EVALUATING THE USE OF SIMULATION WITH BEGINNING NURSING STUDENTS

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ABSTRACT

RESEARCH PAPER: Evaluating the Use of Simulation with Beginning Nursing Students

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The shift from traditional instructional methods toward student-centered learning challenges nursing faculty to create learning experiences that will develop safe and competent graduates. Current literature supports the use of clinical simulation with advanced students, but reports of simulation as a teaching strategy with beginning students are limited. The purpose of this proposed study will be to compare the effect of high-fidelity clinical simulation and a traditional skills demonstration on self-confidence and satisfaction with learning among beginning nursing students. This quasi-experimental study will replicate Alfes (2011) study and will use Tanner’s experiential learning theory as the theoretical framework. A convenience sample of 185 first-semester baccalaureate nursing students will be randomly assigned to a control or an experimental group. Demographic data will be collected and students will complete the National League for Nursing’s Student Satisfaction and Self-Confidence in Learning questionnaire. Results from this study will provide further information about how clinical simulation experiences support confidence and satisfaction in learning among beginning students.
Chapter 1

Introduction

Nurses take an active role in all facets of healthcare and are expected to possess critical thinking and communications skills (National League for Nursing, 2008). Schools of nursing are required to provide students with both theory and clinical opportunities relative to the scope of nursing. Nursing educators who teach in baccalaureate programs foster critical thinking and communication skills through didactic and clinical instruction, as well as learner activities such as simulation (Billings & Halstead, 2009). Piscotty, Grobbel, and Tzeng (2011) stated there are several reasons simulation has expanded in to clinical education: lack of available clinical sites, time, and faculty constraints have promoted the development of effective simulation methods.

The opportunity for students to deliver care in a safe manner in today’s high-risk, complex health care environment is limited. Situations involving high-risk patients are not ideal for student learning experiences. Simulation allows students to practice skills and apply nursing knowledge in a safe environment (Piscotty et al., 2011). In the simulated environment, simulations using human patient simulators are student-centered and provide students with opportunities to practice decision making, problem solving, and team member skills in a non-threatening way (Billings & Halstead, 2009). The environment needs to be sufficiently realistic to allow for suspension of disbelief, so
transition of knowledge from theory to practice can be stimulated (Billings & Halstead). According to Bearman and Wiker (2005), simulation is useful for teaching and valuating specific clinical skills and provides a way to increase safety, decrease errors, and improve clinical judgment.

According to Shepherd, McCunnis, Brown, and Hair (2010) nurses of today must be critical thinkers, effective decision makers, and competent. Critical thinking is essential in nursing practice. Critical thinking, when applied to nursing, incorporates data collection and analysis, explores what is known in relation to the outcome, examines the individual patient and determines the best course of action (Shepherd et al., 2010). Clinical skills laboratories that incorporate simulation improve learners’ skills in a safe, non-threatening experimental environment also provide opportunities for decision making, critical thinking and team building (Shepherd et al.).

With a paradigm shift toward student-centered learning, traditional teaching methods such as lecture and PowerPoint® presentations are no longer desirable (Alfes, 2011). Nurse educators must develop realistic learning experiences that support student transition to the clinical setting while ensuring safe and competent graduates who are prepared for the technological advances in nursing practice (Alfes). One solution to the challenges of incorporating innovative and interactive teaching strategies is the use of simulation.

**Background and Significance**

Simulation was initially used by the airlines and military personnel for training purposes. The first ground-based flight simulator, named the Link trainer, was invented in 1929 by Ed Link (Nickerson & Pollard, 2010). In 1934 the Army purchased 6 Link
trainers to improve training after several catastrophic and fatal accidents occurred due to poor visibility (Rosen, 2008). With the introduction of computers in the 1950s, the complexity and realism of flight simulation increased. During the 1970s full flight simulation was born and the 1980s brought the authorization for the use of high-fidelity simulator training and evaluation of aviation personnel (Rosen). Military and commercial airlines still use flight simulators for training purposes because, although expensive, they prove to be cost-effective. Advanced helicopter simulator and training systems showed a savings in terms of both cost and lives in helicopter and military simulators.

