REALISM, TRANSFERABILITY, AND VALUE:

EXPERIENCES OF STUDENT NURSES AND FACULTY USING HIGH-FIDELITY PATIENT CLINICAL SIMULATORS

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Chapter I

Introduction

The student nursing population is diverse in age and experience, millennial's and baby boomers and those in between combine to form our nursing discipline today. Student diversity creates a challenge for nurse educators in meeting varied learning styles when designing education programs. As a result, nurse educators are utilizing a variety of teaching/learning strategies to help meet student learning needs. Traditional theory/lecture has been and is still, the primary method of educational instruction in most nursing programs (Alinier, Hunt, Gordon, & Harwood, 2006; Lasater, 2007). However, with a shortage of faculty to teach and a shortage of clinical sites available for nursing students to gain practical experience, simulated patient care is becoming more common place in schools of nursing as a teaching/learning strategy.

Simulated patient care experiences offer several advantages for use in nursing education. First, simulation offers a means to provide nursing students with realistic patient care experiences that are transferable to actual practice. Simulated patient care experiences enable nursing students to apply theory and knowledge to realistic practice situations. Second, simulated patient care experiences provide a non-threatening environment in which students can practice and hone their nursing skills without harm to actual patients.

Finally, simulation provides a venue in which students can practice nursing using critical thinking, clinical judgment and decision-making skills and, where faculty can evaluate student competency and program outcomes.

Background and Significance

Human patient simulation using standardized patient care scenarios is frequently discussed in the nursing education literature as an adjunct teaching/learning strategy. Explanations for the increased use of simulation strategies include advancement in human patient simulator technology, faculty shortages and lack of clinical sites where students can acquire practical experience (Durham & Alden, 2008).

While simulated patient care experiences have been used for decades in nursing education, advances in technology, fidelity, and realism have sparked renewed interest in using simulators to teach essential nursing skills, assess skill development, application of theory, and evaluate competency in nursing education (Durham & Alden, 2008). New technology has improved the realism of patient manikins; high-fidelity patient simulators provide the most realistic patient care experiences for students. Simulation can provide experiences suitable for the current millennial generation of nursing students who are comfortable with expect and value information and learning which is transferred through a technological rich environment (Parker & Myrick, 2009).

Faculty shortages continue to be an issue for schools of nursing across the United States (Curl, Smith, Chisholm, & Hamilton, 2007). The AACN (2009) reported that 56% of the schools of nursing responding to a 2009-2010 Faculty Vacancy Survey had faculty vacancies and needed additional faculty.

Reasons the schools of nursing were unable to hire additional faculty included: (a) lack of funds, (b) lack of administrative support to commit to full-time positions, (c) recruitment issues due to marketplace competition, and (d) lack of qualified applicants for a particular geographic area. Additionally, faculty shortages directly affect the number of student nurses who can be accepted into nursing programs. A study by Buerhaus, Auerbach and Staiger (Vanderbilt University Medical Center, 2009) predicts a shortage of 260,000 nurses by the year 2025. This statistic requires measures to improve the numbers of qualified nurses entering the workforce; however, initial survey data from 406 schools of nursing indicate that 27,771 qualified applicants have been turned away from entry-level baccalaureate nursing programs because of a shortage of nursing faculty (AACN, 2008). Simulation can provide additional practice and learning experiences for students to offset faculty shortages.

The issue of limited clinical sites where nursing students can practice knowledge and skills has prompted an increased use of human patient simulation using standardized patient care scenarios. Clinical experiences using human patient simulators allow students the opportunity to participate in practical clinical experiences in a controlled realistic environment without risk to real patients (Feingold, Calaluce, & Kallen, 2004; National Council of State Boards of Nursing [NCSBN], 2009). Regulating agencies for nursing are making efforts to accommodate the needs of schools of nursing related to limited availability of clinical sites to place nursing students. Five states and Puerto Rico allow a percentage of clinical time that can be substituted by clinical simulation. For example, Florida's state board of nursing specifies that 10% of nursing students' clinical experience can be acquired through simulation experiences (Nehring, 2008).

The Virginia Board of Nursing (2009) states " that no more than 20% of direct patient contact hours may be simulation" so for "pre-licensure registered nursing programs, the total number of simulated patient care hours cannot exceed 100 hours"(p. 5).

Due to this shortage of faculty to educate and mentor student nurses and limited clinical sites where students can apply theory and practice skills, viable alternative education methods must be considered and validated in order to ensure nurses entering the healthcare arena are competently trained and adequate in number to meet consumer and industry demand. Further research regarding the value, transferability, and realistic nature of simulation will help to explain if simulation is beneficial as an alternative method to educate student nurses.

Health promotion, ensuring patient safety, and improving patient outcomes are key nursing concepts and goals. According to the Institute of Medicine (IOM), an estimated 44,000 to 98,000 patients die in hospitals each year from preventable medical errors (IOM, 1999). The IOM recommends the use of simulation training as a method "in which learners practice tasks and processes in lifelike circumstances using models or virtual reality, with feedback from observers, other team members, and video cameras to assist improvement of skills" (IOM, 1999, p. 176). Competently trained nurses are needed to promote patient safety and reduce the risk of serious injury and/or death. Simulation is a valuable resource to educate nurses using realistic patient scenarios, improve outcomes through learning, and enables transfer of knowledge and skills to the clinical setting.

Simulation has been used for years by the aviation, military and nuclear industries to train personnel (Durham & Alden, 2008; Waxman & Telles, 2009).

Airplane pilots and flight attendants are trained using flight simulators and simulated flight scenarios. Should airline personnel make judgment or procedure errors during training, the simulation environment provides a venue to practice skills and learn without fear of harming consumers. Flight simulation exercises provide realistic learning experiences transferable to real emergencies that airline personnel might encounter in actual practice while decreasing the risk of injury or death to the passengers (Beya & Kobokovich, 2004; Haskvitz & Koop, 2004; Alinier et al., 2006; Waxman & Telles, 2009). Experience with simulation in a controlled environment provides the same advantage to nursing students. Students can practice skills, integrate theory, and increase knowledge without risk to patients.

Borrowed from the National Aeronautics and Space Administration, Crew Resource Management (CRM) is a team-building framework developed by the aviation industry after reviewing plane crashes and near misses to improve safety. Using simulation as a training strategy, CRM aims to improve communication, collaboration and decision-making, and reduce errors made among multi-disciplinary team members in the health care industry (Durham & Alden, 2008; Pizzi, Goldfarb & Nash, 2009).

Advantages to using simulated patient care experiences as a teaching/learning strategy in nursing education are discussed in the literature. Simulated patient experiences provide students the opportunity to encounter patient care experiences that might not be available in a real clinical setting (NCSBN, 2009). For example, students working in an obstetrical clinical rotation may never have the opportunity to care for a real maternity patient with preeclampsia/eclampsia.

High-fidelity human patient simulators offer nursing students a realistic patient care experience (Feingold et al., 2004; Seropian, Brown, Gavilanes, & Driggers, 2004). Patients benefit when students practice skills in a simulated environment where real patients are not harmed or put at risk (NCSBN, 2009). Simulation experiences enable students to practice clinical judgment and decision-making skills, and allow faculty the opportunity to evaluate student competency (Cioffi, Purcal, & Arundell, 2005; Lasater, 2007). Using simulation as a teaching/learning strategy to provide a standardized curriculum, faculty can develop standardized patient care scenarios and ensure that all students receive the same education and skill training (NCSBN, 2009).

Disadvantages to using simulation as a teaching/learning strategy in nursing education include: (a) cost, (b) faculty time and training, (c) access, and (d) fidelity (Seropian et al., 2004; Childs & Sepples, 2006; Smith & Roehrs, 2009). The financial cost of a operating a simulation environment must be measured against its benefits to nursing education (Harlow & Sportsman, 2007). A high-fidelity human patient simulator can range from $28, 000 to over $150,000 and nursing schools must also factor in operational costs including maintenance and faculty training (Seropian et al., 2004). Faculty must be adequately trained in simulator technology for the method to be most effective (Feingold et al., 2004; Smith & Roehrs, 2009). Student access to a simulation lab and human patient simulator may be limited by the availability of trained faculty. Additionally, the recommended student to simulator ratio is 5-6, and thus may limit the number of students who can be accommodated at each simulation session (NCSBN, 2009).

While it is evident in the literature that high-fidelity human patient simulation is a teaching/learning strategy used to offset faculty and clinical site shortages and educate and evaluate students, there is clear support for further research to establish the benefits simulation provides to students, academia, patients, and nursing.

Statement of Problem

Simulated clinical scenarios using high-fidelity patient manikins is a growing teaching strategy which provides practical patient care experiences for nursing students. Little is known about students' and faculty members' perceptions related to the realistic nature of the simulation experience or its value and transferability to nursing practice.

Purpose of the Study

The purpose of this study is to examine nursing students' and faculty members' perceptions of simulated clinical patient care experiences related to realism, transferability of knowledge and value. The study is a replication of the Feingold et al. (2004) study.

Research Questions

1. What are students' and faculty perceptions of manikin and scenario realism using a high-fidelity human patient simulator?

2. Do students and faculty feel students are able to transfer skills and knowledge from the simulation scenarios to real clinical experiences?

3. Do students and faculty find using a high-fidelity human patient simulator to be valuable in increasing student knowledge and skill acquisition?

Theoretical Framework

The theoretical framework for this study is based on Knowles' adult learning theory of andragogy. Knowles identified six assumptions that uniquely characterize adult learners which were: (a) the need to know why, (b) the learners' self-concept, (c) the role of the learners' experiences, (d) readiness to learn, (e) orientation to learning, and (f) motivation (Knowles, Holton, & Swanson, 2005, p. 64 – 68).

Understanding the adult learning process and providing appropriate educational experiences for adult learners is necessary so that optimum learning can occur. Student nurses, as adult learners are responsible for their decisions, have a need to know, possess a variety of life experiences, demonstrate a readiness to learn, and oriented and motivated to learning. Student nurses must establish themselves as competent practitioners as an outcome of their nursing education program. Adult learning provides a conceptual framework useful in nursing education (Russell, 2006; Bastable, 2008) and simulation provides learning experiences that satisfy adult learning needs (Knowles et al., 2005).

Definition of Terms

Students' perceptions of simulation realism, knowledge transfer, and value of the simulated clinical experience will be measured using a 20-item Likert-type survey based on the previous work of Feingold et al. (2004) and Halamek et al. (2000). A 4-point response choice (4 = *strongly agree*; 1 = *strongly disagree*) will be used to determine faculty and student agreement with items in each of the subscales. The faculty will complete a similar 17-item survey. The survey will include three subscales with items addressing realism, transferability, and value of the simulation experience.

Additional items not included in the subscales will measure student and faculty perceptions of the simulation environment, preparation/orientation time, decision-making, support, and pace and flow of the experience.

A panel of nurse experts who have extensive knowledge in both simulation and acute care of the adult patient will review the survey items and scenarios to ensure content validity. The surveys will be pilot tested for internal consistency reliability prior to use in this proposed study using the same scenarios with a similar population of nursing students and faculty.

Realism: conceptual definition. Realism is defined by Feingold et al. (2004) to include: (a) the level of fidelity, with higher fidelity simulators mimicking real patients, (b) scenarios that recreate real life situations, (c) an environment that resembles a real clinical setting and, (d) a pace and flow that reflects a real clinical environment.

Realism: operational definition. Realism of the simulation experience will be measured using Likert-type student and faculty surveys which include four items addressing realism of the simulator and patient care scenario, the realistic nature of the simulated environment, and the pace and flow of the simulated experience.

Value: conceptual definition. Value as defined by Feingold et al. (2004) includes simulated patient care scenarios that: (a) test students' clinical and decision-making skills, (b) reinforce the course objectives, and (c) viewed as an effective teaching tool which enhances learning.

Value: operational definition. Value of the simulation experience will be measured using Likert-type student and faculty surveys that include six items related to: (a) clinical skills, (b) decision-making skills, (c) meeting course objectives, (d) the effectiveness of simulated patient care scenarios as a teaching tool, and (e) learning enhancement.

Transferability: conceptual definition. Transferability is defined by Feingold et al. (2004) to include: (a) preparing students for real clinical practice, (b) increasing student confidence levels, and (c) improved clinical competence, including cognitive, affective, and psychomotor skills.

Transferability: operational definition. Transferability of the simulation experience will be measured using Likert-type student and faculty surveys that will include three items addressing student preparedness for real clinical practice, confidence levels, and improved clinical competence.

