2014

Nurse educators' use of technical simulators in nursing preparation

Janet Baghoomian

Pepperdine University

The Graduate School of Education and Psychology

NURSE EDUCATORS' USE OF TECHNICAL SIMULATORS IN NURSING PREPARATION

A dissertation submitted in partial satisfaction

of the requirements for the degree

Doctor of Education in Organizational Leadership

by

Janet Baghoomian

June, 2014

Diana B. Hiatt-Michael, Ed.D. – Dissertation Chairperson

This dissertation, written by

Janet Baghoomian

Under the guidance of a Faculty Committee and approved by its members, has been submitted to and accepted by the Graduate Faculty in partial fulfillment of the requirements for the degree of

DOCTOR OF EDUCATION

Doctoral Committee:

Diana B. Hiatt-Michael, Ed.D., Chairperson

June Schmieder-Ramirez, Ph.D.

Fereshteh Amin, Ed.D.

Rebecca Otten, RN, Ed.D.

TABLE OF CONTENTS

Page

Page

Page

LIST OF TABLES

Page

Page

LIST OF FIQURES

Page

DEDICATION

I dedicate my dissertation to my parents Samuel and Margret Baghoomian for their constant love, prayer, and support in this endeavor. They motivated and encouraged me to reach my educational goals and become a lifelong learner that they can be proud of me. Thank you for believing in me. I love you both very dearly.

ACKNOWLEDGEMENTS

First, I thank the Almighty God for giving me courage and strength to reach my educational dreams. I praise you and thank you for your wisdom and understanding that you said in your word, “knowledge is power and without knowledge people perish.” I pray that I use this knowledge not only to serve you, but also be a witness and help others to share what I learned. I love you with all my heart, my being, my soul, and my strength.

Second, I would like to thank my Chairperson, Dr. Hiatt-Michael Diana, who journeyed with me through this process, which I will never forget. She has been my coach, mentor, and guide to the end to complete my journey. I am so grateful for her wisdom, understanding, knowledge, and professionalism. She devoted endless hours reading my draft papers to give me feedback, and redirected me when things were unclear to me. Thank you for all your time dedicated to me. I love you, and I bless you for your hard work.

Next, I would like to thank my precious committee members, Dr. June Schmieder-Ramirez, Dr. Fereshteh Amin, and Dr. Rebecca Otten, for their support and guidance throughout this journey. I cannot find words to express my gratitude. Thank you for your time and being on my committee. Special thanks to Dr. Otten, who assisted me to conduct a pilot study at Fullerton. Also she was one of the expert panels in finalizing the survey questions. Barbara Doyer, coordinator of the simulation lab at Fullerton, and Christina Lee, nursing faculty at Moore Park were also the expert panels for my survey questions. Thank you for your comments and suggestions. Special thanks to Dr. Tom Granoff for my data analysis at the end of my journey. Also, I would

like to thank the school administration personnel, Christie Dailo, who has an answer to every question, keeps Pepperdine running 24/7, and kept us updated throughout this journey. Also, I would like to thank Regina Meister for guiding us through several sessions how to write a good dissertation paper. Also, thanks to my editor, Ardell Broadbent, for her excellent work.

Finally, I would like to thank schools, West College, State University, Bridge College, and Coast University allowing me to conduct my research at their schools. My appreciation goes to all nurse educators and students who participated in my research. May God bless you all.

VITA

EDUCATION

Pepperdine University
Doctorate in Education: Organizational Leadership, May 2014

University of Phoenix
Master of Science in Nursing/Education, October 2006

University of La Verne
Master of Science in Business Administration, May 2004
Master of Science in Health Administration, May 2003
Bachelor of Science in Health Administration, June 2002

Glendale Community College
Associate Degree in Registered Nursing, December 1986

PRESENT EMPLOYMENT

2012-present: Part-time faculty at Westwood College, teaching health and business
2013-present: Online nursing faculty at Stanbridge College, teaching RN-BSN program
2013-present: Leadership Empowerment Charter (LEC) consulting agency: Director for workshops and training

PREVIOUS WORK EXPERIENCE

Providence Health Services: Level III-NICU RN, Charge and transport nurse, 1988-1996
Providence Health Services: Neonatal clinical & competency fair instructor, 1998-2006
Care-Nex Health Services: Neonatal Case Manager, 2006-2009
Cal State University: Nursing instructor for RN-BSN program, 2007-2008
Midland Real Estate: Office manager, responsible for marketing and finance, 2001-2004

ABSTRACT

Simulators ranging from low- to high-fidelity are used by nurse educators to train student nurses. The usefulness of the high-fidelity simulators expose student nurses to clinical situations has been debated for many years. Few nursing schools have embraced the use of high technology simulators in teaching and learning. The purpose of this study was to (a) determine how different types of simulators are used to train student nurses and to (b) examine educator and student perceptions regarding the use of simulators in clinical practice. Two surveys were developed to examine the perceptions of nurse educators and nursing students in 4 training sites. A total of 26 nurse educators and 296 nursing students participated in the study.

The data from the surveys identified their perceptions on the function, benefits, limitations, challenges, and concerns regarding simulator use in clinical settings. Findings from this study indicated that (a) nurse educators were significantly more likely to use low-fidelity simulators (84.6%) than medium- or high-fidelity simulators and (b) they have utilized simulators for all size classes between 35 to 50 students. The greatest challenge reported by educators regarding simulator use (61.5%) was the need for ongoing training and education and technical support with high-fidelity simulators.

The majority of the students in their first or second year of nursing education reported high satisfaction for experiences using simulators, such as teamwork and collaboration (78.7%) and increase in skill competency (77.7%). Nursing students (69.3%) experienced some anxiety working with simulators, especially using high-fidelity simulators.

A critical recommendation stated by nurse educators was an expressed request that the administration provide for (a) initial and ongoing training on simulators and technical support and (b) time to prepare scenarios or funds to purchase scenarios that include use of high-fidelity simulators. An important recommendation for students was to include orientation to and practice in the simulation lab at the beginning of the nursing program, moving from low-fidelity to high-fidelity simulators throughout the program to reduce their anxiety using high-fidelity simulators.

Chapter 1: Problem and Purpose

Technological changes in the healthcare industry are occurring at an unprecedented rate (Bremner, Aduddell, Bennett, & VanGeest, 2006; Cato, 2011; Habel, 2011; Murray, Grant, Howarth, & Leigh, 2008). Advances in noninvasive treatments, the increase of sophisticated surgical procedures and equipment, and introduction of health-management information systems continue to drive up healthcare costs. In recent years, nursing schools have faced economic and political forces that create tremendous pressure to control costs, yet ensure safety and provide quality care with a proof of excellence through evidence-based outcomes (Habel, 2011; Kohn, Grant, Howarth, & Leigh, 2000; Nehring, 2008). These forces drive instructional changes in nursing education. Nurse educators are required to acquire technological knowledge and skills needed to develop new teaching strategies for providing safe and effective care. Approximately, 48,000 to 98,000 patients die each year due to preventable errors and lack of competent care from health professionals in U.S. hospitals (American Association of Colleges of Nursing [AACN], 2012a; AACN, 2008; Campbell & Daley, 2013; Cato, 2011). In its struggle to meet the regulatory requirements of the Joint Commission standards, the health care is turning to technology to improve clinical, financial, and operational outcomes (Cato, 2011).

Technology is used in modern healthcare practice to improve delivery and patient outcomes (Nehring, 2008; Scalese et al., 2008). In recent years, medical schools have utilized high-tech simulators for educational purposes, but the majority of nursing schools have not yet implemented these simulation techniques (Campbell & Daley, 2013; Decker Sportsman, Puetz, & Billings, 2008; King, Moseley, Hindenlang, & Kuritz,

2008; Nehring, 2008; Nehring & Lashley, 2004), perhaps because many nursing educators fail to recognize how simulation technology could be used to provide instruction in assessment and delivery practices (Murray et al., 2008).

Nurse educators are challenged how to teach nursing students to prioritize care and think critically in their practice (Kowslski & Louis, 2000; Lasater, 2007; Parker & Myrick, 2008). Teaching with high-tech simulators could provide an alternative to traditional teaching approaches that emphasize exposure to realistic clinical situations they might not otherwise experience in a practicum setting (Hermann, 2007; Ziv, Ben-David, & Ziv, 2005). The aim of utilizing simulators is to imitate the process of dealing with real patients. However, because simulator practice poses no direct risk to real patients, there is room for error. Educators can develop clinical tasks, control situations, and create scenarios that allow hands-on training of both student nurses and nurse educators (Bremner et al., 2006; Murray et al., 2008; Schoening, Sittner, & Todd, 2006).

Statement of the Problem

Nurse educators and clinicians need advanced technologies such as simulation tools to enhance their effectiveness as practitioners (Alinier, Gordon, Harwood, & Hunt, 2003; Tan & Payton, 2010). The emphasis on simulation requires nurse educators to focus on the integration and application of competency skills, knowledge, and critical thinking (Campbell & Daley, 2013; Nehring, 2008; Seropian, Brown, Gavilanes, & Driggers, 2004). Technological changes are rapidly occurring in healthcare settings; however, some nursing schools have not been developing educational approaches and curricula to incorporate those changes. Nurse educators must keep up with those changes to ensure a well-trained and well-educated nurse force for the future.

Using simulators in nursing education is costly. Today's nursing educational schools are under tight financial constraints and have to justify the purchase and use of expensive simulators (Rogers, 2007). Low-fidelity simulators that have been used to train nurses for 50 years are now being replaced with medium- to high-fidelity simulators. The average cost of a high-fidelity simulator is between $120,000 to $200,000, while a medium-fidelity simulator costs around $80,000 to $100,000, dollars, and a low-fidelity simulator between $5,000 to $25,000 dollars (Laerdal Medical, 2013; McIntosh, 2006). The cost to develop a dedicated simulation center for nurse training may run $750,000 to $1,000,000 (Laerdal Medical, 2013; Nehring, 2010). Nursing administrators in universities and hospitals need data from nurse educators and their students on the benefits and challenges they may experience as a consequence of using different grades of simulators.

In addition, nursing schools administrators need information to make wise decisions in the expenditure of funds. Simulator tools and processes have been developed for student nurse training. Introducing computerized simulators in nursing education has the potential to better prepare students for the stresses they will face in caring for patients in today's healthcare environment. Simulation in classroom settings allows the learner to function in an environment that duplicates real-world clinical activities (Bremner et al, 2006; Elfrink, Kirkpatrick, Nininger, & Schubert, 2010; Gaba & DeAnda, 1988; Johnson, Zerwic, & Theis, 2006). However, introducing such simulators could be stressful for nursing educators, especially if they have neither used them nor have been properly trained to use them. Nurse educators must learn how to apply use of simulation tools in their training for improving patient safety and effectiveness in

clinical care (Medly & Horne, 2005). Student nurses can practice with simulators in a learning environment that is forgiving of making mistakes that could otherwise harm real-life patients.

Statement of Purpose

The purpose of this study was to determine (a) how different types of simulators were used in nursing schools by nurse educators to train student nurses, and (b) the perceptions of nurse educators and students regarding the use of simulators in a clinical setting. These answers could help examine why high-fidelity simulators have not yet been embraced by nurse educators or students.

Nursing schools have long utilized simulators in the form of models of anatomic parts and manikins as clinical teaching tools. Current interest in computerized simulators has grown because it is believed these simulators could help nurse educators teach student nurses how to provide quality care while minimizing mistakes (Schiavenatro, 2009; Shearer & Davidhizar, 2003). Ongoing development of nursing competence is essential to promoting patient safety. Computerized simulators could facilitate a variety of activities to support competence in practice during nursing education and help spur the development and implementation of innovative nursing educational programs. Nurse educators could also benefit from using the simulation programs, which could help them become more future-oriented, stay connected to clinical practice, and remain current in education trends. The goal of this study was to determine whether nurse educators' simulation tools help prepare nursing students to deliver safe and effective patient care.

Research Questions

The following are research questions within the context of the study.

1. What are nurse educators' perceptions of using simulators to train student nurses in a clinical setting?
2. What are student nurses' perceptions of using simulators to receive training for practice in a clinical setting?

Theoretical Basis of Study

This study employs diffusion of innovation theory to assess how nurse educators are adopting medium- and high-fidelity simulators into their teaching. Everett Rogers's diffusion of innovations theory (Rogers, 2003) is viewed as one of the pioneer theories concerning technology adoption and was used to guide this study. Rogers noted that it is difficult for any new practice or idea to be widely adopted (Rogers, 2003). A common problem is how to speed up the rate of diffusion of an innovation in an organization and individuals. When nursing schools implement high-tech or innovative practices, they could face major challenges in the adoption and sustaining of those innovations if they involve major changes in thinking and behavior. Rogers (1962, 2003) described diffusion as a "process in which an innovation is communicated through channels over time among the members of a social system" (p. 5). Diffusion refers to a "social change that allows alteration in the function or structure of a social system" (p. 5). Social change occurs when new ideas are invented, diffused, adopted, or rejected. The diffusion of innovation theory involves four major elements: the innovation, communication channels, time, and the social system (see Table 1).

Table 1

Elements of Rogers's Diffusion Theory

Element	Definition
Innovation	Perceived as new idea or object by an individual
Communication channels	Messages are sent from one person to another
Time	The length of time required for the innovation-decision process; the rate of speed at which the innovation is adopted by members of a social system
Social system	A group of people who are engaged in problem solving to accomplish a common goal

Note. The elements of Rogers' diffusion theory. Adapted from Rogers's diffusion theory, 2003.

Rogers (2004) suggested that diffusion of an innovation occurs through a five-step process. There are a series of communication channels among the members of a social system to make decisions over a period of time in this process. The innovation-decision process describes the steps taken by organizations as they decide whether to adopt an innovation (see Table 2).

Table 2

Five Steps of Rogers's Adoption Process

Stage	Process definition
Knowledge	The person is exposed to an innovation with no prior knowledge and shows no interest to find out information about the innovation
Persuasion	The person shows interest and seeks information about the innovation.
Decision	The person learns about the advantages and disadvantages of the innovation and will decide to reject or adopt; the most difficult stage.
Implementation	The person determines the use of the innovation for a situation and may seek more information.
Confirmation	The person makes the final decision to use the innovation and the group will confirm the decision.

Note. Five steps of Rogers's adaptation process. Adapted from Rogers, 1962 diffusion theory.

Rogers (1962, 2004) defined the rate of adoption and measured the length of time required for members of a social system to adopt the innovation. He further explained that people who adopt an innovation first require a shorter adoption period compared to late adopters. He categorized five types of adopters in his theory: innovators, early adopters, early majority, late majority, and laggards (see Table 3; Figure 1).

Table 3

Adopter Categories by Rogers

Adopter category	Description
Innovators	Innovators are first to adopt something new. They are usually young, risk-takers, have social interaction with other innovators, and take financial risks adopting technologies.
Early adopters	These people are usually young with high education levels, higher social status levels, and they have the highest degree of leadership.
Early majority	People in this category have social status and communicate with early adopters but are unlikely to hold leadership positions.
Late majority	In this category individuals adopt an innovation only after the majority of people have already adopted it. They are skeptical, have low social status, and few financial resources.
Laggards	People in this category are the last to adopt an innovation; they tend to be advanced in age, focus on tradition, and have low social status.

Note. From Rogers's adopter categories. Based on "Rogers's adopter categories," by Rogers, 1962.

Rogers described several intrinsic characteristics of an innovation that influence an individual's decision to reject or adopt it. These characteristics are: relative advantage, compatibility, complexity or simplicity, trialability, and observability (see Table 4).

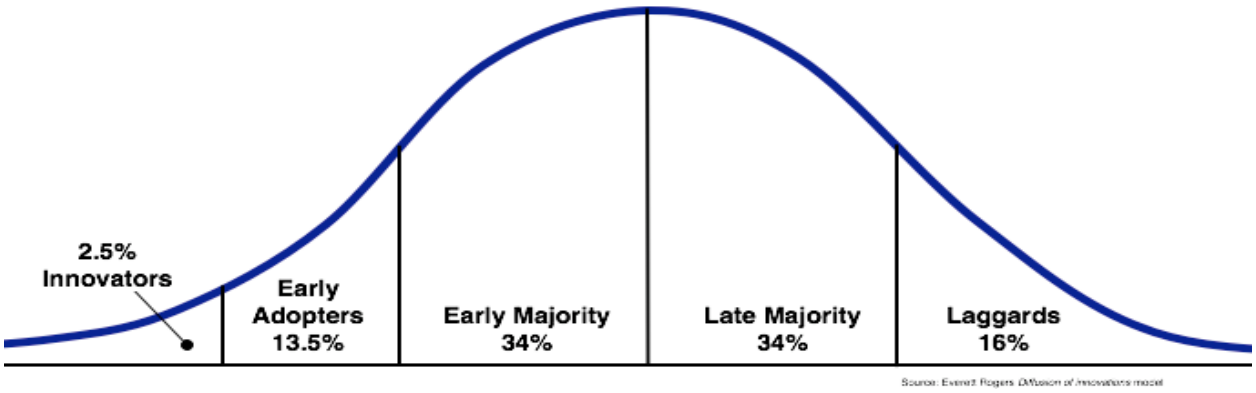


Figure 1. Types of adopters on the adoption curve. Based on "Types of Adopters," by E. M. Rogers, 1983, *Diffusion of Innovation* (3rd ed.), p. 247. Copyright 1983 by the Free Press.

Table 4

Intrinsic Characteristics of Innovation

Intrinsic characteristics	Definition
Relative advantage	How much improvement has been made to an innovation, compared to previous generations of the item or process?
Compatibility	How easily can the innovation be assimilated into an individual's life?
Complexity or simplicity	If an innovation is perceived as complicated, not user-friendly, and difficult to use, it is unlikely to be adopted
Trialability	How the innovation can be tried. If a user tries it, the person will be more likely to adopt it.
Observability	How visible the innovation is to other people. When an innovation is visible and allows communication among social groups, personal networks and peer interactions will create more negative or positive reactions

Note. Based on Rogers's diffusion theory, 1962.

Rogers explained that throughout organizations, leaders play a major role in communication of information about an innovation. Leaders have the most influence on the decision-making process of late adopters. The authoritarian decision-makers with

high positions of power stand behind an innovation and break through any opposition (Rogers, 2003). These leaders are known as change agents who are connected within the network or held in high esteem by employees. When a change agent decides to adopt or reject a technology, his or her employees will likely follow suit.

The diffusion of innovations model can be seen in many nursing schools and healthcare organizations. Examples include adopting a new computer or simulator system in clinical practice settings. Although rarely seen in hospitals a few decades ago, today computers are necessary tools for nursing departments. Use of certain computer programs have proven to help organizations cope with the demands of the environment, reduce ineffective behaviors, while enhancing effective behaviors and driving down overall costs.

Significance of the Study

The significance of this study was to provide a critically needed assessment of the adoption of simulators in the classroom by nurse educators and students. Results have practical, theoretical, and methodological significance for education programs in nursing and healthcare.

Practical significance. This study provides information to administrators of nursing schools, nursing associations, hospitals, and vendors. It has the potential to inform them regarding how nurse educators and student nurses utilize simulators in their learning environment. Information can also be used to guide leaders to make cost effective decisions in selection of simulators for instructional use. In addition, the study provides information on nurse educators' concerns regarding challenges that occur

when using different types of simulators for instruction. This information will guide leaders regarding appropriate professional training opportunities for nurse educators.

Student nurses' concerns regarding perceived benefits from working with simulators have also been addressed. A survey was administered to students with questions regarding level of education, experience with simulators in practice settings, challenges experienced with simulators, benefits from use of simulators, and their roles in simulation practice. The survey results defined perceived benefits of using each type of simulator, which will assist nursing administrators and nurse educators to evaluate simulation learning outcomes and the effectiveness of using each simulator by integrating experience with knowledge.

This simulation method can transform curricular planning from a traditional to a new paradigm with greater flexibility. In addition, simulators do not behave unpredictably as might a real patient. Instead, they provide a standardized clinical experience. Other professions incorporated simulation technology in their training programs, such as flight simulators for pilots, war games, and combat training for military. Skills are improved by placing trainees in life-like situations and providing feedback about their reactions to simulated conditions. This not only enhances the development of trainees' skills, but also creates collaborative work environments among team members that can potentially help foster a safety culture.

Simulation techniques can be adopted for use in training nurses in surgery, maternity, technical, procedural, and life-support skills necessary in a critical care unit or emergency room. Simulation can be especially beneficial for improving educational outcomes in multiple domains. Utilizing human simulators can increase students' self-

confidence and minimize anxiety in the patient care setting. Students can practice psychomotor skills and implement interventions under the supervision of nurse educators so they feel more competent when assigned to care for a patient. Working in a small group with simulators can provide students with a variety of experiences, roles, and opportunity for repeating practice skills and enhancing work proficiency.

Methodological significance. An assessment of the nursing programs and nurse educators was developed to identify teaching approaches for training student nurses to practice with real patients. This allowed for the identification of (a) how the nursing curriculum could be modified and (b) where new teaching methods for improving competency skills.

Theoretical significance. This study applies Rogers's (2003) diffusion of innovation theory, which has not been used in nursing research and practice. The findings from this study enhance the utilization of theoretical frameworks by nurse educators. The rationale for using Rogers's theoretical model are: (a) individual ability to adopt an innovation depends on adopter's awareness, interest, evaluation, trial, and adoption; (b) importance of communication among adopters from early to majority adopters, only through face-to-face communication before individuals decide to adopt; and (c) qualities necessary to spread innovations. Instead of focusing on individuals, focus should be how innovation is perceived, valued, and is consistent with past experiences. Of importance is to understand (a) the degree and rapidity to which the nursing profession as a culture adopts innovations and (b) to what degree are ideas that are simple and easy to understand adopted, versus ideas that require development of new learning skills and understanding (Rogers, 2003).

Key Definitions

- Needs assessment: A systemic process used for addressing needs, education, training, or improvement in learning. It is a tool to clarify problems and identify solutions or interventions. A needs assessment could take the form of a survey, interviews, or group meetings to determine which actions or decisions would be the most effective and efficient for achieving the desired outcomes (Krautscheid & Burton, 2003).
- Nurse educator: A registered nurse with at least a master's degree in nursing who is also a teacher. Nurse educators work as faculty members part-time or full-time in nursing schools, hospitals, and community colleges sharing knowledge and skills to prepare student nurses for effective practice. A nurse educator spends time teaching in the classroom or in the clinical skills lab, handling administrative work, coaching and mentoring students, and keeping up with current nursing knowledge (AACN, 2008). A nurse educator may also be called a *preceptor* or a *clinical supervisor* (Mead, Hopkins, & Wilson, 2011).
- Simulation: Simulation in health care is a set of techniques that often involves technology, but not always. It can be used for purposes of education, assessments, training, or research for real-world practices. Its goal is to replicate reality (Tan & Payton, 2010).
- Fidelity: This term describes the accuracy level of the simulation being used and how well a simulator reproduces the state and behavior of a real-world object, feature, or condition. Fidelity can be defined as low, moderate (medium), or high (Eddington, 2011).

- Low-fidelity simulators: These types of simulators are less expensive and easier to use and transport. Typically, low-fidelity simulators help demonstrate psychomotor skills and do not provide learners with the feeling of working in real-life clinical settings. Examples of low-fidelity simulators are models of anatomic parts with no feedback devices, such as an arm that allows nursing students to practice I.V. insertion techniques (The Staff Educator, 2009).
- Medium-fidelity simulators: These simulators may include a model of full or partial body and can make some use of computer programming. They allow learners to practice intubation, listen for breath sounds, and feel pulses. However, these models do not show any movement when a student is listening to breath sounds or performing other techniques. The medium-fidelity simulators replicate psychomotor skills, but they lack the realism of real-life patient scenarios (National League for Nursing, 2009).
- High-fidelity simulators: These are also referred to as human patient simulators (HPS). This is the most sophisticated type of simulator, including a computerized manikin that feels realistic to the learner. The simulator allows nurse educators to implement a variety of scenarios, and the students' actions in those situations can be videotaped and played back later for debriefing and further instruction. HPS allow learners to develop knowledge and skills to apply in a realistic clinical situation as they participate within a clinical setting without harming a live patient. The HPS manikins are capable of duplicating realistic physiologic responses, such as heart sounds, respirations, pulses, and pupil reaction. Additionally, the

HPS is capable of communicating with students by responding verbally to their interventions (Weaver, 2011).

Key Assumptions

This study takes place under the following assumptions:

1. There is a need to bridge the gap between nursing education and practice.
2. Simulation techniques facilitate learning similar to real-world experiences and problems.
3. Nurse educators possess knowledge regarding the simulation techniques in their practice.
4. Working with simulators increases nurse educator and student competency levels.
5. Working with simulators can boost student confidence and reduce student anxiety levels in the clinical setting.
6. Nurse educators will honestly report their perceptions of utilizing simulator technology as a teaching method.
7. Nurse educators will honestly report their level of knowledge and familiarity with use of simulator technologies as a teaching method.
8. Use of simulators will improve students' competency skills.
9. Simulators help students develop critical thinking skills needed to meet the challenges of the work environment to solve problems.

Limitations of the Study

Limitations for this study include the following:

1. Participation is restricted to nurse educators employed in nursing schools located in the State of California. Therefore, findings may not be generalized to the experiences of nursing programs outside this region.
2. The findings of this study are limited to sites that possess simulators.
3. Lack of unfamiliarity with some survey items may evoke anxiety and/or prompt false reporting, which may threaten validity of findings.
4. Participants may hesitate to report personal feelings and experiences with simulators, thereby threatening validity of findings.

Summary

Utilization of simulators in health care educational settings is a new instructional technique. The rationale for using simulators is to enhance learning and to promote critical thinking skills necessary for effective decision-making and practice in the clinical environment. The rate at which simulators have been adopted by nurse educators, nursing students, and nursing programs is variable. This study uses Rogers's diffusion of innovation theory to describe how nurse educators and students are adopting different types of simulators into their teaching and learning. Nurse educators' and students' perceptions regarding the adaption of simulators within selected nursing schools were further explored.

Chapter 2: Review of Literature

Despite the shortage of experienced nurses, nursing educators, and clinical sites for student practice, healthcare facilities are demanding that nurse educators find a better way to prepare student nurses for the real world of nursing. However, our broken economy no longer can support costly orientation and training programs for nurses. Nurses, however, are still expected to deliver safe patient care and work independently (Campbell & Daley 2013; Nehring 2008; National League for Nursing, 2005), The challenge is to find innovative, cost-effective, and efficient teaching methods that will prepare student nurses to practice safe and effective care.

This chapter provides a review of literature related to the problems in nursing education and suggested solutions. It begins with a review of literature related to the historical background of use of simulators in nursing schools and how it evolved with advancing technology, then moves to provide an introduction to different types of simulators and their effectiveness in teaching and learning, looks at challenges that nurse educators encounter, and considers how simulation technique as a teaching modality could contribute to patient safety and well-being. This overview shows why nursing education needs a powerful instructional tool and how high-fidelity simulators could be incorporated successfully into the curriculum.