One of the earliest mannequins to be used in teaching patient care was in 1911 at the Hartford Hospital Training School in Hartford, Connecticut (Nickerson & Pollard, 2010). In 1932 a detailed report was written about a skills laboratory used at the Indiana University Training School for Nurses describing how students now had the opportunity to practice hypodermics on a mannequin. Rescue Annie was born in 1960 and offered medical personnel the ability to practice mouth-to-mouth breathing. Annie then evolved into a mannequin for chest compression by the simple placement of a spring in her chest. It was not until the 1990s that any significant advancement occurred in simulation. Mannequins were being developed to allow for physician practice of procedures from cholecystectomies to telesurgery. Benner (1984) noted that becoming an expert nurse is achieved by acquiring knowledge through clinical experience; the use of simulation was seen as a helpful tool in meeting this need.

The use of simulation has grown in nursing education, due in part, to increased availability of the technology and to the benefits offered to students and teachers (Feingold, Calaluce, & Kallen, 2004). Simulation offers increased control over learning
Simulation can provide a safe and controlled environment for nursing students to practice technical skills combined with the theoretical perspectives learned in the classroom setting. Benefits of simulation include: (a) enhanced assessment and decision-making skills, (b) retention of knowledge related to procedures, (c) absence of patient risk, (d) exposure of many students to complex problems, and (e) reflection on clinical decision making (Feingold et al.).

Traditionally, simulation has been used in nursing education for psychomotor skills training. However, Feingold et al. (2004) extended traditional thinking about simulation by linking it with cognitive learning theory. Simulation, they reasoned, is interactive, builds on prior knowledge, and relates to real clinical problems. Bandura’s social learning theory, a subset of cognitive learning theory states: “most human behavior is learned observationally through modeling, from observing others form an idea of how new behaviors are performed, and on later occasions this coded information serves as a guide for action” (Bandura, 1977, p. 35). Active participation may promote critical thinking skills and increase confidence levels.

With simulation being an interactive learning experience for beginning students, observed behavior can be learned and demonstrated in a safe controlled environment. This can lead to increased confidence levels of students. Hauber, Cormier and Whyte (2010) state positive student responses to simulation have been documented and some studies have revealed improvement in certain aspects of student performance. Being able to link theory to practice is vital to beginning nursing students’ ability to provide high-quality care to patients. Nurse educators who use a variety of learning strategies such as demonstration, role-play, and simulation while teaching clinical skills in a controlled
learning environment may effectively ease the transition from theory to practice (Alfes, 2011). The use of human patient simulator (HPS) as an innovative tool for experiential learning provides a mechanism in which students can participate in clinical decision making, practice skills, and observe outcomes from clinical decisions (Brannan, White, & Bezanson, 2008).

It has been suggested that confidence may improve if simulation is used and that confidence gained during simulation is disseminated into clinical practice (Shepherd et al., 2010). HPS benefits students in the area of knowledge, value, realism, and learner satisfaction; however, findings have been mixed in terms of student confidence, transfer of knowledge, and stress reduction (Sportsman, Schumacker, & Hamilton, 2011). Sportsman et al. stated that recent attempts to determine the impact of the use of HPS on nursing student perception have been inconclusive. Although existing research on the use of simulation technology in nursing education is limited, some consensus has emerged (Grady et al. 2008). Learning advantages appear from realistic yet controlled contexts and simulation may result in higher skill acquisition. Although studies on self-confidence and a variety of other student and faculty perceptions associated with the use of clinical simulation are accumulating, vital evidence related to knowledge acquisition through clinical simulation is limited (Alfes, 2011; Schlairet & Pollock, 2010). Further study is needed to explore the effectiveness of using simulation as a learning strategy as nurse educators recognize that perceptions of self-confidence may influence students’ actions, effort invested, and perseverance.
Problem Statement