Limitations

A small sample size from a specific geographical location limits generalization of the findings to all nursing students and faculty. In addition, there is potential for a time lag between the simulation experience and completion of the surveys. The participants are asked to turn the surveys in at the end of the semester, not upon completion of the simulation experience. Since the surveys are not required at the time the simulation experience is completed, recollection by the respondents to the simulation experience may be influenced through discussion with other participants or passage of time; and therefore, have an effect on participant responses.

Assumptions

1. Students and faculty will find that patient care experiences using high-fidelity simulators are a valuable teaching/learning strategy.

2. Students and faculty will find that knowledge and skills acquired through theory/lecture can be transferred to the simulated environment.

3. Students and faculty will find that knowledge and skills acquired through high-fidelity patient care experiences are transferable to real clinical practice.

4. Students and faculty will find that patient care experiences using high-fidelity human patient simulators are realistic.

5. Simulated patient care experiences will enable faculty to evaluate student competency, skill acquisition, and program outcomes.

Summary

Nurses entering the healthcare arena must be competent to practice nursing and ensure the best possible outcomes for patients. Nursing schools face the challenge of too few faculty and limited number of clinical sites available to train students. Thus, faculty need to find alternative teaching/learning methods in order to meet the institutions educational objectives and students' needs. New methodologies need to be developed and tested to ensure that students exiting nursing programs are adequately trained for today's healthcare industry. Clinical patient care scenarios, using a human patient simulator, are a teaching/learning strategy that holds promise for educating and evaluating student nurses. Continued research regarding realism, transferability, and value of clinical patient care through simulation is needed to establish if simulation is a viable alternative teaching/learning strategy beneficial to nursing education.

Chapter II

Literature Review

Introduction

Simulated clinical scenarios using high-fidelity human patient simulators is a growing teaching strategy which provides practical patient care experiences for nursing students. Due to a shortage of faculty to teach and limited availability of clinical sites in which nursing students can gain practical experience, simulated patient care is becoming more commonplace in schools of nursing as a teaching/learning strategy. Simulation offers a means to provide nursing students with patient care experiences that are valuable, realistic, and transferable to practice. Research to establish and validate students' and faculty perceptions related to the realistic nature of the simulation experience, its value, and transferability to nursing practice will add to the body of nursing knowledge.

Purpose

The purpose of this descriptive study was to examine nursing students and faculty perceptions of clinical simulated patient care experiences related to realism, transferability of knowledge and value. The study was a replication of Feingold et al's. (2004) study using adult learning theory (Knowles et al., 2005) as the conceptual framework.

Organization of Literature

The literature review to support this study is organized into six sections: (a) conceptual framework, (b) simulation as a teaching/learning strategy, (c) promoting self-efficacy and confidence using simulation, (d) using simulation to develop and evaluate clinical judgment and decision-making skills, (e) simulation scenario development and implementation, and (f) using simulation to improve communication, collaboration and competence.

Conceptual Framework

The pedagogical approach to teaching and learning has encountered a paradigm shift from a teacher-centered to a learner-centered approach, with teachers acting as facilitators of learning (Bastable, 2008). An effective way to motivate learners and encourage learning is to actively involve the learner in the educational process. When students and teachers collaborate to develop curricular objectives and goals, both become active participants in the teaching/learning process.

Involvement and motivation are analogous with concepts and principles of Malcolm Knowles' adult learning theory – andragogy. Knowles identified six assumptions that uniquely characterize adult learners, which are: "(a) the need to know why, (b) the learners' self-concept, (c) the role of the learners' experiences, (d) readiness to learn, (e) orientation to learning, and (f) motivation" (Knowles et al., 2005, p. 64 - 68).

Adult learners are goal- and relevancy-oriented, and "need to know why they should learn something" (Knowles et al., 2005, p. 64) Learning is an observed or measured change in behavior, knowledge, attitudes or skills (Bastable, 2008).

Before attempting to acquire a new skill, increase knowledge or change an attitude the adult leaner needs to understand what the ultimate goal is and why the change is important. The learning task must have relevance to the learner. Teachers, acting as facilitators, can assist the learner to understand "the need to know" by engaging the learner in activities that impart the advantages of knowing. Knowles et al. suggests providing "real or simulated learning experiences in which the learners discover for themselves the gaps between where they are now and where they want to be" (p.65).

Adult learners are autonomous, self-directed and readily accept responsibility for their learning. Adult learners want to actively participate in the learning process. Offering adult learners the opportunity to participate in decision-making and planning of course activities will encourage collaboration and help students "make the transition from dependent to self-directing learners" (Knowles et al., 2005, p. 65).

Adult learners have life-long experiences that influence their learning process. Because of the experiences that adult learners bring with them to the education arena, there is greater variation in learning styles, motivation for learning, and greater diversity among group members in general. Knowles et al. (2005) recommended that experiential learning strategies, such as simulation, focus groups, and case studies, are of most benefit to adult learners. Experiential learning techniques will provide a means for adult learners to apply previously acquired experiences and skills to current learning and competency development.

Adult learners demonstrate a readiness to learn when they understand what they need to know. The relevance of knowledge acquisition motivates adults to master developmental tasks in order to cope with real-life situations.

Teachable moments are essential for adult learning; teaching/learning experiences must coincide with the necessary developmental tasks in order for optimal learning to occur (Knowles et al., 2005). Knowles et al. suggested that various strategies, including simulation exercises can encourage readiness to learn in adult learners.

Readiness to learn and developmental task relevancy is directly associated to the task-centered/problem-centered orientation and motivation of adult learners. Adult learners are internally motivated to learn when "they perceive that learning will help them perform tasks or deal with problems that they confront in their life situations" (Knowles, et al., 2005, p. 67). Bastable (2008) defined learning as a change in behavior (knowledge, attitudes and/or skills) that is observed or measured. Outcomes of learning and competency are achieved when changes in knowledge, attitudes and skills occur. Adult learners are motivated to change behaviors and acquire knowledge, attitudes, and skills which they feel are needed to manage real-life situations.

Understanding the adult learning process and providing experiences for adult learners is necessary so that optimum learning can occur. Student nurses, as adult learners, are responsible for their decisions, have a need to know, possess a variety of life experiences, demonstrate a readiness to learn, and oriented and motivated to learning. Student nurses must establish themselves as competent practitioners as an outcome of their nursing education program. Adult learning provides a conceptual framework useful in nursing education (Bastable, 2008; Russell, 2006) and simulation provides learning experiences that satisfy adult learning needs (Knowles et al., 2005).

Simulation as a Teaching/Learning Strategy

In order to become competent nurses, students require varied teaching strategies that support multiple learning needs so they can fully integrate didactic material with skill performance. Human patient simulation is a strategy which will accommodate the many learning style needs of visual, auditory, reading, kinesthetic, diverging, assimilating, converging, and accommodating learners. Further nursing research is needed to discover what effect high-fidelity simulation (HFS) using a human patient simulator has on the learning style preferences of student nurses.

Fountain and Alfred (2009) designed a study to determine the correlation between learning styles and nursing student satisfaction when using HFS. The conceptual framework for the study was Gardner's 2006 theory of multiple intelligence learning. The descriptive, correlational study took place on three campuses of one school of nursing. All senior, baccalaureate nursing students ($N = 104$) in the advanced medical-surgical course participated in a simulation-enhanced learning activity. The final sample included students who completed and returned the questionnaire ($n = 78$) at the end of the simulation activity. Participating students voluntarily completed the Student Satisfaction and Self-Confidence in Learning Scale following the simulation exercise.

The Student Satisfaction and Self-Confidence in Learning scale developed by the National League for Nursing is a 13-item, 5-point Likert-type scale with scores ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The sum of the 5-item satisfaction subscale was used to measure student satisfaction with the simulation experience.

The authors reported reliability using Cronbach's alpha for satisfaction (.91) and self-confidence (.84), indicating consistency in the reliability of the instrument. Additionally, the researchers used Nurse Entrance Exam test scores administered prior to admission to the nursing program to assess the learning preferences of the study participants. The Nurse Entrance Exam is a test "used to evaluate and identify auditory, visual, social, solitary, orally dependent, and writing-dependent learners" (Fountain & Alfred, 2009, p. 96).

Fountain and Alfred (2009) state that social learning was the most commonly (77%) reported learning style. Social learning ($r = .29$, $p = .01$) and solitary learning ($r = .23$, $p = 0.4$) were the two learning styles most significantly associated with satisfaction. There was a slight but not significant difference ($F = 2.7$; df 2, 75; $p = .071$) regarding satisfaction between the three campuses with the mean score of the larger campus reported to be 22 compared to the smaller campus scores of 22 and 24.The authors concluded that students who were solitary learners and those who are social learners were satisfied by this learning strategy; and that overall, HFS provided a satisfying experience for students with diverse learning preferences.

A human patient simulator (HPS), used as a teaching/learning strategy, can provide realistic patient care experiences for students. HPS experiences allow student nurses to actively engage in patient care scenarios where students can safely apply and develop skills essential to nursing practice including decision-making, critical thinking, and assessment.

While patient simulators provide hands-on experiential learning opportunities for nursing students, classroom lecture does not (Brannan, White, & Bezanson, 2008). HPS scenarios are often used in combination with classroom lecture as an adjunct teaching/learning strategy. Evidence is lacking regarding whether the use of HPS alone is a more effective teaching strategy than traditional teaching strategies used in nursing education.

Brannan et al's. (2008) study purpose was to compare the HPS method and traditional classroom lecture to determine which strategy was more effective in improving student nurses' cognitive skills and confidence when teaching about acute myocardial infarction. The researchers hypothesized that baccalaureate nursing students who received instruction with HPS regarding care of patients with acute myocardial infarction would demonstrate greater levels of cognitive skill and confidence than students who received only traditional classroom instruction. Experiential learning theory (Dewy, 1963; Kolb, 1984, as cited by Brannan et al.) provided the conceptual framework for this study.

The researchers utilized a prospective, quasi-experimental, pretest and posttest comparison group study design. The study took place at a state university in the southern United States. The sample included all matriculated baccalaureate nursing students enrolled in the adult health course during the fall and spring semesters ($N = 107$). Participants were divided into groups based on semester enrollment in the adult health course. Group 1 included students from the fall semester ($n = 53$) who received only the traditional lecture method of instruction and Group 2 included students from the spring semester ($n = 54$) who received instruction using only the HPS method.

Cognitive skill and confidence in treating patients with acute myocardial infarction were the two dependent variables examined in the study and were measured using The Acute Myocardial Infarction Questionnaire: Cognitive Skills Test (AMIQ) and the Confidence Level Tool (CL) (Brannan et al., 2008).

The AMIQ is a 20-item multiple-choice questionnaire with scores ranging from 0 to 20, with higher scores indicating higher cognitive skill levels. Parallel AMIQ forms were developed by the researchers for each student group; form A for group 1 and form B for group 2. Questionnaire items were designed using four major content areas: (a) diagnostic evaluation, (b) pathogenesis and prevention, (c) nursing care of acutely ill acute myocardial infarction patients, and (d) nursing care of patients with acute myocardial infarction during early recovery and discharge teaching. The AMIQ form A and form B were pilot tested for reliability and agreement between the two forms using a single cohort of 16 nursing students. A reliable Pearson *r* correlation coefficient ($r = .59$, $p = 0.02$) was obtained by comparing the total number of correct responses recorded by the students on the forms. Using the parallel form reliability method to determine internal consistency, an acceptable Spearman-Brown reliability coefficient of 0.74 was reported (Brannan et al., 2008).

The CL is a 34-item Likert-type questionnaire adapted by the researchers, with permission, for use in this study. The CL was "originally developed by Madorin and Iwasiw to measure the effects of computer-assisted instruction on the confidence level of baccalaureate nursing students in skills specific to surgical nursing practice" (Brannan et al., p. 497). A reliability coefficient of 0.89 was reported.

The scale of the CL ranged from 1 (*completely lacking in confidence*) to 4 (*very confident*). Internal consistency of the CL, using Cronbach's alpha, ranged from 0.95 to 0.97. In addition to the AMIQ and CL, study participants in each group completed a Demographic Data form to describe and compare the sample. Nursing student characteristics examined by the researchers included ethnicity, gender, age, prior nursing experience, and grade in their first nursing course (Brannan et al., 2008).

A traditional lecture and HPS scenario were developed using the four content areas of nursing care of a patient with acute myocardial infarction. Two experienced adult health nurse educators determined content validity of both teaching methods. Students in both groups completed the AMIQ, CL and Demographic Data Form prior to the teaching method. Following the assigned teaching method, the participants completed the same AMIQ and CL questionnaires (Brannan, et al., 2008).