Historical Background of Nursing Simulators

The initial development of simulators was for use in the aviation industry. The first aircraft simulator was built in 1929 by Edwin Link for training pilots and helping them maintain their skills in the event of emergency (Doyle, 2011; Wong, 2004). In the nursing field, a simulator was developed in the early 1900s, with the Chase manikin,

which was created by a physician's wife, Mrs. Martha Chase, who was making cloth dolls for children. Lauder Sutherland, a superintendent and principal of the Hartford Hospital Training School, saw the cloth doll and requested a larger doll to be made for student nurses to practice basic nursing skills. Mrs. Chase made the doll and sent it to the hospital as a training tool (Eddington, 2011; Nehring, 2010; Nickerson & Polland, 2010). In 1969, the first anesthesia stimulator (SIM1) concept was described by Denson and Abrahamson and was developed so that healthcare workers could learn how to intubate patients and administer anesthesia. The SIM1 was a manikin that consisted of airway, upper torso, and arms only. Because of its high cost, further development was abandoned and its practical use was limited. In the mid-1980s, with the explosion of technology, computerized versions were developed, such as *sleeper* and *body* simulators, as well as the Anesthesia Simulator Consultant (ASC). These simulators were inexpensive, flexible, and could display the representation of the real patient on the screen. The sleeper and body models were used for pharmacy and physiological purposes, and ASC for crisis management in anesthesia.

In 1994, a model in the aviation industry was developed, called LOFT (Line Oriented Flight Training), in which all aspects of flight are simulated and practiced. In the medical field, TOMS (Team Oriented Medical Simulation) was developed at the University of Basel to help train professional teams to perform during critical events (Wong, 2004). Along the way, modern simulators were developed for risk-management needs, training for nuclear power production, the military, and a variety of other industries and professions that need to operate with low failure rates (Bradly 2006;

Gaba, 2004). Simulation programs and techniques were used in different fields for performance optimization, testing, training, education, safety engineering, and gaming.

The healthcare industry adapted technology simulators for procedural skills enhancement that did not compromise patient safety. Simulators for nursing education and training are not new; however, use of high-technology simulators is a recent development. In nursing education, information technology (IT), is referred to as *nursing informatics*, which is a term related to computer science (Cato, 2011; Wilson, 2011). It is considered a specialty that integrates computer science, information science, and nursing science to help nurses manage and communicate in their practice.

The first healthcare simulators were simple models of human body parts; today's models have been developed to help healthcare professionals learn the anatomy, physiology, and musculoskeletal system. Healthcare simulators are developed to teach diagnostic procedures and treatment procedures, allowing students to practice blood draws, starting I.V. lines, and inserting catheters. Simulators can also be used to develop special skills, such as critical thinking and decision-making. Currently, simulators are used in research into new treatments, therapies, and early diagnosis in medicine (Fraenkel & Wallen, 2003; Neamson & Wiker, 2005).

The Harvey manikin was one of the earliest medical simulators used in training of health care professionals. It was developed by Dr. Michael Gordon in 1968 at the University of Miami and was used to teach all levels of medical education to medical students and residents. For beginners, Harvey could be used to teach the technique involved in blood pressure measurement, while senior level students could use Harvey to learn to recognize a heart murmur, diagnose cardiac issues, and palpate the carotid

and jugular veins and arteries. Harvey, which cost around $100,000, allowed medical professionals to practice on the teaching tool instead of on a patient volunteer. The current version of the Harvey simulator can simulate six different breath sounds, nine cardiac auscultation areas, and 12 digital impulses; in addition, its heart beat intensity is changeable, which allows a trainee to listen to the sounds with a stethoscope, palpate the pulses, and perform electrocardiography (Gordon, 1997).

Types of Simulators and Applications in Nursing Education

The contemporary nurse requires skills in technology to promote optimal performance. The opportunity to train with simulators ensures early competency with technology in the nursing field. Simulators attempt to replicate characteristics of the real world. These devices are designed for demonstrating procedures, solving problems, and promoting critical thinking and decision-making skills (Gaba, 2004; Jeffries, 2005). The current use of simulators and simulation experiences will be discussed in this section.

- Low-fidelity simulators: Low-fidelity, such as a foam intramuscular injection simulator, can be used to instruct nurses in psychomotor tasks. However, they are often static and lack realism (Eddington, 2011; Nehring, 2010).
- Moderate-fidelity simulators: This type can allow students to practice skills such as listening to breath sounds, detecting a heart murmur, and palpating pulses. These simulators are more realistic than low-fidelity models but still lack certain realistic characteristics. For example, these simulators would show no chest movement as a student listens to breath sounds (Eddington, 2011; Nehring 2010).

- High-fidelity simulators: These high-tech simulators are computerized, full-body manikins that produce the most realistic patient-interaction experiences. The simulator is instructor driven and can demonstrate the characteristics of life-like situations (Eddington, 2011; Nehring, 2010).
- Part-task and procedural trainers: These simulators replicate a part of the body or environment. Simulators of human body parts are used to teach students the basic psychomotor skills. Very simple part-task trainers include I.V. arms for drawing blood or inserting I.V. catheters and intubation manikins. This type of tool is inexpensive, and it is utilized by all nursing schools.
- Complex task trainers: This type of tool is useful in a clinical environment where the instructor cannot fully see as the student is assessing the patient. For example, in a pelvic exam, it is difficult for the instructor to see if the student is doing a thorough exam. Therefore sensors are applied to provide feedback to the student. This type of simulator is expensive (Nehring, 2010).
- Screen-based computer simulators. The most complex of these types of simulators present a virtual reality in which the organs exist only in a virtual computer world and are presented on a two-dimensional screen. This is appropriate for procedures such as minimally invasive surgeries (Benner, Hooper-Kyriakidis, & Stannard, 1999; Nehring, 2010; Tan & Payton, 2010). These virtual reality practices can offer opportunities for learners to practice surgical skills procedures, such as central line insertion, via computer-based training (Galloway, 2009).

- Manikin-based simulation (human patient simulators): This is one of the most recent advances in technology models for nursing education. The Human Patient Simulator was developed by Medical Education Technologies Incorporated (METI) and SimMan by Laerdal. The devices are computerized whole-body manikins of different ages (infant, child, adult) to meet the educational needs of students at all levels. The METI HPS models are used for physiological and pharmacological purposes, allowing the simulator to act like a live patient. It initiates response, including verbal communication with the learner during the simulation exercise. The SimMan from Laerdal operates using personal computer software. It displays patient physiologic parameters on monitor screen. The vital signs can be seen not only in the manikin, but the data can also be presented from electronic monitors. The manikin allows practice of procedures such as pulmonary resuscitation, intubation, chest tube placement, and can respond to other interventions, even medications. The manikin also provides a voice-link and speaker so that an instructor can talk to students who are participating in the procedure. These simulators are very appealing to educators because they can contribute high degrees of realism (fidelity) to scenarios (Campbell & Daley, 2013).

Simulators are costly, which needs to be considered with purchasing. The average cost of a high-fidelity simulator is ranges between $120,000 to $200,000; a medium-fidelity simulator between $80,000 to $100,000, and low-fidelity about $5,000 to $25,000 (Laerdal Medical, 2013; McIntosh, 2006). Establishing a simulation center with simulators can be up to $1 million, depending on the space and the type of clinical

equipment to be used. Fixed costs for maintaining and training faculty per year have been found to cost between $360,000 and $425,000 (McIntosh, 2006). The number of simulation centers worldwide has increased since 1994.

Types of Simulation

Tan and Payton (2010) have defined simulation in health care as a "set of techniques, not a technology, for replicating sufficient aspects of the clinical world for particular purposes of education, training, performance assessment, or research. Simulations can be used as a replacement for real-world clinical activities or as a supplement" (p. 351). Further, Gaba (2004) describes that a simulator is a device that replicates a real patient and interacts with the learner. Specific ways simulation is used through scenarios in clinical settings include the following:

Simulated patients. Nurse educators can utilize simulated patients in teaching to perform physical assessments, procedures, document patient history, and communicate. The instructor will assess the student's performance and provide feedback. Performance of student nurses can be risky and disturbing to a real patient, but no risks are involved with simulated patients. Students become aware of their competency skills and improve their clinical weaknesses. Additionally, simulated patients are more readily available for practice than real patients. The disadvantages of teaching with simulated patients can be cost and being forced to schedule actors (Jeffries, 2005).

Full mission simulation. This simulation usually involves a team. The process begins when a case scenario is given by the educator; students perform the task, and a debriefing session provides a review of the situation and the performances. An

example would be when an emergency scenario is created and carried out in a replicated emergency room (Beaubien & Baker, 2004). The manikin allows practice of procedures such as pulmonary resuscitation, intubation, and can respond to other interventions, even medications. These simulators are very appealing to educators because they can contribute high degrees of realism to scenarios (Campbell & Daley, 2013).

Integrated simulators. This model is instructor driven with combination of low-, medium-, and high-fidelity simulations (Eddington, 2011). The ultimate goal of simulation is that the learners incorporate what is learned from simulation exercises and apply the learning to real world situations.

Role playing. This involves acting out an event or situation to achieve fidelity. According to Aldrich (2005), fidelity in a clinical situation would help the learner to take actions as they would in a real-life situation or to see a situation from another person's point of view. Role playing allows students to practice communication skills, which often can be videotaped so they can later critique their performance (Nehring, 2010).

Simulation Scenarios

Each simulation is presented in three parts: (a) preparation, (b) scenario, and (c) debriefing (Campbell & Daley, 2013; Elsevier, 2011).

Step 1: Preparation. In this step, detailed outlines are created by educators to help guide students through the simulation experience. The following items can be included:

- Staging instructions, in which educators walk through the set up needed for each scenario, such as equipment and supplies, medications, lab collection supplies,

and reference materials (lab book, normal lab values), and what must be done to prepare the simulator to reflect the scenario

- Algorithm quick card, describes actions in each phase
- A performance checklist
- RN-to-RN report on patient
- A patient response guide
- Role-playing tools
- An observer evaluation rubric

Step 2: Initiating the scenario. Each simulation scenario is presented with clear instructions for initiating experience with clear description of different physiological phases (phase I: introduction; phase II: experience; phase III: outcomes).

Step 3: Debriefing. This is the most important step in simulation experience, when students reflect on their perceptions and experiences of simulation, educators analyze students' performances and provide feedback, and students and educators collaborate and communicate with each other. After discussion, nurse educators identify areas that are needed for further review and direct students toward resources based on their individual needs so they can improve (Elsevier, 2011).

Simulation scenario with a case study. This scenario is designed to simulate an unstable obstetrical patient with placenta previa. As a case study, the following are teach-and-assess skills involved in caring for this patient and recognizing the possible implications of placenta previa (see Table 5). Julie Jones is a 25-year-old mother, gravid 2, para 1 (G2, P1), at 37 weeks gestation. She wakes up at midnight thinking she wet the bed, and then she discovers that her bed was fully covered in bright red

blood. Her husband called the doctor who directed him to take Julie to the hospital immediately. She was admitted to the labor and delivery unit with diagnosis of placenta previa. Her medical history is that her past pregnancy was uneventful, and she had a baby girl 2600 grams at birth. This current pregnancy was uneventful up until this time.

Table 5

Simulation Scenario

No.	Question example and response categories
1.	Recognition and assessment of the sign and symptoms of placenta previa a) Assess for hemorrhaging b) Assess for changes in cognition, and for confusion and lethargy c) Assess vital signs d) Assess for knowledge deficit related to placenta previa
2.	Initiate interdisciplinary collaboration in hospital setting a) Report any changes in patient's condition to the physician b) Implement new orders from physician c) Document findings on nursing flow sheets
3.	Select appropriate intervention for this patient a) Start an IV b) Monitor vital signs frequently c) Offer consent form for patient to sign, or to be signed by significant person d) Administer medication e) Prepare for cesarean section
4.	Observe closely and monitor therapeutic response to interventions (outcomes) a) Monitor amount of blood loss b) Monitor mentally alertness and orientation c) Monitor vital signs till patient is stable

Note. Based on Kansas State Board of Nursing. (2009). From simulation scenario library. Retrieved from the public domain www.ksbn.org

For care of this patient, answer the following questions:

- What would be your first assessment?
- What would be your first question to ask?
- What you would not do?
- After documenting your assessment, proceed with patient care.

The Benefits of Using Simulators

For patient safety and for the sake of good quality care, nurse educators must stay informed about new technology and use their knowledge, skills, and critical thinking to teach the same skills to their students. According to Nehring (2010), skills assessment requires measure of competence. Today's students have grown up with technology. They prefer to learn with computers, teamwork, experiential, goal-oriented activities, and the chance to be active learners. Simulation scenarios allow students to take an active role in their education and get involved in different situations.

The ability for medical personnel to take actions prudently in an unexpected situation is one of the most critical factors to creating a positive outcome in a medical emergency. That ability the person is not born with, but rather skills are learned and developed with time, practice, training, and repetition. Today, with technology advancement, new and better methods are created for teaching student nurses how to practice medicine and reinforce best practices. Some of the most exciting innovations in healthcare come from the field of medical simulation.

There are many reasons why simulators can be powerful learning tools. One of the most important benefits is that learners can be allowed to make errors with simulators that they could not safely make with a real patient. If a student is about to

make an error while working with a real patient, a nurse educator must intervene to protect the patient. But with simulators, students can learn from their own mistakes, which sometimes provide the most memorable lessons (Gaba, 2004).

Because the potential for nursing students to make errors is high, simulator-based training decreases the potential risk of injury or harm to the patient or to the learner. Obviously, the risk is lowered because student nurses are not getting their initial practice of particular techniques on real patients. Benefits extend into the future practice because nurses who have been trained well with simulators are less likely to make mistakes when working with real patients because they have been able to practice a technique repeatedly.

Simulation also provides opportunities for nurse educators to teach techniques that are not possible or appropriate to demonstrate with real patients. Simulated scenarios or events can be created to stimulate discussion and foster teamwork and collaboration in ways that are not possible in real-life settings. The techniques and the critical-thinking skills learned during these simulated settings can be invaluable to nurses when they face similar problems in the real world (Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005).

Simulators are also adaptable for multiple learning strategies (Issenberg et al., 2005). When the learning environment is controlled as it is in simulator-based training, students can participate and choose the approach that best fits the situation and their skills, which allows them to build self-confidence (Gaba, 2004; Simpson, 2002).

Far more experiential learning opportunities are available through simulated settings than are available in classroom instruction alone. Therefore, simulators can

play a huge role in helping student nurses transform theoretical knowledge into practical knowledge (Weller, 2004).

Although simulators and simulation centers are expensive and require a large initial investment, simulator-based training may help nursing training programs overcome faculty and preceptor shortages and lack of clinical sites (see Table 6).

Table 6

Advantages and Disadvantages of Simulators

Advantages	Disadvantages
• Flexible, easy, unlimited access • Useful to develop skills in decision-making, critical thinking, delegation, and knowledge acquisition • Easy access • Good for lower-level nursing students • Good for procedural and repetitive practice • Good for communication skills training • Useful for evaluation and feedback • Occurs on schedule • Safe for patients • Sessions can be videotaped • Instruction is learner-focused, not teacher-focused	• Costly • Depends on availability of instructors and operators • Limits realistic human interactions • Not real • Students may not take the practice seriously • The faculty requires preparation time for the sessions

Note. Advantages and disadvantages of simulators. Based on Issenberg et al., 2005.

Understanding the benefits of simulators could help hospitals justify the cost of simulation centers. Simulation-based training offers great potential to reduce health-care costs by reducing the risks of harming patients and also by reducing staffing costs, because training time can be decreased and turnover of faculty can be reduced if

nurses feel better trained to handle their jobs (McIntosh, 2006). According to an Institute of Medicine (IOM) report titled, "To Err Is Human: Building a Safer Health System," preventable adverse events are a leading cause of death in the United States, and the use of simulation-based training could help reduce those numbers (IOM, 2010).

Theoretical Frameworks

Different theoretical frameworks have been used in nursing practice as a framework to conceptualize a plan of care and promote a safe-practice philosophy for the entire healthcare and educational community. In this section, Roy's and Kolb's theories are discussed and their impact in nursing practice and education described.

Roy's adaptation model. This study also utilizes Roy's (1976) theoretical model to consider how adaptation occurs in nursing education and practice, particularly when nurses respond positively to environmental changes. Roy's model aims to promote personal and environmental transformations. Understanding the process explained by the model helps nurses to prioritize care and challenges them to develop knowledge that will help them cope better in their workplaces. Roy believes the environment affects a person's behavior (Roy, 1999), and her model (1980) shows how those four concepts—person, health, environment, and nursing—are closely linked.

- Person (adaptive system): A person is a bio-psycho-social creature who constantly interacts with the changing environment. There are internal and external changes within every environment, and each person must maintain his or her integrity while continuously adapting. Hence, the person becomes a holistic system. Environmental stimulus can challenge a person's adaptation or influence a person to adapt positively in a situation (Roy, 1999). Nurses'

adaptive systems will affect how they respond to the workplace environment, which, in turn, will affect their health and their ability to perform their jobs.

- Health (outcome of adaptation): Roy (1980) defines health as a state of being and becoming integrated and a whole person. A person needs to be able to meet the goals of survival, growth, reproduction, and mastery. Adaptive responses positively affect the health of a person. Healthy educators will be better able to cope with a stressful environment.
- Environment (stimuli): The environment affects the behavior of people. The aim of educators is to alter, decrease, or remove the internal and external stimuli of the environment as appropriate for the situation. Learning how to remove or adjust stimuli within an educational environment can help a person learn how to similarly adjust stimuli in the workplace so that they can better cope in a stressful work environment (Roy, 1999). This knowledge can lead to a more positive adaptive behavior and improve health and workplace performance.
- Nursing (promoting adaptation and health): The nurse's adaptive level determines whether a positive response to stimuli will be elicited. Nurses aim to promote health in all life processes, including their own working environment. Therefore, nurses and educators must take actions in their work and make adjustments that can help them adapt in healthy ways. The goal of nursing is to promote positive adaptation (Roy, 1976).

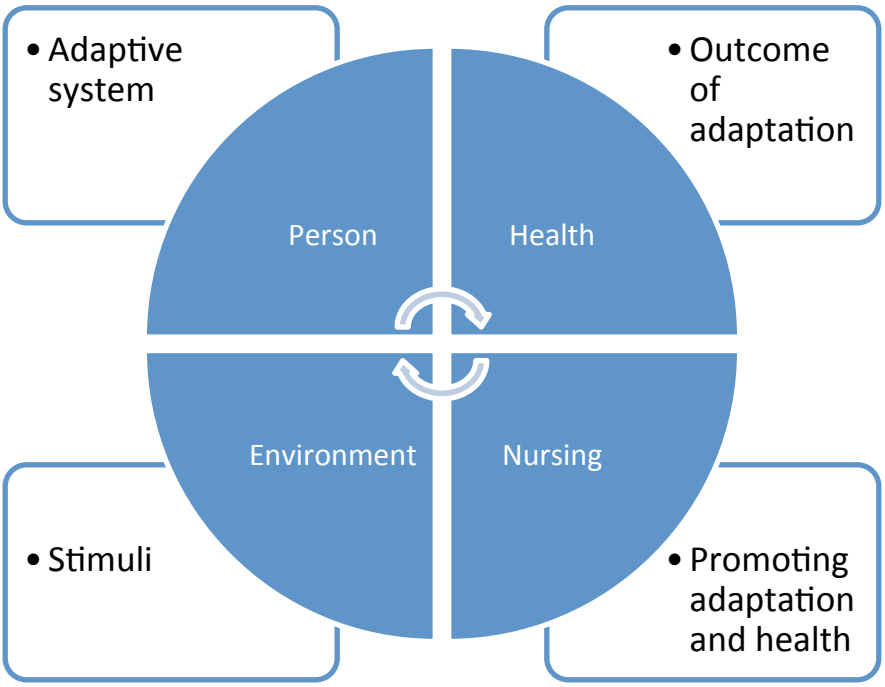


Figure 2. Roy's adaptation model. Based on "Roy's Adaptation Theory," by C. Roy, 1976, *Nursing Outlook, 24*(11), p. 690.

Roy's adaptation model has been used for over 30 years in nursing practice (see Figure 2). This model has been used as a framework to conceptualize plan of care; create intervention; provide patient assessment, care plans, documentation, and training tools for learners; foster involvement of the people affected by change; and promote a safe-practice philosophy for the entire healthcare and educational community. To apply Roy's adaptation model to nursing practice, the nurse works collaboratively with others to address issues they encounter in health promotion (Senesac, 2010).

Both Rogers's and Roy's models focus on adaptation to environmental demands. Individuals can adapt to environmental stimuli both from both outside and inside the social system, which can influence individuals to respond. Prior behaviors and stimuli influence the diffusion process, and an integrated social system implies a continuous

process of change. The innovation-decision process uses communication channels to integrate the innovation into the social system, which roughly parallels the nursing process and has a goal of successful adaptation of the innovation. According to the Institute of Medicine (IOM, 2010) many medical innovations are developed in the United States, but not all are adopted.

Kolb's Experiential learning theory. Kolb's experiential theory of learning offers an appropriate framework for simulation learning activities that combines perception, cognition, experience, and behavior. Kolb (1984) believes "learning is the process whereby knowledge is created through the transformation of experience" (p. 38). The term *experiential* is used to differentiate his theory from cognitive and behavioral learning theories. His theory is called experiential because of its origins in the experiential works of Dewey, Lewin, and Piaget on learning and development (Kolb, 1984).

Experiential learning theory emerged from "a set of assumptions that ideas are formed and re-formed through experience, and learning is described as a process in which concepts are derived from and modified by experience" (Kolb, 1984, p. 41).

Six characteristics of experiential learning are:

- Learning is best conceived as a process, not an outcome
- Learning is a continuous process grounded in experience
- Learning is a holistic process of adaptation to the world
- Learning involves transactions between the person and environment
- Learning is the process of creating knowledge
- Learning is by its very nature full of tension

In the experiential learning model, the learner continually chooses which set of learning skills to use in a specific learning situation. Some learners perceive new information through experiencing the concrete; others tend to perceive through symbolic presentation or abstract conceptualization, analyzing, planning, and thinking about rather than using sensation as a guide. In transforming an experience, some learners carefully watch others who are involved in the experience, while others to choose to jump in and start doing things. The watchers observe, and the doers get involved in active experimentation. Because of the demands of our present environment and our past experiences, we choose which way to learn (Kolb, 1984, 1999; Kolb, Osland, & Rubin 1995).

Kolb's experiential learning theory presents a cycle with four elements:

1. Concrete experience
2. Reflective observation
3. Abstract conceptualization
4. Active experimentation

This cycle starts with an experience that the learners had, followed by reflecting on that experience. Then the learners may conceptualize and draw conclusions about what they observed and experienced, leading to actions in which the learners experiment with different cognitive and affective behaviors (Kolb, 1984, 1976). Depending on the environment, the learners can enter the cycle at any point if they practice all four modes.

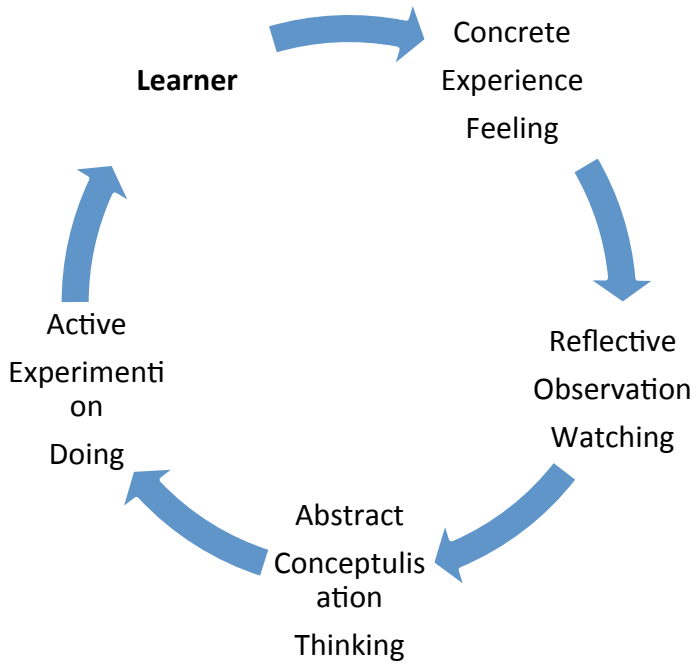


Figure 3. Kolb's learning cycle. Based on "Kolb's Experiential Learning Theory," by D. A. Kolb, 1976, The Learning Style Inventory: Technical Manual. Copyright 1976 by McBer.

Kolb's experiential learning theory. In recent years, experiential learning has become firmly established in nursing curricula. It is a kind of learning that results from experience, by getting involved, rather than listening to lectures or reading. The active involvement of the students is the key characteristic of this form of learning.

David Kolb (1984) developed an experiential learning model based on earlier work by John Dewey and Kurt Levin (see Figure 3). Kolb believes that "learning is the process whereby knowledge is created through the transformation of experience" (p. 38). His theory consists of four stages. An individual may begin at any stage, but follow in the sequence (see Figure 4).

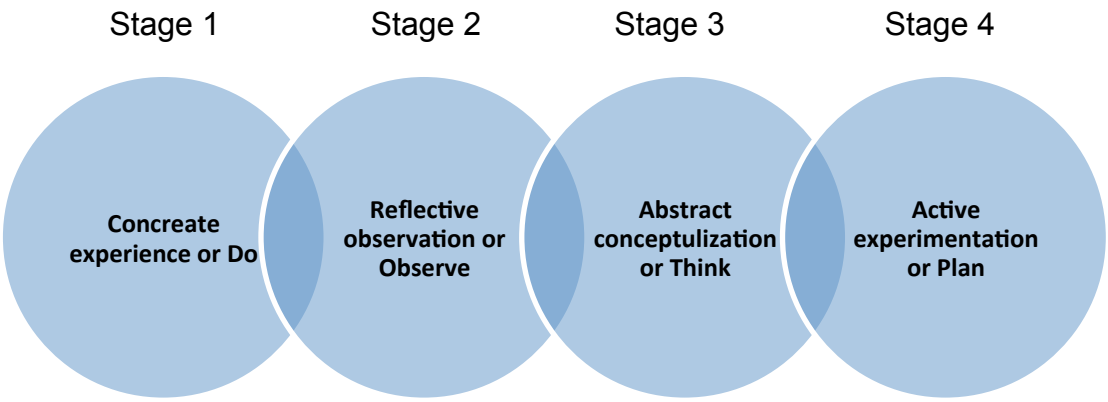


Figure 4. Four stages of experiential learning. Based on "Kolb's Experiential Learning Theory, Theory," by D. A. Kolb, 1976, The Learning Style Inventory: Technical Manual. Copyright 1976 by McBer.

The first stage, concrete experience (CE), is based on observation and reflections when the learner experiences an activity such as in simulation lab and can be actively tested to create a new experience. The second stage, reflective observation (RO), is when the learner reflects back what is learned from a variety of perspectives. The third stage, abstract conceptualization (AC), is when the learner tries to conceptualize what is observed. In this stage, the learner must develop concepts that integrate observation into logical theories. The fourth stage, active experimentation (AE), is when the learner plans to test the theory for upcoming experience and apply in decision-making and problem solving.

Kolb's Learning Styles

In 1971, the Learning Style Inventory (LSI) was developed by David Kolb to assess individual learning styles. Kolb believes that learning styles reflect how people prefer to learn. He identified four learning styles: (a) diverging, (b) assimilating, (c) converging, and (d) accommodating (see Figure 5 and Table 7). These four basic learning styles are based on both clinical observations and research (Kolb, 1984).

