLN stressed that educators must collaborate with other health care practitioners to develop inter professional education practice that will open doors for nursing students. Simulation helped to develop teamwork and collaborative learning among nursing students. The results of the current study suggest use of high-fidelity simulation as part of the nursing curriculum helps students experience the dynamic of teamwork and collaboration, leading to a safe working environment and added safety in patient outcomes.

### **Benefits of Simulation**

Simulation in the nursing curriculum is now widely accepted for learning both theory and clinical practice. Nurse

educators are now incorporating this technology in all phases as a teaching pedagogy. According to the nurse educators in this study, simulation is used to help substitute for lack of traditional clinical sites. More importantly, high-fidelity simulation provides a safe learning environment. Learners build confidence, learn from their mistakes, and develop competencies, without compromising patient safety. [16] reported positive cognitive benefits to students after the use of simulation. The nursing faculty stated that high-fidelity simulation is a valuable learning and teaching pedagogy. The [20] advocated the use of simulators to aid in preventing errors in the clinical setting. Learning experiences using high-fidelity simulation offer students the opportunity to engage in critical thinking, practice clinical skills such as assessment, and implement treatment without harm to the real patient. High-fidelity simulation bridges the classroom lecture and clinical practice area by using realistic patient scenarios.

## Research Question 2

What are the perceptions of nurse educators regarding the barriers to the inclusion of high-fidelity simulation in the nursing curriculum in a university nursing program? Health care professionals have had the available use of high-fidelity simulation for many years, but much debate exists regarding its use as a teaching tool. The focus in the literature was on the advantages it brings to students and faculty. Also, literature has described the acceptance of student and faculty of high-fidelity simulation, concerns on how student outcomes are met, and the transferability of skill to the clinical setting [36].

The barriers identified through personal experience in this study from nursing faculty were (a) the lack of staffing, (b) lack of adaptation to new simulators, (c) the lack of technical support, (d) lack of time in developing scenarios, (e) delay in repairs to equipment, (f) rapid changes in technology, and (g) cost of equipment. The literature also confirmed what faculty shared as barriers to inclusion of high-fidelity simulation into nursing curriculum: (a) lack of time and expertise in developing and implementing patient scenarios, (b) lack of time to devote to the learning needed to be successful with high-fidelity simulation, (c) lack of resources and faculty knowledge about high-fidelity simulation, (d) too many students in clinical groups, (f) lack of technical expertise and support, and (g) lack of consistency on how to implement this teaching.

The literature review confirmed other barriers to simulation. Barriers to the use of simulation in evaluation. Nurse educators may want to give some students the “benefit of the doubt”. Also, Wolf et al. claimed other barriers to simulation include university setting standards that are less rigorous than nursing program standards. Therefore, administrators and faculty need to work to overcome

the barriers that prevent this teaching tool from being integrated into the curriculum. A main factor in overcoming barriers is staff development, which related to Research Question 3.

## Research Question 3

What recommendations can be made to maximize the use and benefits of high-fidelity simulation in a university nursing program? The interviewed faculty suggested ongoing training of faculty, having the full cooperation of all faculty and support of administration, and adequate technical assistance. Having buy-in from all faculty is a major step to maximize use of high-fidelity simulation in the curriculum. Faculty also noted the need for orientation of new faculty.

Pointed out a vast need for expert faculty with knowledge of simulation to investigate and promote the further use of simulation in nursing education. Most faculty can learn about simulation by observing expert faculty at conferences, attending workshops, and reviewing simulation literature. Moreover, the need for faculty training and orientation sessions. They stressed that all faculty should have training on simulation equipment to fulfill their role in the implementation of simulation. Faculty in the current study stressed the need for continuing inservice training as technology changes.

## Implication of The Results for Practice

The data analysis from this study generated several important themes with implications for the nursing curriculum. The faculty perceived several major benefits of the use of simulation: patient safety, increase of student knowledge, improvement of critical thinking, and transferability of skills into the clinical environment. Specifically, participants reported that the debriefing process right after the simulation is a critical component of simulation and helps students to learn from their mistakes and improve their critical thinking skills. Use of high-fidelity simulation gives students self-confidence and develops teamwork. The result of this study may have an impact on the nursing curriculum. Researchers have agreed with the findings of this study that high-fidelity simulation increases nursing student learning outcomes, develops critical thinking skills, and helps in the retention of knowledge. All of the faculty observed barriers to the maximum implementation of simulation in the nursing curriculum. However, all faculty also showed a desire to learn more and to be able to use this technology in the curriculum. Faculty clearly would appreciate additional training. Hence, the information provided in this research can help nursing administrators, curriculum developers, and faculty. This research study also helps to fill the gap in the literature concerning the use of high-fidelity simulation in nursing education.

## Assumptions

The first assumption of the study was that the review of the literature was thorough and in depth. The study produced emerging categories and themes, including the following: (a) the benefit of simulation technology in nursing education, (b) the theoretical framework of constructivism, (c) the positive effect of simulation on student learning outcomes, (d) the effective use of simulation to promote patient safety, (e) the importance of debriefing after simulation, and (f) the use of simulation to improve teamwork and collaboration. Another assumption was that the responses of the experienced nurse educators were honest. These faculty had an extensive background in nursing education, including years of clinical background, and their feedback was considered to be authentic and valuable. Finally, the interview questionnaire was assumed to be reliable and valid, as well as the data collection and interpretation processes.