Literature supports the use of HPS to benefit students in the areas of knowledge, value and realism, but further research is needed to determine if HPS, as a learning strategy, enhances students’ perceptions of self-confidence and satisfaction. Despite the diminishing availability of clinical sites, nursing faculty shortages, and an exponentially growing knowledge base, employers are asking educators to do a better job of preparing students for the real world of nursing. Immersing students in lecture content while providing limited clinical experience is inadequate to prepare nurses for the complexities of the workplace (Jeffries, 2005). There is insufficient research to support the benefits of simulation in relation to undergraduate nursing students’ self-confidence and satisfaction with HFS.

Purpose Statement

Human patient simulation experiences provide nursing students an opportunity to perform tactile skills and develop critical thought processes that may then be transferred to the healthcare setting. The purpose of this study is to partially replicate the Alfes (2011) study to explore the perceptions of undergraduate baccalaureate nursing students about the implementation of high-fidelity simulation using SimMan® into an existing clinical course.

Research Questions

1. Is there a difference in level of self-confidence between students receiving traditional skills laboratory instruction and students participating in a simulation experience?
2. Is there a difference in satisfaction with learning between students receiving traditional laboratory instruction and students participating in a simulation experience?
3. Is there a relationship between student self-confidence and satisfaction with learning following a traditional or simulated skills laboratory experience?
4. Is there a change in students’ level of self-confidence following a traditional or simulation learning experience?

*Theoretical Model*

Tanner’s clinical judgment model will guide this study. Tanner’s clinical judgment model offers a functional way to understand the ongoing influences and processes that result in nursing judgments and actions and, ultimately, in optimal nursing care (Nielsen, Stragnell, & Jester, 2007). Tanner’s clinical judgment model allows for “problem-solving activity, beginning with assessment and nursing diagnosis, proceeding with planning and implementing nursing interventions directed toward the resolution of the diagnosed problems, and culminating in the evaluation of the effectiveness of the interventions” (Tanner, 2006, p. 204). Although Tanner’s model describes the clinical judgment of experienced nurses, it also provides faculty with the means to help students diagnose breakdowns, identify areas for growth, and consider learning experiences that focus attention on those areas (Tanner). This model consists of four aspects: noticing, interpreting, responding, and reflecting. Noticing is defined as grasping the situation at hand. Interpreting is defined as developing an understanding of the situation and is followed by the course of action decided upon by the nurse, or responding. The nurse also reflects on the patient’s responses and the clinical decisions that were made.
Tanner’s model is appropriate to guide this study because it allows reflection on student actions with human patient simulation.

Definition of Terms

Self-Confidence – Conceptual Definition

Self-confidence is generally viewed as a valued educational outcome. Self-confidence in nursing students is defined by Larew, Lessans, Spunt, Foster, and Covington (2006) as increased awareness of and insight into the skills needed to identify and solve problems in the health care setting.

Self-Confidence – Operational Definition

Self-confidence, for the purpose of this study, is how individual nursing students perceive their capabilities for delivering nursing interventions after a simulation experience. The National League for Nursing’s Student Satisfaction and Self-Confidence in Learning questionnaire will be used to measure students’ perceptions. Written permission will be obtained prior to using this tool from the National League for Nursing.

Student Satisfaction with Learning – Conceptual Definition

Student satisfaction with learning is defined as the degree to which students believe they have opportunity to be involved in a learning activity and to receive feedback about their learning. This process occurs in an environment that respectfully challenges students as they participate in the learning experience.

Student Satisfaction with Learning – Operational Definition

Student satisfaction, for the purpose of this study, will examine how satisfied students are after completing a HPS lab. The National League for Nursing’s Student Satisfaction and Self-Confidence in Learning questionnaire will be used to measure
satisfaction. Written permission will be obtained prior to using this tool from the National League for Nursing.