Table 7

Kolb's Four Learning Styles

Style	Description
Diverging	These individuals prefer to watch rather than get involved. They use imagination and gather information to solve problems. They like to work in a group, share ideas, listen, and receive feedback.
Assimilating	These individuals prefer reading, listening to lectures, and exploring logical approaches.
Converging	These individuals prefer technical tasks, experiment with new ideas, and perform practical applications.
Accommodating	These individuals prefer hands-on practice and take an experiential approach. They prefer teamwork to complete their tasks and try different approaches to achieve their goals.

Note. Four learning styles. Based on Kolb's experiential learning theory, by Kolb, 1984.

Diverging. This style includes concrete experience and reflective observation. People with this learning style have innovative and imaginative approaches for doing things. They view concrete situations and adapt by observation rather than by action. Studies show that they like other people, have broad cultural interests, get involved in group activities, prefer to work in cooperative groups, listen, generate ideas such as in brainstorming, and provide feedback (Kolb, 1999).

Assimilating. This style includes abstract conceptualization and reflective observation. With this learning style people are more task-oriented, and they like to design projects and experiment with things rather than focus on people. Individuals with an assimilating style like to create models and theories, read, lecture, and explore analytical models (Kolb, 1999).

Converging. This style includes abstract conceptualization and active experimentation. With this learning style people apply practical ideas and are able to make decisions and solve problems. They prefer to deal with technical problems rather

than interpersonal issues. This learning skill is effective in technology; people prefer to experiment with new ideas, simulations, and practical applications (Kolb, 1999).

Accommodating. This style includes concrete experience and active experimentation. With this learning style people get involved in challenging experiences. They use trial-and-error methods rather than thought or logic. They like to be around people, solve problems, and get assignments done. These individuals like to do field work, try different approaches to complete a project, and discover new things during learning (Kolb, 1999).

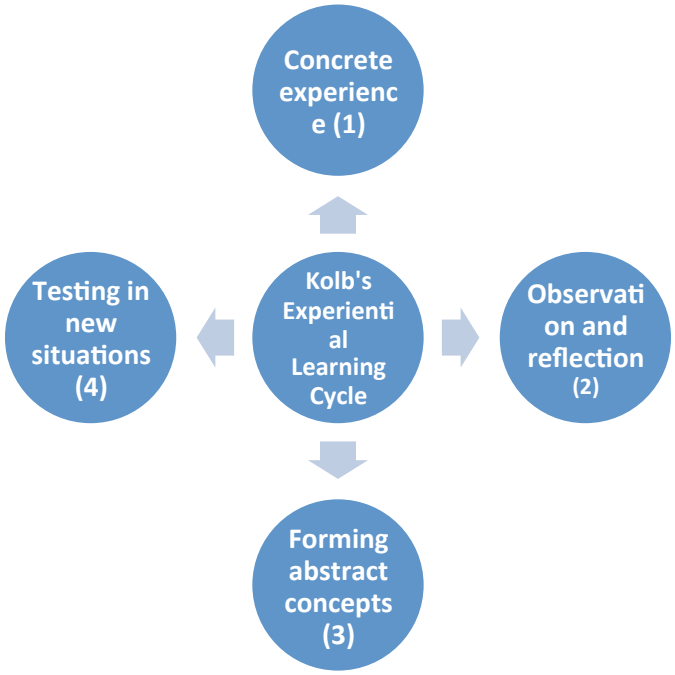


Figure 5. Kolb's experiential learning cycle. Based on Kolb's Theory," by D. A. Kolb, 1999, The Learning Style Inventory: Technical Manual. Copyright 2013 by Author.

Experiential learning theory has been tested in nursing programs, which were found to predominantly utilize a concrete learning process. Kolb's cycle of learning is a valid and useful model for considering how to design instructional methods and improve processes in nursing education in ways that will help students improve their learning.

Miller's pyramid model in learning. Miller's pyramid has been used as a framework for assessing clinical competence. George Miller's pyramid describes a set of competencies in healthcare education that involves the assessment of skills and behavior (Miller, 1990). He describes competence as what people can do in clinical practice. The lowest level of the pyramid (see Figure 6) is knowledge (knows), followed by competence (knows how), then followed by performance (shows how), and top level action (does).

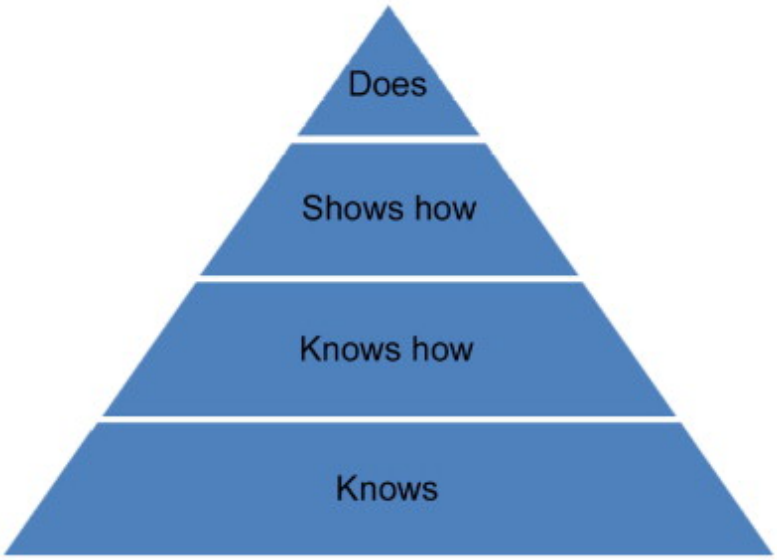


Figure 6. Miller's pyramid model in learning. Based on "The Assessment of Clinical Skills/Competence/Performance," by G. E. Miller, 1990, *Academia Medicine, 65*.

This model concentrates on two main learning processes: cognitive (knows and knows how), and performance (shows how and does). On Miller's pyramid, traditional written exam techniques, such as essays, multiple-choice, and short answers, can be used to assess students' competence at the lower level (knows, knows how), and assessments that incorporate simulation can be used to assess students at the level of "shows how" (Miller, 1990, p. 65). This model has been utilized in simulation-based

training environments. Because nursing is a hands-on profession, nursing education needs assessment methods that can focus on the top of the pyramid.

Simulation as a Teaching Strategy in Nursing Education

Teaching strategy with simulation is made to resemble clinical practice (Rauen, 2004). It is used to teach theory, assessment, pharmacology, technology, and skills. The main emphasis is on application and integration of knowledge, interaction, critical thinking, and skills (Bremner et al., 2006; Issenberg et al., 2005, Rauen, 2004).

Simulation in nursing education in the form of manikin or rubber body parts have been utilized as teaching modalities since World War II (Ward-Smith, 2008). These types are still in use for basic skills. With advanced technology, computer-based or human patient simulators allow learners to experience clinical situations, practice skills, respond to problems, analyze data, make decisions through critical thinking, and receive feedback on performance. Learners gain experience, learn skills, and develop competencies without harming a live patient. Computerized high-fidelity simulator is a new advanced technology in nursing education but has become a popular tool for teaching student nurses as it requires learners to apply theory to practice and creates real-life scenarios to foster critical-thinking skills. However, use of computerized high-fidelity simulators is limited in most nursing education for a variety of reasons. Previous studies about whether such simulators could create positive learning outcomes will be discussed in an attempt to answer this question.

Simulators boost multiple outcomes. Simulation exercises could help nursing students with simulations obtain knowledge and achieve educational goals through multiple learning strategies (Issenberg et al., 2005; Murray et al., 2008; Nehring, 2008).

Benner (1984) stated, “The goal of educational programs is to provide a broad base of clinical theory and skills that will provide the nurse with maximum flexibility and scope of practice after graduation” (p. 185). Simulation learning outcomes include: (a) increasing competency skills, (b) improving communication skills, (c) developing critical thinking, (d) and facilitating teamwork and collaboration (Wotton, Davis, Button, & Kelton, 2010).

Developing competency skills. Administrators in nursing programs develop curricula, hire nurse educators, and choose effective teaching methods in an effort to graduate competent nurses (Kohn et al., 2000). Didactic and clinical teaching strategies are used to promote critical thinking and decision-making skills and to develop competence in new graduates (Smith & Roehrs, 2009). Of course, it is impossible for students to receive all their training while in the program, so when they depart from nursing school, they should have continuing education to help them sharpen their skills, increase their knowledge, and provide an ongoing evaluation of competence to promote patient safety. An Institute of Medicine (IOM, 2012) report recommends simulation training as a teaching strategy that can be used to reduce errors in clinical settings and encourages health-care organizations and nursing schools to participate in the development and use of simulation for training staff, especially when new procedures and equipment are introduced.

The National Council of State Boards of Nursing (NCSBN) in 2009 reported a study on the effectiveness of simulation on knowledge retention, self-confidence, and clinical performance. Students in a critical care unit were divided into three groups: simulation only, simulation and clinical teaching, and clinical teaching only. The students’ knowledge was assessed before and after the simulation, and clinical

experience exam and skills were assessed through three clinical scenarios. Results indicated that all three groups scored similarly on the post experience exam with no significant difference on knowledge retention in patient scenarios, but the combination of simulation and clinical experience received the highest scores with respect to knowledge retention and clinical skills.

Improving communication. According to Benner (1984), effective communication with team members is a skill. Use of simulation can improve communication between team members (Gaba, 2004; Kyle & Murray 2008). Studies by Kameg, Howard, Clochesy, Mitchell, and Suresky (2010) found that simulation can increase confidence in communication, which "is a critical component of nursing education as well as a necessity in maintaining patient safety" (p. 315). Examples include, student-to-student communication during performance and students' feedback to faculty.

Alinier, Gordon, Harwood, and Hunt (2006) conducted research to determine the effect of scenario-based Human Patient Simulation (HPS) on competence and clinical skills. The participants were 99 second-year undergraduate nursing students. Findings from this study showed that the experimental group had statistically higher scores than control group. There was no statistically significant change in increased confidence or perception of stress, but benefits were associated with use of simulation.

Developing critical thinking. Simulation activity is one of the best ways to allow students to learn actively and to think spontaneously (Larew, Lessan, Spunt, Foster, & Covington, 2006). Many times nurses must make quick, independent

decisions and take risks; simulations allow them to develop a systemic approach to think critically and solve problems (Simpson, 2002; Weller, 2004).

Bandman and Bandman (1995) emphasized the importance of developing and demonstrating critical thinking skills through simulation practices. They define critical thinking as follows:

> The rational examination of ideas, inferences, assumptions, principles, arguments, conclusions, issues, statements, beliefs, and actions. This examination covers scientific reasoning and includes the nursing process, decision making, and reasoning in controversial issues. The four types of reasoning that comprise critical thinking are: deductive, inductive, informal, and practical (p. 176).

The practical scenarios are developed by the instructor or by simulator manufacturing companies to allow learners to incorporate classroom knowledge and assessment skills while developing a plan and implementing it. The learners are then given an opportunity to evaluate their plans and make appropriate changes if necessary. With simulation exercises, the entire nursing process can be replicated, which requires students and to think critically.

Howard (2007) conducted a study on simulation and its effectiveness on critical thinking. He studied an experimental group of 24 and a control group of 25 participants. Results showed that experimental group scores were 10.5% above the knowledge scores in the control group. They also found a positive, but not statistically significant trend in critical thinking for the simulation experimental group.

Facilitating teamwork and collaboration. According to Gaba (2004), teamwork is a collaborative practice. Weller (2004) found that during simulations students develop teamwork skills, promote collaborative learning opportunities among instructors, students, and other healthcare professionals to create an environment where working together is required, mimicking what occurs in real life.

According to Klein and Doran (1999), students who used simulation in a small group for discussion of a patient situation made decisions, chose appropriate intervention, and reported positive evaluation comments to the instructors. Three major benefits were identified with sharing ideas in a group: (a) course content was implemented in to realistic situations without stressing a patient, (b) students' self-confidence increased about using critical thinking, and (c) decision making improved within the group.

Ackermann, Kenny, and Walker (2007) evaluated the use of simulation with 21 nurses. They found that all the participants believed high-fidelity simulators facilitated their learning with no risk to a live patient. They also found that use of simulation enhanced communication in the professional role.

Sears, Goldsworthty, and Goodman (2010) reported a study with second year nursing students with a focus on the administration of medication. They divided the students into a simulation group and a control group. The simulation group had received simulation-based training, while the control group had worked with preceptors during practice but did not have hands-on practice with medication administration. The study took place over 8 hours of clinical practice, and nurse educators observed the students during administration of medication with the *five rights*. The study results

showed that students in the simulation group committed fewer errors in administrating medication than did students in the control group.

Breyea, Slattery, and Von Reyn (2010) used simulation experiences in a nursing residency program with 260 participants. They ensured that all student nurses had exposure to simulation in clinical setting, and then they evaluated their performance. They found that students' orientation time was decreased and their productivity was increased. In addition, recruitment increased while turnover decreased.

Kait, Mei, Nagammal, and Jonnie (2007) conducted a descriptive study to evaluate the effectiveness of the HPS on students' learning experiences. The study participants were 260 second-year student nurses in a school of nursing. From this study, they found that 95% of students felt positive using simulation during instruction. However, the study was somewhat limited because the nurse educators were still learning how to the use simulators.

Another study was done to evaluate simulation methods for critical care units. This method is more realistic, helps students enhance and retain knowledge, and requires the use of psychomotor skills and critical thinking. The ability to learn these skills are best learned through practice. Simulation allows the learner to practice nursing skills in a safe and controlled environment. In 2002, Georgetown University Hospital opened a new cardiac surgery unit and integrated simulation into critical-care nursing orientation. Initially, the courses, which included instruction in areas such as electrocardiographic rhythms, chest tubes, cardiac drugs, pacemakers, and discharge planning, were taught in more traditional styles and then simulation sessions were given to nursing staff. Three high-acuity scenarios were developed by the hospital to allow

nurses to integrate theory into their practices. The nurses reacted to situations, provided treatments based on their assessments, interpreted data, and observed changes that occurred as a result of interventions. Self-evaluation was given to the instructors. Nurses who demonstrated strong assessment and used critical-thinking skills were more confident than those who did not demonstrate strong skills. Based on both written and verbal evaluations, nurses previously had no idea how quickly the patient's condition could deteriorate and the importance of application of assessment skills to improve the patient's outcome. These scenarios surprised many nurses and simulations provided positive learning opportunities (Rauen, 2004).

Gordon and Buckley (2009) conducted a study with 50 graduate registered nurses who had an average of 9 years of nursing experience. The goal of their study was (a) to determine nurses' improvement in confidence level and practice after practicing with HPS simulator and (b) to identify the most helpful components of HPS in learning. Findings of their study from nurses' self-report demonstrated that there was an increase of confidence and competency skills in caring for critical patients and emergency patients after using simulation. This study concluded that developing scenarios in emergency situations was helpful in simulation exercise success. The simulation results were positive even though all the participating nurses had years of practical nursing experience but none had experience with HPS simulator.

There is limited research on student learning outcomes with simulators, but Bambini, Washburn, and Perkins (2009) suggest using the framework of self-efficacy can determine the effectiveness of simulations on learning outcomes. They conducted a study to evaluate the self-efficacy of nursing students and found improvements in

communication, critical thinking, and confidence in skills. The research seems to bear out the idea that simulation techniques can be a wonderful bridge between theory and practice.

Simulation Challenges for Nurse Educators

In recent years, nursing practice has changed, placing demands on nursing educators to utilize different approaches in education (Eddington, 2011). Technology advancements in healthcare have led to the increased use of computerized simulators as a teaching and learning tool in nursing curricula. But new techniques and processes can present new challenges to nursing educators. Several studies have explored some of those, and results of those studies will be presented here.

According to Eddington (2011), one of the biggest challenges that nursing schools are facing is how to prepare nurse educators for this paradigm shift from clinical to simulated instruction. The educators need to have a broad understanding of types of simulators that are available and which ones would be best to meet the needs of their learners, the scope of their use, and the degree of realism. Seropian et al. (2004) found that some nurse educators have not embraced the new technology and are not prepared to teach with simulators. Alinier et al. (2006) studied the impact of using medium-fidelity simulation in clinical settings and found that both instructors and students need to be prepared for simulation as a teaching tool. It can only benefit learners if it is used appropriately in teaching and learning.

Another challenge to nurse educators will be to choose the best type of simulator to meet the needs of their students so that they can accomplish their educational goals (Bremner et al., 2006). Lack of resources is another challenge that

nurse educators encounter. The National League of Nursing (NLN) has provided resources to assist nurse educators with implementation of simulation for teaching. One resource that is available now is S.T.E.P. (Simulations Take Educator Preparation). This resource is designed to help nurse educators understand the benefits and practical use of simulations in clinical education. Other resources provided by the NLN include mentoring, workshops, conferences, websites, literature, and funding for research (Eddington, 2011).

Table 8

Seven Categories of Challenges to Using Simulation

Challenges	Faculty statements
1. Time	• Difficult to find time to develop scenarios and figure them out • Developing and incorporating simulation into courses increases workload
2. Training	• Difficult to learn the technology itself • Technology requires consultation with experts • Lack of training to use simulators • Training required to putting together a scenario
3. Attitude of non-acceptance	• See no fit between simulation and curriculum • Not applicable for courses at the present time • RN-BSN students do not need stress on technical skills
4. Equipment & logistics	• Deficiencies in space and equipment • Difficulties in scheduling lab time
5. Funding	• High cost to buy simulation equipment • Expensive to funding the development of simulations • Lack of resources to purchase equipment
6. Staffing	• No staff to manage the manikin lab • Only one faculty member available to run equipment
7. Few students involved	• In theory course, all students could not be engaged in the scenarios at same time; some students would need to be observed • Only a handful of students may get involved in simulation

Note. Challenges of nurse educators. Based on Jansen et al., 2008.

A simulation challenge study done by Jansen, Berry, Brenner, Johnson, and Larson (2008) with the faculty team at the University of Wisconsin-Eau Claire identified challenges that faculty perceived to using simulation in their clinical courses. Jansen and colleagues categorized seven main challenges to simulation, provided faculty objectives in each of those categories, and offered possible solutions to overcome the biggest obstacles (see Table 8).

Nurse Educator Perception of Simulators

Although the advantages of simulation-based training have been well documented, some nurse educators still may not feel comfortable in using technology in the clinical setting or lack the motivation to learn how to use the technology (Axley, 2008). Nurse educators who have experience with simulation-based training have expressed frustration and anxiety about where to start, especially with high-fidelity simulators (Campbell & Daley, 2013). They struggle with learning how to include these high technology tools within the realm of nursing education, and particularly in the light of faculty shortages. Because nurse educators are already busy, they do not feel they have the time to learn how to use high-fidelity simulators, and so these powerful tools remain in a box unused. Nursing educators have been discouraged by the amount of work required to implement simulation within nursing courses, often becoming confused, frustrated, and overwhelmed by the effort needed to develop scenarios for each course.

Despite advances in technology in healthcare and concerns for patient safety, clinical practice in nursing has not changed significantly for the past 40 years (Tanner, 2006). Traditionally, student nurses have been taught to use nursing processes to

make clinical judgments and then placed in clinical settings with one or two patients. This model of practice is no longer effective and acceptable for today's complex and demanding health care systems (Benner, Tanner, & Chesla, 2010), but some nurse educators do not perceive the need to use simulators as a teaching strategy in nursing education. The view below examines results of studies that explore how nurse educators feel about using simulators in education.

Nursing educators play a vital role in guiding and helping student nurses to learn competency skills, acquire knowledge, demonstrate affective attitudes, and perfect psychomotor skills for a safe professional practice (Hsu, 2006; Tanner 2006). Rogers (2003) describe the significant factors that allow the adoption of innovative teaching strategies. Further, he explained that innovation is an idea, object, or practice that is new to an individual. Before deciding to adopt a new tactic, the individual must consider the following characteristics: (a) *relative advantage*, innovation is perceived as a better idea; (b) *compatibility*, the degree innovation is perceived as being consistent with existing values, and needs adopters; (c) *complexity*, innovation is perceived as difficult to use and understand; (d) *trial ability*, innovation gets experimented with; (e) *observe-ability*, innovation is visible to others.

Rogers performed his study with 71 nurse educators from the Indiana University School of Nursing and the National League for Nursing who had experienced the traditional model in their own nursing education, completed an online teaching course, and they were familiar with innovation teaching strategies. He had a 97% response rate; 58% of his participants were clinical instructors for at least 2 years, 41% taught associate nursing programs, and 30% taught in baccalaureate nursing programs. Of

the participants, 88% were female; 65% Caucasian, 17% Asian, and 13% Hispanic; and 53% had master's degree. The first section of the study was made up of demographic questions, but the second part was about 10 innovative teaching strategies. A five-point Likert scale was used to score each question from 1 (strongly disagree) to 5 (strongly agree). The strategies include: (a) role modeling, (b) coaching, (c) providing guidance, (d) questioning, (e) exploration and application, (f) articulation, (g) reflection and self-awareness, (h) articulation, (i) cognitive task structuring, and (j) managing instruction with feedback. Data analysis for both current use and intent to adopt in the future was completed, and results were documented as follows: (a) allow students to make their own assignments; (b) delegate responsibilities to other student nurses; (c) use scenarios, role playing; (d) use simulation, especially a high-fidelity simulator, live models, games, and communication. The most frequent categories adopted by nurse educators were exploration, application, reflection, self-awareness, case study scenarios using simulation, and critical-thinking assignments. These categories not only encourage student participation and self-direction, but also encourage evaluating one's learning experiences. Roger's innovation decision process can be used in clinical nursing education as teaching strategies.

Feingold, Calaluce, and Kallen (2004) conducted research to evaluate the perceptions of nurse educators and nursing students' using SimMan Patient simulator. Participants were 65 students who were engaged in simulation for two consecutive semesters; the study employed a 20-item tool. Four nurse educators completed a survey, through a 17-item tool. Results showed the majority of faculty and students felt that the simulations were very valuable and realistic, but only half the students felt the

learned skills could be transferable to a real patient during clinical care. Concerns from faculty included problems in getting prepared and lack of faculty to support and encourage the use of technology.

Roles of Nursing Educators

In recent years, questions have been raised about the roles of nurse educators, particularly whether they should place their priorities in academia or in clinical credibility. Demands within higher education force nurse educators to spend more time in the classroom teaching theories and less time at clinical sites (Griscti, Jaccono, & Jacono, 2005).

Nursing educators play a pivotal role in improving the image of nursing**.** Their focus is to facilitate learning. The main duty of nurse educators is to create a learning environment in classrooms and clinical skills lab to facilitate student learning to achieve desirable outcomes (Siela, Twibell, & Keller, 2009). In the past, nurse educators lectured passively and students listened, but in the current paradigm of education, faculty members do not simply teach but rather support a student's learning. For example, instead of lecturing for 2 hours, faculty will engage students in discussions about real-life scenarios. Nurse educators are becoming more creative about how to prepare nursing students. They are using technology, simulators, and computer-based lessons in skills labs (Hausman, 2012). However, Johnson et al. (2006) found that nurse teachers require assistance with simulator use and benefit from workshops that allow educators to experience new learning along with their students. According to Rauen (2001), nurse educators need to design teaching activities based on skill

competencies, course objectives, and learning outcomes. They must focus on five areas: objectives, planning, fidelity, complexity, cues, and debriefing.

- Objectives: When simulations are used, clear written objectives are needed to guide the students for achievable outcomes. Rauen (2001) pointed out that objectives must match the learners' experience and knowledge. In addition, the nurse educator must provide information about the activity, such as the length of time required, process, role, and outcome expectations.
- Planning: A well-planned strategy is necessary to achieve learning objectives. Identifying objectives, providing time frames, guidelines for roles, explaining activity that is relevant to the theoretical concepts, and monitoring the simulation experience all go into the planning nurse educators must do.
- Fidelity: Clinical simulations need to mimic reality. Barrow and Feltovich (1987) reported that a realistic clinical situation should provide (a) a little information to the learner initially, (b) a chance for the learner to investigate freely, and (c) clinical information during the simulation.
- Complexity: Environments should be complex with high levels of uncertainty. Students are aware that problems in patients occur in relationship with one another and must be interpreted as task complexity present in patients.
- Cues: During simulation, the nurse educator can assist students by providing some information about the steps they are taking or approaching. According to Johnson et al. (2006), nurse educators should provide cues only if students are stuck in the activity and cannot go forward.

- Debriefing: Debriefing becomes a valuable tool when used with simulation. It reinforces the experience and encourages the learner to link theory to practice, think critically, and determine what intervention to apply in complex situations. Debriefing occurs at the end of the simulation session so that information and experience can be shared with students.

Several studies reported that knowledge gained from using simulations is retained longer in students than gained from lectures in the classroom.

Educators as mentors. Nurse educators act as mentors to provide guidance, support, and role models for nursing students in clinical settings (Mead et al., 2011). The major component of mentoring is providing personal help to students to become competent and well prepared to practice safely in clinical settings. However, according to Duffy (2003), mentors often pass failing students whose competence is in question. He also suggested that there is evidence that some mentors lack confidence to guide students in practice settings. It is now the intention of nursing schools to further explore effective and safe practices of mentoring in nursing education.

Peters and Boylston (2006) identified three areas where support should be given to help nurse educators' transition into the role of mentors: (a) orientation to the nursing program and facility; (b) instruction on how to develop a syllabus, prepare a lecture, oversee clinical orientation, and grade students; and (c) how to work with challenging students who require extra attention. It is necessary for schools to invest time and money to support educational and professional growth of nurse educators.

Why Simulation Training is Important

According to Campbell and Daley (2013), nursing schools need to address issues that are troubling in nursing education. Some of these issues include shifting roles of the nurse educator, the influence of technological advances on theoretical and conceptual aspects of nursing education, nursing faculty shortages, and the expectations that nursing school graduates will be able to perform effectively in a complex demanding health care environment. Simulation techniques in a variety of scenarios can help provide an environment where students can learn skills in effective communication, delegation, and critical thinking that can help ensure patient safety (Jeffries, 2005; Tanner, 2006).

According to Ravert (2002), the effectiveness of simulation-based training is influenced by factors in three levels: environmental, equipment, and psychological. Environmental fidelity relates to the realism of the clinical environment where the simulation takes place, while the hardware and software of simulators affect the equipment. Both factors affect the way students perceive whether the simulation represents reality.

Role of simulation in nursing education. Because of technology advancement in nursing education in the past decade, the nurse educators now recognize that simulators are valuable tools for education and acquisition of knowledge (Childs & Sepples, 2006; Henneman & Cunningham 2005; Jeffries, 2005). Today's students study in a digital culture and learn through innovative approaches with integrated technology (Jeffries, 2005). In order for nursing schools to provide optimal

learning experiences, they need to incorporate technology to achieve outcome objectives in educational practices.

The obstacles to simulation-based training. There has not been a smooth transition into the kind of nursing training that relies more on technology. The need for nursing programs to purchase simulators, renovate space, and hire educators to work with the technology has slowed simulator-based training. Integrating simulation throughout the curriculum requires faculty support, encouragement, and faith (Campbell & Daley, 2013). Most nursing faculty members are comfortable working with computers for basic tasks, but high-fidelity simulation requires more sophisticated technological skills. Finding the time and resources to train faculty in how to use simulators could be a very daunting task.

Specific benefits of simulation-based training. Murray et al. (2008) discuss the use of simulation in nursing education, stating that "simulation is strategy to enhance clinical competence" (p. 5) and that simulation promotes better decision-making, problem-solving, and creative thinking. Stakweather and Kardong-Edgren (2008) suggest that "the best outcome with simulation is to integrate across a curriculum" (p. 2). Simulations enhance effective communication, which could help reduce patient mortality and morbidity caused by miscommunication in real-life settings.