Comparison of group demographic and educational variables confirmed there were no statistically significant ($p = 0.05$) group differences. The authors reported a significant difference ($t = 2.0$, $df = 79$, $p = 0.5$) in the posttest AMIQ scores of students in group 2; providing support for the researchers' first hypothesis that students who received the intervention would report higher cognitive skill levels. The second hypothesis students who received the intervention would report higher confidence levels, was not supported. There was no significant difference ($t = -1.74$, $df = 81$, $p = 0.09$) in reported confidence levels between group 2 nursing students who received the HPS intervention and group 1 nursing students who received the traditional lecture method (Brannan, et al., 2008).

The authors concluded that the study provides insight regarding junior level baccalaureate nursing students' acquisition of knowledge and skills related to caring for a patient with acute myocardial infarction. Study data suggested that HPS is an effective alternative teaching strategy useful for nursing students and can be utilized in the nursing curriculum to enhance the development of cognitive skills. The authors called for more research "to determine best practices and use of the simulator to achieve optimum learning outcomes" (Brannan et al., 2008, p. 500).

Simulation scenarios used as a teaching/learning strategy in nursing education is well documented in the literature. However, few nursing research studies have been designed to determine whether simulation is a more effective teaching/learning method compared to traditional methods used in nursing education.

In a study by Alinier et al. (2006), the research purpose was to determine the effectiveness of scenario-based simulation training on nursing students' clinical skills and competence when compared to traditional teaching strategies. The authors did not identify a specific conceptual framework used to guide the study but a number of concepts important to nursing were identified including communication, teamwork, situation awareness, decision-making, clinical skills, and debriefing. The pretest/posttest quasi-experimental design of this study was intended "to critically appraise the value of the use of simulation in nursing education by comparing the performance in a practical examination of two groups of students" (p. 361).

The study took place in a nursing program in the United Kingdom. Three consecutive cohorts of students ($N = 344$) in the second year of a Diploma in Higher Education in Adult Nursing were invited to attend two teaching/learning research sessions. These sessions were offered as an adjunct or alternative method to regularly scheduled curriculum. The final sample included 99 student volunteers who attended both research sessions and the simulation session for participants recruited to the experimental group. Students were randomly assigned to one of two groups. The experimental/simulation group ($n = 49$) received the usual traditional teaching method and was involved with a scenario-based simulation experience. The control/traditional group ($n = 50$) received only the usual traditional teaching method. Based on demographic data, the researchers concluded that the sample was representative of the student population (Alinier et al., 2006).

The researchers developed a 15-station simulation exercise and used the Objective Structured Clinical Examination (OSCE), originally developed by the University of Dundee to assess clinical competence. The tool assesses the practical skills of healthcare students using stations focusing on a particular clinical aspect. The students also completed a 5-point Likert-type questionnaire asking about the use of technology in nursing practice, their level of confidence and stress when working in a technological environment, and demographic information. No reliability coefficients are reported in the study. The authors stated, “In most allied health professions, it [OSCE] is recognized as a valid, reliable and practical assessment method” (Harden & Gleeson, 1979: Sloan et al., 1995 as cited in Alinier et al., p. 362).

Content validity was determined by a "panel of educators" and through pilot studies performed prior to the full study, which improved validity and objectivity of the OSCE (Alinier et al., p. 364).

Data were collected between 2001 and 2003 through observations of prepared examiners, the OSCE, and demographic questionnaire. The first OSCE was presented to all students. Students in the experimental group completed the simulation experience 5 weeks after the first OSCE. All students then completed a second OSCE with a period of 6 months separating the two OSCEs.

Findings reported by the researchers showed that the students in the simulation group generally obtained higher marks than those in the traditional group. In addition, there was a highly statistically significance obtained in the improvement performance on the second OSCE of the experimental group compared to the control group using an independent sample *t*-test ($p < 0.001$). Based on data from the Likert-type questionnaire (1 = *not stressful*; 5 = *very stressful*) and (1 = *very confident*; 5 = *not confident*), the mean difference between the two groups regarding perception of stress and confidence differed only slightly, 2.9 and 3.5 for the control group and 3.0 and 3.4 for the experimental group. Simulation training did not have a statistically significant effect on the perception of stress or confidence in the experimental group (Mann-Whitney U-test: perception of stress P = 0.562; confidence P = 0.819) (Alinier et al., 2006).

Alinier et al. (2006) concluded that the study results support the use of simulation in nursing education and that new training tools require new ways of teaching. Nursing students will benefit most if simulation training is appropriate thus planning activities that meet the students' needs is important.

Nursing educators must be prepared to act as facilitators while the student makes decisions about planning and implementing their patient's care during the simulation experience; thus focusing on a learner centered pedagogy. Experiential learning will occur through the practice of nursing skills and application of theoretical concepts that occurs during simulation experiences. In addition, debriefing sessions are necessary to help inform the student, increase knowledge and confidence and ensure that learning objectives have been met.

A study conducted by Feingold et al. (2004) drew attention to the concern that little is known about new HPS simulator technology and its use in nursing education related to realism, knowledge transfer, and value. Using Knowles' adult learning theory, the researchers designed a descriptive study to determine both faculty and students' perceptions related to the realistic nature of the simulation experience, its value and transferability to nursing practice. The research questions identified by Feingold et al. were:

1. What are student and faculty members' perceptions of patient and scenario realism using SimMan?
2. Do students and faculty members feel students are able to transfer knowledge from the simulated clinical scenarios to real clinical experiences?
3. Do students and faculty find using SimMan is valuable in increasing student knowledge and skill acquisition?

The study by Feingold et al. (2004) took place in the critical care area of the Patient Care Learning Center using SimMan simulators and scenarios designed by faculty members teaching the Advanced Acute Care of the Adult Course in a baccalaureate school of nursing. All students ($N = 97$) "enrolled in the Advanced Acute Care of the Adult Course during two consecutive semesters of a single academic year" (p. 158) were eligible to participate in the study. In addition, all faculty ($N = 4$) teaching the Advanced Acute Care of the Adult Course met criteria for inclusion in the study. The final sample included 50 students from the fall semester (Group 1) and 47 students from the spring semester (Group 2) and faculty ($n = 4$) who completed the surveys.

A 20 item, 4-point Likert-style satisfaction survey tool obtained from the literature was used to measure student perceptions of realism, transferability, and value of the simulation experience. Students voluntarily completed the survey after interactions with SimMan at the end of the fall/spring semesters. The faculty working with the students completed a similar 17-item Likert-style tool to measure realism, transferability, value, faculty support and training at the end of the same fall/spring semesters. The authors did not report on the validity or reliability of the instruments used for the study.

Results reported by Feingold et al. (2004) related to research question 1 indicated that students agreed that using the SimMan simulator provided a realistic clinical experience (86.1%), setting (76.27%), and patient (64.1%). Faculty agreed (100%) that the scenarios represented a real patient in a real clinical situation and environment.

Students agreed (73.0%) that the "pace and flow" was comparable to a real patient care setting. Faculty agreed (75%) that the "pace and flow" was comparable to a real patient care setting. Regarding research question 2, the authors reported that the transferability subscale had the lowest agreement among students (n = 65, 50.8%) (*M* = 2.52). Less than 50% of the students believed the experience increased confidence or competence in patient care situations. Slightly over half of the students (54.7%) believed the simulator experience prepared them for a real clinical situation. Faculty agreed (100%) that the simulated experience prepared the students for clinical situations. The value subscale used with research question 3 had the highest agreement among students (*n* = 65, 92.3%) (*M* = 3.04). Most students agreed valuable skills were gained through the simulation exercise (*M* = 3.53) but few agreed that the experience increased clinical competence (*M* = 2.5). All four instructors perceived that the simulator experience adequately tested the students' decision-making skills, was an effective teaching tool and prepared the students for real patient situations. An alpha of 0.05 was used for all statistical tests.

The study findings suggested that simulation has value for students and instructors and provides a realistic patient care experience. Nursing educators felt that knowledge gained during the simulation experience would transfer to the clinical setting by preparing students for real life experiences. In addition, the researchers found that student simulation performance may predict the level of student success in the clinical setting and that more research is needed to validate this observation (Feingold et al., 2004).

Promoting Self-efficacy and Confidence using Simulation

Nursing students need exposure to a variety of realistic learning experiences that provide opportunities to gain confidence, increase knowledge, and test their competence with essential patient care skills. Bambini, Washburn, and Perkins (2009) posit that the value of clinical simulation in providing practical learning experiences for and increasing confidence among nursing students has not been established. The purpose of the study was to determine if using simulation as a teaching/learning strategy enhanced nursing students' self-efficacy. The researchers used self-efficacy theory as the framework for the nursing study and identified three research questions, which were:

1. Do simulated experiences increase the self-efficacy of students preparing to enter the obstetrics setting?
2. What are students' perceptions of the simulated experience?
3. What effect does previous experience working with patients have on students' perceived level of confidence in their clinical skills.

A midsized college of nursing in the midwestern United Sates provided the setting for the study by Bambini et al. (2009), and took four semesters to complete. All baccalaureate nursing students ($N = 224$) in their first semester of undergraduate clinical experiences were included in the study; the simulation experience was required for all students during their maternal-infant rotation. A final convenience sample was obtained from students ($n = 112$) who voluntarily completed the pretest and posttest surveys. Demographic data showed the average age of the participants to be 24.85 years; 57% had previous health care experience and 26% held a baccalaureate degree in another discipline.

The researchers (Bambini et al., 2009) used an integrated, quasi-experimental, repeated measures design and developed the instruments for the study. Three Likert-type surveys (pretest, posttest and follow-up) were used to evaluate simulation experiences as a teaching/learning strategy and the effect of this method on student's self-efficacy. Each survey consisted of six questions using a 10-point scale with scores ranging from 1 (*not at all confident*) to 10 (*very confident*). Three open-ended questions were included on the posttest and follow-up surveys to elicit additional student perceptions of the experience. Due to lack of response by the participants ($n = 20$), the follow-up survey was not used for analysis. Faculty with expertise in obstetrical nursing reviewed the surveys to establish content validity. Reliability and internal consistency was reported using Cronbach's alpha of 0.817 for the pretest and 0.858 for the posttest.

Students participated in a three-hour, eight station simulation experience using low-fidelity, medium-fidelity, and high-fidelity manikins. The stations were designed so that student groups of four could practice caring for and assessing antepartum, postpartum and newborn patients. Faculty observed the students using closed-circuit cameras to provide opportunities for student and teacher debriefing sessions. The researchers collected pretest and posttest survey data from the students prior to and after completion of the simulation session (Bambini et al., 2009).

Bambini et al. (2009) reported quantitative and qualitative results obtained from the surveys. There was a significant increase ($p < 0.01$) in postpartum exam self-efficacy scores following the simulation experience. A significant increase in confidence ($p < .001$) was observed in measured skill variables including vital signs, breast exam, fundal and lochia assessment, and patient teaching.

According to the researchers, the demographic variables had no effect on the study. Based on the open-ended survey questions "qualitative data suggested that the students found this simulation sequence to be a valuable learning experience; it increased their confidence in what to expect and how to conduct themselves in the clinical setting" (p. 81). The students expressed having gained the most confidence in performance of fundal assessments from the simulation experience. The authors describe three themes that emerged from data obtained from the open-ended questions: (a) communication, (b) confidence in psychomotor skills and patient interaction, and (c) clinical judgment. Students reported that the simulation experience increased confidence by allowing them to practice assessment skills and clinical decision-making. Students expressed the value in simulation experiences, which helped to improve their ability to assess patients, problem solve, and make appropriate clinical judgments (Bambini et al.).

The authors conclude that "clinical simulation experiences can be effective in increasing students' self-efficacy in their ability to perform clinical skills" (Bambini et al., 2009, p. 81). The study provides support for using simulation as a teaching/learning strategy, which allows students to encounter realistic patient care scenarios. Results of the study also provided support for the construct of that self-efficacy which was defined as the belief that one is capable of performing certain tasks if they have confidence in skills and abilities. Students expressed confidence in ability to perform essential nursing skills and tasks following exposure to realistic simulated patient care scenarios. Self-efficacy is an achievable outcome from the use of clinical patient simulators in nursing education.