## Limitations

There are limitations of every research study, and case studies have limiting factors in particular. Limitations can cause restrictions and possible weakness in a study. The researcher needs to address the reliability and validity of each limitation and be aware of them during the research. Four limitations of this study are noted.

1. The small convenience sample (N = 12) was delimited to faculty only and did not include nursing students, who might have different perceptions regarding the benefits and barriers to simulation being included in the curricula. Further, the small sample of participants was entirely female and restricted to nurse educators employed in a nursing program located in South Florida. Therefore, findings may not be generalized to experiences of nurse educators outside of this region. The intended goal of the research was a sample size of 30 nursing faculty teaching in a 4-year university with a minimum of 1 year of experience. Although the sample size was small, the nurse faculty were able to provide ample themes for data analysis. Having a larger sample size or a sample including nursing students might have provided more strength and increased the generalizability of the study, however.

2. Participants might have been hesitant in the reporting of personal feelings and experiences with simulation use, thereby limiting the validity of findings. The use of carefully worded interview questions and efforts of impartiality by the interviewer might have alleviated this limitation.

3. Time constraint was another factor in the collection of data. The researcher had a deadline; after the initial e-mail and response, the participants had 21 days to return the survey or complete the interview. Therefore, the short response time likely affected the response rate for this study. The researcher also believed that time constraints were a factor for many potential participants, who did

not wish to sit for an hour to do an interview.

4. The limitation to a 4-year university limited the size of the sample and generalizability of findings. The findings are limited to one specific school. Many other nursing programs use simulation. The response could have been larger if the study had been open to all nursing faculty who had taught with high-fidelity simulation for at least a year at various institutions. Hence, regardless of the limitation, participants of the study were experts in the use of simulation and varied in age, work experience, and educational level.

## Recommendations for Practice

The results of ideal practices to integrate simulation into the curriculum should lead to safer practitioners and better patient outcomes. The nursing faculty asserted that high-fidelity simulation improves student performance, increases patient safety, increases knowledge, develops critical thinking, and promotes teamwork and collaboration among nursing students. Continued or expanded use of high-fidelity simulation is recommended in nursing curricula. However, additional training is recommended, both orientation for new faculty and ongoing in-service training for current faculty. Staff development can improve staff attitudes toward and competency with new technology. Further, administrators should ensure adequate technology support and assistance.

## Recommendations for Future Research

Nurse educators should get involved and evaluate new technologies to assess how they can best be implemented to prepare future nursing students better for clinical practice. The faculty in this study perceived that high-fidelity simulation is an effective learning pedagogy in the classroom and clinical area. However, research is still unclear regarding the best way to utilize simulation and measure its effectiveness on student learning outcomes. Simulation is a technology pedagogy that can help the student to learn new information and be able to problem solve and diagnose patients in a safe and protected environment. The knowledge transfers to the clinical setting.

However, educators face many barriers to the use and implementation of simulation into the curriculum. It is costly and time-consuming, training for faculty is lacking, organizations lack funds, and faculty may lack administrators' support. The literature review and the results of this study lead to the conclusion that high-fidelity simulation can benefit the nursing student by improving their skills and critical thinking for actual practice. The benefit of hands-on learning can include unusual emergencies and occurs in a safe environment, not impacting real patients.

The recommendation is made for future study on the use of high-fidelity simulation in the nursing curriculum to add to the body of knowledge. A second recommendation is qualitative research on the individual critical themes that emerged during this research,



such as critical thinking skills and teamwork and collaboration. This researcher believes nurse educators have a responsibility to assess and evaluate any new technology that will assist in the preparation of nursing students to be great practitioners. Nurse educators need to be more involved determine the effectiveness of this remarkable teaching tool. The literature indicated some uncertainty about the use of simulation in student assessment, which is an area for future study.

The study presented here is a qualitative exploratory case study to investigate nurse educators' perceptions of high-fidelity simulation integration into the nursing curriculum. Therefore, results add to the body of knowledge about the use of simulation in nursing education. However, this qualitative case study research can be replicated using a larger sample size.

## Conclusion

The rapid changes in health care and large number of nurses reaching retirement age result in an increased demand for educational institutions to prepare competent nurses. Further, new nursing graduates in the workplace will encounter patients with high acuity. In addition, the lack of traditional clinical sites for the training of nursing students suggests the need for simulated learning. These learners need to be competent and skilled to enter clinical practice. For nursing program personnel to meet this demand adequately, they must adjust the curriculum by integrating high-fidelity simulation to aid in the learning outcomes of these learners. Simulation has been utilized for years by many disciplines such as aviation, military, and medicine and has proven to be effective in learning outcomes. Nursing is the latest profession to integrate simulation into curricula. This conclusion and data from this study can be used for further research on faculty perceptions of high-fidelity simulation in the nursing curriculum to help to produce skilled and competent nurse graduates.

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