Nurse Educator Perceptions of High-fidelity Simulators

The National League for Nursing (2005) issued a statement that nurse educators must create "learning environments that facilitate student's critical thinking, self-reflection, and prepare graduates for practice in a complex, dynamic health care environment" (p. 1). With the advancement in technology, some nursing schools have

revolutionized their teaching formats and clinical settings instruction by including different types of simulators that allow nursing students to practice psychomotor skills and gain knowledge (Axley, 2008; Decker et al., 2008). The Institute of Medicine (IOM, 2010) stated the future of nursing lies in encouraging nursing educators to use technology, such as high-fidelity simulators, as an important component of nursing education.

High-fidelity simulators are effective teaching and learning tools. Abdo and Ravert (2005) reported that high-fidelity simulators can increase technical and decision-making skills. He studied 48 baccalaureate students in a medical/surgical course who had 1 hour of simulation experience. After the simulation, the students completed a satisfaction survey. Only 17 students responded to the survey, and all reported that they experienced an increase in technical and decision-making skills.

Nurse educators might be reluctant to use simulation-based training. Factors that limit nurse educators' use of high-fidelity simulators were studied by King et al. (2008). Twenty-one nurse educators were asked open-ended questions; according to survey results, 62% of educators reported they had little training in how to use high-fidelity simulators, and 73% did not attend any educational programs for their use. King et al. found that the nurse educators overall did not have a positive attitude toward the technology and lacked confidence in the use of high-fidelity simulators. The researchers concluded that a nurse educator's attitude toward technology was the most important factor in whether and how high-fidelity simulators would be utilized in their teaching. This study also identified other challenges, such as nursing educators' lack of

time, support, education, or training when trying to adopt high-fidelity simulators into curriculum.

Starkweather and Kardong-Edgren (2008) studied the use of high-fidelity simulators in nursing programs in Washington. They applied the diffusion of innovation theoretical framework to their study and found that nurse educators' interest and enthusiasm must be sparked to increase the acceptance of high-fidelity simulators in nursing teaching programs.

Harlow and Sportsman (2007) also reported on barriers in the use of high-fidelity simulators in nursing education. The biggest barriers to the adoption of this type of technology included programs' lack of space, time, funding, staff, and training to properly utilize simulators and develop scenarios; educators' fear of making errors while operating complex equipment; and lack of support from administrators.

To evaluate nurse educators' comfort in using high-fidelity simulators, Jones and Hegge (2007) conducted a study with 29 nurse educators. They utilized a questionnaire with responses recorded on a Likert scale of 1 to 5, with 1 being *no comfort* and 5 being *very comfortable*. They reported the highest level of comfort was a mean of 3.03, and lowest level of comfort was a mean of 1.9 to utilize high-fidelity simulators to replace lecture, and a mean of 1.62 for use of high-fidelity simulator to replace clinical hours. They said variables such as educators' comfort and interest levels could be barriers in using the high-fidelity simulators.

To utilize high-fidelity simulators in education requires faculty training. Nguyen, Zierler, and Nguyen (2011) conducted a survey to evaluate nurse educators' needs for training in the use of technology. A total of 193 educators participated and responded

to distance education, simulation, telehealth, and informatics technologies. Results showed that 59% felt competent in distance learning, 70% reported that they were novices in simulation, 68% were novices in telehealth, and 65% were competent in the use of informatics. The researchers found that educational level, age, and teaching institution were not associated with the use of simulation technology. Results showed that 59% felt competent in distance learning, 70% reported that they were novices in simulation, 68% were novices in telehealth, and 65% were competent in the use of informatics. The researchers found that educational level, age, and teaching institution were not associated with the use of simulation technology.

Nurse Student Perceptions of Simulation-based Training

Researchers believe simulation-based training facilitates learning (Benner, 1984; Issenberg et al., 2005; Smith & Roehrs, 2009) and can help nursing students achieve their educational goals. Nursing educators want to know how well simulation assists learners to acquire knowledge and skills, develop confidence, and improve critical thinking when compared to traditional clinical education (Hughes, 2005; Kuznar 2007). Bambini (2009) conducted a study with 162 participants nursing students from different backgrounds, who completed a survey on their perceptions of simulation experiences. They were asked to rank the learning outcomes, with number 1 being the highest achievement and 5 the lowest. The results indicated that the students believed the simulation-based training most helped them develop critical thinking, nursing skills, and perceptions of collaboration and teamwork were increased toward later semesters in school. Students gave lowest marks to the idea that simulators helped improve communication skills and technology knowledge.

Recently, these of high-fidelity simulators have been used in educational programs as a substitute for actual clinical experience. The National Council of State Boards of Nursing (NCSBN, 2009) conducted a pilot study in Rush University College of Nursing in Chicago to examine the differences between traditional clinical experience and experience based on simulation in a pre-licensure nursing program. The study also analyzed the impact of simulation on knowledge, confidence levels, and clinical performance of undergraduate students to compare with traditional clinical experience. All 92 participants were students in two separate cohorts (2006 and 2007). A total of 58 students (cohort 1 = 23; cohort 2 = 25) chose to participate in this study, and students who chose not to participate were assigned to the *usual treatment* group. Measurements of self-confidence as well as knowledge acquisition and retention were taken before and after clinical simulation experiences, and clinical performance was assessed after clinical or simulation experiences.

Students in the simulation group were exposed to critical care scenarios that emphasized assessment and interventions, while students in clinical experience were provided supervised access to a variety of critically ill individuals. Students were given pre and post written examinations with simulation experience. All examinations were scored on a scale from 0 to 100%. The performance of each student was analyzed based on professional behavior, assessments, and interventions. The evaluation tools consisted of four dimensions: (a) patient-nurse relationships, (b) sign and symptoms recognition, (c) assessment, and (d) interventions. Self-confidence variable was measured on a Likert-type scale with higher scores indicating higher self-confidence. The results were 0.93 for pretest and 0.96 for post-test. Of the 58 students, no

statistically significant differences were noted in the demographic variables. Students in the simulation group had a statistically significant increase in their measure of self-confidence ($p < 0.05$), but there was no significant change in self-confidence for participants in the clinical group. From this study, the researchers concluded that a combination of simulation training with clinical experience may provide the best performance outcomes.

According to Peteani (2004), high-fidelity simulators expose the students to specific clinical experiences that provide opportunities to perform interventions to meet specific learning objectives. Two significant challenges using high-fidelity simulators are to focus on critical, emergency situations (focused on reactive behaviors), and the second measuring and evaluating students' competence outcomes. When a student is faced with critical conditions, his or her actions will be guided by prior experiences. Lack of information on how to react to emergency situations will (a) limit reactive behaviors, (b) limit the student's ability to differentiate clinical warning signs, and (c) identify patient problems.

Child and Sepples (2006) and Nehring (2008) reported that active learning can achieve competencies. They acknowledged that nursing students through various active learning can acquire knowledge, critical thinking, and psychomotor skills and transfer these skills into clinical practice. One technique being used to teach these skills is simulation.

Cook et al. (2011) stated that simulation training in nursing education provides outcomes of knowledge, skills, behaviors, and effects on patient outcomes. Further

research is necessary to clarify where and how to use technology simulations for training nurse educators and healthcare professionals.

Nursing students in this study reported high level of anxiety using high-fidelity simulators. High anxiety cannot only influence students' learning, it can impact decision-making and clinical performance. Use of high-fidelity simulators in learning can provide nurse educators the opportunity to exercise the theory of *andragogy*, or teaching strategies developed for adult learners. Knowles (1989; 1990) described adult students as less able to learn under strict and observational methods. Rather, they learn best through their own experience, motivation, and concepts that are focused on real life situations. Knowles also reported that anxiety is least likely to occur when there is mutual trust and respect, physical comfort, assistance, and acceptance in the learning environment. By contrast, anxiety levels will increase when students are being watched, judged, and made to feel incompetent while using simulators. Rhodes and Curran (2005) reported that nursing students get overwhelmed in simulation labs for their lack of knowledge and experience.

To decrease students' anxiety level using high-fidelity simulators, the application of adult learning theory should be considered. Students learn based on their perceptions of knowledge on high-fidelity simulators, the benefits, and applicability to their nursing career. Some barriers in learning and motivation could be lack of resources, lack of orientation to simulation environments, overly large groups of students, and not having the access to simulators for practice.

A pilot study was conducted to examine students' anxiety level, self-confidence, critical thinking, and competency skills in very complex clinical situations. Students

completed a self-evaluation survey, which consisted of 13 questions, and reported their perceptions of the simulation experience. The nurse educators observed how the students worked as a team, communicated, demonstrated critical thinking, and made decisions based on their judgments. Their findings supported their hypothesis that high-fidelity simulators can enhance learning, increase critical skills, and decrease anxiety level.

Schoening et al. (2006) studied undergraduate students in a non-threatening clinical environment. Findings reported that hands-on practice increased students' perception of self-confidence, self-concept, teamwork, critical thinking, and communication. They suggested that students in clinical environment should be responsible for self-directed learning and that the environment must be free of oppression. Otherwise, students may lose feelings of respect, motivation, and confidence needed learning new skills. Learning in a safe environment minimizes a sense of failure (Casey, Finek, Krugman, & Propst, 2004).

Experiential learning provides the opportunity for students to see real-life consequences and patient problems. While high-fidelity simulators have the potential to add value and support in development of clinical judgment skills, they also risk increasing the anxiety level in students. Lasater (2007) examined nursing student experiences with developing clinical judgment skills using high-fidelity simulators. The study was conducted in the Oregon Heath and Science School of nursing. Two groups of 12 students participated in simulation lab using high-fidelity simulator twice a week for 2 1/2 hours per group. The nurse educator provided a scenario caring for a patient with respiratory problem that required immediate action. In each group, there was one

student designated as the primary nurse, responsible for patient care, intervention, and delegation to group members. Results from this study suggested that students start having anxiety in the beginning of the scenario, and some reported feeling inadequate as a primary care giver. In a debriefing session, students communicated what they should have done in retrospect. In spite of anxiety experiences, they did report that the scenario supported learning, collaboration, and flexible thinking with interventions and clinical judgment. The simulation lab provided situations that challenged students to integrate their learning into practice and debriefing, and use alternative interventions suggested from other members of group.

Nursing Schools Consider Curriculum Redesign

In response to challenges in healthcare, nursing schools throughout the country are redesigning curriculum to identify more efficient and effective education strategies (Kalb, 2008; Medly & Horne, 2005). When graduate nurses enter the profession, employers demand a higher level of competency and skills for today's complex healthcare environment. The National League for Nursing (2005) developed a set of standards of practice for nurse educators, which provided a comprehensive framework for lifelong learning. It is paramount that these standards be integrated in nursing curricula, with their role descriptions and evaluation processes. With focusing on the core competencies, nurse educators will be required to advance their own practice and transform the future of nursing education.

Teaching Criteria for Nurse Educators

Eight core competencies of nurse educators are: (a) facilitating learning, (b) facilitating learner development and evaluation strategies, (c) using assessment and

evaluation strategies, (d) participating in curriculum design and evaluating program outcomes, (e) functioning as a change agent and leader, (f) pursuing continuous quality improvement in the nurse educator role, (g) engaging in scholarship, and (h) functioning within the educational environment.

In 2010, the Nursing of Future, Competency Committee began revising definitions of the core competencies by the National League for Nursing (NLN) and developing a set of core competencies for all nurses of the future. These guidelines now are being used as the framework for curriculum redesign and a transition into practice model that can positively impact patient safety, improve patient care, and provide a competent nursing workforce. The model represents 10 essential competencies that guide nursing curricula and practice. These competencies include: patient-centered care, professionalism, leadership, systems-based practice, informatics and technology, communication, teamwork and collaboration, safety, quality improvement, and evidence-based practice.

These competencies are designed to be applicable in all care settings. Therefore, some nurse educators will need to use a set of different knowledge and teaching strategies to integrate these nursing core competencies into their curriculum. The 10 competencies were further articulated using the knowledge, attitudes, and skills (KAS) approach that are the affective, cognitive, and psychomotor domains of learning (National League for Nursing, 2010). The following are requirements for student nurses and nurse educators for the nursing education:

1. Licensure: All RNs must have a nursing license to practice and to teach. In order for RNs to become licensed, they must graduate from an approved nursing

program and pass the NCLEX-RN. An active registered nursing license with continuing education is mandatory in the United States.

2. Educational certificate: Certification in nursing education is marked as professionalism, which faculty must demonstrate in their specialty. It shows students, peers, and the academic field that the highest educational standards of excellence in skills, communication, practice, and knowledge are being met. Certification in specialty areas is voluntary in some states and mandatory in others. Some employers may require it.
3. Education: A master's or doctoral degree in nursing is required for nursing educators; nursing programs prefer for their faculty to possess a doctoral degree in nursing, or a related field with a major emphasis in nursing education. Some schools allow nurses with bachelor degrees to teach in clinical settings only.
4. Experience: Two or more years of employment as academic faculty in nursing schools to teach particular nursing course work.
5. Research: Nursing educators must have the ability to write journal articles, make presentations at conferences, and apply for outside research funding. They should be able to communicate effectively and able to create and work in a collaborative environment.
6. Critical thinking skills: Nurse educators should be able to assess changes in educational settings, technology, and nursing practice to be able to take corrective actions and make decisions.
7. Compassion: Nurse educators should be caring, sympathetic, and have emotional intelligence.

8. Emotional stability: Nurse educators need emotional stability to cope with educational changes, technology advancement, and stress.
9. Patience: Nurse educators should be patient so that they can perform under stressful circumstances.
10. Communication skills: Nurse educators must be able to talk clearly and effectively, facilitate discussion, engage students in classroom activities, create teamwork and collaboration, instruct with demonstrations and with hands-on activities, and meet the student's learning needs.

Nursing Student Requirements

To fulfill all state training requirements and become a licensed registered nurse (RN) in the state of California, students must earn an associate degree (ADN), or bachelor of science in nursing (BSN), or a master's degree in nursing (MSN) from an approved nursing program. Licensed practical or vocational nurses (LPN, LVN) must complete an educational nursing program and pass a board exam to earn their nursing license before they can work. LVNs usually work under the supervision of registered nurses and physicians (Bureau of Labor Statistics, 2012).

Students generally take from 2 to 6 years to complete nursing school, depending on the curriculum and type of degree. An associate degree in nursing (ADN) usually requires 2 to 3 years, a bachelor in nursing (BSN) up to 4 years, and a master's degree in nursing (MSN) generally takes about 2 years beyond the BSN to complete. The time required for the licensed vocational and practical nursing training generally ranges from 1 year to 15 months. Some nursing schools offer combined nursing degrees, such as LVN-BSN, RN-MSN, and even BSN-PhD. Nursing students are required to take

courses in anatomy, physiology, psychology, microbiology, nutrition, social and behavioral sciences, ethics, and humanities. Bachelor's and master's degree programs usually include training in critical thinking, communication, leadership, and clinical experience. A higher degree in nursing is necessary for teaching, consulting, research, and administrative positions (Bureau of Labor Statistics, 2012; National League for Nursing, 2010).

The National League for Nursing (2013) reported that in the Fall of 2012, 39% of applicants into nursing programs were accepted, 33% were rejected because they were not qualified, and 28% were qualified but not accepted. The percent of qualified applicants by nursing programs in Fall of 2012 for the diploma, BSN, MSN, and DNP was substantial. According to the NLN, 30% of the qualified-but-rejected applicants were turned away because of lack of nursing program faculty, 44% because of a lack of clinical placements, 10% because of a lack of classroom space, and 15% for other reasons. Graduate programs reported lack of faculty as the primary obstacle to an expansion of nursing programs.

Licensed registered nurses who do not have direct patient care because they work as nurse educators, healthcare consultants, research nurses, or in hospital administration, still must keep their nursing licenses active. Some registered nurses continue their education in nursing specialties, such as clinical nurse specialist, nurse anesthetists, nurse midwives, and nurse practitioners, all positions that require a master's degree in nursing and a certificate in the specialty area (Bureau of Labor Statistics, 2012). In 2010, 2.7 million nurses were employed in a heath care position. Table 9 gives a breakdown of where nurses were employed.

The remainder of nurses is working in government agencies and administration services. In 2010, 20% of registered nurses worked part-time. Employment for RNs is expected to grow 26% by 2020 because of technological advancements in healthcare and an increase in preventative care (Bureau of Labor Statistics, 2012). In addition, a large segment of the current population is entering retirement and needing more age-related care.

Table 9

RN Employment in Health Care

Where RNs are employed in United States	Percentages
General hospitals (private)	48
Physicians offices	8
General hospitals (local)	6
Home health care services	5
Nursing care facilities	5
Nursing educational services	21
Consultants	0.9
Researchers	0.7
Informatics	0.3

Note. Based on Bureau of Labor Statistics, 2012

According to the National League for Nursing (2009), 25% of full-time nursing instructors were between the ages of 30 and 45; 60% were between 46 and 60; and 13% were 60 or older. For part-time nurse educators, 39% were 30 to 45; 46% were 46

to 60; and 9% were 60 or older. The vast majority of nurse educators were female: 95% of full-time nurse educators and 94% of part-time educators.

According to the American Nurses Association (ANA; 2011), there are 3.1 million licensed registered nurses in the United States, and 2.6 million of those are employed in the nursing profession. The average age of employed RNs is 45.5, and the average age RN annual salary in 2008 was $66,973. Table 10 provides a snapshot of some other characteristics regarding registered nurses in the United States.

Table 10

Characteristics of RNs and Nurse Educators in the United States

Characteristics of nurses and nurse educators	Percentage
RNs age 50 or older	45
RNs from a racial or ethnic minority group	16.8
Male RNs	6.6
RNs with baccalaureate or higher degree	50
RNs with a master's or doctoral degree	13.2
Employed RNs working in hospitals	52

Note. From ANA (2011).

When looking toward the future, the ANA (2011) projects a shortage of 260,000 nurses needed to meet healthcare demands by 2025. Current nursing education programs cannot meet demands, as is shown by statistics from recent years. Although enrollment in entry-level baccalaureate nursing programs increased by 3.5% in the 2008-2009 school year, 54,991 qualified nursing school applications were turned away in 2009 (ANA, 2011). A nurse faculty vacancy rate of 6.9% in 2010 hampered efforts of

students to get into nursing programs, and because 60% of nurse educators are 50 years old or older, the problem may get worse in the near future as those educators retire (ANA, 2011).

Simulation Helps Resolve Concerns about Patient Safety

Another aspect of nurse educators' responsibilities is to introduce patient safety in clinical practice (Blum & Parcells, 2012; Institute of Medicine, 2000; Napier & Youngberg, 2011). Patient safety is one of the biggest concerns for healthcare organizations. Patients suffer injuries and even death because of medical errors and lack of training among health professionals. Patient safety is achieved through education and training to avoid or minimize harm to patients (Cronenwett et al., 2007; IOM, 2004). In 2000, the Institute of Medicine (IOM) reported alarming numbers of preventable medical errors to patients and challenged the health providers and educational institutes to develop a culture of learning that would apply principles to ensure patient safety instead of blaming the individuals who were involved in harmful events.

Medical errors kill up to 98,000 patients annually and cost $37 to $50 million, while the bill for preventable adverse events is $17 to $29 billion. Deaths in hospitals due to preventable adverse events are the eighth-ranking cause of death, which exceeds the number of deaths from AIDS, cancer, and motor vehicle accidents in the United States (Napier & Youngberg, 2011).

The IOM focuses on patient safety and developing policies and practices that will create a safe and high-quality environment. Patients must rely on educational institutes and health care professionals for their safety and well being (Institute of Medicine,

2012). In 2006, the IOM reported that 1.5 million preventable medication errors occur each year in the United States, which means, on average, a hospital patient is subjected to more than one error each day. The Joint Commission on Accreditation of Healthcare Organizations (JCAHO, 2007) targeted improving medication safety to accurately and completely reconcile medications across the continuum of care. Research has shown that medication errors usually occur during administration and at the time of the prescription. Medication errors related to nursing practices involve inappropriate medication dosage, allergies, wrong drug, and wrong administration site. All of these errors are usually caused by miscommunication, wrong labels, and environmental distractions (JCAHO, 2007; Wolf, Hicks, & Serembus, 2006). Miscalculation of medication dosages also has been related to weak math skills and lack of practice in clinical settings (Wolf et al., 2006), although medication administration is an important aspect of nursing education curricula.

Innovative simulation processes for training in these areas are now being used to help medical professionals reduce the number of safety errors. According to Nishisaki, Keren, and Nadkami (2007), simulation training on manikins improves healthcare organizations as well as employees' competence, self-efficacy, and performance in clinical settings. There is no hard evidence that simulation does improve patient outcome, but research has shown simulation training to improve patient safety.

Bremner et al. (2006) reported the benefits and limitations of using METI HPS as a substitute for a clinical day in the course. Each student was involved in a 2-hour scenario. After the simulation activity, the students were asked to fill out a survey with a Likert type scale (1 = *strongly disagree* to 4 = *strongly agree*), and three open-ended

questions. Findings showed that the HPS simulation increased knowledge of medication side effects (*M* = 3.13), increased knowledge (*M* = 3.31), increased ability to administer medications safely (*M* = 3. 06), and increased confidence in medication administration skills (*M* = 3.00). All responses to open-ended questions were positive.

According to Leigh (2011), a study found that when Generation X and Millennial students begin nursing programs, they expect simulation to be a part of their education. Leigh in his study identified the benefits of simulation not only in certification courses, but also in training nurse educators and student nurses while ensuring patient safety.

Simulation Helps Ameliorate Recent Nursing Faculty Shortage

Nurse educators are needed more than ever, but concurrent shortage of nurse educators will have a significant impact on preparing nursing students to address the shortage of well-trained nurses. Nurse educators continue to be in demand, and nursing schools often struggle to find qualified instructors to fill the teaching positions. The present shortage impacts both nursing education and healthcare organizations to increase the number of nurse educators, especially those who can teach clinical skills to future nurses (American Association of Colleges of Nursing, 2012; Cangelosi, Crocker, & Sorrell, 2009).

According to the American Association of Colleges of Nursing (2012), baccalaureate and graduate programs in nursing in the United States turned away 75,587 qualified applicants in 2011 due to lack of nursing faculty, classroom space, clinical sites, and budget constraints. The report also identified 1,181 faculty vacancies in a survey of 662 nursing schools across the country. About 88.3% were for positions that preferred a doctoral degree.

The main reasons nursing schools have difficulty finding faculty is due to a limited pool of qualified nurses with doctoral degrees. Furthermore, salaries for teaching are significantly lower compared to salaries for clinical nursing practice. The average salary for a practicing nurse is $80,000, but the average nursing faculty salary is about $50,000. Practicing nurses with master's degrees specialized in practical areas are often paid $120,000 a year, but a nurse educator after 10 years of teaching generally is paid $75,000 (Fitzgerald, Kantrowitz-Gordon, Katz, & Hirsch, 2012; Hausman, 2012).

Another factor contributing to faculty shortage is that the average age of nursing faculty members with doctoral degrees for full associate professor, and assistant professor are 60.5, 57.1, and 51.5 years respectively, when the average retirement age is 62.5 (AACN, 2012b; National League for Nursing, 2010). Only 12% of nurse educators are younger than 34 years (Siela et al., 2009).

Doctorate of Nursing Practice (DNP) programs have been developed and implemented in many universities. The American College of Nursing recommended that by 2015, the DNP should replace the master's degree in nursing. As DNP programs increase, more educators will be needed, which will increase the nursing faculty shortage (Siela et al., 2009).

Another factor contributing to the nursing faculty shortage is lack of training provided for newly hired nurse educators. Many nurse educators enjoy sharing their nursing knowledge and expertise, but they are not prepared to step into the teaching role (Cangelosi et al., 2009). Stanley, Capers, and Berlin (2007) recommend that nurse educators' assignments should be made based on their expertise and interest. The

nursing department administrators should include faculty in nursing committees to increase their sense of belonging and also to provide opportunities for leadership development in academia for successful retention (Moody, 2004; Stanley et al., 2007).

The nurse educator academy is designed for part-time or full-time at the baccalaureate or master's level, moving from expert to novice. Benner (1984) stated that as nurses move from practical area of expertise to a new role, they should become novices again. This transition into a new role can create anxiety and tension (Benner 1984; Ebright, 2004; Forbes & Jessup, 2004; Gershenson, Moravick, Sellman, & Somerville, 2004). Benner (1984) believed that nurse educators are aware of their responsibility, calling, and experience, but lack theoretical knowledge to build their teaching practice. They may be expert clinical nurses, but they are novice nurse educators. He also described how novice nurses learn best in structured learning environments, and experienced nurses learn best with experiential learning strategies. Research has shown that much of the frustration that arose when moving from a nursing role to a nurse educators' role came from having little guidance and being thrown into the new role with no formal orientation or training. They were expected to perform well without receiving preparation for their roles (Cangelosi et al., 2009).

Summary

High-fidelity simulation techniques have not yet been developed to their fullest potential in nursing education, while viewed positively by learners. Most of these studies on simulation have been valuable, to justify a powerful and superior tool for instruction and student investment.

Using different types of simulators and simulation techniques in teaching and learning is a challenging, complex, and multifaceted idea. As simulation becomes more prevalent in clinical practice, nurse educators will be obligated to teach with simulation. The available literature on simulators provides evidence to show that simulation is beneficial in nursing education and contributes to knowledge, skills, confidence, and patient safety. There is also a strong theoretical base for its use. However, it will be difficult to convince nursing schools and nurse educators to make enormous investments in high-fidelity simulators unless nurse researchers conduct more experimental studies and develop more validated measures that can prove the worth. Pioneering innovation is not an easy task, but if we believe the Chinese proverb that states, “I hear, I forget; I see, I remember; I do, I understand,” the introduction of high-fidelity simulators in education can succeed.

Chapter 3: Methodology

This chapter focuses on the methodology of the study used to answer questions about the use and perception of simulator-based training in nursing education. Data was gathered from a sample nurse educators and a sample of nursing students who have used different types of simulators in clinical settings. The questions asked of the educators and nursing students were based on reviews of previous research on simulator-based training.

In this chapter, five sections presented include: (a) explanations of how nurse educators and students were selected for this study, (b) qualifications of the researcher, (c) data collection procedures, (d) protection of human rights of study participants, and (e) data analysis strategy.

The study used a descriptive research design, which the Office of Human research Protection (OHRP) defines as research collected without changing or manipulating the environment. Data used univariate analysis including frequencies, averages, and percentages.

The following research questions were examined:

1. What are nurse educators' perceptions of using simulators to train student nurses in a clinical setting?
2. What are student nurses perceptions of using simulators to receive training for practice in a clinical setting?

Researcher's Qualifications

The researcher in this study was a registered nurse for over 20 years and currently is a nurse educator and a member of the Nursing Service Association. The

researcher teaches in nursing, business leadership and management, and medical programs that focus on the use of low- to high-fidelity simulators as a teaching and learning strategy in nursing education.

Population and Sample

Study participants were adult nurse educators and student nurses from colleges and universities in the first and second years of a registered nursing, or licensed vocational/medical programs, RN-MSN, and also RN-BSN nursing programs in California. Study participants included both female and male nurse educators and students from different age and ethnic groups, who spoke a variety of languages, and have received or delivered education with simulators. In this study, 26 nurse educators and 296 nursing students participated. The designated facilities were West College, State University, Bridge College, and Coast University (pseudonyms). Table 11 shows the number of participants in each site.