In order to practice in the current fast-paced, technological health care setting, nurses need to be adequately prepared with the skills and knowledge necessary to function in a variety of situations. Self-efficacy, the belief that one can accomplish tasks, can be developed and reinforced through repetition and experience. Students realize that they have acquired the nursing skills and knowledge required to practice the art and science of nursing and gain confidence with recurring experience and repetition.

A problem observed by Goldenberg, Andrusyszyn, and Iwasiw (2005) was that nursing students have little experience with teaching patients about health prior to actual clinical rotations and thus lack confidence in their ability to teach patients effectively. Goldenberg et al. designed an exploratory, descriptive study to determine the effects of classroom simulation on students' self-efficacy related to health teaching. Using self-efficacy theory the researchers sought to answer the following questions:

1. What are the differences in mean self-efficacy scores before and after participating in simulated health teaching (assessment, planning, implementation, and evaluation) through case study and role-play?

2. What are the relationships between self-efficacy scores and selected demographic variables (i.e., age, gender, student status, and years in program, GPA, nursing experience, postsecondary education, and hours of health teaching in clinical area)?

3. What ratings do student' ascribe to the effectiveness of case study and role-play simulation as a teaching method?

The setting for the study by Goldenberg et al. (2005) took place in a university baccalaureate nursing program located in southwestern Ontario, Canada.

The population included 66 third-year full and part-time BScN students. The final non-probability convenience sample included 22 students who voluntarily completed the pre and post surveys.

The researchers developed a two-part 63-item Baccalaureate Nursing Student Teaching-Learning Self-Efficacy Questionnaire derived from the literature (Boyd et al., 1998; Ranking & Stallings, 2001, as cited in Goldenberg et al., 2005)) and the researchers' teaching experiences. The items in Part I of the survey included questions related to self-efficacy; items in Part II included questions asking for student demographic information. Cronbach's alpha reliability coefficient for the sample was 0.97. Three experts in nursing education established content validity. Face validity was determined through pilot testing with seven fourth-year students who had completed the course the previous year (Goldenberg et al.).

Faculty developed case study and role-play simulations that replicated patient care situations students might encounter in practice. The simulations were used in a workshop setting for students enrolled in a 13-week course entitled Professional Issues II - Teaching and Learning. During the role-play simulations, students assessed client learning needs and developmental stage and used the data to design a teaching plan using Bandura's Self-efficacy theory. Students submitted the completed study questionnaires before and after participating in the workshop (Goldenberg et al., 2005).

Results of the demographic data indicated that all 22 participants were female, generic baccalaureate students. The majority (86%) was less than 25 years old, 96% indicated they were full-time students, and 46% stated they had previous nursing experience, mostly as nursing aides.

Less than half (36%) had additional postsecondary education other than nursing and 64% of the participants had already provided 3 to 10 hours of patient teaching. The participants reported either an A or B scholastic average. According to the researchers, these characteristics were representative of the total student nurse population (Goldenberg et al., 2005).

The results showed that the students' self-efficacy scores following the simulation experience were significantly higher ($p = 0.001$). According to the researchers, the data reflected "greater overall confidence related to health teaching ($M = 3.55$) after participating in the workshop than before ($M = 2.96$)" (p.312). Significant differences ($p < 0.001$) were also found between students' pretest and posttest scores for the assessment, implementation, and evaluation segments of the health teaching process. Student reported self-efficacy scores for "planning were unchanged, possibly due to insufficient time to consider and implement a teaching plan" (p. 312). No significant relationships were found between students' self-efficacy scores and selected demographic variables. The authors stated that the small sample might explain this finding. More than 50% of the students rated the simulations as effective and one third of the respondents rated them as very effective (Goldenberg et al., 2005). Conclusions drawn by the authors based on the study results support the assumption that simulation, as a teaching method, will increase students' perceptions of self-efficacy related to health teaching.

Self-efficacy scores were higher following the simulation workshop demonstrating the selected learning strategy led to increased student confidence levels. The authors noted the importance of integrating teaching/learning strategies to accommodate all types of learners and designing outcomes based on course content.

In addition, providing a "comfortable, risk-free" teaching/learning environment will help to decrease anxiety and promote confidence (Goldenberg et al., 2005).

Using Simulation to Develop and Evaluate Clinical Judgment and Decision-making Skills

To ensure that nursing students are prepared to practice in a real clinical setting, faculty must be able to determine if students demonstrate competence in making appropriate assessments, formulating and implementing a plan of care, and evaluating patient outcomes using clinical judgment and decision-making skills. Emerging research suggests that simulation experiences improve students' clinical decision-making and that faculty can use simulation experiences to evaluate students' clinical judgment and decision-making abilities. Further research will establish if simulation is an effective method for developing students' clinical judgment and decision-making.

Lasater (2007) designed a qualitative study to examine the experiences of students using high-fidelity simulation and the influence those experiences have on their development of clinical judgment. Adult learning theory and the Lasater interactive model of clinical judgment were used as frameworks guiding the study.

The study took place in a hospital-like room with a computerized human patient simulator at a university in the northwestern United States. Forty-eight junior-level nursing students enrolled in the Nursing Care of the Acutely Ill Adult course during the winter 2004 term came to a simulation laboratory setting in place of their on-site clinical rotation. Thirty-nine students were observed during the simulation exercise, met eligibility for inclusion in a focus group; and therefore, invited to participate in the study. Fifteen students volunteered to participate in the study, only eight students were able to meet for a focus group, thus establishing the final sample.

All participants (n = 8) were nontraditional nursing students, a potential bias, noted by the author. However, based on the participants' demographics, education and placement in the larger simulation experience, the sample was representative of the nursing student population (Lasater, 2007).

The study by Lasater (2007) was part of a larger study that previously examined four dimensions of the Lasater interactive model of clinical judgment development. Lasater focused on one dimension, students' experience with simulation as conveyed through a focus group, in this 2007 study. The researcher videotaped student responses during the 90-minute focus group, which took place in the simulation lab. The definition of clinical judgment and conceptual framework used for observations was reviewed with the students. The author, who also conducted the focus group, used Morgan's principles for facilitating focus group discussion and open-ended questions to clarify information. Reliability of the instrument was not discussed in the study.

Results reported by Lasater (2007) revealed 13 primary themes that emerged during data analysis, which the researchers organized into five major codes. The five codes include the strengths and limitations of high-fidelity simulations, feelings and increased awareness, desire for feedback, value of working with others, and recommendations.

Strengths of simulation included the integration of theory with realistic scenarios, providing instant feedback and broader range of experiences, and encouraging students to anticipate what might happen in a real clinical setting.

Limitations noted by the participants included factors affecting transferability, such as the simulator always having a female voice; lack of visual/non-verbal communication, such as grimaces or smiles; and certain changes that can not be assessed or observed, such as reflexes, swelling and color.

Students reported feeling “anxious” until they were familiar with the format of the scenario and felt “stupid” when acting as the primary nurse (Lasater, 2007, p. 273). However, reflecting on the exercises during debriefing sessions allowed the students to recognize and verbalize the correct patient care action/response. Students expressed a need for regular critique during the experience from the facilitator. In particular, students desired more information regarding the decisions they made during the scenario, and the consequence to the patient, if the patient had been a real patient. Students expressed value in working with, and learning from others during the simulation exercises and debriefing sessions. Narrative learning, “the opportunity to hear others’ stories” and to also receive affirmation from the facilitator that “you’ll see this a lot in your practice” was a positive strategy reported by the participants (Lasater, 2007, p. 274).

Three general recommendations for improving the simulation experience were identified by Lasater (2007). The recommendations included: (a) improving reflection through the debriefing process, (b) providing students with unambiguous evaluation objectives that students are motivated to attain, and (c) actively engaging all students including those who are just observing the simulation exercise to improve the quality of learning.

Lasater (2007) concluded that high-fidelity simulation has the potential to support and affect development of clinical judgment and add value to practice for nursing students. Additionally, the focus group method proved to be an effective strategy useful in eliciting nursing students' perceptions related to high-fidelity simulation.

In a pilot study by Cioffi, Purcal, and Arundell (2005) the researchers sought to determine the effect of a simulation strategy on the clinical decision-making process of midwifery students. The research question identified by the authors was: "Do midwifery students who receive the simulation strategy arrive at assessment decisions more quickly, collect more clinical information, revisit information less often, make more inferences, and report higher confidence levels than students who receive the usual lecture material"? (p. 131). A "thinking aloud" methodology provides the framework for the study.

The study took place in a university in the Sydney, Australia region and included all students entering a three-semester midwifery graduate diploma course. The researchers reported using a posttest-only, control group design for the study. Student volunteers (n = 36) were randomly assigned to one of two groups by drawing names from a box. Instead of the usual didactic material, the experimental group received only the normal labor simulation and physiologic jaundice simulation while the control group received only the scheduled lectures. The simulations for normal labor and physiologic jaundice were used for posttesting of both the experimental and control group (Cioffi et al., 2005).

The authors (Cioffi et al., 2005) developed two simulations for normal labor and physiologic jaundice. Decision rules for the simulation exercises were developed using the knowledgeable and experienced midwives.

The teaching/learning strategy consisted of two simulations, each with a set of decision rules, thinking-aloud techniques, and audiotapes for critical reflection on the decision-making process. Thinking aloud is a technique that results in verbal protocols. In addition, a confidence self-report (*0* to *100%* scale) posttest was developed by the researchers to determine the students' perceived confidence levels during the posttest simulation. A panel of expert nurses reviewed the simulation interventions and decision rules, assessing both adequacy and sufficiency to determine content validity. The mean interrater reliability index was 89% for 67% of the randomly selected protocols from the videotaped sessions used to analyze the decision-makers thinking aloud-verbal protocols.

Two independent raters transcribed audiotapes of the verbal protocols expressed during simulation exercises for data collection. The raters analyzed and categorized the resulting verbal protocols into segments, which included data collection, data review and inference. The total number of segments for each verbal protocol, group means, and standard deviation were calculated to provide a descriptive summary. Students acting as "decision makers" during the simulation exercises self-reported their confidence level after each simulation exercise (Cioffi et al., 2005, p. 133).

The results of the study by Cioffi et al. (2005) indicate that students who received the simulation strategy arrived at their decisions more quickly than students in the control group did. The experimental group recorded fewer segments ($M = 52$; $SD = 19$) in the verbal protocols compared to the control group ($M = 59$; $SD = 14$), indicating less thinking aloud was used by the experimental group to make a decision for normal labor but not for physiological jaundice.

The experimental group recorded more segments (*M* = 43; *SD* = 14), requiring more thinking aloud for the physiological jaundice simulation compared to the control group (*M* = 39; *SD* = 18).

The experimental groups collected more patient data during the normal labor simulation (*M* = 63; *SD* = 13) compared to control group (*M* = 56; *SD* = 18) and for the physiological jaundice simulation (*M* = 69; *SD* = 9) for the experimental group and (*M* = 62; *SD* =14) for the control group. The results indicate that students who participated in the simulation strategy collected more clinical data than students in the control group (Cioffi et al., 2005).

The study data showed that students in the experimental group needed to review the clinical data less frequently compared to students in the control group. For normal labor, the mean number of segments was 16 (*SD* 9) for the experimental group, compared to a mean of 20 (*SD* = 9) for the control group. For physiological jaundice, the mean number of segments was 12 (*SD* = 9) for the experimental group and 14 (*SD* = 8) for the control group (Cioffi et al., 2005).

The results also showed that students who participated in the experimental group did not make as many inferences within the decision-making process. For normal labor, the mean number of inference segments was 20 (*SD* = 16) for the experimental group and 22 (*SD* = 10) for the control group and for physiological jaundice, the mean number of segments related to inference was 17 (*SD* = 8) for the experimental group and 9 (*SD* = 11) for the control group (Cioffi et al., 2005).

Results reported regarding students' posttest confidence levels for the normal labor simulation was 70% among students in the experimental group compared to 60% in the control group. For the physiological jaundice simulation, the experimental group reported confidence levels of 80% compared to 50% in the control group showing that self reported confidence levels were higher among students who participated in both simulation strategies (Cioffi et al., 2005).

In conclusion, the study showed that the students who took part in the simulation strategies made clinical decisions more quickly and collected more clinical data than students in the control group (Cioffi et al., 2005). In addition, the students in the experimental group reviewed the clinical data less often, made fewer inferences and reported higher confidence levels during the decision-making process. The authors' noted that while the study "addressed these outcomes descriptively, the results suggest that the students benefited from the simulation strategy" (p. 133). The researchers tentatively concluded that simulation strategies provide knowledge through learning experiences that were realistic, transferable to practice, and which promotes critical thinking and decision-making.