**Limitations**

Possible limitations might include:

1. The study will take place during one nursing course.
2. The sample will be one of convenience in a single setting.
3. Sample size will be dependent on number of students who enroll in the course.
4. The length of the school semester is a time limiting factor.

**Assumptions**

Assumptions include:

1. Participants will give honest answers.
2. Participants will be willing to participate with the researcher.
3. Participants will have no prior experience with nursing simulation.
4. The research questions are appropriate to generate relevant information in an attempt to identify changes in the nursing students’ perceptions through high-fidelity human patient simulation experiences.

**Summary**

High-fidelity simulation was initially used by airlines and military personnel for training purposes. High-fidelity simulation was first noted to be used in healthcare in 1911 with the first detailed report of a nursing skills lab occurring in 1932. The early
mannequins allowed for the practice of hypodermics and mouth-to-mouth breathing and have evolved into the interactive mannequins we see today. Many nursing programs are now utilizing patient simulation sessions to enhance student learning. The high-fidelity human patient simulator appears to be the primary type of mannequin used in these sessions (Schiavenato, 2009). The benefits of using simulation as a teaching and/or learning strategy includes students’ application of critical thinking skills, use in the classroom or laboratory setting, provision of immediate feedback by faculty, and ease of repetition of exercises and experiences (Billings & Halstead, 2009).

The purpose of this proposed study is to partially replicate Alfes’ (2011) study to explore the perceptions of baccalaureate nursing students about the implementation of high-fidelity simulation using SimMan® into an existing nursing course. The framework used to guide this study is Tanner’s clinical judgment model. The significance of the study will be increased understanding of how simulation affects baccalaureate nursing students’ self-confidence and satisfaction regarding high-fidelity simulation.
Chapter II

Literature Review

Introduction

Nursing education literature addresses the use of high-fidelity simulation with more advanced students. However, little information is available about the effectiveness of this strategy to help beginning students learn basic nursing skills (Alfes, 2011). This proposed study is a partial replication of Alfes study. The purpose of this study will be to explore the perceptions of beginning nursing students about the implementation of high-fidelity simulation into an existing course.

Organization of the Literature

The literature review covers the theoretical framework as well as selected studies conducted over the last 7 years and pertaining to undergraduate nursing students and high-fidelity simulation. The literature is organized under four categories:

1. Theoretical framework
2. Students’ perceptions, satisfaction and outcomes
3. The use of high-fidelity simulation to change traditional nursing education methods
4. High-fidelity versus traditional learning experiences in nursing education
Theoretical Framework

Tanner’s clinical judgment model is the framework for this study. Tanner’s (2006) clinical judgment model includes five steps:

1. A perceptual grasp of the situation at hand, termed “noticing.”
2. Developing a sufficient understanding of the situation to respond, termed “interpreting.”
3. Deciding on a course of action deemed appropriate for the situation, which may include no immediate action, termed “responding.”
4. Attending to patients’ responses to the nursing action while in the process of acting, termed “reflecting.”
5. Reviewing the outcomes of the action, focusing on the appropriateness of all the preceding aspects.

Noticing is a function of nurses’ expectations of the situation, whether or not those expectations are made explicit. Tanner (2006) stated “these expectations stem from nurses’ knowledge of the particular patient and his or her patterns of responses; their clinical or practical knowledge of similar patients, drawn from experience; and their textbook knowledge.” Nurses’ vision of excellent practice, their values related to the particular patient situation, the culture on the unit and typical patterns of care on that unit, and the complexity of the work environment will influence the nurses’ noticing of a change in the clinical situation that demands attention.

Interpreting and responding occurs after the nurse notices and grasps the clinical situation that has triggered one or more reasoning patterns. The experienced nurse interprets the meaning of the data and then, intuitively, determines an appropriate course
of action. The patient’s response to the intervention confirms the nurse’s interpretation of the data and appropriateness of the response. Clinical reasoning, in this model, is supported by the acts of assessing and intervening.