Table 11

Number of Nurse Educators and Students at Each Site

Participants	West College	State University	Bridge College	Coast University	Total
Nurse educators	2	7	6	11	28
Students	27	97	112	60	296

Participants were from designated nursing schools from licensed vocational nursing (LVN), registered nursing, baccalaureate, and master's nursing programs. Participants were selected with the permission of nursing school administrators. The researcher contacted nursing school administrators, set up start dates, and discussed

how many nurse educators and students would be allowed to participate. The nursing administrators were given summary of the proposal. The purpose of the study and consent form (see Appendix B) was provided for nurse educators and students who voluntarily chose to participate in this study. IRB and permission to conduct research was obtained from all participating institutions.

Research Design

The research design was descriptive and based on data collected through surveys without making any changes to the environment. The purpose of this study was to find out how different types of simulators are used by nurse educators and students in four nursing schools.

Survey Development

The surveys were developed by the researcher using the literature review on simulator-based training to guide question development. Specific emphasis was made on perceptions of nurse educators and nursing students. These survey questions were reviewed by three experts from nursing schools: (a) Rebecca Otten, RN, Ed.D., coordinator of the nursing program at Fullerton; (b) Barbara Doyer, RN, coordinator of the simulation lab at Fullerton School of Nursing; and (c) Christina Lee, RN, MSN, nursing faculty at Moorpark College. After revisions were made based on input, Dr. Rebecca Otten provided a separate review of the final version.

The survey for nurse educators includes questions intended to help educators identify major challenges or obstacles in their teaching environment and their perceptions of using simulators for clinical practice. This survey has two parts. Part 1 includes a series of questions including years of experience as a nurse educator, years

of experience teaching with simulators, highest level of education, types of simulators used, role as a nurse educator, as well as perceived challenges, benefits, and learning outcomes resulting from high simulator use in clinical education. Part 2 included the extent of experience and familiarity with using high-fidelity simulators for teaching specific procedures. Participants were asked to select responses that best reflect their experiences. This survey examined nurse educators' perceptions and experiences with the use of simulator-based training.

The student survey included only one part, with questions focused on level of educational program, as well as experiences, perceived challenges, and benefits from use of simulators in their clinical training. Each survey required approximately 5 to 10 minutes to complete.

Pilot Study

First pilot study was conducted at California State University in Fullerton on June 17, 2013. Twenty-four nursing students participated. Second pilot study was conducted in West College, on August 12, 2013, only six students participated. The goal of this pilot study was to provide insight into the validity and reliability of the study and to guide any needed changes to the survey tool. According to McMillan and Schumacher (2010), a pilot study is a "trial done in preparation for the major study" and to "pre-test" a particular research instrument.

The pilot study helped to assess the feasibility of the survey, modify any needed changes to the design protocol for the major study, identify potential problems with distributing surveys, and to determine what resources were needed to enhance the research process (McMillan, & Schumacher, 2010).

To conduct the first pilot study, the researcher arranged to meet with the coordinator of a nursing program. The coordinator took the researcher for a tour of the simulation lab that includes different types of simulators from low- to high-fidelity. After our tour, we met 24 nursing students at different levels of their education. The researcher described the topic and the purpose of the study. Students were asked to provide feedback on the pilot study. No questions were asked after introduction to the study was made. The survey was distributed to all 24 nursing students, who were studying in a combination RN-BSN, RN-MSN, and LVN-BSN program. The second pilot study was conducted in the same manner.

As the students completed the survey, the amount of time needed was estimated at a range between 4 and 7 minutes for an average of 6.5 minutes to complete. All surveys were collected and checked for any incomplete of missing responses. After reviewing the completed surveys, two questions were revised and reworded based on students' responses and questions asked while completing the pilot survey.

Validity of Survey

Validity and reliability are traditional standards used to judge the quality of research studies and must be addressed in all studies. Studies must have high quality and findings must be dependable and trustworthy (Merriam, 1998). Validity in research has been defined as the ability to determine whether the collected data measured what it was supposed to measure (Cohen, Denzin, & Lincoln, 2005). Creswell (1998, 2003) defines validity as the strength of the research method in achieving accuracy in the findings from the perspective of the researcher and participant.

Cohen et al. (2005) say fairness in reporting will increase the validity of the research. A truthful reporting from the surveys would represent an authentic interpretation (Creswell 2009; Silverman, 2001). Another step to establish the validity of the findings would be to relate it to the review of existing literature (Strauss & Corbin, 1990).

In this study, attempts to assure validity of questions included a literature review of materials collected from a wide variety of sources including nursing books, magazines, and articles, on simulator topics published within the last decade.

The researcher informed the participants of the purpose of the study and its value to the nursing profession. Certain sensitive variables were avoided for demographic questions such as age, color, and citizenship in order to assure a high participation rate and to prevent discomfort. Each participant received a code number as a form of identification. Personal names were not required as an effort to maintain confidentiality. All data was stored securely in a locked cabinet.

Reliability

Merriam (1998) describes reliability as the ability for research results to be replicated or repeated, which is based upon the assumption of the existence of a single reality. Creswell (2009) defines reliability as “an examination of the stability or consistency of responses” (p. 191). The researcher in this study will focus on the ability to replicate results and its internal consistency in data collection. If the consistency of the questionnaire (survey) results in the same answers over and over, then the instrument is stable. If the degree of stability is higher, it will result in higher degrees of

reliability, which means the results will be repeatable. A reliability test was conducted using SPSS, and the measure was determined to be adequate.

Data Collection Procedures

Educators and students received separate survey questions (see Appendix C & D). The researcher met with educational department administrators from designated facilities to seek approval to conduct this study. The research proposal, purpose of this study, a letter from Pepperdine University with IRB approval, a form requesting the institution's consent, participant consent forms, and copies of both surveys were given to the appropriate nursing school administrators (see Appendix A, B, C, and D). Administrators were also assured of the time needed to complete the study (5 to 10 minutes) and steps taken to ensure privacy and confidentiality of the participants.

Administrative approval. The researcher met with nursing school managers or directors. During these meetings, the researcher provided all relevant materials including the surveys and a letter from dissertation chair confirming researcher confirming the researcher's educational status in doctorate program. The researcher contacted four different facilities to set up start dates to discuss how many people would be allowed to participate during working hours. The nursing directors were informed of the purpose of the study, procedures, confidentiality, and told of what benefits simulators might provide for both nurse educators and students. A copy of the proposal was given to each director. The informed consent forms (see Appendix A & B) were provided.

Once permission was granted from all four schools, the researcher met the educators and students on campus in the classrooms and also in faculty meetings to

distribute the surveys with consent forms by hand, face-to-face, and collected all completed surveys. An introduction summary of the proposal was given, directions how to complete the survey, and encouragement to ask questions and give feedback. Participants were informed for any reason they could discontinue their participation at any time. They were ensured that the collected data would be locked in a cabinet of the researcher for at least 3 years after completion. The data will be kept confidential at all times. Total of 296 students and 26 educators participated in the study.

The following is a list of forms and permissions that were used in the study.

- Appendix A: Permission request from nursing directors
- Appendix B: Volunteer participant research consent form
- Appendix C: Nurse educators' survey
- Appendix D: Students' survey
- Appendix E: Matrix of Research Questions
- Appendix F: IRB Approval Letter for Research
- Appendix G: Permission Letters From Participating Colleges and Universities

Field notes. The researcher received support from nursing administrators for this study. The field notes began from August 2013 to December 2013. The initial field notes took place with pilot study. The researcher met the nursing education coordinator in her office in the nursing department, and then toured in the university. The researcher visited simulation lab and met a couple of faculty members. The simulation lab was a large space occupied with many different types of simulators. High-fidelity simulators were placed in bed like live patients. The simulation lab was very clean and neat. We met students in a classroom with educator. The researcher took 5 minutes to

introduce herself and gave a summary of research proposal. Thirty two students participated and based on their comments, one of the survey questions was revised.

Following the pilot study and after IRB approval, the researcher met each school administrator in person with an appointment. The researcher met nurse educators and director in a faculty meeting at school and discussed about the study. All surveys were collected in the same manner, except at Coast University, where the researcher met 60 educators in a faculty meeting in a big conference room. At Coast University, the students' survey was distributed through the instructors in the classroom. All surveys were collected in person, coded, and placed in a safe place. During these meetings, the researcher met each nurse educator and had informal conversations regarding simulators. The researcher got the impression that faculty members were interested to assist the researcher and be a part of the study.

The researcher observed the students while they were engaged in completing the survey. Students were from different backgrounds and different age groups, with the majority being female. The researcher took notes for the number of participants in each school and comments that were made by both educators and students.

Protection of Human Subjects

The researcher acted in accordance with ethical principles and standards to ensure that research participants will not come to any harm. Ethical considerations of beneficence, confidentiality, fidelity, and voluntary participation were applicable. The research was conducted and data was collected on site at participating nursing schools or simulation labs to allow direct interaction with each participant and to encourage feedback and comments.

All data was collected and stored in a locked file cabinet. Data were not shared between participants or external persons. Data was recorded into an Excel format and stored in a computer file to which only the researcher has access and password to the computer. Data will be held for 3 years from date of completion, after which time, all data and other supporting documentation will be shredded.

The researcher submitted an application for a claim of exemption review to Institutional Review Board (IRB). The IRB determined that the proposal met the requirements for exemption under the federal regulations 45 CFR 46 & 101 (b) (2) status.

Data Analysis

Research data were analyzed using quantitative methods. Survey data was recorded into Excel Spreadsheets and transferred into Statistical Package for the Social Sciences (SPSS) for analysis. Analysis included descriptive statistics to calculate responses by frequency counts and percentages under study. Visual graphs such as tables were used for each question where appropriate. Creswell (2009) described the following steps for analysis of research data: (a) organize the collected data and prepare for analysis, (b) read through all the collected data and gain a general sense of the information that was obtained and how that reflects the overall meaning, (c) conduct data analysis based on specific theoretical method and approach, (d) generate a description of people and search for theme, (e) present the finding data within the research report, and (f) interpret the meaning of the collected data.

The embedded perceptions, knowledge, experiences and feelings of the participants reflected in their survey answers, which allowed the researcher to see

honesty, truth, and richness in the way participants sincerely reported and expressed themselves (Creswell, 2003, 2009). Therefore, reported feelings and perceptions of the participants as they responded to each question increased the accuracy of findings. Having *rich and thick descriptions* allows the researcher to interpret findings (Creswell, 2003; Lincoln & Gaba, 1985).

Summary

This chapter summarized the methods used to assure reliability, validity, ethical accountability, and proper evaluation of information collected. Research was conducted in four nursing schools and included educators (N = 26) and students (N = 296). Data were collected and stored into an Excel database and transferred to SPSS for analysis. The appropriate statistical tests were used to explore questions and measure outcomes. Findings are reported in Chapter 4.

Chapter 4: Data Analysis and Findings

Overview

The purpose of this study was to determine (a) how different types of simulators were used in nursing schools by nurse educators to train student nurses, and (b) the perceptions of nurse educators and students regarding the use of simulators in a clinical setting. Currently, three types of simulators (low, medium, and high fidelity) are used in nursing schools and clinical settings. Specifically, the adoption, experiences, and perceptions of high-fidelity simulators at four nursing schools serve as the focus of this study. For this study, two surveys were developed for each group of participants: nurse educators and students.

The chapter will be presented in the following main sections: analysis of data, description of participant demographics, findings for research question 1, findings for research question 2, additional findings, and summary. This study asked two research questions. Tables 16 to 24 address the first research question, while Tables 25 to 30 addresses the second research question. The following are the two research questions for this study:

1. What are nurse educators' perceptions of using simulators to train student nurses in a clinical setting?
2. What are student nurse perceptions of using simulators to receive training for practice in a clinical setting?

Analysis of Data

Survey data was collected from four schools in Southern California from 26 nurse educators and 296 nursing students. Respondent data were collected and input into an

Excel Spreadsheet and transferred to SPSS for analysis. Descriptive statistics in the form of frequencies, percentages, mean, and standard deviation were reported. Tests including Spearman rank-ordered correlations were used for the student dataset only to compare survey items.

Demographic Findings for the Nurse Educators

Data was collected from 26 nurse educators at four schools located in the State of California. The actual names of the schools were omitted to maintain confidentiality. The four schools are referred to as follows: State University, Bridge College, West College, and Coast University.

Years of experience as an educator and years using simulators. Several background questions were asked to ensure that educators were qualified to respond to the study questions. Respondents were asked to report on years of experience as a nurse educator and years of teaching experience with any type of simulator. Table 12 displays the descriptive statistics for the nurse educator years of experience in teaching and use of simulators.

Table 12

Descriptive Statistics Pertaining to the Educator's Years of Experience as an Educator and Using Simulators

Variable	*n*	*M*	*SD*	Low	High
Years as educator	22	10.05	7.37	3.00	30.00
Years with simulator	20	5.75	5.25	1.00	20.00

Years experience teaching was asked of each educator in the sample. There was a wide range in teaching experience reported from 3 years to 30 years. On the

average, these nurses had been educators a mean of 10.05 years (*SD* = 7.37). Four participants did not offer a response for years of experience teaching. Thus, results suggested that the nurse educators who completed the survey had an adequate experience with teaching and simulator use to respond to the items.

Years of experience with simulators was asked of each educator in the sample. There was a wide range in simulator experience reported from 1 year to 20 years. The average number of years experience teaching with simulators for this sample of educators was a mean of 5.75 years (*SD* = 5.25). Six participants did not report years experience teaching with a simulator (see Table 13).

Table 13

Frequency Counts for Selected Variables from Educator Dataset

Variable	Category	*n*	%
Site	State University	7	26.9
	Bridge College	6	23.1
	West College	2	7.7
	Coast University	11	42.3
Education	Master's degree	18	69.2
	Doctorate	2	7.7
	Other	6	23.1

Level of nurse educator education. The first question of the survey asked nurse educators the highest level of their education. Table 13 (*N* = 26) displays reported level of education. Nurse educators worked at one of the four schools. The distributions of respondents according to site were as follows: State University (26.9%), Bridge College (23.1%), West College (7.7%), and Coast University (42.3%). The most commonly reported level of education was master's degree (69%), while (23.1%) reported another credentials such as BSN (*n* = 4), MBA (*n* = 1), and MHA (*n* = 1). A doctorate degree was reported by two respondents (7.7%), one MD at West College, and one DNP at State University. These findings indicate that the nurse educators had adequate education and significant experiences qualifying them to respond to the survey.

Types of simulators used. The second survey question asked nurse educators to identify what types of simulators they use to train nursing students. Table 14 displays the educators' response for the types of simulators used at their schools.

Table 14

Educator's Responses to the Types of Simulators Used in Their School

Type	*n*	%
2a. Low-fidelity	22	84.6
2c. High-fidelity	15	57.7
2b. Medium-fidelity	14	53.8
2d. Other (fabric dolls or plastic manikin)	1	3.8

Note. Educators were allowed to endorse multiple answers.

Most educators reported use of simulators: 84% used low-fidelity simulators, 57.7% used high-fidelity simulators, and 53.8% used medium-fidelity simulators, while 3.8% reported *other*, such as plastic or fabric dolls used in pediatrics. These findings indicate that the majority of nurse educators used and favored low-fidelity simulators more than medium or high-fidelity. West College was the only school that did not possess medium or high-fidelity simulators (see Table 14*; N* = 26).

Educational levels of students. Nurse educators were asked to report the educational levels of their students. Table 15 displays the educators' responses regarding the education levels of their students.

Table 15

Educator's Responses to the Educational Levels of their Students

Type	*n*	%
3b. Second year	19	73.1
3a. First year	15	57.7
3c. RN to BSN	5	19.2
3d. MSN	2	7.7
3e. DNP	0	0.0

Note. Educators were allowed to endorse multiple answers.

Most educators (73.1%) taught second year students, and over half (57.7%) taught first year students. Only two educators (7.7%) reported teaching MSN candidates. Results suggested that the majority of educators taught second year

students, followed by first year students, and very few students were working toward a BSN, MSN, or DNP program (see Table 15; *N* = 26).

Survey Findings for Research Question 1: Nurse Educators' Perceptions of Using Different Types of Simulators in Clinical Settings

This part of the survey reveals nurse educators' perceptions using different types of simulators in teaching. The following tables and narratives revealed the findings for survey questions 4 to 12, which are related to research question 1. Research question 1 asked: What are nurse educators' perceptions of using simulators to train student nurses in a clinical setting? The last three survey questions asked nurse educators if they have experience with high-fidelity simulators.

Roles as an instructor with simulation-based training. Educators were asked to state their roles as an instructor with simulation-based training (survey question 4). Table 16 displays the perceptions of the educator's role.

Table 16

Educator's Role as an Instructor with Simulation-Based Training

Role	*n*	%
4a. Writing scenarios	19	73.1
4b. Running the scenario	18	69.2
4d. Debriefing	17	65.4
4c. Planning prep work for students	16	61.5
4e. Other	5	19.2

Note. Educators were allowed to endorse multiple answers.

The most common roles were writing scenarios (73.1%), running the scenarios (69.2%), and debriefing" (65.4%). Thus, findings reveal that nurse educators spent a lot of time writing scenarios for simulation activities, followed by running scenarios and debriefing. Five of the educators (19.2%) listed other roles including involvement with observations, discussion with students, testing students, and practicing basic skills (see Table 16; *N* = 26).

Situations simulators are used for. Nurse educators were asked clinical situations in which use simulators to teach students (survey question 5). Table 17 displays the educator's responses pertaining to situations simulators were used for.

Table 17

Educator's Answers about Which Situations Simulators are Used

Situation	*n*	%
5d. Emergency situations, such as cardiac arrest, hemorrhage	21	80.8
5a. Patient assessment and vital signs	21	80.8
5e. Cardiac resuscitation	19	73.1
5b. Foley catheter insertion	19	73.1
5f. Dressing change	18	69.2
5h. Administration of IV, IM, SQ, and oral medications	18	69.2
5g. Suctioning	16	61.5
5c. IV insertion/removal	15	57.7

(continues)

5j. Emergency decision-making	14	53.8
5i. Birthing instruction	8	30.8
5k. Other	5	19.2

Note. Educators were allowed to endorse multiple answers.

Clinical situations in which nurse educators reportedly used simulators were "emergency situations, such as cardiac arrest, hemorrhage" (80.8%), "patient assessment and vital signs" (80.8%), followed by "cardiac resuscitation" (73.1%). The less common use of simulator was reportedly used for "birthing" (30.8%). Six nurse educators (19.2%) listed other clinical situations including surgical procedures, positioning for comfort, charting, calls to doctor's office, ethical issues, and pediatrics. These findings reveal that educators use high-fidelity simulators for emergency situations to observe students' reaction and action more than routine procedural situations (see Table 17; *N* = 26).

Goals for simulator use. After the most frequent clinical situations for simulator use were determined, educators were asked to list perceived goals for using simulations in their facility (survey question 6). Table 18 displays the educators' answers about goals for simulator use.

The three goals reported by the majority of educators included "helping students acquire and retain knowledge" (96.2%), "increasing students' competency skills" (96.2%), and "building students' self-confidence" (92.3%). Four nurse educators reported other goals including "increase critical thinking," "measuring knowledge after taught" and "identifying weak areas for improvement" (15.4%). Thus, findings suggest

that educators' major goals are focused on building skills and improve confidence in students to become competent nurses (see Table 18; *N* = 26).

Table 18

Educator's Answers about Goals for Simulator Use

Goal	*n*	%
6d. Helping students acquire and retain knowledge	25	96.2
6b. Increasing students' competency skills	25	96.2
6a. Building students' self-confidence	24	92.3
6e. Encouraging teamwork and collaboration	23	88.5
6c. Teaching effective communication and feedback	19	73.1
6f. Other	4	15.4

Note. Educators were allowed to endorse multiple answers.

Challenges related to the use of simulators. Educators' perceptions about the challenges could arise as a consequence of simulator use (survey question 7). Table 19 displays the educators' perceptions about the challenges or problems related to the use of simulators. The most commonly reported challenges were "need for ongoing training and education" (61.5%) and "need technical support" (61.5%). The least common challenge was "creating individualized lessons" (3.8%). Four nurse educators (15.4%) offered other challenges, such as "lack of adaptation to simulators." Thus, findings suggest that nurse educators lack ongoing technology training and tech support to use high tech simulators (see Table 19; *N* = 26).

Table 19

Educator's Perceptions of Challenges Related to the Use of Simulators

Challenge or problem	*n*	%
7h. Need for ongoing training and education	16	61.5
7b. Need technical support	16	61.5
7c. Developing scenarios	13	50.0
7f. Repairs to equipment	8	30.8
7a. Time-consuming	8	30.8
7g. Rapid changes in technology	6	23.1
7e. Cost of equipment	5	19.2
7i. Other	4	15.4
7d. Creating individualized lessons	1	3.8

Note. Educators were allowed to endorse multiple answers.

Concerns related to the use of simulators. Besides challenges and problems that nurse educators encountered using simulators, they also had major concerns (survey question 8). Table 20 displays the educator's major concerns related to the use of simulators. The most frequently listed concerns were "need for ongoing faculty training" (53.8%), "lack of experience faculty to use simulators" (42.3%), "lack of time to practice" (42.3%), and "lack of technical support" (42.3%). Thus, findings indicate that educators had significant concerns for ongoing faculty training and support to use high tech simulators, and they also need more time to practice to become comfortable in using simulators.

Table 20

Educator's Major Concerns Related to the Use of Simulators

Major concern	*n*	%
8d. Need for ongoing faculty training	14	53.8
8b. Lack of experienced faculty to use simulators	11	42.3
8e. Lack of time to practice	11	42.3
8c. Lack of technical support	11	42.3
8f. Addition to workload	10	38.5
8a. Lack of space	9	34.6
8g. Cost	4	15.4
8h. Other	3	11.5

Note. Educators were allowed to endorse multiple answers.

Three nurse educators (11.5%) reported other concerns including "need for full time faculty with simulators," "theory instructors do not have access for use of simulators," and "not enough faculty time" (see Table 20; *N* = 26).

Expected simulation learning outcomes. Nurse educators were asked to identify the simulation learning outcomes at the school (survey question 9). Table 21 displays the educators expected simulation learning outcomes. The most common learning outcomes were "students will gain decision-making and critical thinking skills" (96.2%), "increased self-confidence for students" (96.2%),"increased teamwork and collaboration," (92.3%), and "safe patient care" (92.3%).

Table 21

Educator's Expected Simulation Learning Outcomes

Learning outcome	*n*	%
9c. Students will gain decision-making and critical-thinking skills	25	96.2
9a. Increased self-confidence for students	25	96.2
9e. Increased teamwork and collaboration	24	92.3
9f. Safe patient care	24	92.3
9d. Enhanced interaction, feedback with students	21	80.8
9b. Increased competency skills for students	21	80.8
9g. Other	2	7.7

Note. Educators were allowed to endorse multiple answers.

Thus, findings indicate satisfactory outcomes from simulation activities, not only for students, but for educators as well. Two nurse educators (7.7%) provided other expected learning outcomes, including "conflict resolution," "multi patient triage," "and improving family center care" (see Table 21; *N* = 26).

Benefits of the high-fidelity simulators. Nurse educators were asked regarding benefits of the high-fidelity simulators (survey question 10). Table 22 displays the educators' perceptions of the benefits of using high-fidelity simulators in practice of clinical skills. The most commonly endorsed benefits were "more realistic simulations of patient reactions" (87.5%), "changes in patient condition and vital signs" (79.2%), and "more realistic simulations of patient reactions to intervention" (70.8%).

Table 22

Educator's Perceptions of the Benefits of Using High-Fidelity Simulators

Benefit	*n*	%
10a. More realistic simulations of patient reactions	21	87.5
10c. Changes in patient condition and vital signs	19	79.2
10d. More realistic simulations of patient reactions to intervention	17	70.8
10f. More realistic simulations overall	15	62.5
10g. Multiple errors can be made safely	14	58.3
10e. Chances for observation and monitoring	14	58.3
10b. More realistic simulations of patient pain	9	37.5
10h. Other	2	8.3

Note. Educators were allowed to endorse multiple answers.

The lowest benefit was reported as providing a "more realistic simulations of patient pain" (37.5%). Thus, findings indicate that high-fidelity simulators are more realistic and more beneficial compared to low- or medium-fidelity. Two nurse educators (8.3%) listed other benefits including "gaining a slight advantage from using high-fidelity simulators," and "getting experience without having patients" (see Table 22; *n* = 24).

Educators' reasons for selecting high-fidelity simulators. Nurse educators were asked perceived reasons for selecting high-fidelity simulators for teaching at their institution (survey question 23). Table 12 displays the educators' reasons for selecting high-fidelity simulators.

Table 23

Educator's Reasons for Selecting High-Fidelity Simulators

Reason	*n*	%
11c. To improve technical skills of students	16	66.7
11a. To help reduce students' medical errors	11	45.8
11b. To improve faculty teaching	6	25.0
11e. Other	6	25.0
11d. Required by school policy	0	0.0

Note. Educators were allowed to endorse multiple answers.

The most commonly endorsed reasons were "to improve technical skills of students" (66.7%) and "to help reduce students' medical errors" (45.8%). Thus, findings suggest educators' main reasons were students' improvement of skills and patient safety. Six nurse educators (25%) provided other reasons including "to increase students' learning outcomes" and to "close gaps in educational process" (see Table 23; *n* = 24).

Steps nursing schools should take. The last question of the survey asked nurse educators' steps nursing schools should take to improve patient safety (survey question 12). Table 24 displays the educators' perceptions of steps for improvement. The highest endorsement for improving patient safety was "to provide more training and continuing education for nursing faculty" (87%), and "provide more faculty support" (79.2%). The least critical was "facilitate more discussion and feedback" (41.7%).

Table 24

Educator's Perceptions of Steps They Think Nursing Schools Should Take to Improve Patient Safety

Step	*n*	%
12b. Provide more training and continuing education for nursing faculty	21	87.5
12c. Provide more faculty support	19	79.2
12a. Incorporate more high-fidelity simulation in nursing curricula	16	66.7
12d. Facilitate more discussion and feedback	10	41.7
12e. Other	2	8.3

Note. Educators were allowed to endorse multiple answers.

Thus, findings indicate that nurse educators suggested the most critical steps for schools to take to improve patient safety. Two nurse educators (8.3%) offered other suggestions including "reducing number of students in clinical groups from 15:1 ratio to 5:1," and "to build scenarios for all courses to practice" (see Table 24; *n* = 24).

Survey Findings for Research Question 2: Students' Perceptions Using Different Types of Simulators in Clinical Settings

The students' survey consisted of six questions, and 296 students participated from four sites. The following tables and narratives revealed the findings for survey questions from 1 to 6. Tables from 14 to 19 address the students' perceptions using different types of simulators, which are related to the research question. Research

question 2 asks: What are student nurse perceptions of using simulators to receive training for practice in a clinical setting?

Survey question 1. The first question asked students their level of education. Table 25 displays the frequency counts for selected student variables.

Table 25

Frequency Counts for Selected Variables from the Student Dataset

Variable	Category	*n*	%
Site	State University	97	32.8
	Bridge College	112	37.8
	West College	27	9.1
	Coast University	60	20.3
Quality of school	Lowest	27	9.1
	Middle	112	37.8
	Highest	157	53.0
Public university	No	199	67.2
	Yes	97	32.8
Education level of student	First year	159	53.7
	Second year	92	31.1
	Third year or higher	45	15.2

Student surveys were gathered from the same four schools. These four schools were ranked based on quality. The quality criteria included: (a) number of different types of simulator used in each school, (b) number of each student in the classroom, (c)

size of simulation lab and space, (d) use of high-fidelity simulators, and (e) number of nursing programs each school offers. Table 25 also displays student's educational level in different nursing programs.