Simulation Scenario Development and Implementation

The use of high-fidelity simulation is becoming more commonplace as a method to educate student nurses. More research is needed focusing on how faculty can best implement and evaluate simulation in nursing education. The purpose of a study by Dillard, Sideras, Ryan, Hodson-Carlton, Lasater, and Siktberg (2009) was to "describe faculty development in the use of the Lasater Clinical Judgment Rubric (LCJR)" (p. 99).

Applying the LCJR, the researchers focused on evaluating students' critical thinking and learning during one simulation case. Additionally, the researchers explored the perceptions of students and faculty regarding the transfer of knowledge from the simulation experience to actual clinical practice. Tanner's (2006) clinical judgment model and the Cervero model (1985, 1988) provided the conceptual framework for this study (as cited in Dillard et al.).

Educators from two schools of nursing participated in a faculty development workshop. The purpose of the workshop was to provide faculty with information regarding student evaluation of clinical judgment, simulation scenario development, and use of the LCJR tool. The simulation exercise took place in a simulation lab. Two faculty members with knowledge of Tanner's model of clinical judgment and the LCJR guided the faculty development workshop. The sample included 16 faculty who attended the workshop and 68 nursing students enrolled in a junior adult health course. The participants took part in a simulation exercise the week following the faculty development workshop. In addition, a subset of students (n = 25) from the study who were also assigned to provide care for an actual patient during a clinical rotation provided written reflections regarding their experiences. Faculty used the student reflections to evaluate clinical judgment using the LCJR (Dillard et al., 2009).

The descriptive design of the study by Dillard et al. (2009) "focuses on three outcomes: 1) response of faculty to the development workshop, 2) evaluation of the simulation by students, and 3) students' reflections on simulation learning subsequent to their clinical practice with a similar population" (p. 101). Faculty completed two questionnaires for the study.

The first instrument, a 40-item, 5-point Likert scale (1 = *strongly disagree* and 5 = *strongly agree*) questionnaire was designed to elicit faculty perceptions of the workshop experience. The researchers for the current study modified the original questionnaire by Ryan, Campbell, & Brigham (as cited in Dillard et al., 2009). While modifying the original questionnaire, six subscales were identified and used in the study by Dillard et al. The subscales include: (a) work environment, (b) motivation related to change in nursing education, (c) educational program in relation to change, (d) educational offering in relation to clinical judgment and clinical simulation, (e) instructor presentation, and (f) faculty self-examination about the application of the clinical judgment model and clinical judgment rubric. A reliability coefficient of $r = .94$ was reported, indicating a high degree of consistency in measurement reliability for this instrument. The faculty also completed a 5-point self-report evaluation rating their simulation skill attainment and performance using a novice-to-expert scale with higher scores indicating expertise. Data from both faculty surveys was collected following the faculty development workshop.

Student participants completed a 6-item, Likert-type scale (1 = *did not get it at all* to 4 = *totally got it*) evaluation survey. The survey assessed the degree to which they understood each of the six objectives specifically developed for the simulation experience by the faculty attending the workshop. Data regarding the six objectives was collected from the student participants following a 15-minute simulation and debriefing session. In addition, reflective journaling enabled the faculty to apply the LCJR and determine students' level of clinical judgment based on the four dimensions of Tanner's (2006) clinical judgment model: noticing, interpreting, responding and reflecting (Dillard et al., 2009).

Findings related to the developmental workshop showed that faculty perceived the organizational environment as encouraging, flexible and rewarding (M = 4.3), the motivational level of faculty to continue to enhance student learning and implement changes in education was perceived as exciting (M = 4.7). The faculty perceived the change in an educational program using the model and rubric as an approach that could be understood, applied and enhanced teaching (M = 4.3). Faculty also reported the program on clinical judgment was well organized and presented (M = 4.5). Using the *novice* = 1 to *expert* = 5 scale the faculty rated themselves as competent (M = 3.0) (Dillard et al., 2009).

Students' reporting on their attainment and understanding of the simulation experience objectives stated they either mostly got the concept or totally got the concept in all six of the learning objectives on a scale of 1 (*did not get it at all*) to 4 (*totally got it*). The highest mean score (3.81) reported was related to understanding body position and breathing, indicating the students felt they understood the importance of this concept. Understanding the significance of laboratory values had the lowest mean score (3.12) and had the greatest variance. The authors mentioned that students only received information regarding lab values if they asked for this information specifically during simulation or debriefing, helping to explain the variance (Dillard et al., 2009).

Qualitatively, the nursing educators involved with the study were able to apply the LCJR and determine students' clinical judgment ability while reviewing their reflective journals. The LCJR guided faculty in (a) identifying the clinical judgment level attained by the student, (b) providing a constructive critique of students' reflective observations, and (c) offering suggestions to improve their clinical judgment skills.

The authors concluded that the workshop provided a positive experience for the faculty and that the simulation experience was a valuable strategy to test students' clinical judgment abilities using the Tanner clinical judgment model and the LCJR. Faculty development workshops have the potential to provide standardized curriculum and evaluation methods when using simulation as a teaching method for student nurses (Dillard et al., 2009). Simulation experiences provide a means to engage students actively in the learning process and HFS environments allow faculty the opportunity to observe students during a simulated patient interaction in a realistic clinical-like setting. Nurse educators need a reliable method to assess student learning needs and clinical judgment abilities in order to assist students with integrating theoretical knowledge into clinical practice. The LCJR is an effective framework that faculty can use to evaluate student development of clinical judgment and then design learning activities which promote critical thinking and refine clinical judgment and decision-making skills.

Emerging research indicates that the use of high-fidelity simulation (HFS) as a teaching strategy has potential benefits for nursing education. HFS outcomes which guide the development, design, implementation, and evaluation of simulation programs are a component of the Nursing Education Simulation Framework and include learning (knowledge), critical thinking, skill performance, self-confidence, and learner satisfaction. As the use of simulation technology in nursing education continues to grow, further research is needed to help explain outcome variables associated with this teaching/learning strategy.

The purpose of the study by Smith and Roehrs (2009) was to "examine the effects of a simulation experience on two outcomes; student satisfaction and self-confidence as well as factors correlating with these outcomes" (p. 74). The authors posed the following research questions:

1. How satisfied are bachelor of science (BSN) nursing students with an HFS scenario experience?

2. What is the self-reported effect on an HFS scenario experience on BSN student self-confidence?

3. How do BSN nursing students evaluate an HFS scenario experience in terms of how well five simulation design characteristics are present in the experience?

4. Is there any correlation between the perceived presence of design characteristics and reports of satisfaction and self-confidence of BSN nursing students who take part in an HFS experience?

5. Is there any correlation between demographic characteristics of BSN nursing students and reports of satisfaction and self-confidence after an HFS experience?

The framework used in this study is the nursing education simulation framework and includes five major components: teacher factors, student factors, educational practices, design factors and outcomes. The components are associated with one or more linked variables. For example, the outcome component is associated with two variables: learner satisfaction and self-confidence.

The study took place at a school of nursing in a public university in the western United States. All junior students in the traditional BSN program ($N = 72$) enrolled in their first medical/surgical course following a fundamentals course and who completed an HFS simulation experience related to the care of a patient with a respiratory disorder, were included in the study. The study sample included nursing students ($n = 68$) who voluntarily completed the survey following the simulation exercise and debriefing session (Smith & Roehrs, 2009).

The researchers designed a descriptive correlational study to describe and explain the relationship between the outcomes of satisfaction and self-confidence discovered through nursing students' experiences with simulation education. Smith and Roehrs (2009) used three instruments to collect data. The Demographic Instrument was developed by the researchers to "describe the sample and assess the possible correlation of demographic characteristics to student satisfaction and self-confidence" (p. 76). The five variables examined included age, gender, previous degree, health experience or simulation experience. The Student Satisfaction and Self-Confidence in Learning Scale is a 13-item, 5-point Likert-type scale developed by the National League for Nursing. Scores ranged from 1 (*strongly disagree*) to 5 (*strongly agree*). Reliability was reported using Cronbach's alpha of 0.94 for the satisfaction subscale and 0.87 for the self-confidence subscale. The Simulation Design Scale (SDS), (NLN, as cited in Smith & Roehrs) is a 20-item, 5-point Likert-type scale with scores ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) and the option of choosing *not applicable* as a response. The instrument measures five subscales: objectives, support, problem solving, feedback, and fidelity.

Reliability of the instrument was reported using a Cronbach's alpha of 0.92. Ten medical/surgical nursing experts reviewed the NLN instruments to establish content validity. Study participants took approximately 10 minutes to complete the surveys following the simulation scenario and a debriefing session.

Demographic data indicated that 90% of the participants were female with an average age of 23.4 years (SD=5.4) and 69% had no previous experience in a health care setting. Participants with prior nursing-related experience reported work as certified nursing assistants or patient care technicians. The majority (82%) reported previous experience with a patient having respiratory disease and 47% of the participants reported no previous experience with HFS prior to the study (Smith & Roehrs, 2009).

Smith and Roehrs (2009) reported the results specific to the research questions. Regarding research question 1, the overall mean score on the Student Satisfaction & Self Confidence in Learning Scale was 4.5 (SD = 0.5), suggesting that students were satisfied with the teaching method. There was a statically insignificant finding in mean satisfaction scores with students who had previous experience taking care of a patient with respiratory disease of 4.5 (SD = 0.5) compared to those without experience of 4.6 (SD = 0.4) using Mann-Whitney U ($p = 0.05$).

Smith and Roehrs (2009) reported mean scores of 4.2 ($SD = 0.4$) on the Student Satisfaction & Self Confidence in Learning Scale for research question 2, following the simulation experience, indicating that students perceived confidence in their ability to care for a patient with a respiratory condition.

The researchers found no statistical difference in the mean self-confidence scores of the students with prior experience 4.2 ($SD = 0.5$) when compared to those students without prior experience caring for a patient with a respiratory condition 4.3 ($SD = 0.4$) with a Mann-Whitney U ($p = 0.05$).

Smith and Roehrs (2009) reported the results for research question 3 related to students' scores on the SDS survey and stimulation design. The student scores on the SDS survey indicated the students "had positive feelings about the presence of the five design characteristics" (Smith & Roehrs, 2009, p. 76) with mean scores ranging from 4.4 (objectives) to 4.8 (guided reflection).

Regarding research question 4, the objective subscale from the SDS survey had the highest correlation to both student satisfaction ($r_s = 0.614$) and self-confidence ($r_s = 0.573$) indicating a moderate correlation between objectives and the outcomes of satisfaction and self-confidence using Spearman's rho. Guided reflection ($r_s = 0.452$) had the lowest correlation for satisfaction; fidelity had the lowest correlation for self-confidence ($r_s = 0.430$). Multiple linear regression analysis was used to help explain the variance in these outcomes. The five design characteristics explained a little under half (46.9%) of the variance in satisfaction scores with objectives significantly ($p = 0.01$) contributing to the level of satisfaction. Multiple regressions analysis showed that objectives contributed to 35.7% of the variance in satisfaction. Problem solving was the only characteristic found to contribute significantly ($p = 0.01$) to the level of self-confidence and further analysis showed that problem-solving alone contributed to almost 34% of variance in self-confidence (Smith & Roehrs, 2009).

Results for research question 5 using Spearman's rho ($p = 0.05$) showed that no significant correlations were found to exist between any of the demographic variables and students' reported self-confidence or satisfaction. Multiple linear regression analysis revealed no significant differences between the demographic variables in predicting the outcomes of self-confidence and satisfaction.

Further analysis demonstrated that a combination of demographic and design characteristics accounts for half of the variance in self-confidence and satisfaction when using HFS. The design characteristics of objectives and problem solving were the only significant factors ($p = 0.01$) in a model predicting the outcomes of both satisfaction and self-confidence. None of the demographic characteristics were found to be significantly associated in a model predicting the outcomes of both satisfaction and self-confidence (Smith & Roehrs, 2009).

The authors concluded that the study "provides information regarding characteristics that correlate with student satisfaction and self-confidence as two outcomes of a high-fidelity simulation experience" (Smith & Roehrs, 2009, p. 78). According to the researchers, objectives and problem solving were the two design characteristics reported as significant and accounted for most of the variance in the outcomes of satisfaction and self-confidence, suggesting that any simulation scenario designed by nurse educators requires careful planning with clear objectives and an appropriate problem to solve.

Factors related to the simulation development and implementation process are not fully understood and the value to and satisfaction of students using simulators requires further investigation.