Reflection refers to the nurse’s ability to read the patient’s response to the nursing intervention and to adjust the interventions based on said assessment. Reflection also adds to the nurse’s knowledge base and ability to clinically judge future situations. Tanner (2006) states reflection requires the ability to ascertain what resulted from nursing actions.

Tanner’s clinical judgment model describes how practicing nurses think when engaged in clinical situations that require judgment. Using this model, nurse educators can provide feedback and coaching to students in areas that may have been identified as knowledge deficits. This allows students to develop insight into their own clinical thinking. Skills in clinical judgment are also enhanced by pointing out areas where specific learning activities can enhance clinical thinking. Patient manifestation of textbook signs and symptoms as well as recognizing changes in patient conditions can be learned using Tanner’s model. Teaching students to understand and develop their clinical knowledge through the clinical judgment model encourages students to become habitual in reflection-on-practice. By repetition of this model, nurses develop a fundamental sense of what is good and right along with a vision for what makes for excellent care.

Students’ perceptions, satisfaction and outcomes

The purpose of evaluation in education is to improve teaching and learning (Feingold et al., 2004). Feingold et al. conducted a study to evaluate student and faculty perceptions of the use of a computerized patient model. The authors hypothesized that an
adequate test of students’ clinical competence would involve assessment, communication, decision making and psychomotor performance in a clinically simulated environment which could then be applied to real life (Feingold et al.). There was no clear framework identified for this study.

Baccalaureate nursing students enrolled in an advanced acute care of the adult course were approached over two consecutive semesters to participate in the study. Enrollment in this course was the only inclusion criterion. Students in the fall semester were labeled group 1; spring semester students made up group 2. There were 50 students in group 1 and 47 students in group 2. Twenty-eight students (56.0%) from group 1 and 37 students (78.7%) from group 2 completed the study for a mean completion rate of 67% (Feingold et al., 2004).

Students and faculty were surveyed about the value of the simulation learning experience. A 20-question survey drafted from a tool described in the literature was given to students to provide an evaluation of their experience. The survey asked students their thoughts about the ability to transfer skills learned in simulation to the real world, perception of the realism of the experience, and perceived overall value of the learning experience. Realism, transfer of skills learned, and value variables were measured with 3 sub-scales. Responses were measured using a 4-point Likert scale (1 = strongly disagree to 4 = strongly agree). A 17-item survey, using the same the same 4 response choices, was used to gather faculty feedback (Feingold et al., 2004). Reliability and validity of the survey instruments were not reported.

There were no significant differences between students who responded and those who declined based on age and gender (Feingold et al., 2004). However, a greater
percentage of minority students did not participate as compared with Anglo students \[x^2 (1, N = 97) = 3.88, p = .049\]. The majority of students in this sample were female and under the age of 30 years. When comparing the group 1 students with the group 2 students, no significant demographic variables were identified.

Half of the students believed that working with patient simulation increased their confidence, clinical competence, and prepared them for real clinical settings; yet, 100% of faculty believed the learning would transfer. Two-thirds of students (69.3%) believed the learning experience was valuable and 76.5% believed it enhanced learning. Students also agreed the simulated clinical experience was an adequate test of clinical skills (83%) and decision making (87.7%). An unexpected finding was that 49.9% of students felt their confidence levels were increased and 46.9% experienced improvement in their clinical competence. However, only 54.7% believed that the clinical simulation prepared them to function in a real clinical environment. No significant differences were found between student GPAs and responses to the three survey subscales or between student age and survey responses. The value subscale had the highest level of student agreement (mean = 3.04); the lowest level of agreement (mean = 2.52) was found for the transferability subscale (Feingold et al., 2004).