Half the students (53.0%) attended a "highest quality school," others (37.8%) attended the "middle quality school," and few (9.1%) attended the "lowest quality school." Approximately one third (32.8%) attended a public university, and approximately two thirds (67.2%) attended private schools. As for the student's education level, about half (53.7%) were in their first year, with fewer students in their second (31.1%), and third year or higher (15.2%). Thus, findings indicate that the majority of students were in the first year of a nursing program and very few in the third or higher level of education, such as BSN or MSN (see Table 25; *N* = 296).

Survey question 2. Students were asked which type of simulators they use for practice. Table 26 displays the students' responses for which training situations they used and which type of simulators.

Low-fidelity simulators were most likely used for "IV insertion/removal" (59.8%), "administration of IV, IM, SQ, and oral medications" (59.5%), and medium-fidelity simulators were most often used for "patient assessment and vital signs" (37.8%) and "Foley catheter insertion" (37.8%). High-fidelity simulators were most likely used for "patient assessment and vital signs" (36.8%) and "cardiac resuscitation" (24.3%). Findings indicate that students used all three types of simulators in different situations in practice, but low-fidelity was used more for stable situations and high-fidelity for emergency situations (see Table 26; *N* = 296).

Table 26

Student Responses for Which Training Situations They Used and Which Types of Simulator

Training situation	Simulator fidelity level					
	High		Medium		Low	
	n	%	*n*	%	*n*	%
2a. Patient assessment and vital signs	97	32.8	112	37.8	109	36.8
2b. Foley catheter insertion	157	53.0	112	37.8	29	9.8
2c. IV insertion/removal	177	59.8	58	19.6	17	5.7
2d. Emergency situations, such as hemorrhaging	116	39.2	64	21.6	65	22.0
2e. Cardiac resuscitation	121	40.9	74	25.0	72	24.3
2f. Dressing change	174	58.8	76	25.7	40	13.5
2g. Suctioning	141	47.6	108	36.5	32	10.8
2h. Administration of IV, IM, SQ, and oral medications	176	59.5	67	22.6	40	13.5
2i. Birthing	119	40.2	46	15.5	62	20.9

Note. Students could provide multiple responses if they used more types of simulators for a training situation.

Challenges during simulation practice. Students were asked to report some of the challenges that they experienced during simulation practice (survey question 3). Table 27 displays the student perceptions for challenges they experienced during simulation practice. The common challenges were “increased anxiety” (69.3%), “ability to identify patient problems” (44.6%), and “ability to prioritize care” (37.2%). In addition,

students were asked how often they experienced anxiety using the three types of simulators. The percentage of students reported experiencing anxiety was as follows: low-fidelity (15.2%), medium-fidelity (20.3%), and high-fidelity (31.8%). Thus, findings indicate that using simulators cause anxiety in students, especially high-fidelity simulators, which could indicate lack of self-confidence or knowledge of how and when to use them.

Table 27

Student Perceptions for Challenges Experienced During Simulation Practice

Challenge	*n*	%
3a. Increased anxiety	205	69.3
3b. Ability to identify patient problems	132	44.6
3f. Ability to prioritize care	110	37.2
3c. Ability to perform appropriate assessments	104	35.1
3h. Problems adapting to simulation environment	96	32.4
3g. Lack of confidence in providing safe care	88	29.7
3b. Problems related to lack of technical skills	84	28.4
3e. Ability to implement care plan and understand rationale for treatment plan	81	27.4
3i. Other	15	5.1

Note. Students were allowed to endorse multiple answers.

Fifteen students (5.1%) responded to *other* by writing, “lack of communication,” “too many students during skills lab,” “large number of students in lab,” “instructors are

sitting down and telling you," "you are doing something wrong," "need staff for certain tasks," "cannot see actual assessments," "not real patients," "very nerve wracking," and "we have been watched through the two way windows" (see Table 27; *N* = 296).

Self-improvement experienced. Students were asked what self-improvement they experienced after simulation (survey question 4). Table 28 displays students' perceptions for self-improvement experiences.

Table 28

Student Perceptions for Self-Improvement Experienced After Simulation Exercises

Type of self-improvement	*n*	%
4d. Enhanced teamwork and collaboration	233	78.7
4b. Increase in competency skills	230	77.7
4a. Increase in self-confidence	216	73.0
4f. Improvements in critical thinking	200	67.6
4h. Ability to give and receive feedback	188	63.5
4c. Increase in communication skills	184	62.2
4e. Improvements in decision-making	166	56.1
4g. Improvements in leadership skills	146	49.3
4i. Other	5	1.7

Note. Students were allowed to endorse multiple answers.

The most commonly cited improvements were "enhanced teamwork and collaboration" (78.7%), "increase in competency skills" (77.7%), and "increase in self-

confidence" (73.0%). The least improvement was reported in "leadership skills" (49.3%) Five students (1.7%) responded to other, stated "self-improvement with stress," and "did not see any self-improvement." Thus, findings indicate that the majority of students noticed improvement in their skills, but a few did not see any improvements (see Table 28; *N* = 296).

Learning benefits using simulators. Students were asked to identify their learning benefits using simulators in practice (survey question 5). Table 29 displays the students' perceptions of the learning benefits derived from using a simulator.

Table 29

Student Perceptions of Learning Benefits from Using a Simulator

Learning benefit	*n*	%
5a. Increased my nursing skills (e.g., administrating medications, taking vital signs, providing assessments)	247	83.4
5c. Facilitated teamwork (working with classmates)	208	70.3
5b. Improved my critical thinking (e.g., prioritization, decision-making process)	195	65.9
5d. Improved my communication skills (talking to patients, doctors, and other staff members)	176	59.5
5e. Other	6	2.0

Note. Students were allowed to endorse multiple answers.

Students most commonly reported benefits were "increased my nursing skills" (83.4%) and "facilitated teamwork" (70.3%). Six students (2%) gave additional benefits using simulators, including "gave me the opportunity to be knowledgeable," "it gave me

more hands-on experience," "less anxiety as opposed to real patients," "simulation is great, but it cannot take away the experience we get from human interaction," and "only been once to simulation lab, cannot tell." Thus, findings indicate that the majority of the students believe they benefitted from using a simulator, but some mentioned it cannot take the place of practice with a human patient (see Table 29; *N* = 296).

Roles in simulation practice. Students were asked to identify their roles in simulation practice (survey question 6). Table 30 displays the student perceptions of their role during simulation.

Table 30

Student Perceptions of Their Role During Simulator Practice

Role	*n*	%
6a. Involvement	264	89.2
6b. Part of a team	248	83.8
6c. Asking questions	225	76.0
6f. Prioritization	217	73.3
6d. Interaction and delegation	208	70.3
6e. Responsible for decision-making	196	66.2
6g. Giving feedback	179	60.5
6h. Other	3	1.0

Note. Students were allowed to endorse multiple answers.

The highest frequency responses were “involvement” (89.2%), “part of a team” (83.8%), and “asking questions” (76.0%). Thus, findings indicate that the majority of students get involved in simulation activity and enjoy teamwork. Three students responded to *other*, including “shadowing RN,” and “got firsthand experience how to act on the floor,” and “showed weaknesses that I need to work on” (see Table 30; $N = 296$).

Additional Findings From Student Survey Data

The following is additional analysis, driven from student data. As an additional set of analyses, Spearman rank-ordered correlations were used for the student dataset ($N = 296$) to compare the education level of the student and the quality of their school with all subparts of survey items 2 through 6. Spearman rank-ordered correlations were selected over the more common Pearson product-moment correlations due to the non-normally distributed data found in most of the survey responses.

Cohen (1988) suggested some guidelines for interpreting the strength of linear correlations. He suggested that a weak correlation typically had an absolute value of $r = .10$ (about 1% of the variance explained), a moderate correlation typically had an absolute value of $r = .30$ (about 9% of the variance explained) and a strong correlation typically had an absolute value of $r = .50$ (about 25% of the variance explained). With this sample size of $N = 296$, a trivial correlation of $r = .12$ (only 1.4% of the variance accounted for) is significant at the $p < .05$ level. Therefore, for the sake of parsimony, the results chapter will primarily highlight those correlations that were of at least moderate strength to minimize the potential of numerous Type I errors stemming from interpreting and drawing conclusions based on potentially spurious correlations.

Survey item 2 queried students about nine training situations and whether they used low-fidelity, medium-fidelity, and/or high-fidelity simulators for any or all of those situations. These 27 variables (nine training situations with three types of simulators) were correlated with the education level of the student and the quality of their school. For the resulting 54 correlations, 29 were significant at the $p < .05$ level, but only four were of moderate strength using the Cohen (1988) criteria. Specifically, students at a higher educational level were more likely to use a medium-fidelity simulator for patient assessment and vital signs ($r_s = .35$, $p < .001$). For the moderate strength correlations with the quality of school, students were more likely to use a medium-fidelity simulator for patient assessment and vital signs ($r_s = .36$, $p < .001$), IV insertion/removal ($r_s = .38$, $p < .001$), and suctioning ($r_s = .34$, $p < .001$) (no table shown). It is important to note that for this study the operational definition of a high quality school included having a higher degree program. The students in higher degree programs were likely to have more access to high-fidelity simulators for learning more advanced skills. Thus, this correlation likely resulted in part from the fact that there was a variation in the program availability. If all four schools had the same degree programs offered, then this question would have possibly provided relevant data.

In addition, the education level of the student and the quality of their school were correlated with all of the subparts from survey Items 3 through 6. For the resulting 62 correlations, two were significant at the $p < .05$ level but none were of at least moderate strength using the Cohen (1988) criteria.

Summary

Survey data from 26 nurse educators and 296 nursing students were collected to determine (a) how different types of simulators were used in nursing schools by nurse educators to train student nurses, and (b) the perceptions of nurse educators and students regarding the use of simulators in a clinical setting. Some of the key findings from these analyses were: (a) ownership of high-fidelity simulators related to their use; (b) students were more likely to use a medium-fidelity simulator; (c) second year students use simulators in their class more than first year students; (d) nurse educators reported need for further faculty training; (e) nurse educators shared need of technical support to use simulators, and (f) lack of time to prepare scenarios. In the final chapter, these findings will be compared to the literature, conclusions and implications will be drawn, and a series of recommendations will be suggested.

Chapter 5: Summary, Conclusions, Recommendations

Restatement of Problem

Technology is used in every modern healthcare practice to improve delivery and patient outcomes while also reducing human error (Nehring, 2008; Scalese, Obeso, & Issenberg, 2008). Approximately, 48,000 to 98,000 patients die each year due to preventable errors and lack of competent care from health professionals (AACN, 2012b; AACN, 2008; Campbell & Daley, 2013; Cato, 2011). Nursing schools have long utilized simulators in the form of anatomic parts and manikins as clinical teaching tools. Current interest in computerized simulators has grown because many people believe these simulators could help nurse educators teach student nurses how to provide quality care while minimizing mistakes (Schiavenatro, 2009; Shearer & Davidhizar, 2003).

The majority of nursing schools have not implemented consistent use of medium- and high-fidelity simulators into their training curricula (Gaba, 2004; Jeffries, 2005; Nehring, 2010). Teaching with high-tech simulators could provide an alternative to traditional teaching approaches. Simulators can emphasize learning needs and allow the educators to expose students to situations that they might not otherwise experience in a clinical practicum in a healthcare setting (Hermann, 2007; Ziv et al., 2005). In spite of the advantages, failure to use advanced technologies persists due to lack of understanding of how simulation technology could be utilized to deliver instruction. Lack of technical skills and support from administration is another potential reason for non utilization. Furthermore, in recent years, nursing schools have faced tremendous economic and political pressure to control costs. As a result, they are unable to purchase high tech simulators for training purposes.

Summary of Purpose

The purpose of this study was to determine (a) how different types of simulators were used in nursing schools by nurse educators to train student nurses, and (b) the perceptions of nurse educators and students regarding the use of simulators in a clinical setting. The following research questions guided this study:

1. What are nurse educators' perceptions of using simulators to train student nurses in a clinical setting?
2. What are student nurse perceptions of using simulators to receive training in a clinical setting?

Research Design

The study utilized a descriptive quantitative design, in which information was collected through two surveys from four nursing education facilities in Southern California. The population of this study was composed of 26 nurse educators and 296 students from different nursing programs.

The researcher developed two surveys from reviews of previous research on simulator-based training. The surveys were pilot-tested for validity and reliability. The nurse educators' survey had total of 12 questions and students' survey had 6 questions. Questions asked about level of education, experience with simulators in practice settings, challenges experienced with simulators, benefits from use of simulators, and their roles in simulation practice. Each survey took approximately 5 to 10 minutes to complete.

In addition, the researcher collected data through meeting in person with educational department administrators and faculty from designated facilities and asked

for approval to conduct this study. Four out of seven facilities gave permission to conduct the research.

The researcher met the nursing educators and students at the end of a class session and distributed the surveys in person to complete. Survey data was collected from four schools in Southern California from 26 nurse educators and 296 nursing students. Respondent data were collected and input into an Excel Spreadsheet and transferred to SPSS for analysis. Descriptive statistics in the form of frequency, percentage, mean, and standard deviation were reported. Test including Spearman rank-ordered correlations were used for the student dataset only for comparisons among survey items.

Major Findings of the Study

The following paragraphs describe the major findings from nurse educators' survey.

Demographic findings. The nurse educators who were surveyed at the four sites reported years of teaching experience from 3 years to 30 years, with a mean of 10.05 years (*SD* = 7.37). Simulation experience reported was from 1 year to 20 years, with a mean of 5.75 years (*SD* = 5.25). The most commonly reported level of education was master's degree (69%), while some (23.1%) reported another credentials: BSN (*n* = 4), MBA (*n* = 1), and MHA (*n* = 1). A doctorate degree was reported by two respondents (7.7%).

Nurse educators used different types of simulators in different situations in their current schools. Most educators (84%) reported they used low-fidelity simulators; some (53.8%) used medium-fidelity simulators, while others (57.7%) used high-fidelity

simulators. Most educators (73.1%) taught second year students, and over half (57.7%) taught first year students. Only two educators (7.7%) reported teaching MSN candidates.

Responses related to RQ 1. The major findings from the nurse educators' surveys are described in the following paragraphs.

Simulators were most commonly used by educators for situations such as "emergency situations, cardiac arrest, hemorrhage" (80.8%), and "patient assessment and vital signs" (80.8%). Educators' top three goals using simulators in teaching were "helping students acquire and retain knowledge" (96.2%), "increasing students' competency skills" (96.2%), "building students' self-confidence" (92.3%), and "encouraging teamwork and collaboration" (88.5%). But the greatest challenge that educators experienced using simulators was "need for ongoing training and education" (61.5%), and "need technical support" (61.5%).

The most common learning outcomes nurse educators reported using simulators were "students will gain decision-making and critical thinking skills" (96.2%), "increased self-confidence " (96.2%), "increased teamwork and collaboration" (92.3%), "safe patient care" (92.3%), "enhanced interaction, feedback with students" (80.8%), and "increased competency skills" (80.8%).

Besides challenges and concerns using simulators, nurse educators also reported some benefits using simulators in teaching. The most common benefits using high-fidelity simulators were "more realistic simulations of patient reactions" (87.5%) and "changes in patient condition and vital signs" (79.2%).

To improve patient safety, nurse educators suggested several steps that schools need to take. Major steps were “to provide more training and continuing education for nursing faculty” (87%) and “provide more faculty support” (79.2%).

Responses related to RQ 2. The major findings from the students’ surveys are described in the following paragraphs. Students used simulators in different situations in clinical practice. The most common challenge that students experienced was “increased anxiety” (69.3%). The percentage of students who reported experiencing anxiety while using simulators was as follows: low-fidelity (15.2%), medium-fidelity (20.3%), and high-fidelity (31.8%).

Students also experienced some improvements working with simulators. Some of the improvements were “enhanced teamwork and collaboration” (78.7%) and “increase in competency skills” (77.7%). Their major learning benefit using simulators was “increased nursing skills” (83.4%). Students played different roles in simulation activities. Their major roles were “involvement” (89.2%), “be a part of a team” (83.8%), and “asking questions” (76.0%).

In an additional set of analyses, Spearman rank-ordered correlations were used to compare the educational level of the students and the quality of their schools. Findings revealed correlation of (r_S = .12) with 1.4% significant at the $p < .05$. Therefore using those three types of simulators were correlated with their educational level and the quality of their schools. It is important to note that for this study the operational definition of a high quality school included having a higher degree program. The students in higher degree programs were likely to have a higher educational level. Thus,

this correlation likely resulted in part from the fact that there was a variation in the program availability.

Conclusions

There were several conclusions based on the findings from this study. These are discussed in the following paragraphs.

Conclusion 1. Nurse educators across the four schools used low-fidelity simulators more than medium- or high-fidelity in clinical practice. Low-fidelity simulators are easy to access, are economical, portable, and lack realism (Nehring 2010). Findings from this study revealed that the nurse educators utilized the three types of simulators (low, medium, and high) depending on the type of clinical situations, but the majority (84.6%) used low-fidelity simulators in teaching, compared to medium- or high-fidelity. West College was the only school did not possess medium or high-fidelity simulators. Only low-fidelity simulators were used at this institution. Even those schools that possessed the high-fidelity simulators did not seem to utilize them fully.

Eddington (2011) reported that nursing schools are facing difficulties in how to prepare nurse educators for this paradigm shift toward more use of simulated instruction in clinical education settings. The educators need to have a broad understanding of types of simulators that are available and which ones would be best to meet the needs of their learners, the scope of their use, and the degree of realism. Seropian et al. (2004) found that some nurse educators have not embraced the new technology and are not prepared to teach with high-fidelity simulators. They feel comfortable using low-fidelity simulators, but high-fidelity simulation requires more sophisticated technological

skills. Some nurse educators do not perceive the need to use high tech simulators as a teaching strategy in nursing education.

The reluctance by nursing programs to purchase simulators, renovate space, and hire educators to work with the technology has slowed simulator-based training. Integrating simulation throughout the curriculum requires faculty support, encouragement, and faith (Campbell & Daley, 2013).

Conclusion 2. Nurse educators across four schools reported satisfactory learning outcomes using simulators in teaching. Informal discussion with the nurse educators indicated that they believe the high-fidelity simulators are more realistic and may be more interesting for students than simulators are for instructors. Students can get more experience without having access to patients, which increases learning outcomes and provides a more realistic learning experience. Educators reported learning outcomes such as, “students will gain decision-making and critical-thinking skills” (96.2%), “increased self-confidence” (96.2%), “increased teamwork and collaboration” (92.3%), “safe patient care” (92.3%), “enhanced interaction, feedback with students” (80.8%), and “competency skills for students” (80.8%). These findings are similar to other prior studies by Murray et al. (2008) that discuss the use of simulation in nursing education in that “simulation is a strategy to enhance clinical competence” (p. 5) and that simulation stimulates better decision-making, problem-solving, and creative thinking. Stakweather and Kardong-Edgren (2008) suggest that “the best outcome with simulation is to integrate across a curriculum” (p. 2).

Researchers believe simulation-based training facilitates learning (Benner, 1984; Issenberg et al., 2005; Smith & Roehrs, 2009) and can help nursing students

achieve their educational goals. Nursing educators want to know how well simulation assists learners to acquire knowledge and skills, develop confidence, and improve critical thinking when compared to traditional, clinical education (Hughes, 2005; Kuznar, 2007). Bambini's (2009) results indicated that the students believed the simulation-based training most helped them develop critical thinking, nursing skills. In addition, perceptions of collaboration and teamwork were increased toward later semesters in school. In order for nursing schools to provide optimal learning experiences, they need to incorporate technology to achieve outcome objectives in educational practices.

Conclusion 3. Nurse educators reported major challenges related to use of simulators; there is a need for ongoing training and technical support. From all four sites, educators reported major challenges using medium- and high-fidelity simulators in simulation training. This study revealed major challenges such as, "need for ongoing training and education" (61.5%), and "need technical support" (61.5%). These findings support a study by King et al. (2008) showing what factors could limit nurse educators' use of high-fidelity simulators, which included nursing educators' lack of time, support, education, or training when trying to adopt high-fidelity simulators into curriculum.

A simulation challenge study done by Jansen et al. (2008) with the faculty team at the University of Wisconsin-Eau Claire identified challenges that faculty perceived regarding using simulation in their clinical courses. Jansen and colleagues categorized seven main challenges to simulation, provided faculty objectives in each of those categories, and offered possible solutions to overcome the biggest obstacles. The challenges are as follows:

- Time: difficult to find time to practice and develop scenarios using simulators
- Training: lack of training and difficult to learn simulator technology
- Not-applicable attitude: see no fit between simulation and curriculum
- Lack of space and equipment
- Funding: high cost to purchase equipment
- Only a few students are involved in simulation: students in theory courses do not get involved in simulation activities

Lack of resources is another challenge that nurse educators encounter. The National League of Nursing (NLN) has provided resources to assist nurse educators with implementation of simulation for teaching. One resource that is available now is S.T.E.P. (Simulations Take Educator Preparation). This resource is designed to help nurse educators understand the benefits and practical use of simulations in clinical education. Other resources provided by the NLN include: mentoring, workshops, conferences, websites, literature, and funding for future research (Eddington, 2011). Another challenge to nurse educators will be to choose the best type of simulator to meet the needs of their students so that they can accomplish their educational goals (Bremner et al., 2006).

Conclusion 4. Nurse educators and college administrators reported that cost is a major deterrent in purchasing high-fidelity simulators. During informal conversion with nursing administrators and faculty, the researcher learned that all of these administrators and the faculty members believe that high technology equipment is expensive and requires the presence of a technical expert at the site during the use of these simulators. Administrators and educators stated that schools are under strict

budgets currently, while maintaining and running the simulation lab is expensive and repairs are costly. In this study, only a few educators reported in surveys a concern for the simulator cost (15.4%), but high concern for technical support and the development of scenarios for the use of high-fidelity simulators. Both of these costs relate to the cost of qualified persons' salaries. One cost is to maintain the equipment and provide on-site training for the nurse educators. The other cost is to allocate nurse educator time to create scenarios using the simulators.

Thus, the cost of the use of simulators in nursing education is a significant concern. Today's nursing educational schools must justify the purchase and use of these expensive simulators (Rogers, 2007). Rogers' findings reveal low-fidelity simulators that have been used for 50 years are being replaced with medium- to high-fidelity simulators. The average cost of a high-fidelity simulator is around $120,000 to $200,000, a medium-fidelity simulator is around $80,000 to $100,000, and low-fidelity is around $5,000 to 25,000 (Laerdal Medical, 2013; McIntosh, 2006). The cost to develop a dedicated simulation center for nurse training may run $750,000 to $1,000,000 (Laerdal Medical, 2013). Nursing administrators in universities and hospitals need data from practices by nurse educators and their students on the benefits and challenges that they face using the different types of simulators in order to justify the cost.

Conclusion 5. Students across the four schools reported self-improvement in (a) teamwork and collaboration and (b) increased in competency in skills after simulation experiences. Schools select simulators to improve students' technical and nursing skills. Students reported self-improvement using simulators in clinical environment. They perceived "enhanced teamwork and collaboration" (78.7%), and

"increase in competency skills" (77.7%). Weller (2004) too found that during simulations, students develop teamwork and collaborative learning. In the present study, students perceived self-improvement working with classmates, but disliked the methods used to evaluate and critique, such as being observed through windows (1.7%).

The present study's findings support those by Bambini et al. (2009) as well as Klein and Doran (1999) in that the students believed the simulation-based training most helped them develop critical thinking and nursing skills, while perceptions of collaboration and teamwork were increased toward later semesters in school.

Child and Sepples (2006) as well as Nehring (2008) reported that active learning can achieve competencies. They acknowledged that nursing students through various active learning opportunities can acquire knowledge, critical thinking, and psychomotor skills, and then transfer these skills into clinical practice. One technique being used to teach these skills is simulation. Cook et al. (2011) stated that simulation training in nursing education provides outcomes of knowledge, skills, behaviors, and effects on patient outcomes.

According to Nehring (2010), today's nursing students have grown up with technology. They prefer teamwork, experiential, goal-oriented activities, and the chance to be active learners. Simulation allows students to take an active role in their education.

Conclusion 6. Nursing students reported increased anxiety using high-fidelity simulators more than low- or medium-fidelity. Nursing students in this study reported high level of anxiety using high-fidelity simulators (69.3%). The percentage of students reported experiencing anxiety was as follows: low-fidelity (15.2%), medium-

fidelity (20.3%), and high-fidelity (31.8%). These findings support the literature by Benner et al. (1996) who reported students' initial learning is based on an extrinsic motivation. They explained that learning environment can create and move the students forward to intrinsic motivation. When nursing education requires students to enter a clinical environment that is unfamiliar, students experience high level of anxiety, which will have a negative impact on students' confidence level and clinical performance. High anxiety cannot only influence students' learning; it can impact decision-making and clinical performance.

Knowles (1989; 1990) described adult students as less able to learn under strict grading and observational methods. Rather, they learn best through their own experience, motivation, and concepts that are focused on real life situations. Knowles also reported that anxiety is least likely to occur when there is mutual trust and respect, physical comfort, assistance, and acceptance in the learning environment. By contrast, anxiety levels will increase when students are being watched, judged, and made to feel incompetent while using simulators. Rhodes and Curran (2005) reported that nursing students get overwhelmed in simulation labs due to their lack of knowledge and experience.

To decrease students' anxiety level using high-fidelity simulators, the application of adult learning theory should be considered. Students learn based on their perceptions of knowledge on high-fidelity simulators, the benefits, and applicability to their nursing career. Some barriers in learning and motivation could be lack of resources, lack of orientation to simulation environments, overly large groups of students, and not having the access to simulators for practice.

Recommendations for Practical Application

Based upon the prior conclusions, the researcher provides the following recommendations.

Nursing schools need to utilize standards and guidelines to use high-fidelity simulators in clinical practice. Standard guidelines on how to use high-fidelity simulators will assist nurse educators with functions, features, set-up simulation lab, develop and run the scenarios, and how to guide students through the experience by facilitating and debriefing. The California Board of Registered nursing allows 25% of scheduled clinical time for simulation. Therefore, nurse educators must consider innovative ways for students to practice in small teams 5 to 10 and use them independently. More practice leads to higher confidence when placed in a real-life setting.

Nursing administrators need to implement simulations in educational settings. Simulations will enable students to practice nursing skills in an environment that allows for mistakes, gain confidence and knowledge how to react in emergency situations, and grow professionally. Simulation usage should be part of educational preparation of nurse educators in master's programs and should be incorporated into their training. Simulation preparation should be initiated at the beginning of the nursing program, starting with low-fidelity then advance gradually to medium- and high-fidelity after building some confidence in students.

Nursing administrators need to provide ongoing faculty training and education with technical support at all times. Ongoing faculty training and technical support will (a) assist nurse educators to integrate technology into clinical practice, (b)

enable them to utilize high-fidelity simulators as a teaching strategy, (c) enhance confidence, and (d) make them more competent educators. For this purpose, ongoing faculty training with simulators is essential to enhance their ability to perform in a clinical environment. Support and encouragement from administrators is necessary to provide a technical (IT) person to train a faculty member to become an expert in simulator use. This expert could then supervise other educators during clinical practice. With high-fidelity simulators, a tech person should be present to guide its use and provide demonstrations during training. Schools should provide extra time for practice on technology tools for educators to become more familiar with a simulation environment and have a broad understanding of types of simulators that are available for them.