A study by Childs and Sepples (2006) was part of a national collaborative study that took place over three years and involved eight schools of nursing, the National League for Nursing and the Laerdal Corporation. Childs and Sepples chose to concentrate on examining the simulation development and implementation process, and evaluate student satisfaction of simulated learning experiences. Additionally, the researchers tested the reliability and validity of two instruments, which were also used in the larger study. The framework used was the simulation model designed for the NLN/Laerdal study.

The study took place took place in the learning resource center at a university in the northeastern United States. Four learning stations with scenarios of increasing complexity were designed for nursing students in the senior capstone skills lab course at the university. Students enrolled in the course included both traditional and second-degree option students. A final sample of 55 nursing students participated in the study (Childs & Sepples, 2006).

Childs and Sepples (2006) used a descriptive design to explore simulation scenario development and implementation, student satisfaction with the experience, and instrument reliability and validity. Two instruments used by the researchers and others in the larger NLN/Laerdal study included the Simulation Design Scale (SDS) and the Educational Practice Scale for Simulation (EPSS). The SDS is a 20-item scale that asks students to evaluate five design features including objectives/information, support, problems solving, feedback, and fidelity. The EPSS is a 16-item instrument, using a 5-point scale to measure educational practices present within the scenarios including active learning, collaboration, diverse ways of learning, and high expectations.

Participants completed a 13-item scale, study specific instrument, asking students to rate their level of confidence, usefulness, and feelings about simulation as a teaching strategy. Students were asked to rank the four stations based on personal preference after completing all four of the simulation stations.

Based on the results of the SDS, the participants rated feedback and objectives/information as the most important design features in the simulation exercise, closely followed by level of complexity and fidelity (Childs & Sepples, 2006). Results from the EPSS found that the most important education practice rated by the students was feedback. The students reported that the simulation experience was very positive and that the simulation method provided a better learning experience compared to other strategies. Concerns expressed by the participants included feeling pressured by time constraints and, because stations were set up in the same room, noise from the other stations was distracting. Issues related to development and implementation discovered during the study include: (a) allowing adequate time for preparation of scenarios and the simulation experience, (b) using gender specific voices if simulators have a voice-recording feature, (c) providing adequate time for debriefing, (d) keeping group sizes small, and (e) having adequate faculty and staff available. Finally, the SDS and EPSS were reported to be reliable and valid.

Childs and Sepples (2006) concluded that developing and implementing simulation laboratory experiences requires more time than traditional teaching strategies. However, simulation provides valuable learning experiences for students and helps the student to meet course outcomes.

In addition, the authors felt that the simulation experiences "proved to be valuable experiences for learning psychomotor skills and developing critical thinking" (p. 158). The researchers expressed that simulation research is necessary in order to identify essential design components, outcomes and evidence based practice issues that are necessary to incorporate during simulation development and implementation.

Using Simulation to Improve Communication, Collaboration and Competence

Effective communication skills and teamwork are essential components of nursing practice. Learning how to communicate effectively develops overtime through observation and active engagement with patients, family members, and interdisciplinary team members. "Safety and quality of patient care is dependent on teamwork, communication, and a collaborative work environment" (The Joint Commission, 2008, ¶ 1). Studies have shown that improved communication is directly associated to improving patient outcomes (The Joint Commission, 2004).

Simulated patient care scenarios that center on teamwork, communication and competency can be designed for cooperative use with multiple disciplines. However, more research is needed to explain the effect of interdisciplinary team simulation scenarios on competency, communication, collaboration and patient outcomes. Messmer's (2008) study focuses on the interactions of nurse/physician teams, interacting in three human patient simulation scenarios involving mock pediatric cardiac arrests, to determine the level of nurse-physician collaboration during simulation training. This descriptive study examined communication, group cohesion and satisfaction with decision-making, and performance using a novice to expert model (Benner, 1984 as cited in Messmer).

The study by Messmer (2008) took place in a freestanding children's hospital in the southeastern United States. All nurses employed by the hospital were invited to participate in the study. Eighteen teams consisting of pediatric residents/fellows and nurse volunteers composed the final sample (n = 105). The nurse volunteers worked in a variety of specialty areas including medical-surgical, ambulatory, emergency room, cardiac intensive care, pediatric intensive care, and neonatal intensive care nursing. The majority (49) had greater than 5 years of nursing experience. The total number of participants was 105; including 55 pediatric residents and 50 nurses.

Data for the study were collected using four surveys and observational field notes. The four surveys utilized by Messmer (2008) included the Kramer and Schmalenberg Nurse-Physician Scale (KSNPS), the Clinical Practice Group Cohesion (GC), the Collaboration & Satisfaction with Patient Care Decision (CSPCD), and demographic questionnaire asking gender, age, level of education, years of experience, and specialty (area of expertise).

The KSNPS is a 5-pont Likert-type scale to categorize relationships (1 = *collegial or excellent* and 5 = *being negative or marked by frustration*, *hostility or resignation*). The KSNPS is used to elicit respondents' perception about interactions between nurses and physicians. Messmer (2008) cites Kramer and Schmalenberg (2002, 2003) who "established reliability and validity of the scale over two decades, refining items with diverse nurse-physician cohorts" (p. 323).

The GC instrument from the National Association of Children's Hospitals and Related Institutions is a six-item survey.

Four of the items have seven response options ranging from *very much about average* (highest) to *very much below average* and two items with seven responses ranging from *like it very much* (highest) to *dislike it very much*. The scale was found to be reliable (α = 0.85) (Messmer, 2008).

The CSPCD instrument, also from the NACHRI, is an eight-item survey. Six of the items have seven responses ranging from *strongly disagree* (lowest) to *strongly agree*. One item has seven response options ranging from *no collaboration* to *complete collaboration* (highest) and one item has seven response options ranging from *not satisfied* to *very satisfied* (highest). The scale was found to be reliable (α = 0.90) (Messmer, 2008). The author did not provide score ranges for the potential response options on the GC or CSPCD instruments.

Teams of five to six participants were videotaped during three life-threatening simulation scenarios. Three nonparticipating nurse experts reviewed videotapes and using the KSNPS, measured levels of nurse-physician collaboration to assess whether a higher level of collaboration was associated with higher competency scores on patient care scenarios. Participants completed the demographic questionnaire and two NACHRI instruments following the scenarios (Messmer, 2008).

Messmer (2008) reported a "high level of group cohesion and collaboration and satisfaction with patient care decisions for nurses and physicians" based on the scores from the GC and CSPCD (p. 324). Male participants had significantly higher scores on both the GC ($p = 0.029$) and CSPCD ($p = .005$) compared to the female participants.

Messmer explains that while all participants felt they collaborated during the scenarios, collaboration was observed to evolve over time when the nurse experts reviewed the three videotapes. The participants reported a mean score of 4.5 related to their satisfaction with the simulation experience. A central theme reported by the participants was that the simulation experience was realistic.

Messmer (2008) concluded that the study provides evidence that "nurses and pediatric residents could collaborate and value that collaboration while decreasing medical errors and improving patient outcomes" (p. 325). The study adds to the body of nursing knowledge regarding the effectiveness in using interdisciplinary simulation scenarios representing real patient care encounters. Additionally, the study provides evidence that simulation is a strategy that can be used to train interdisciplinary teams safely, thereby improving competency without risk to patients.

Summary

The use of human patient simulators in simulated clinical scenarios is a teaching/learning strategy which provides many benefits in nursing education. Fountain and Alfred (2009) conclude that high fidelity simulation provides a satisfying experience for students with diverse learning styles. Human patient simulation is an effective teaching strategy and can be utilized in the nursing curriculum to foster the development of cognitive skills (Brannan et al., 2008). Simulation, as a teaching/learning strategy, is more effective in improving students' clinical skills and competence than traditional classroom lecture (Alinier et al., 2006). As a teaching/learning strategy, simulation has value for students and faculty and provides a realistic patient care experience.

Nursing faculty believe that knowledge gained during the simulation experience will transfer to the clinical setting and prepares students for real life clinical experiences (Feingold et al. 2004).

Clinical simulation is beneficial for promoting confidence and self-efficacy by providing opportunities to practice and acquire new skills and increase knowledge and competence in a variety of realistic patient care settings. After participating in realistic simulated patient care scenarios, nursing students' expressed confidence in their ability to perform essential nursing skills, demonstrating that self-efficacy is an achievable outcome in nursing education (Bambini et al. 2009). Nursing students can apply experiential learning acquired through repetition and practice during simulated patient care encounters to real clinical situations. Competence gained through skill practice and synthesis of knowledge promotes feelings of increased confidence and self-efficacy levels among student nurses (Goldenberg et al., 2005).

Clinical simulation experiences can be used to assess competency, skill acquisition, and integration of knowledge necessary for nursing practice. Educational outcomes such as clinical judgment, decision-making, and critical thinking skills can be developed and evaluated using clinical simulation scenarios in nursing education. Lasater (2007) concluded that high-fidelity simulation has the potential to support and affect development of clinical judgment; adding value to practice for nursing students. Participation in clinical simulation scenarios provides experiential learning opportunities, which help guide the student nurse to arrive at decisions more quickly, collect more clinical data, and make fewer inferences regarding patient care (Cioffi et al., 2005).

Attention to developing and implementing a simulation program is essential in order to provide clinical simulation experiences that are realistic, transferable to actual practice, and which offer the most value to nursing students. Simulated patient care scenarios must be designed to meet the desired curricular outcomes and learning needs of the students, "It is not the level of simulation fidelity that determines the effectiveness as an educational tool, but rather the faculty who designs the educational experience" (Durham & Alden, 2008).

Faculty development workshops have the potential to guide faculty when designing standardized curriculum and evaluation methods for use in clinical simulation training (Dillard et al., 2009). Smith and Roehrs (2009) concluded that any simulation scenario designed by nurse educators requires careful planning with clear objectives and an appropriate problem for students to solve. One disadvantage noted in the literature is that simulation planning, development and implementation requires more design time than traditional teaching/learning strategies (Childs & Sepples, 2006).

The Joint Commission (2008) reported that teamwork and effective communication were essential elements in providing safe and quality patient care. Messmer's (2008) study provided evidence that simulation is a strategy useful in training interdisciplinary teams to collaborate and communicate effectively. Participants in the study expressed satisfaction with the simulation experience and reported positively that the simulation experience was realistic.

The ultimate goal in nursing is to provide professionally competent care that ensures the best possible outcomes for patients. The literature supports using adult learning theory as framework suitable for designing nursing education programs.

A simulated patient care scenario is a realistic, transferable and valuable teaching strategy that can be used in nursing education to further knowledge and skill development, improve collaboration, communication and teamwork, and provide a means to evaluate nursing education outcomes.

Chapter III

Methods and Procedures

Introduction

Simulated clinical scenarios using high-fidelity patient manikins is a growing teaching strategy which provides practical patient care experiences for nursing students. Little is known about students' and faculty perceptions related to the realistic nature of the simulation experience or its value and transferability to nursing practice. The purpose of this study is to examine nursing students' and faculty perceptions of simulated clinical patient care experiences related to realism, transferability of knowledge and value. The study is a replication of Feingold et al's. (2004) study using adult learning theory as the conceptual framework.

Research Questions

1. What are students' and faculty perceptions of manikin and scenario realism using a high-fidelity human patient simulator?

2. Do students and faculty feel students are able to transfer skills and knowledge from the simulation scenarios to real clinical experiences?

3. Do students and faculty find using a high-fidelity human patient simulator to be valuable in increasing student knowledge and skill acquisition?

Population, Sample and Setting

The population for the study will include all senior nursing students enrolled in, and all faculty members teaching the Acute Care of the Adult course in a community college in Dearborn, Michigan during the spring and fall semesters. The target convenience sample is approximately 65 Associate Degree Nursing students enrolled in the course. Four faculty members who teach the Acute Care of the Adult course will also participate in the study. The study will take place on the campus of the community college in the health sciences simulation lab. The lab setting is a hospital-like room with a high-fidelity human patient simulator.

This particular community college and its nursing student population were chosen for the study because of its representativeness to nursing students in general. The nursing student demographics of age, ethnicity, and gender are similar to the national demographics of nursing students as reported by the National League for Nursing (2009).

Protection of Human Subjects

The study will be conducted in an ethical manner to ensure that human rights are protected. Prior to conducting the study, all necessary documentation will be submitted to the institutional review board (IRB) of the community college and Ball State University for approval.