In summary, Feingold et al. (2004) found that, as a result of the simulation half of the students (49.9%) reported an increase in their confidence and clinical competence. The students also reported that the simulation prepared them to perform in real life settings. However, the realism needed improvement. Students also felt that the interactive experience reinforced clinical objectives, tested clinical skills and decision making, and enhanced learning. Faculty members reported that simulation experiences prepared
students to perform in real clinical settings. These findings, combined with cost containment concerns, suggest that innovative simulation experiences may replace some patient care experiences (Feingold et al.).

Nurse educators need to understand both the best practices associated with high-fidelity simulation (HFS) and the benefits HFS has for nursing students. Using Jeffries’ nursing education simulation framework, Smith and Roehrs (2009) explored factors that correlated with two outcomes of HFS: student satisfaction and self-confidence. In addition, the study examined the correlation between student demographic characteristics, simulation design characteristics, and student reports of satisfaction and self-confidence.

The study took place at a school of nursing in a public university in the western United States. The sample was obtained from junior students in the traditional BSN program. Sixty-eight of the 72 students enrolled in the first medical-surgical course agreed to participate in the study. Ninety percent of the sample was female with an average age of 23.4 years (SD = 5.4). Sixty-nine percent of the students had no experience working in healthcare. Forty-seven percent had no previous experience working with HFS prior to the study. For the HFS experience, the students were put into groups of four with two being the nursing students and two participating as observers. The two nursing students conducted a physical assessment and passed medications on an elderly female admitted with an exacerbation of chronic obstructive pulmonary disease (Smith & Roehrs, 2009).

Smith and Roehrs (2009) used three instruments to obtain data: a researcher-designed demographic instrument, the National League for Nursing (NLN) Student
Satisfaction and Self-Confidence in Learning Scale and the NLN Simulation Design Scale (SDS). The self-reported NLN scales use 5-point Likert type scales (1 = strongly disagree, 5 = strongly agree) with the SDS providing an option to select not applicable. Smith and Roehrs (2009) reported that both NLN instruments have established reliability and content validity. The 13-item Student Satisfaction and Self-Confidence in Learning Scale has a reported Cronbach’s alpha of .94 for the Satisfaction Subscale and .87 for the Self-Confidence subscale. The SDS is a 20-item instrument with five subscales (Objectives, Support, Problem-Solving, Feedback, and Fidelity) and a reported Cronbach’s alpha of .92. The subscales include objectives, support, problem-solving, feedback, and fidelity.

Smith and Roehrs (2009) reported positive results for the HFS experience. Overall, students were satisfied with HFS as a teaching method as indicated by a mean score of 4.5 (SD = 0.5) on the Satisfaction subscale of the Student Satisfaction and Self-Confidence in Learning scale. Students also had a sense of confidence in the care of a patient with respiratory distress as indicated by a mean score of 4.2 (SD = 0.4) on the Self-Confidence subscale. There were no statistically significant differences in satisfaction or self-confidence between students who had clinical experience with a patient in respiratory distress and those who did not have such experience. The five simulation design elements were all rated positively with mean scores ranging from 4.4 (SD = .5) for objectives to 4.8 (SD = .4) for guided reflection.

Although the correlations between simulation design characteristics and satisfaction and between design characteristics and self-confidence were significant (p = .01), none of the variables were strongly correlated. Following multiple linear regression
analysis, Smith and Roehrs (2009) determined that all variables together accounted for 46.9% of the variance in satisfaction with the design element of objectives accounting for 35.7% of the variance. A similar finding was made related to self-confidence; over 45% of the variance was accounted for by all design variables with problem solving accounting for 34% by itself. No significant correlations were found between the demographic variables of age, gender, previous degree, health care experience or simulation experience and student satisfaction or self-confidence. Although a regression model including both demographics and design characteristics accounted for half of the variance, the design characteristics of objectives and problem solving were the only significant predictors of satisfaction and self-confidence. This analysis demonstrated that student characteristics did not significantly affect satisfaction or self-confidence ratings.