Nursing schools need to partner with providers, nursing associations, hospitals, and vendors for funding. Simulators vary in cost and are expensive. For financial support, schools can be partners with providers, vendors, hospitals, and nursing associations to purchase different types of simulators. Their financial support will directly benefit nursing students and will prepare them to be safe, confident, and competent nurses. Simulators may be rented out from providers or from other nursing schools that are not using their simulators during a certain time period.

It is the responsibility of the nursing administrators to contact vendors, hospitals, and nursing associations to become partners who can assist financially or offer discounts to purchase simulators. Resources to explore as partners to help defray the cost includes: Simulation Innovation Resource Center (SIRC), Laerdal Medical, ATI, Robert Wood Johnson Foundation, US Department of Health and human Services,

Health Resources and Service Administration (HRSA), and community partner hospitals.

All educators should utilize all types of simulation as an evaluation method. In addition to its usefulness in clinical practice, simulation provides a methodology for student skill performance, especially in the area of communication, technical, and interpersonal skills. Simulation can provide innovative learning experiences and enable nurse educators to assess students' clinical judgment and critical thinking. Also, simulation provides a method to evaluate educators teaching, as they can determine what improvements students need in order to achieve educational goals.

Nursing schools should overcome students' anxiety through orientation at the beginning of nursing program in the simulation lab. Orientation at the beginning of the nursing program will allow students to become familiar with the new technology environment and its use. Student involvement and participation is necessary to build confidence. Students get little guidance and are being thrown into new environments with no formal training, yet they are expected to perform well. Students should be encouraged to practice on low-fidelity simulators first. As they develop some confidence, they should start using medium- or high-fidelity simulators. Jefferies (2005) suggests that student orientation to the clinical environment and simulator must be included. These techniques would overcome students' anxiety using high-fidelity simulators. Also, nurse educators should consider utilizing a "standardized patient" along with simulators in the classroom to reduce student anxiety levels.

Nursing administrators need to implement medium-fidelity simulations in educational settings. High-fidelity simulators are expensive and require extensive technical support and faculty training. Increased anxiety using a high-fidelity simulator is a common factor in resistance to its use. Using a medium-fidelity simulator can reduce the anxiety level in nurse educators and students because it is less technical and very useful when teaching abnormal vital signs and symptoms. Medium-fidelity simulators create a less threatening environment and are easily managed.

Summary

This chapter provided summary of problem and purpose statements, the significance of this study, data collection procedures, and data analysis findings. Conclusions and recommendations were made to assist nursing educators and administrators to develop educational strategies to utilize high-fidelity simulators to enhance students learning and to practice skills with confidence.

Findings from this study indicate a high level of satisfaction using high-fidelity simulators among student users. Continuing faculty training and education, and providing technical support, will build success in clinical practice within nursing schools throughout the country.

Recommendations for Future Study

This study was conducted in four schools in California with a sample of nurse educators (N = 26) and nursing students (N = 296). Identification of challenges and barriers to using high-fidelity simulators in clinical practice is one of many areas of study necessary to close the gap between nursing science and technology. Future research

with larger sample populations should be repeated in different regions of the United States. Other methodological approaches might also be considered.

Nurse educators repetitively need to assess and monitor when using high-fidelity simulators in clinical practice and the effects on students learning outcomes. Educators need to evaluate the learning skills of students from the first year until students graduate. Comparison should be made of who had experience using high-fidelity simulators with those who had low- or medium-fidelity simulators for practice.

Conclusion

In recent years, technology advancement has forced nursing schools to integrate technology into curriculum to increase competence among future nurses. Unfortunately, the majority of nursing schools have yet embrace new technologies, such as high-fidelity simulators, for educational purposes. This study was able to determine what type of simulators nursing schools utilize and to identify barriers for use of high-fidelity simulators by certain institutions.

Published literature related to the historical and evolving use of simulator technologies by nursing schools was reviewed. Advantages and disadvantages, challenges, and perceptions among nurse educators and students in previous studies were likewise reviewed.

A quantitatively based descriptive design was used to ascertain perceptions and experiences of nurse educators (N = 26) and students (N = 296) using different types of simulators at four nursing schools. Two surveys were developed for each group of participants and distributed with permission from nursing administrators.

Based on the results, 6 conclusions were made. Conclusions were consistent with the literature review conducted on previous studies. Institutional recommendations and suggestions for future research were made accordingly.

Rogers's theory of diffusion innovation and Kolb's experiential learning were used as the foundational bases because the process of adoption is considered key to implementing new technologies. According to Rogers's theory of innovation diffusion, when new ideas are invented, three possible outcomes are diffusion, adoption, or rejection.

Findings from this study revealed that some nurse educators and nursing programs are late adopters of new technologies and are considered under the *late majority* and *laggards* categories. The promotion of high-fidelity simulators use greatly depends on the leadership (i.e., nursing school administration). Institutional leaders as change agents for the adoption of higher technologies is essential. Policy makers with the capacity to enforce use of high-fidelity simulators technologies as a mechanism for protecting patient safety, minimizing harm or injury, and promoting favorable outcomes is essential.

REFERENCES

Abdo, A., & Ravert, P. (2005). *Student satisfaction with stimulation experiences. Clinical Simulation in Nursing*, *2*, 13-16. doi:10.1016/j.ecns.2009.05.009

Ackermann, A. D., Kenny, G., & Walker, C. (2007). Simulator programs for new nurses' orientation. *Staff Development, 23*(3)*,* 136-139. doi:10.1097/01.NND.0000277183.32582.43

Aldrich, C. (2005). *Learning by doing: A comprehensive guide to simulations, computer games, and pedagogy in e-learning and other educational experiences.* San Francisco, CA: Pfeiffer.

Alinier, G., Gordon, R., Harwood, C., & Hunt, B. (2006). Effectiveness of intermediate-fidelity simulation training technology in undergraduate nursing education. *Journal of Advanced Nursing, 54*(3), 359-367. doi:10.1111/j.1365-2648.2006.03810.x

Alinier, G., Hunt, W., & Gordon, R. (2003). Determining the value of simulation in nurse education: Study design and initial results. *Nurse Education in Practice, 4,* 200-207. doi:10.1016/S1471-5953(03)00066-0

American Association of Colleges of Nursing. (2008, December 31). *Nurse educator.* Retrieved from www.aacn.nche.edu

American Association of Colleges of Nursing. (2012a). *Essentials of baccalaureate education for professional nursing practice*. Retrieved from www.aacn.nche.edu

American Association of Colleges of Nursing. (2012b). *Nursing faculty shortage*. Retrieved from www.aacn.nche.edu/media-relations/fact.../nursingfaculty-shortage

American Nurses Association. (2011). *Fact sheet*. Retrieved from http://nursingworld .org/nursingbythenumbersfactsheet.aspx

Axley, L. (2008). The integration of technology into nursing curricula: Supporting faculty via the Technology Fellowship Program. *Journal of Issues in Nursing, 13*(3). doi:10.3912/OJIN.Vol13No03PPT01

Bambini, D., Washburn, J., & Perkins, R. (2009). Outcomes of clinical simulation for novice students: Communication, confidence, clinical judgment. *Nursing Education Perspectives, 30*(2), 79-82. Retrieved from http://www.ncbi.nlm.nih .gov/pubmed/19476069

Bandman, E., & Bandman, B. (Eds.). (1995). *Critical thinking in nursing* (2nd ed.). Norwalk, CO: Appleton & Lange.

Barrow, H. S., & Feltovich P. J. (1987). The clinical reasoning process. *Medical Education, 2*(2), 86-91. doi:10.1111/j.1365-2923.1987.tb00671.x

Beaubien, J., & Baker, D. (2004). The use of simulation for training teamwork skills in health care: How low can you go? *Quality and Safety in Health Care, 13*(1), 51-56. doi:10.1136/qshc.2004.009845

Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice.* Menlo Park, CA: Addison-Wesley Publishing Company.

Benner, P., Hooper-Kyriakidis, P., & Stannard, D. (1999). *Clinical wisdom and interventions in critical care: A thinking in action approach*. Philadelphia, PA: W.B. Saunders.

Benner, P., Sutphen, M., Leonard, V., & Day, L. (2010). *Educating nurses: A call for transformation*. San Francisco, CA: Jossey-Bass.

Benner, P., Tanner, C., & Chesla, C. (1996). *Expertise in nursing practice: Caring, clinical judgment, and ethics*. New-York, NY: Springer.

Blum, C. A., & Parcells, D. A. (2012, August). Relationship between high-fidelity simulation and patient safety in pre licensure nursing education: A comprehensive review. *Journal of Nursing Education, 51*(8), 429-435. doi:10.3928/01484834-20120523-01

Bradley, P. (2006). The history of simulation in medical education and possible future directions. *Medical Education, 40,* 254-262. doi:10.1111/j.1365-2929.2006.02394.x

Bremner, M. N., Aduddell, K., Bennett, D. N., & VanGeest, J. B. (2006). The use of human patient simulators: Best practice with novice nursing students. *Nurse Educator, 31*(4), 170-174. doi:10.1097/00006223-200607000-00011

Breyea, S. C., Slattery, M. J., & Von Reyn, L. J. (2010). Outcomes of a simulation-based residency program. *Clinical Simulation in Nursing, 6*(5), 169-175. doi:10.1016/j.ecns.2010.01.005

Bureau of Labor Statistics. (2012). *Nursing: A profile of the profession*. Retrieved from dpeaficio.org/wp…/Nursing-A-Profile-of-the-Profession-2012.pdf

Campbell, S. H., & Daley, K. M. (2013). *Simulation scenarios for nursing educators*: *Making it real* (2nd ed.). New York, NY: Springer Publishing Company.

Cangelosi, P. R., Crocker, S., & Sorrell, J. M. (2009). Expert to novice: Clinicians learning new roles as clinical nurse educators. *Nursing Education Perspectives, 30*(6), 367-371. Retrieved from www.nln.org/nlnjournal/

Casey, K., Finek, R., Krugman, M., & Propst, J. (2004). The graduate nurse experience. *Journal of Nursing Administration, 34,* 303-311. doi:10.1097/00005110-200406000-00010

Cato, J. (2011, March 7). Nursing informatics: Leveraging technology to improve patient care. *NurseWeek*, 38-42. Retrieved from www.nurse.com/

Childs, J. C., & Sepples, S. B. (2006). Lessons learned from a complex patient care scenario. *Nursing Education Perspectives, 27*(3), 154-158. Retrieved from www.nln.org/nlnjournal/

Cook, D., Hatala, R., Brydges, R., Szostek, J., Wang, A., Erwin, P., & Hamstra, S. (2011). Technology-enhanced simulation for health professionals education: A systemic review and meta-analysis, *JAMA, 306*(9), 978-988. doi:10.1001/jama.2011.1234

Cohen, L., Denzin, N. K., & Lincoln, Y. S. (2005). *Introduction: Entering the field of qualitative research*. Thousand Oaks, CA: Sage Publications.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum.

Creswell, J. W. (1998). *Qualitative inquiry and research design: Choosing among five traditions*. Thousand Oaks, CA: Sage.

Creswell, J. W. (2003). *Research design: Qualitative, quantitative, and mixed methods approaches* (2nd ed.). Thousand Oaks, CA: Sage.

Creswell, J. W. (2009). *Research design: Qualitative, quantitative, and mixed methods approaches* (3rd ed.). Los Angeles, CA: Sage.

Cronenwett, L., Sherwood, G., Barnsteiner, J., Disch, J., Johnson, J., Mitchell, P., & Warren, J. (2007). Quality and safety education for nurses. *Nursing Outlook, 57*, 122-131. doi:10.1016/j.outlook.2007.02.006

Decker, S., Sportsman, S., Puetz, L., & Billings, L. (2008). The evolution of simulation and its contribution to competency. *Journal of Continuing Education in Nursing, 39*(2), 74-80. doi:10.3928/00220124-20080201-06

Doyle, T. J. (2011, April 5). Do the patient no harm: Using simulation to prepare nurses for the real world. *Reflections on Nursing Leadership, 37(2).* Retrieved from www.reflectionsnursingleadership.org

Duffy, K. (2003). *Failing students: A qualitative study of factors that influence the decisions regarding assessment of students' competence in practice* (Doctoral dissertation). Available from ProQuest Dissertations & Theses. (UMI No. 3071337)

Ebright, P. R. (2004). Understanding nurse work. *Clinical Nurse Specialist, 18*(4), 168-170. doi:10.1097/00002800-200407000-00002

Eddington, C. L. (2011, February 17). *Simulation: Preparing the nurse educator*. Retrieved from http://nursing.advanceweb.com/Features/Articles/Simulation-in-Nursing-Preparing-the-Nurse-Educator.aspx

Elfrink, V. I., Kirkpatrick, B., Nininger, J., & Schubert, C. (2010). Using learning outcomes to inform teaching practices in human patient simulation. *Nursing Education Perspectives, 31*(2)*,* 97-100. Retrieved from www.nln.org/nlnjournal/

Elsevier. (2011). *"And, scene:" Some great places to get simulation scenarios.* Retrieved from healthysimulation.com/316/great-places-to-get-free- simulation-scenarios/

Feingold, C. E., Calaluce, M., & Kallen, M. A. (2004). Computerized patient model and simulated clinical experiences. Evaluation with baccalaureate nursing students. *Journal of Nursing Education, 43*(4), 156-63. Retrieved from www.healio.com/journals/jne

Fitzgerald, C., Kantrowitz-Gordon, I., Katz, J., & Hirsch, A. (2012). Advanced practice nursing education: Challenges and strategies. *Nursing Research and Practice.* Retrieved from www.hindawi.com/journals/nrp/2012/854918

Forbes, V. J., & Jessup, A. L. (2004). From expert to novice: The unnerving transition from experienced RN to neophyte APN. *Journal of Holistic Nursing, 22*(2), 180-185. doi.org/10.1177/0898010104266067

Fraenkel, J. R., & Wallen, N. E. (2003). *How to design and evaluate research in education* (5th ed.). Boston, MA: McGraw Hill.

Gaba, D. (2004). The future vision of simulation in health care. *Quality and Safety in Health Care, 13*(1)*,* 2-10. doi.org/10.1136/qshc.2004.009878

Gaba, D., & DeAnda, A. (1988). A comprehensive anesthesia simulation environment: Recreating the operating room for research and training. *Anesthesiology, 69*(3), 387-394. doi:10.1097/00000542-198809000-00017

Galloway, S. J. (2009). Simulation techniques to bridge the gap between novice and competent healthcare professionals. *Online Journal of Issues in Nursing, 14*(*2*), 3. Retrieved from www.nursingworld.org/ojin/

Gershenson, T. A., Moravick, D. A., Sellman, E., & Somerville, S. (2004). Expert to novice: A nurse leader's evolution. *Nursing Management, 35*(6), 48-52. doi:10.1097/00006247-200406000-00017

Gordon, M. (1997). All new Harvey, major changes. *University of Miami*. Retrieved from http://gcrme.miami.edu/#harvey-major-changes

Gordon, C. J., & Buckley, T. (2009). The effect of high-fidelity simulation training on medical-surgical graduate nurses' perceived ability to respond to patient clinical emergencies. *Journal of Continuing Education in Nursing, 40*(11), 491-498. doi.org/10.3928/00220124-20091023-06

Griscti, O., Jaccono, B., & Jacono, J. (2005). The nurse educator's clinical role. *Journal of Advanced Nursing, 50*(1), 84-92. doi.org/10.1111/j.1365-2648.2004.03351.x

Habel, M. (2011, September 12). The power of change. *Nurse.com*, 57-59. Retrieved from www.nurse.com/

Hausman, S. (2012, August 03). Nursing schools brace for faculty shortage. Retried from www.npr.org/blogs/.../nursing-schools-brace-for-faculty-shortage

Harlow, K., & Sportsman, S. (2007). An economic analysis of patient simulators for clinical training in nursing education. *Nursing Economics, 25*(1), 24-29. Retrieved from https://www.nursingeconomics.net/

Henneman, E. A., & Cunningham, H. (2005). Using clinical to teach patient safety in an acute/critical care nursing course. *Nurse Educator, 43*(4), 181-184. Retrieved from http://journals.lww.com/nurseeducatoronline/

Hermann, M. L. (2007). Virtual surgery: Energizing the nursing classroom. *Nurse Educator, 32,* 144. doi:10.1097/01.NNE.0000281082.56549.28

Howard, V. M. (2007). *A comparison of educational strategies for the acquisition of medical-surgical nursing knowledge and critical thinking skills: Human patient simulator vs. the interactive case study approach* (Doctoral dissertation). Available from ProQuest Dissertations & Theses. (UMI No. 3270096)

Hsu, L. (2006). An analysis of clinical teacher behavior in a nursing practicum in Taiwan. *Journal of Clinical Nursing, 15,* 619-628. doi:10.1111/j.1365-2702.2006.01332.x

Hughes, E. (2005). Nurses' perceptions of continuing professional development. *Nursing Standard, 19*(43), 41-49. doi:10.7748/ns2005.07.19.43.41.c3904

Institute of Medicine. (2000). *Errors in health care: A leading cause of death and injury*. Retrieved from iomwww@nas.edu

Institute of Medicine. (2004). *Patient safety: Achieving a new standard for care*. Washington, DC: National Academies Press.

Institute of Medicine. (2010). *The future of nursing: Focus on Education*. Washington, DC: National Academies Press. Retrieved from http://www.iom.edu/~/media/Files/Report%20Files/2010/The-FutureofNursing/Nursing%20Education%202010%20Brief.pdf

Institute of Medicine. (2012, November 12). *Quality and patient safety.* Retrieved from iomwww@nas.edu

Issenberg, S. B., McGaghie, W. C., Petrusa, E. R., Gordon, D. G., & Scalese, R. J. (2005). Features and uses of high-fidelity medical simulations that lead to effective learning: A BEME systematic review. *Medical Teacher, 27*(1), 10-28. doi:10.1080/01421590500046924

Joint Commission on Accreditation of healthcare Organizations. (2007). *National patient safety goals*. Retrieved from http://www.joint commission.org/PatientSafety/ NationalPatientSafetyGoals/07

Jansen, D. A., Berry, C., Brenner, G. H., Johnson, N., & Larson, G. (2008). *Mannequin-based simulations in nursing education: Challenges and solutions.* Retrieved from research.son.wisc.edu/tecne/manikinsimulation/manikinsim

Jeffries, P. (2005). A framework for designing, implementing, and evaluating: Simulations used as teaching strategies in nursing. *Nursing Education Perspectives, 26*(2), 96-103. Retrieved from www.nln.org/nlnjournal/

Johnson, J., Zerwic, J., & Theis, S. (2006). Clinical simulation laboratory: An adjunct to clinical teaching. *Nurse Educator, 24*(5), 37-41. doi:10.1097/00006223-199909000-00016

Jones, A., & Hegge, M. (2007). Faculty comfort levels with simulation. *Clinical Simulation in Nursing, 3*, 15-19. doi:10.1016/j.ecns.2009.05.034

Kalb, K. A. (2008). Core competencies of nurse educators: Inspiring excellence in nurse educator practice. *Nursing Education Perspectives, 29*(4), 217-219. Retrieved from www.nln.org/nlnjournal/

Kait, T. K., Mei, T. T. Y., Nagammal, S., & Jonnie, A. D. A. (2007). A review of learners' experience with simulation based training. *Singapore Nursing Journal, 34*(4)*,* 37-43. Retrieved from www.sna.org.sg/site/singapore-nursing-journal/index.php

Kameg, K., Howard, V. M., Clochesy, J. M., Mitchell, A. M., & Suresky, J. M. (2010). The impact of high fidelity human simulation on self-efficacy of communication

skills. *Issues in Mental Health Nursing, 31*(5)*,* 315-323. doi:10.3109/01612840903420331

Kowslski, S. D., & Louis, M. A. (2000). Using computer technology to teach critical thinking. *Nurse Educator, 25,* 210-212. doi:10.1097/00006223-200009000-00009

King, C., Moseley, S., Hindenlang, B., & Kuritz, P. (2008). Limited use of the human patient simulator by nurse faculty: An intervention program designed to increase. *International Journal of Nursing Education Scholarship, 5*(1)*,* 1-17. doi:10.2202/1548-923X.1546

Klein, J., & Doran, M. (1999). Implementing individual and small group learning structures with a computer simulation. *Educational Technology, Research and Development, 47*(1), 97-110. doi:10.1007/BF02299479

Knowles, M.S. (1989). *The making of an adult educator: An autobiographical journey.* San Francisco, CA: Jossey-Bass.

Knowles, M. S. (1990). *The adult learner: A neglected species*. Houston, TX: Gulf Publishing.

Kohn, L., Grant, M. J., Howarth, M. L., & Leigh, M. (Eds). (2000). *To err is human: Building a safer health system*. Washington, DC: National Press.

Kolb, D. A. (1976). *The learning style inventory: Technical manual*. Boston, MA: McBer.

Kolb, D. A. (1984). *Experiential learning: Experience as the source of learning and development*. Englewood Cliffs, NJ: Prentice-Hall.

Kolb, D. A. (1999). *The Kolb learning style inventory* (3rd ed.). Boston, MA: Hay Group.

Kolb, D. A., Osland, J., & Rubin, I. (1995). *Organizational behavior: An experiential approach to human behavior in organizations*. Englewood, Cliffs, NJ: Prentice Hall.

Krautscheid, L., & Burton, D. (2003). *Technology in nursing education*. Retrieved from www.oregoncenterfor nursing.org/documents/Tech_Assessment.pdf

Kuznar, K. (2007). Associate degree nursing students' perceptions of learning using a high-fidelity patient simulator. *Teaching and learning in Nursing, 2*(2), 46-52. doi:10.1016/j.teln.2007.01.009

Kyle, R. R., Jr., & Murray, W. B. (2008). *Clinical simulation: Operations, engineering, and management* (1st ed.). Burlington, MA: Elsevier.

Laerdal Medical. (2013). *The national center for simulation*. Retrieved from http://www.laerdal.com/us/

Larew, C., Lessan, S., Spunt, D., Foster, D., & Covington, B. G. (2006). Application of Benner's theory in an interactive patient care simulation. *Nursing Education Perspectives, 27*(1)*,* 16-21. Retrieved from www.nln.org/nlnjournal/

Lasater, K. (2007). High-fidelity simulation and the development of clinical judgment: Students experience. *Journal of Nursing Education, 46*, 269-276. Retrieved from www.healio.com/journals/jne

Leigh, G. (2011). The simulation revolution: What are the implications for nurses in staff development. *Journal for nurses in Staff Development, 27*(2)*,* 54-57. doi:10.1097/NND.0b013e31820eecea

Lincoln, Y. S., & Gaba, E. G. (1985). *Naturalistic inquiry*. Beverly Hills, CA: Sage.

McIntosh, C. (2006). Simulation: What does it really cost? *Journal of the Society for Simulation in Healthcare, 1*(2), 109. doi:10.1097/01266021-200600120-00041

McMillan, J. H., & Schumacher, S. (2010). *Research Education: Evidence-based inquiry* (7th ed.). Upper Saddle River, NJ: Pearson Education.

Mead, D., Hopkins, A., & Wilson, C. (2011). Views of nurse mentors about their role. *Nursing Management, 18*(6)*,* 18-23. doi:10.7748/nm2011.10.18.6.18.c8716

Medly, C. F., & Horne, C. (2005). Using simulation technology for undergraduate nursing education. *Journal of Nursing Education, 44*, 31-34. Retrieved from www.healio.com/journals/jne

Merriam, S. B. (1998). *Quantitative reasons and case study applications in education.* San Francisco, CA: Jossey-Bass.

Miller, G. E. (1990). The assessment of clinical skills/competence/performance. *Academia Medicine, 65*, 63-37. doi:10.1097/00001888-199009000-00045

Moody, J. (2004). Supporting women and minority faculty. *Academe, 90(1),* 47-52. doi:10.2307/40252590

Murray, C., Grant, M. J., Howarth, M. L., & Leigh, J. (2008). The use of simulation as a teaching and learning approach to support practice learning. *Nurse Education in Practice, 8,* 5-8. doi:10.1016/j.nepr.2007.08.001

Napier, J., & Youngberg, B. J. (2011). *Risk management and patient safety: The synergy and the tension*. Sudbury, MA: Jones & Bartlett Learning.

National League for Nursing. (2005). *Core competencies of nurse educators with task statements*. Retrieved from www.nln.org/profdev/corecompetencies.pdf

National League for Nursing. (2009). Simulation in nursing education. *Nursing Education Perspectives, 30*(2)*,* 71-128. Retrieved from www.nln.org/nlnjournal/

National League for Nursing. (2010). *2010 nurse educator shortage fact sheet*. Retrieved from www.nln.org/governmentaffairs/pdf/nursefacultyshortage.pdf

National Council State Boards of Nursing. (2009). *Report of findings from the effect of high-fidelity simulation on nursing students' knowledge and performance: A pilot study*. Retrieved from http://www.necsbn.org

Neamson, C. S., & Wiker, K. M. (2005). Human patient simulators: A new face in baccalaureate nursing education at Brigham Young University. *Journal of Nursing Education, 44*(9), 421-425. Retrieved from www.healio.com/journals/jne

Nehring, W. M. (2008). U.S. boards of nursing and the use of high-fidelity patient simulators in nursing education. *Journal of Professional Nursing, 24*(2), 109-117. doi:10.1016/j.profnurs.2007.06.027

Nehring, W. (2010). *History of simulation in nursing*. Retrieved from nursingeducationhistory.org/…/Simulations_in_Nursing_Education

Nehring, W. M., & Lashley, F. R. (2004). Use of human patient simulator in nursing education. *Annual Review of Nursing Education, 2*, 163-181. Retrieved from http://www.springerpub.com/products/series/Annual-Review-of-Nursing-Education#.U0RExK1dWHs

Nguyen, D., Zierler, B., & Nguyen, H. (2011). A survey of nursing faculty needs for training in the use of new technologies for education and practice. *Journal of Nursing Education, 50*(4), 181-189. doi.org/10.3928/01484834-20101130-06

Nickerson, M., & Polland, M. (2010). Mrs. Chase and her descendants: A historical view of simulation. *Creative Nursing, 16*(3), 101-105. doi:10.1891/1078-4535.16.3.101

Nishisaki, A., Keren, R., & Nadkami, V. (2007). Does simulation improve patient safety? Self-efficacy, competence, operational performance, and patient safety. *Anesthesiology, 25*(2)*,* 225-236. doi:10.1016/j.anclin.2007.03.009

Parker, B. C., & Myrick, F. (2008). A critical examination of high-fidelity human patient simulation within the context of nursing pedagogy. *Nurse Education Today, 29*(3)*,* 322-329. doi:10.1016/j.nedt.2008.10.012

Peteani, L. A. (2004). Enhancing clinical practice and education with high-fidelity human patient simulators. *Nurse Education, 29,* 25-30. doi:10.1097/00006223-200401000-00008

Peters, M. A., & Boylston, M. (2006). Mentoring adjunct faculty: Innovative solutions. *Nurse Educator, 31*, 61-64. doi:10.1097/00006223-200603000-00006

Rauen, C. A. (2001). Using simulation to teach critical thinking skills. *Critical Care Nursing Clinics of North America, 13*(1)*,* 93-103. Retrieved from www.ccnursing.theclinics.com/

Rauen, C. A. (2004). Simulation as a teaching strategy for nursing education and orientation in cardiac surgery. *Critical Care Nurse, 24*(3), 46-51. Retrieved from ccn.aacnjournals.org/

Ravert, P. (2002). An integrative review of computer-based simulation in the education process. *Computers, Informatics, Nursing, 20,* 203-208. Retrieved from doi:10.1097/00024665-200209000-00013

Rhodes, M. L., & Curran, C. (2005). Use of the human patient simulator to teach clinical judgment skills in a baccalaureate nursing program. *Computers, Informatics, Nursing, 23*, 256-262. doi:10.1097/00024665-200509000-00009

Rogers, D. L. (2007). *High-fidelity patient simulation: A descriptive white paper report.* Retrieved from www.sim.strategies.com

Rogers, E. (1962). *Diffusion of innovations* (1st ed.). New York, NY: Free Press.