All nursing students are required to take the Acute Care of the Adult course. Each student will receive written information regarding the purpose and nature of the study at the beginning of the course. Student participation is voluntary and students who complete and return the study survey during the week the course semester ends will signify consent to participate in the study.

Students will not be graded during the study simulation experience, nor will their final course grade be dependent on participation or non-participation in the study. All data obtained during the study will remain confidential. In order to assure that information can not be linked to an individual student or faculty member, all students and faculty members will generate their own code for the survey using mothers first name initial, fathers first name initial, number of brothers, number of sisters and the subjects middle initial: for example, PW11A, as recommended by Burns and Grove (2005).

Faculty members are required to complete the survey questionnaire but will not benefit financially from participating in the study. Additionally, faculty members will not know which students completed the study survey, eliminating potential grade bias.

The researcher will not benefit financially from the study. There are no subject risks identified. The benefit of the study is in adding knowledge of how clinical simulation can be used as a valuable teaching strategy that provides realistic patient care experiences and enhance the transfer of skills and knowledge to actual clinical practice.

Procedure

Following IRB approval, the students and faculty members will be informed regarding the details of the study at the beginning of the designated spring and fall semesters of the Acute Care of the Adult course.

Feingold et al. (2004) designed two acute care patient scenarios to evaluate students' knowledge, assessment, clinical judgment, decision-making, communication, and collaboration skills. The scenarios will be replicated for use in this proposed study. The scenarios represent patients that the students might encounter in a real acute care clinical setting.

Faculty members will use one scenario at the beginning of each fall/spring semester to evaluate the students and determine each student's clinical placement in the hospital setting. The second scenario will be presented to the students at the end of the fall/spring semesters.

Faculty members, using a high-fidelity human simulator will program the computerized patient with changes in vital signs, hemodynamic values, breath and lung sounds, bowel sounds, or peripheral pulses to indicate deterioration in the patient's condition. The health services lab is a hospital-like room with equipment available for adaptation to a critical care-like setting. A cardiac monitor displays a rhythm strip, blood pressure, respirations, heart rate, temperature, oxygen saturation, and carbon dioxide levels. To enhance realism, a suction machine, oxygen, and various intravenous supplies is also available for use during the scenario.

Upon entering the simulation lab, the students will receive a verbal report from the faculty members facilitating the scenario. The students will also receive the patient's current laboratory values and physician orders. The students will proceed with introducing themselves to the patient and continuing with patient assessment and care. Over a ten-minute period, the patient's condition will decline based on the scenario programmed into the simulator by the faculty. During this time, the students must assess the patient, implement appropriate care, problem solve, communicate with the patient and family, and collaborate with other members of the health care team. Debriefing sessions will occur following the simulation scenarios.

The researcher will not be involved in the student assessments. Students who consent to participate will voluntarily complete and submit the study survey the last week of the spring/fall course semester. Faculty members will complete and submit the study survey the last week of the spring/fall course semester.

Research Design

The study is descriptive and designed to elicit students' and faculty members' perceptions of the simulation scenario realism, ability of students to transfer knowledge and skills to real clinical practice, and the value of the simulated clinical experience as a teaching/learning strategy.

Instrumentation, reliability and validity

A 20-item Likert-type survey based on the previous work of Feingold et al. (2004) and Halamek et al. (2000) will be used to measure students' perceptions of simulation realism, knowledge transfer, and value of the simulated clinical experience. The faculty will complete a similar 17-item survey. The survey will include three subscales with items addressing realism, transferability and value of the simulation experience. Additional items not included in the subscales will measure student and faculty perceptions of the simulation environment, preparation/orientation time, decision-making, support and pace and flow of the experience.

A panel of nurse experts who have extensive knowledge in both simulation and acute care of the adult patient will review the survey items and scenarios to ensure content validity. The surveys will be pilot tested for internal consistency reliability prior to use in this proposed study using the same scenarios with a similar population of nursing students and faculty.

Measures of Data Analysis

Differences between students who responded and those who did not respond to the survey on the demographic variables of gender, ethnicity and age will be determined using Chi-square tests. In addition, Chi-square tests will be used to determine if any differences exist between group respondents on the variables of age, ethnicity, grade point average (GPA) and gender.

Descriptive statistics will be used to analyze data from the survey related to the three subscales and individual items not included in the subscales. Mean scores, standard deviations, frequencies and percentages will be calculated for each survey item and subscale. Two-tailed, independent-group *t* tests will determine if any statistically significant differences exist between the GPA levels of the respondents to the three subscales (realism, transferability and value) and to the items not included in those subscales. To determine if any statistically significant differences exist between or within students' age groups and responses to the three subscales and items not included in the subscales analyses of variance (ANOVAs) will be performed. The significance level will be set at alpha .05 for all statistical tests.

Summary

The proposed study is a replication of a study by Feingold et al. (2004) and this chapter describes the methods and procedures that will be used to gather and report study data. The descriptive design of the proposed study will examine student and faculty perceptions of simulated clinical scenarios related to the primary study variables of realism, transferability and value. Data will be collected from approximately 65 nursing students and 4 faculty members using a Likert-type survey tool.

Descriptive statistics, ANOVAs, two-tailed, independent-group *t* tests, and Chi-square tests will be used to analyze the data at a significance level of .05.

Continued research is needed to validate the findings of previous nursing studies regarding the use of clinical simulation as a teaching strategy that provides valuable patient care experiences and realistic practice scenarios that enable students to transfer knowledge and skills to real practice. The proposed study seeks to support Feingold et al.'s results and add to the body of nursing knowledge related to using simulated patient care scenarios in nursing education.

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APPENDIX A: EVIDENCED-BASED PRACTICE TABLE RES697S800C Nursing Research

Name: Nancy Paggi **Topic:** Clinical Simulations and Technology in Nursing Education

Source	Problem	Purpose Research Questions	Framework or Concepts	Sample	Design	Instruments	Results
Fountain & Alfred (2009)	More research is needed to discover what effect high-fidelity simulation (HFS) has on the learning style preferences of student nurses.	To explore how learning styles correlate with student satisfaction when high-fidelity simulation is used in a baccalaureate nursing program	Theory of Multiple Intelligence Learning (Gardner, 2006)	87 students who completed the Student Satisfaction and Self-Confidence in Learning scale following completion of the simulation lab activity	Descriptive Correlational	**Student Satisfaction and Self-Confidence in Learning Scale (Nati**onal League for Nursing) a 13-item, 5-point scale, scores ranging from 1 (strongly disagree) to 5 (strongly agree). Sum of the 5-item Satisfaction subscale used to measure satisfaction of the simulation experience, possible scores ranging from 5-25. **Nurse Entrance Exam test scores** to evaluate	Social learning - most commonly (77%) reported learning style. Social learning ($r = .29$, $p = .01$) and solitary learning ($r = .23$, $p = 0.4$) - two learning styles most significantly associated with satisfaction. There was a slight but not significant difference ($F = 2.7$; df 2, 75; $p = .071$) regarding satisfaction between the three campuses with the mean score of the larger campus reported to be 22 and the smaller campus scores of 22 and 24.

Source	Problem	Purpose Research Questions	Framework or Concepts	Sample	Design	Instruments	Results
						learning preferences (administered prior to admission to the nursing program)	
Brannan, White, & Bezanson, (2008)	There is not enough research to establish that patient simulation is a more effective teaching strategy when compared to traditional teaching strategies used in nursing education nurses.	To compare the effectiveness of two instructional methods to teach specific nursing education content, acute myocardial infarction, on junior-level nursing students' cognitive skills and confidence	Experiential Learning Theory (Dewy, 1963; Kolb, 1984)	107 baccalaureate nursing students enrolled in the junior-level adult health courses for the fall and spring semesters. Group 1 (n=53) received only the traditional lecture method and group 2 (n=54) received the intervene-tional HPS method.	Prospec tive, quasi-experim ental, pretest and posttest compari son group	**Acute Myocardial Infarction Questionnaire: Cognitive Skills Test (AMIQ).** Developed by the investigators to measure students' levels of cognitive skills consisted of a 20-item multiple-choice questionnaire with scores from 0 – 20. Higher scores = higher cognitive skill levels. **Confidence Level Tool (CL):** A 34-item Likert-type	Similar demographic and educational data existed in both groups, no significantly significant group differences were identified for any of the variables that described the sample ($p = 0.05$). There was a significant difference ($t = 2.0$, $df = 79$, $p = 0.5$) in the posttest AMIQ scores of students in group 2; providing support for the first hypothesis; students who received the intervention would report higher cognitive skill levels. The second hypothesis was not supported. There was no significant difference ($t = -1.74$, $df = 81$, $p = 0.09$) in reported confidence levels between group 2 nursing

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				Students were not randomly assigned to groups.		questionnaire, adapted by the researchers, originally developed by Madorin and Iwasiw (1999). Scale ranged from 1 = completely lacking in confidence to 4 = very confident. **Demographic Data Form**	students who received the HPS intervention and group 1 nursing students who received the traditional lecture method.
Alinier et al., (2006)	It is unknown whether simulation is a better teaching/ learning strategy for nursing students compared to more traditional strategies	To determine the effect of scenario-based simulation training on nursing students' clinical skills and competence when compared to traditional teaching strategies	Communication Teamwork Situation awareness Decision-making Clinical skills Debriefing	99 student volunteers in the second year of a Diploma of Higher Education in Nursing program in the United Kingdom. 50 students were in the control (traditional)	Quasi-experimental	A 15-station Objective Structured Clinical Examination (OSCE) developed by the University of Dundee. Students completed a 5-point Likert-type survey regarding use of technology and level of	Students in the experimental/simulation group obtained higher marks than those in the control group. There was high statistical significance noted in improvement performance on the second OSCE for the experi-mental group ($p < 0.001$). There was a slight observed difference between the two groups regarding perception of stress and confidence, 2.9

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				group and 49 in the experimental (simulation) group. Students were randomly assigned to the two groups.		confidence and stress when working in a technological environment. The scale ranged from 1 = not stressful to 5 = very stressful, higher scores indicate higher stress levels **Demographic information**	and 3.5 for the control group and 3.0 and 3.4 for the experimental group. Simulation training did not have a statistically significant effect on the perception of stress or confidence in the experimental group (Mann-Whitney U-test: perception of stress P = 0.562; confidence P = 0.819.
Feingold et al. (2004)	New simulator technology needs to be evaluated for effectiveness in education related to realism, knowledge transfer and value of the experience.	To determine both faculty and student perception of the realistic nature of simulations and the value and application to practice. ***Research Questions:*** 1. What are student and faculty members' perceptions of patient and scenario realism	Knowles (1990) Adult Learning Theory	97 students in the Advanced Acute Care-Adult course BSN program 4 faculty members teaching the Advanced Acute Care-Adult course who worked with the students using	Descriptive	A 20-item Likert-style satisfaction survey tool that the researchers found in the literature developed by Halamek et al. (2000). The scale used a 4-point range with 1 = strongly disagree to 4 = strongly agree. The faculty completed a similar 17-item	**Research question 1 – Realism** Students agreed simulation provided a realistic clinical experience (86.1%), setting (76.27%), and patient (64.1%). Faculty agreed (100%) the scenarios represented a real clinical situation. Students agreed (73.0%) the "pace and flow" was comparable to a real patient care setting. Faculty agreed (75%) the "pace and flow" was comparable to a real

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		using SimMan? 2. Do students and faculty members feel students are able to transfer knowledge from the simulated clinical scenarios to real clinical experiences? 3. Do students and faculty find using SimMan is valuable in increasing student knowledge and skill acquisition?		SimMan		Likert-style tool.	patient care setting. **Research question 2 – Transferability** Transferability had lowest agreement among students (n = 65, 50.8%) (M= 2.52). Over half of the students believed the experience prepared them for a real clinical situation (54.7%). Faculty agreed (100%) the experience prepared students for real clinical situations. **Research question 3 – Value** Value had the highest agreement for students (92.3%) (M= 3.04). Most students agreed valuable skills were gained (M= 3.53) few agreed the experience increased clinical competence (M = 2.5). All instructors believed the experience tested students' decision-making skills, was an effective teaching tool and prepared students for real patient situations.