Smith and Roehrs (2009) concluded that this study added to the body of simulation knowledge by providing information about characteristics that correlate with student satisfaction and self-confidence as outcomes of high-fidelity experience. Findings also emphasized the importance of design characteristics to effective simulations. As technology becomes more sophisticated, nursing educators need to conduct further research to document the effectiveness of high-fidelity simulation.

Effectiveness of HFS depends on student learning styles as well. To teach students with different learning styles how to fuse required theoretical, affective, and perceptual/motor skills, nursing educators need to employ creative methods. Fountain and Alfred (2009) conducted a study to ascertain if the outcomes of high-fidelity simulation (HFS) technology-enhanced activities were influenced by a student’s learning style. There are different categories of learning preferences: linguistic learning, interpersonal...
learning, intrapersonal learning, kinesthetic learning, and spatial learning. Nursing entrance exams can evaluate and identify these learning preferences. Gardner’s multiple intelligence learning theory was used for this study.

Fountain and Alfred (2009) used a convenience sample of 104 senior baccalaureate nursing students from three campuses of a southern university. The students, enrolled in an advanced medical-surgical course, had been introduced to HFS during their first semester of the nursing program. They had eight hours of laboratory experience at the time of the study. Prior to attending the 3-hour HFS lab, students attended a lecture on acute coronary syndrome and dysrhythmia and completed five case studies.

To measure student personal attitudes about HFS activities, Fountain and Alfred (2009) used the National League for Nursing Student Satisfaction and Self-Confidence in Learning Scale. This is a 13-item instrument and is scored on a 5-point Likert-type scale, with scores ranging from 1 (strongly disagree) to 5 (strongly agree). A 5-item subscale is used to measure satisfaction with the simulation experience. Jeffries reported the reliability of the scale using Cronbach’s alpha (satisfaction = .94; self-confidence = .87). Cronbach’s alpha for satisfaction was .91 and .84 for self-confidence for this study.

Seventy-eight students completed the form resulting in a 75% return rate. Pearson product-moment correlation was used to analyze the data. Social learning (77%) was the most common learning style for the students. Social learning (r = .29, p = .01) and solitary learning (r = .23, p = .04) were significantly correlated with satisfaction. There were no significant differences in satisfaction with simulation-enhanced learning activities between the campuses (Fountain & Alfred, 2009).
Fountain and Alfred (2009) concluded that students with a learning style of solitary learning as well as those with a preference for social learning were satisfied with the HFS-enhanced learning experience. The solitary learner can actively learn by watching others as the students with social learning can interact with others. HFS-enhanced lab activity can increase the student’s ability to synthesize critical content. Technology can increase student learning satisfaction and allow students with different learning styles to apply new information in a non-threatening way.

Sportsman et al. (2011) evaluated the impact of scenario-based, high fidelity patient simulation on students’ sense of their own clinical competence, graduating grade point average (GPA), and performance on standardized exit examinations. The purpose was to see how participation in scenario-based, high fidelity patient simulations which were substituted for a portion of the traditional clinical experience would influence student outcomes. Two research questions guided the study. The first asked about the impact of high-fidelity simulation on students’ sense of their own clinical competence, anxiety regarding school performance, attitudes about and interest in learning opportunities, motivation to learn, concentration during learning activities, and satisfaction with the clinical learning environment. The second question evaluated the impact of clinical simulation on seniors’ GPA and standardized exit examination scores. Researchers used the Baramee and Blegen model which describes predictors of student perception of clinical competence as the theoretical framework for this study (Sportsman et al.).

The study took place in the Regional Simulation Center (RSC), a facility located in a renovated hospital unit and shared between a university, community college, and
hospital in north central Texas. Sportsman et al. (2011) collected data from junior and senior nursing students over a 3-year period. The sample of 895 students included associate degree (ADN) and baccalaureate (BSN) nursing students who had successfully completed their fundamentals course the previous fall. Eighty-five percent of the sample was female; the majority (63%) was between the ages of 19 and 29 years.