Rogers, E. (2003). *Diffusion of innovations* (5th ed.). New-York, NY: Free Press.

Rogers, E. M. (2004). A prospective and retrospective look at diffusion model. *Journal of Health Communications, 9*(1), 13-19. doi:10.1080/10810730490271449

Roy, C. (1976). Adaptation model: Comments. *Nursing Outlook, 24*(11), 690-691. Retrieved from www.nursingoutlook.org/

Roy, C. (1980). *The Roy adaptation model*. Norwalk, CT: Appleton and Lange.

Roy, C. (1999). *The Roy adaptation model* (2nd ed.). Upper Saddle River, NJ: Prentice Hall.

Scalese, R. J., Obeso, V. T., & Issenberg, S. B. (2008). Simulation technology for skills training and competency assessment in medical education. *Journal of Internal Medicine, 1,* 46-49. Retrieved from http://www.springer.com/medicine/internal /journal/11606

Schiavenato, M. (2009). Reevaluating simulation in nursing education: Beyond the human patient simulator. *Journal of Nursing Education, 48*(7), 388-394. doi.org/10.3928/01484834-20090615-06

Schoening, A. M., Sittner, B. J., & Todd, M. J. (2006). Simulated clinical experience: Nursing students' perceptions and the educator role. *Nurse Educator, 31,* 253-258. doi.org/10.1097/00006223-200611000-00008

Senesac, P. (2010). *Implementing the Roy adaptation model: From theory to practice*. Retrieved from www.bc.edu/.../featured/theorist/Roy_ Adaptation_Model/ Practice.html

Seropian, M. A., Brown, K., Gavilanes, J. S., & Driggers, B. (2004). Simulation: Not just a manikin. *Journal of Nursing Education, 43*(4), 164-169. Retrieved from www.healio.com/journals/jne

Sears, K., Goldsworthty, S., & Goodman, W. M. (2010). The relationship between simulation in nursing education and medication administration. *Journal of Nursing Education, 49*, 52-55. doi:10.3928/01484834-20090918-12

Shearer, R., & Davidhizar, R. (2003). Using role play to develop cultural competence. *Journal of Nursing Education, 42*, 273-276. Retrieved from www.healio.com /journals/jne

Siela, D., Twibell, R. K., & Keller, V. (2009). *The shortage of nurses and nursing faculty*. Retrieved from www.aacn.org/WD/CeTests/Media/CG02092.pdf

Silverman, W. G. (2001). *An introduction to qualitative research* (2nd ed.). Thousand Oaks, CA: Sage.

Simpson, R. L. (2002). The virtual reality revolution: Technology changes nursing education. *Nursing Management, 33*(9), 14. doi:10.1097/00006247-200209000-00007

Smith, S., & Roehrs, C. (2009). High-fidelity simulation: Factors correlated with nursing student satisfaction and self-confidence. *Nursing Education Perspectives, 30*(2), 74-78. Retrieved from www.nln.org/nlnjournal/

Staff Educator. (2009, November 3). *The many forms of simulation training*. Retrieved from www.healthleadersmedia.com

Stanley, J., Capers, C., & Berlin, L. (2007). Changing the face of nursing faculty: Minority faculty recruitment and retention. *Journal of Professional Nursing, 23,* 253-261. doi:10.1016/j.profnurs.2007.07.005

Starkweather, A. R., & Kardong-Edgren, S. (2008). Diffusion of innovation: Embedding simulation into nursing curricula. *International Journal of Nursing Education Scholarship, 5*(1)*,* 1-11. doi.org/10.2202/1548-923X.1567

Strauss, A., & Corbin, J. (1990). *Basics of qualitative research: Grounded theory procedures and techniques*. Newbury Park, CA: Sage.

Tan, J., & Payton, F. C. (2010). *Adaptive health management information systems*: *Concepts, cases, and practical applications* (3rd ed.). Sudbury, MA: Jones and Bartlet Publications.

Tanner, C. A. (2006). The next transformation: Clinical education. *Journal of Nursing Education, 45*(4)*,* 99-100. Retrieved from www.healio.com/journals/jne

Ward-Smith, P. (2008). The effect of simulation learning as a quality initiative. *Urologic Nursing, 28*(6), 471-473. Retrieved from https://www.suna.org/unj

Weaver, A. (2011). *High-fidelity patient simulation in nursing education: An integrative review*. Retrieved from www.thefreelibrary.com

Weller, J. M. (2004). Simulation in undergraduate medical education: Bridging the gap between theory and practice. *Medical Education, 38*(1)*,* 32-38. doi:10.1111/j.1365-2923.2004.01739.x

Wilson, M. L. (2011, April 4). Jump your career in nursing informatics. *NurseWeek*, 44. Retrieved from urlm.co/www.nurseweek.com

Wolf, Z. R., Hicks, R., & Serembus, J. F. (2006). Characteristics of medication errors made by students during the administration phase: A descriptive study. *Journal of Professional Nursing, 22*(1)*,* 39-51. doi:10.1016/j.profnurs.2005.12.008

Wong, A. K. (2004). Full scale computer simulators in anesthesia training and evaluation. *Canadian Journal of Anesthesia, 51*(5)*,* 455-464. Retrieved from www.cas.ca/english/canadian-journal-of-anesthesia

Wotton, K., Davis, J., Button, D., & Kelton, M. (2010). Third-year undergraduate nursing students' perceptions of high-fidelity simulation. *Journal of Nursing Education, 49*(11)*,* 632-639. doi.org/10.3928/01484834-20100831-01

Ziv, A., Ben-David, S., & Ziv, M. (2005). Simulation based medical education: An opportunity to learn from errors. *Medical Teacher, 27*(3), 193-199. doi:10.1080/01421590500126718

APPENDIX A

Permission Request for Nursing Directors

Dear Educational Program Director,

My name is Janet Baghoomian, and I am a doctoral student in Organizational Leadership at Pepperdine University. I am conducting a research study to determine how simulators are used by nurse educators and how their use affects learning outcomes. I am also an RN, and a nurse educator in health and business management with many years of experience. I am fully aware of confidentiality rules and regulations and would do my best to be compliant with your school policy requirements.

I would like to ask your permission to conduct my research in your nursing school and ask nurse educators and student nurses to participate in this study. This study will begin in October and continue until it is completed. Participation is voluntary and educators or students can end their participation at any time if they do not feel comfortable. Participation in this study may help provide valuable information to the nursing profession and may show whether simulators can benefit nursing students.

To participate in this research, the nurse educators and students will be asked to complete a written survey based on their experience using different types of simulators. Every effort will be made to protect the confidentiality of the participants.

If you agree to allow your nurse educators and students to participate in this study, please provide a permission letter to the researcher. If you have any questions, you may contact me, at Janet.Baghoomian@pepperdine.edu, or my dissertation chairperson at Diana.Hiatt-Michael@pepperdine.edu Thank you in advance for your consideration.

Janet Baghoomian
(Doctoral candidate)

APPENDIX B

Protocol for Survey Data Collection

Name of Researcher: Hello. I am Janet Baghoomian, a doctoral student in Organizational Leadership at Pepperdine University, Graduate School of Education and Psychology. This research study is being conducted in partial fulfillment of the requirement for the Doctor of Education Degree in Organizational Leadership. I am also an RN and a nurse educator in health and business.

Title of Research: The title of my study is “Nurse Educators Use of Technical Simulators in Nursing Preparation.” My dissertation chairperson is Dr. Dianna Hiatt-Michael at Pepperdine University, Graduate School of Education and Psychology.

Explanation: You are being asked to participate in a research study designed to test the effectiveness of low, medium, and high-fidelity simulators in clinical settings in nursing schools as a safe way for student nurses to acquire knowledge, develop self-confidence, improve communication skills, and develop critical thinking abilities to help provide safe patient care. The purposes of this study are: 1) to determine how simulators are used by nurse educators in clinical practice, for what courses, and how the effect on learning outcomes is measured; and 2) to determine what challenges nurse educators and students may encounter when using simulators for teaching and learning.

Please understand that your participation in my study is strictly voluntary. If you decide to participate in this research, you will be asked to complete a written survey based on your experience with different types of simulators, including high-fidelity simulators. Completing the survey will take approximately 5 to10 minutes. I will give you the surveys to complete here on campus. If you are not comfortable answering questions, you can end your participation in this research at any time. Although every effort will be made to protect your confidentiality, there are small risks involved, like inconvenience location and the time needed to complete the survey. In order to minimize the risks, the researcher will meet the participants in person to ensure the place and time is convenient for participants. In addition, no identifying information will be released or published without your written consent, as required by law. No personally identifiable information will appear in any published material. The researcher will be the only person who will be able to identify study participants from the data. The researcher will assign a code number to you, and only the researcher will be able to identify the code. All collected data will be kept in a locked file cabinet in the researcher's home. In addition, the data will be securely processed and stored in the researcher's computer. Only the researcher will have access to the locked cabinet and surveys that you complete, and documents in the computer will be password-protected. All raw data, whether paper-based or electronic, and signed consent forms will be securely retained for three years.

You are encouraged to ask questions at any time regarding the nature of the research and the method the researcher is using. Your suggestions and concerns are important

to the researcher. Moreover, if you have any questions or concerns regarding your rights as a study participant, or if you are dissatisfied with any aspect of the study, you may contact:

Dr. Diana B. Hiatt-Michael, professor and chairperson of the dissertation committee for this study at (310) 568-5600 or by e-mail at Diana.Hiatt-Michael@Pepperdine.edu; or

Dr. Thema Bryant-Davis, chairperson of the Graduate and Professional IRB, Pepperdine University, at (818) 501-1632, or by e-mail at thema.bryant-davis@pepperdine.edu

Thank you for taking time to read this information. If you agree to be a participant in my research study, please sign below:

As a participant, I voluntarily agree to participate in this research:

Participant_____ Date _____

As a researcher, I have explained in detail the research procedure in which the participant has consented to participate.

Researcher _____Date_____

APPENDIX C

Nurse Educators' Survey

_____Code

How many years of experience do you have as a nurse educator?_____

How many years of teaching experience do you have with any type of simulator? _____

Please complete the following questions by entering information or checking the answers that pertain to you. Check all that apply.

1. What is your highest level of education?

   ___MSN
   ___Doctorate, PhD or EdD
   ___Other, please specify_____

2. What type of simulators do you use in your nursing school?

   ___Low-fidelity
   ___Medium-fidelity
   ___High-fidelity
   ___Other, please specify_____

3. What is the educational level of your students?

   ___First year
   ___Second year
   ___RN to BSN
   ___MSN
   ___DNP

4. What is your role as an instructor with simulation-based training?

   ___Writing scenarios
   ___Running the scenario
   ___Planning prep work for students
   ___Debriefing
   ___Other, please specify_____

5. In which of the following situations would you use a simulator?

   ___Patient assessment and vital signs
   ___Foley catheter insertion
   ___IV insertion/removal

___Emergency situations, such as cardiac arrest, hemorrhage
___Cardiac resuscitation
___Dressing change
___Suctioning
___Administration of IV, IM, SQ, and oral medications
___Birthing instruction
___Emergency decision-making
___Other, please specify_____

6. What are the goals of the use of simulators in your facility?

___Building students' self-confidence
___Increasing students' competency skills
___Teaching effective communication and feedback
___Helping students acquire and retain knowledge
___Encouraging teamwork and collaboration
___Other, please specify_____

7. What are some challenges or problems related to the use of simulators?

___Time-consuming
___Need technical support
___Developing scenarios
___Creating individualized lessons
___Cost of equipment
___Repairs to equipment
___Rapid changes in technology
___Need for ongoing training and education
___Other, please specify_____

8. What are your major concerns regarding the use of simulators in practice?

___Lack of space
___Lack of experienced faculty to use simulators
___Lack of technical support
___Need for ongoing faculty training
___Lack of time to practice
___Addition to workload
___Cost
___Other, please specify_____

9. What are expected simulation learning outcomes in your facility?

___Increased self-confidence for students
___Increased competency skills for students
___Students will gain decision-making and critical-thinking skills

___Enhanced interaction, feedback with students
___Increased teamwork and collaboration
___Safe patient care
___Other, please specify_____

Please answer the following questions if you have experience with high-fidelity simulators.

10. What are the benefits to using high-fidelity simulators in comparison with low-or medium-fidelity simulators?

___More realistic simulations of patient reactions
___More realistic simulations of patient pain
___Changes in patient condition and vital signs
___More realistic simulations of patient reactions to intervention
___Chances for observation and monitoring
___More realistic simulations overall
___Multiple errors can be made safely
___Other, please specify_____

11. Why did your school select high-fidelity simulators?

___To help reduce students' medical errors
___To improve faculty teaching
___To improve technical skills of students
___Required by school policy
___Other, please specify_____

12. What steps do you think nursing schools should take to improve patient safety?

___Incorporate more high-fidelity simulation in nursing curricula
___Provide more training and continuing education for nursing faculty
___Provide more faculty support
___Facilitate more discussion and feedback
___Other, please specify_____
_____

Thank you for participating in this survey.

APPENDIX D

Students' Survey

____code

Please answer the following questions by entering information or checking the answers that pertain to you. Check all that apply.

1. What is your level of education in nursing school?
   ___First year
   ___Second year
   ___RN to BSN
   ___MSN
   ___Other, please specify_____

2. Which of the following situations do you practice using which type of simulator?

Patient assessment and vital signs	___low___medium___high fidelity
Foley catheter insertion	___low ___medium___high fidelity
IV insertion/removal	___low___medium___high fidelity
Emergency situations, such as hemorrhaging	___low___medium___high fidelity
Cardiac resuscitation	___low___medium___high fidelity
Dressing change	___low___medium___high fidelity
Suctioning	___low___medium___high fidelity
Administration of IV, IM, SQ, and oral medications	___low___medium___high fidelity
Birthing	___low___medium___high fidelity
Other, please specify_____	

3. What challenges do you experience during simulation practice?

   ___Increased anxiety, from which type? __low, __medium or __high fidelity
   ___Problems related to lack of technical skills
   ___Ability to perform appropriate assessments
   ___Ability to identify patient problems
   ___Ability to implement care plan and understand rationale for treatment plan
   ___Ability to prioritize care
   ___Lack of confidence in providing safe care
   ___Problems adapting to simulation environment
   ___Other, please specify_____

4. What self-improvement have you experienced after simulation experiences?

___Increase in self-confidence
___Increase in competency skills
___Increase in communication skills
___Enhanced teamwork and collaboration
___Improvements in decision-making
___Improvements in critical thinking
___Improvements in leadership skills
___Ability to give and receive feedback
___Other, please specify_____

5. How did your learning benefit from using a simulator?

___Increased my nursing skills (e.g., administrating medications, taking vital signs, providing assessments)
___Improved my critical thinking (e.g., prioritization, decision-making process)
___Facilitated teamwork (working with classmates)
___Improved my communication skills: Talking to patients, doctors, and other staff members)
___Other, please specify_____

6. What is your role as a student in simulation practice? Select all that apply.

___Involvement
___Part of a team
___Asking questions
___Interaction and delegation
___Responsible for decision-making
___Prioritization
___Giving feedback
___Other, please specify_____

Thank you for participating in this survey.

APPENDIX E

Matrix of Research Questions

Research questions	Educators experiences and perceptions
Educators demographic questions Item 1, 2, 3	How many years of experience do you have as a nurse educator?_____ How many years of teaching experience do you have with any type of simulator? _____ **1.** What is your highest level of education? ___MSN ___Doctorate, PhD or Ed.D ___Other, please specify_____ **2.** What type of simulators do you use in your nursing school? ___Low-fidelity ___Medium-fidelity ___High-fidelity ___Other, please specify **3.** What is the educational level of your students? ___First year ___Second year ___RN to BSN ___MSN ___DNP
2. What are nurse educators' perceptions of using simulators to train student nurses in a clinical setting?	**4.** What is your role as an instructor with simulation-based training? ___Writing scenarios

Item 4, 5, 6, 7, 8, 9, 10, 11, 12	___Running the scenario ___Planning prep work for students ___Debriefing ___Other, please specify_____ **5.** In which of the following situations would you use a simulator? ___Patient assessment and vital signs ___Foley catheter insertion ___IV insertion/removal ___Emergency situations, such as cardiac arrest, hemorrhage ___Cardiac resuscitation ___Dressing change ___Suctioning ___Administration of IV, IM, SQ, and oral medications ___Birthing instruction ___Emergency decision-making ___Other, please specify_____ **6.** What are the goals of the use of simulators in your facility? ___Building students' self-confidence ___Increasing students' competency skills ___Teaching effective communication and feedback ___Helping students acquire and retain knowledge ___Encouraging teamwork and collaboration ___Other, please specify_____ **7.** What are some challenges or problems related to the use of simulators? ___Time-consuming

___Need technical support

___Developing scenarios

___Creating individualized lessons

___Cost of equipment

___Repairs to equipment

___Rapid changes in technology

___Need for ongoing training and education

___Other, please specify_____

8. What are your major concerns regarding the use of simulators in practice?

___Lack of space

___Lack of experienced faculty to use simulators

___Lack of technical support

___Need for ongoing faculty training

___Lack of time to practice

___Addition to workload

___Cost

___Other, please specify_____

9. What are expected simulation learning outcomes in your facility?

___Increased self-confidence for students

___Increased competency skills for students

___Students will gain decision-making and critical-thinking skills

___Enhanced interaction, feedback with students

___Increased teamwork and collaboration

___Safe patient care

___Other, please specify_____

	Please answer the following questions if you have experience with high-fidelity simulators. **10.** What are the benefits to using high-fidelity simulators in comparison with low-or medium-fidelity simulators? ___More realistic simulations of patient reactions ___More realistic simulations of patient pain ___Changes in patient condition and vital signs ___More realistic simulations of patient reactions to intervention ___Chances for observation and monitoring ___More realistic simulations overall ___Multiple errors can be made safely ___Other, please specify_____ **11.** Why did your school select high-fidelity simulators? ___To help reduce students' medical errors ___To improve faculty teaching ___To improve technical skills of students ___Required by school policy ___Other, please specify_____ **12.** What steps do you think nursing schools should take to improve patient safety? ___Incorporate more high-fidelity simulation in nursing curricula ___Provide more training and continuing education for nursing faculty ___Provide more faculty support ___Facilitate more discussion and feedback ___Other, please specify_____

3. What are student nurse perceptions of using simulators to receive training for practice in a clinical environment setting? Item 1, 2, 3, 4, 5, 6	7. What is your level of education in nursing school? ___First year ___Second year ___RN to BSN ___MSN ___Other, please specify_____ 8. Which of the following situations do you practice using which type of simulator? Patient assessment and vital signs ___low___medium___high fidelity Foley catheter insertion ___low ___medium___high fidelity IV insertion/removal ___low___medium___high fidelity Emergency situations, such as hemorrhaging ___low___medium___high fidelity Cardiac resuscitation ___low___medium___high fidelity Dressing change ___low___medium___high fidelity Suctioning ___low___medium___high fidelity Administration of IV, IM, SQ, and oral medications ___low___medium___high fidelity Birthing ___low___medium___high fidelity Other, please specify_____ 9. What challenges do you experience during simulation practice? ___Increased anxiety, from which type? __low, __medium or __high fidelity ___Problems related to lack of technical skills ___Ability to perform appropriate assessments ___Ability to identify patient problems ___Ability to implement care plan and understand rationale for treatment plan

	___Ability to prioritize care ___Lack of confidence in providing safe care ___Problems adapting to simulation environment ___Other, please specify_____ 10. What self-improvement have you experienced after simulation experiences? ___Increase in self-confidence ___Increase in competency skills ___Increase in communication skills ___Enhanced teamwork and collaboration ___Improvements in decision-making ___Improvements in critical thinking ___Improvements in leadership skills ___Ability to give and receive feedback ___Other, please specify_____ 11. How did your learning benefit from using a simulator? ___Increased my nursing skills (e.g., administrating medications, taking vital signs, providing assessments) ___Improved my critical thinking (e.g., prioritization, decision-making process) ___Facilitated teamwork (working with classmates) ___Improved my communication skills: Talking to patients, doctors, and other staff members) ___Other, please specify_____ 12. What is your role as a student in simulation practice? Select all that apply.

	___Involvement ___Part of a team ___Asking questions ___Interaction and delegation ___Responsible for decision-making ___Prioritization ___Giving feedback ___Other, please specify_____

APPENDIX F

IRB Approval Letter for Research

PEPPERDINE UNIVERSITY

Graduate & Professional Schools Institutional Review Board

October 4, 2013

[redacted]

Protocol #: E0813D01
Title: Nurse Educators' Use of Technical Simulators in Nursing Preparation

Dear Ms. Baghoomian:

Thank you for submitting your application, *Nurse Educators' Use of Technical Simulators in Nursing Preparation,* for exempt review to Pepperdine University's Graduate and Professional Schools Institutional Review Board (GPS IRB). The IRB appreciates the work you and your faculty advisor, Dr. Diana B. Hiatt-Michael, have done on the proposal. The IRB has reviewed your submitted IRB application and all ancillary materials. Upon review, the IRB has determined that the above entitled project meets the requirements for exemption under the federal regulations (45 CFR 46 - http://www.nihtraining.com/ohsrsite/guidelines/45cfr46.html) that govern the protections of human subjects. Specifically, section 45 CFR 46.101(b)(2) states:

> (b) Unless otherwise required by Department or Agency heads, research activities in which the only involvement of human subjects will be in one or more of the following categories are exempt from this policy:
>
> **Category (2) of 45 CFR 46.101**, research involving the use of educational tests (cognitive, diagnostic, aptitude, achievement), survey procedures, interview procedures or observation of public behavior, unless: a) Information obtained is recorded in such a manner that human subjects can be identified, directly or through identifiers linked to the subjects; and b) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.

Your research must be conducted according to the proposal that was submitted to the IRB. If changes to the approved protocol occur, a revised protocol must be reviewed and approved by the IRB before implementation. For any proposed changes in your research protocol, please submit a **Request for Modification Form** to the GPS IRB. Because your study falls under exemption, there is no requirement for continuing IRB review of your project. Please be aware that changes to your protocol may prevent the research from qualifying for exemption from 45 CFR 46.101 and require submission of a new IRB application or other materials to the GPS IRB.

A goal of the IRB is to prevent negative occurrences during any research study. However, despite our best intent, unforeseen circumstances or events may arise during the research. If an unexpected situation or adverse event happens during your investigation, please notify the GPS IRB as soon as possible. We will ask for a complete explanation of the event and your response. Other actions also may be required depending on the nature of the event. Details regarding the

timeframe in which adverse events must be reported to the GPS IRB and the appropriate form to be used to report this information can be found in the *Pepperdine University Protection of Human Participants in Research: Policies and Procedures Manual* (see link to "policy material" at http://www.pepperdine.edu/irb/graduate/).

Please refer to the protocol number denoted above in all further communication or correspondence related to this approval. Should you have additional questions, please contact the GPS IRB office at gpsirb@peppderdine.edu. On behalf of the GPS IRB, I wish you success in this scholarly pursuit.

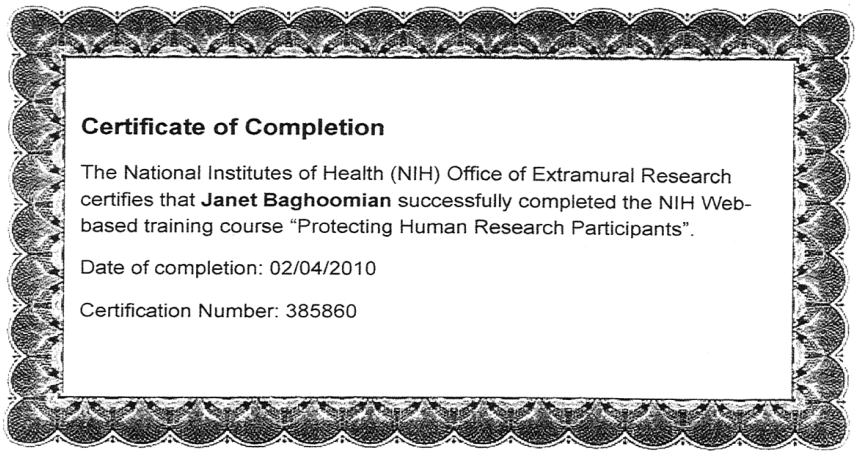
Sincerely,

Thema Bryant-Davis, Ph.D.
Chair, Graduate and Professional Schools IRB

cc: Dr. Lee Kats, Vice Provost for Research and Strategic Initiatives
Ms. Alexandra Roosa, Director Research and Sponsored Programs
Dr. Diana B. Hiatt-Michael, Graduate School of Education and Psychology

APPENDIX G

Certificate of Completion of IRB Training



Certificate of Completion

The National Institutes of Health (NIH) Office of Extramural Research certifies that **Janet Baghoomian** successfully completed the NIH Web-based training course "Protecting Human Research Participants".

Date of completion: 02/04/2010

Certification Number: 385860

APPENDIX H

Letters to Participating Colleges and Universities From Dissertation Chairperson

PEPPERDINE UNIVERSITY
Graduate School of Education and Psychology

May 28, 2013

TO WHOM IT MAY CONCERN:

Janet Baghoomian is a registered nurse, nurse educator, and a dissertation student in the Graduate School of Education and Psychology in Pepperdine University, California. She is pursuing a Doctorate of Education degree in Organizational Leadership and has completed the comprehensive examination of her coursework in December 2011. She intends to defend her dissertation proposal on June 13, 2013. The proposed title of her dissertation is "Nurse Educators' Use of Technical Simulators in Nursing Preparation." She is working under my guidance as her dissertation chairperson as well as committee members Drs. Schmieder-Ramirez, Otten, and Amin.

Ms Baghoomian is interested to involve your nurse educators in this study. The involvement would require that the nurse educators complete a short survey, requiring approximately 5-10 minutes. This data collection could occur during any staff meeting. In addition, she will request that each nurse educator distribute a short survey to her/her students. She intends to collect and analyze nurse educator and student survey data regarding perceptions of teaching and learning with different types of technical simulators. A report of her findings will be shared with you and any interested parties in your organization.

If you have any questions for me, please contact me at 310-568-5600 (o) or cell 310-663-1581.

Respectfully,
Diana Hiatt-Michael
Diana B. Hiatt-Michael, Ed. D.
Professor Emeritus
Pepperdine University

6100 Center Drive, Los Angeles, California 90045 ▪ 310-568-5600 Fax: 310-568-5755