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Bambini, Washburn, & Perkins, (2009)	Evidence is lacking related to the value of clinical simulation in providing practical learning experiences for nursing students	To evaluate simulated clinical experiences as a teaching/ learning method to increase the self-efficacy of nursing students	Self-efficacy Theory (Bandura 1977, 1986)	Convenience sample included students (n= 112) who voluntarily completed the pretest and posttest surveys	An integrated, quasi-experimental, repeated-measures design	Three surveys (pretest, posttest and follow-up) developed by the researchers to evaluate simulation experiences as a teaching method. Likert-type, 10-item surveys used a 10-point scale with scores from 1 (not at all confident) to 10 (very confident). Three open-ended questions on posttest and follow up surveys. **Demographic data**	There was a significant increase ($p < 0.01$) in postpartum exam self-efficacy scores following the simulation experience. A significant increase in confidence in skill variables measured including vital signs, breast exam, fundal and lochia assessment, and patient teaching. The students found simulation to be a valuable learning experience; it increased their confidence in what to expect in the clinical setting. Three themes emerged from the open-ended questions including communication, confidence, and clinical judgment. Students reported the simulation experiences increased their confidence. Students expressed the value in simulation experiences.

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Goldenberg, Andrusyszyn & Iwasiw (2005)	Students have little experience with teaching patients about health prior to actual clinical rotations and thus lack confidence in their ability to teach patients effectively.	To determine the effects of classroom simulation on students self-efficacy ***Research Questions:*** 1. What are the differences in mean self-efficacy scores before and after participating in simulated health teaching through case study and role-play? 2. What are the relationships between self-efficacy scores and selected demographic variables? 3. What ratings do students' ascribe to the effectiveness of case study and role-play simulations as a teaching method?	Bandura's (1977, 1986) Theory of Self-efficacy	22 third-year full and part-time BScN students enrolled in a university located in south-western Ontario, Canada	Exploratory Descriptive	A two-part 63-item Baccalaureate Nursing Student Teaching-Learning Self-Efficacy Questionnaire derived from the literature (Boyd et al., 1998; Ranking & Stallings, 2001) and the researchers' teaching experiences. The tool is a "4-point scale, ranging from completely lacking in confidence to very confident"	**Research Question 1 -** Self-efficacy scores were significantly higher (p = 0.001) (M = 3.55) after participating in the workshop than before (M = 2.96).Significant differences were found between pretest and posttest scores for the assessment, implementation, and evaluation phases of health teaching. Self-efficacy scores for planning were unchanged. **Research Question 2** –No significant relationships were found between students' self-efficacy scores and the selected demographic variables. **Research Question 3** – More than 50% of the students rated the simulations as effective and one third of the respondents rated them as very effective.

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Lasater (2007)	Research is lacking regarding the effects of simulation on learning, especially related to clinical judgment.	To examine the experiences of students using high-fidelity simulation.	Adult Learning Theory, Experiential Learning, Clinical Judgment Model	15 student volunteers (non-traditional students) who participated in the focus group	Embedded within a larger study Qualitative Descriptive	Morgan's (1997) principles for focus group discussion Open-ended questions	5 major codes emerged: 1. Strengths and limitations: Strengths- simulation helped integrate theory with realistic scenarios, provided instant feedback, broader range of experiences, encouraged students to anticipate what could happen in clinical setting. Limitations- problems affecting transferability related to using simulators 2. Paradox of anxious/stupid feelings and increased awareness. Debriefing sessions helped students to recognize and verbalize the correct action/response for patient care. 3. Desire for direct feedback- students expressed a need for feedback from the simulation facilitator regarding the choices made during the scenario and the effect if, the patient had

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							been a real patient. 4. Value of students' connection with others - students expressed value in working with and learning from others during the simulation exercises and debriefing sessions. 5.General recommendations: Improve reflection through debriefing process, provide clear evaluation objectives,engage all students including those observing the exercise to improve learning.
Cioffi, Purcal, & Arundell, (2005)	The effect of simulations on clinical decision making is inconclusive.	***Purpose:*** A pilot study to determine the effect of a simulation strategy on the clinical decision-making process of midwifery students ***Research Question:*** Do midwifery students who	Clinical decision-making	36 student volunteers randomly assigned to two groups by drawing names from a box.	Quasi-experimental One group posttest -only	Decision rules for the simulation exercises which were developed from the inferences of experienced midwives and a confidence self-report (0 – 100% scale) developed by the researchers.	Students who received the simulation strategy arrived at their decisions more quickly, collected more clinical data than those in the control group, needed to revisit the clinical data less frequently, and did not make as many inferences compared to the control group. Self reported confidence levels were higher among students

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		participate in simulation strategy arrive at assessment decisions more quickly, collect more clinical information, revisit information less often, make more inferences, and report higher confidence levels than students who receive the usual lecture material?					who participated in the simulation strategy.
Dillard et al. (2009).	Not enough is known about implementing and evaluating simulation education in nursing	To describe faculty development in the use of the Lasater (2007), Clinical Judgment Rubric (LCJR).	Tanner's (2006) Clinical Judgment Model and the Cervero model (1985, 1988)	16 faculty and 68 students enrolled in a junior adult health course and a sub sample of 25 students who participated in the final stage of the project and	Descrip tive	Faculty used a 40-item, 5-point Likert scale (1 = strongly disagree, 5 = strongly agree) questionnaire to measure 6 subscales related to the workshop, modified (Ryan, Campbell, & Brigham, 1999) and a novice-to-	Faculty perceived the organizational environment as encouraging, flexible, and rewarding (M= 4.3), motivational level of faculty to continue to enhance student learning and implement changes in education was perceived as exciting (M= 4.7). Change in educational program using the Clinical Judgment Model and

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				were assigned to a cardio-vascular practicum to provide care to a patient with heart failure.		expert rating scale (1 = novice, 5 = expert) to evaluate skill acquisition. Students self-reported assessing the degree to which they understood each of the concepts (1 = did not get it at all; 4 = totally got it). The LCJR used by faculty to measure clinical judgments through reflections in student journals.	Clinical Judgment Rubric was perceived by the faculty as an approach that could be understood, applied, and enhanced teaching (M= 4.3). Faculty reported the program on clinical judgment was well organized and presented (M = 4.5) and the faculty rated themselves as competent (M= 3.0). Students reported they either "mostly got the concept" or "totally got the concept" in all six of the learning objectives. Faculty were able to determine the students' level of clinical judgment using the CJR. Simulation enables the student to practice at a comfortable level and pace compared to a clinical setting.
Smith & Roehrs (2009)	Clinical simulation research is lacking which identifies	To examine the effects of a simulation experience on two outcomes; student	The Nursing Education Simulation Framework	Nursing students volunteers who completed	Descrip tive Correlat ional	**Demographic Infomation** age, gender, previous degree, health experience or	**Demographics**: 90% were female with an average age of 23.4 years (SD=5.4). 69% had no previous experience in a health care

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	outcomes that enhance self-confidence and satisfaction amongst student nurses	satisfaction and self-confidence as well as factors correlating with these outcomes **Research Questions:** 1. How satisfied are bachelor of science (BSN) nursing students with an HFS scenario experience? 2. What is the self-reported effect on an HFS scenario experience on BSN student self-confidence? 3. How do BSN nursing students evaluate an HFS scenario experience in terms of how well five simulation design characteristics are present in the experience?	(Jefferies, 2005, 2007)	the survey following the simulation exercise and debriefing session (n=68)		simulation experience. **Student Satisfaction and Self-Confidence in Learning Scale –** developed by the National League for Nursing (NLN); a 13-item, 5-point Likert-type scale. Scores ranged from 1 (strongly disagree) to 5 (strongly agree). **Simulation Design Scale (SDS)**, (NLN); a 20-item, 5-point Likert-type scale with scores ranging from 1 (strongly disagree) to 5 (strongly agree) and the option of choosing Not Applicable as a response.	setting. 82% reported previous experience with a patient having respiratory disease. 47% of the participants reported no previous experience with HFS prior to the study. **Research Question 1:** Students were satisfied with the teaching method (M= 4.5; SD = 0.5). **Research Question 2:** Students expressed confidence in caring for a patient with a respiratory condition (M = 4.2; SD = 0.4). No statistical difference in the mean Self-Confidence scores of students with prior experience (M = 4.2; SD = 0.5) when compared to students without prior experience caring for a patient with a respiratory condition (M =4.3; SD = 0.4) with a Mann-Whitney U (∞ = 0.05). **Research Question 3:** SDS scores indicated positive feelings about the

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		4. Is there any correlation between the perceived presence of design characteristics and reports of satisfaction and self-confidence of BSN nursing students who take part in an HFS experience? 5. Is there any correlation between demographic characteristics of BSN nursing students and reports of satisfaction and self-confidence after an HFS experience?					five design characteristics. Mean scores ranging from 4.4 to 4.8; Guided Reflection had the highest mean score and Objectives the lowest. **Research Question 4:** The Objective subscale had the highest correlation to both student satisfaction ($r_s = 0.614$) and self-confidence ($r_s = 0.573$) indicating a moderate correlation. Guided Reflection ($r_s = 0.452$) had the lowest correlation for satisfaction and Fidelity had the lowest correlation for self-confidence ($r_s = 0.430$). The five design characteristics explained the variance for satisfaction scores (46.9%) with Objectives found to significantly ($p = 0.01$) contribute to the level of satisfaction. Objectives contributed to 35.7% of the variance in satisfaction. Over 45% of the variance for self-confidence was

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							explained by the five design characteristics. Problem Solving was the only characteristic found to contribute significantly ($p = 0.01$) to the level of self-confidence and further analysis showed that Problem-Solving alone contributed to almost 34% of variance in self-confidence. **Research Question 5:** No significant correlations (Spearman's rho $\infty = 0.05$) found between the five demographic variables and students' reported self-confidence or satisfaction. Multiple linear regression analysis revealed no significant differences between the demographic variables in predicting the outcomes of self-confidence and satisfaction. Only the design characteristics of Objectives and Problem Solving were significant factors in predicting the

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							outcomes of satisfaction and self-confidence. None of the demographic studies were significantly associated in a model predicting the outcomes of both satisfaction and self-confidence.
Childs & Sepples (2006).	Factors related to simulation development and implementation processes are not fully understood and the value to and satisfaction of students using simulators requires further investigation.	To examine the simulation development and implementation process and evaluate student satisfaction of simulated learning experiences.	The simulation model designed for the NLN/Laerdal study (Jefferies, 2005).	55 nursing students in the senior capstone "skills lab" course at the USM	Descriptive	**The Educational Practice Scale for Simulation (EPSS)**, a 16-item instrument, using a 5-point scale **The Simulation Design Scale (SDS)**, a 20 -item scale **USM specific instrument**, a 13-item scale asking students to rank the four stations based on personal preference. No scale ranges were provided for any of the	Students reported feedback and objectives/information were the most important features. Feedback was the most important education practice. Students rated the experience as positive. Issues related to development and implementation include allowing adequate time for preparation of scenarios and the simulation experience, using gender specific voices, providing adequate time for debriefing, keeping group sizes small, and having adequate faculty and staff available.

Source	Problem	Purpose Research Questions	Framework or Concepts	Sample	Design	Instruments	Results
						instruments.	
Messmer, (2008)	Little research exists to explain the effect of interdisciplinary team simulation scenarios on competency, communication, collaboration and patient outcomes.	To determine the level of nurse-physician collaboration during simulation training	Novice to Expert Model Benner (1984)	Eighteen teams of pediatric residents/ fellows and nurses with varied specialty & years of experience. The total number of participants was 105: 55 pediatric residents and 50 nurses.	Descriptive	**Kramer and Schmalenberg Nurse-Physician Scale (KSNPS)** – a 5-pont Likert-type scale to categorize relationships (1 = collegial or excellent to5 = being negative or marked by frustration, hostility or resignation). **Clinical Practice Group Cohesion (GC)** (National Association of Children's Hospitals and Related Institutions) (NACHRI) - a six-item survey. Four items with seven response options ranging from "very much	High levels of group cohesion and satisfaction with patient care decisions for nurses and physicians were reported on the GC and CSPCD. Male participants had significantly higher scores on both the GC (p = 0.029) and CSPCD (p = .005) compared to female participants. Collaboration was observed to evolve over time when the nurse experts reviewed the three videotapes. Participants reported a mean score of 4.5 related to satisfaction with the simulation experience and a central theme reported by the participants was that the simulation experience was realistic.

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						about average" to very much below average" and two items with seven responses ranging from "like it very much:" to "dislike it very much". **Collaboration & Satisfaction with Patient Care Decision (CSPCD)** NACHRI – an eight-item survey. Six items have seven responses ranging from "strongly disagree" to "strongly agree". One item has seven response options ranging from "no collaboration" to "complete collaboration" and one item has seven response	

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						options ranging from “not satisfied” to “very satisfied”. **Field notes**	