Sportsman et al. (2011) used a demographic data sheet and four data collection instruments. The demographic data sheet included questions about gender, age, nursing school, previous healthcare experience, current work in health care, and family health care experience. The Clinical Learning Environment Scale (CLE) measured student satisfaction with the last semester of clinical experience. The CLE is a 23-item survey with 5 subscales. Validity has been established with confirmatory factor analysis; reliability coefficients for the subscales range from marginal (.63) to high (.85). The Clinical Competence Appraisal Scale (CCAS) and four subscales from the Learning and Study Skills Inventory (LASSI) were also used. The CCAS is a 44-item instrument to assess students’ perceptions of their own clinical competency using 6-point Likert scale (1 = dependent, 6 = independent). The instrument had 5 subscales: (a) Psychomotor Skills Perception (PSP), (b) Leadership, (c) Teaching/Collaboration, (d) Planning/Evaluation, and (e) Interpersonal Relationships/Communication. The CCAS has a reported Cronbach’s alpha reliability coefficient of .819 to .953. The Learning and Study Skills Inventory (LASSI) was used to assess how respondents learn and study. The scale has 4 subscales: (a) Anxiety, (b) Attitude, (c) Concentration, and (d) Motivation. Alpha reliability coefficients were reported for each subscale: Anxiety = .87; Attitude = .77; Concentration = .86; and Motivation = .84. Sportsman et al. (2011) obtained scores
from the comprehensive exit examination administered to participants and their total GPA to ascertain motivation to learn.

Findings for the first research question reflected a significant decrease during the study in junior students’ perceived psychomotor skills \( (n = 482, f = 15.616, p = .0001) \). Mean scores for the Psychomotor Performance subscale of the CCAS dropped from 44.41 to 40.71 for junior students. Senior students in the first year of the study demonstrated significantly lower anxiety scores than seniors in the second study year \( (n = 327, f = 4.249, p = .015) \). Satisfaction with the clinical experience in the senior year also decreased significantly over the study period \( (n = 339, f = 7.633, p = .001) \). Senior students’ perceived leadership skills significantly improved \( (n = 308, f = 8.723, p = .0001) \). Other variables, including perceived psychomotor skills, did not change for senior students over two years (Sportsman et al., 2011). The second research question evaluated the impact of participation in scenario-based simulation upon seniors’ graduating grade point average and scores on the standardized exit examination. Sportsman et al. found that regardless of the amount of simulation experienced there was no significant difference in mean exit scores between seniors who graduated in 2006 and those who graduated in 2007.

The study suggests that simulation may positively influence students’ perceptions of the clinical environment. However, several factors limit the generalizability of the study findings. Because the simulation center was a partnership between a hospital, university, and a community college, BSN-prepared non-faculty lab mentors supervised the student experiences. Because there are few centers in the United States with similar organizational structure, this unique study environment may reduce external validity.
Threats to internal validity were apparent as well. Over the study period, the operation of the RSC improved and staff gained expertise in simulation. This could have led to very different experiences for students in 2007 than the 2006 students. Sportsman et al. (2011) suggest this study should be replicated using random assignment and a control group that does not participate in the simulation experience due to the threats to internal and external validity.

Sportsman et al. (2011) concluded that as the use of high-fidelity patient simulation grows in nursing education, this study helps provide initial evidence of its impact on the academic success of ADN and BSN students in north central Texas. These findings support the hypothesis that high-fidelity simulation positively influences student outcomes. The findings also suggest that, as simulation becomes an integral component of nursing students’ experience, there is an additional need for continued research.

*The use of high-fidelity simulation to change traditional nursing education methods*

There has been an increased need for acute care facilities to respond to a higher patient acuity while functioning under a nursing shortage (Hauber et al., 2010). In addition, the changing health care system in the United States requires changes to traditional health care education with a stronger focus on patient safety, quality of care, and decision-making skills. High-fidelity patient simulation (HFPS) is one possible means to address these requirements in the face of increased patient acuity. Hauber et al. conducted a study to examine the relationships among students’ abilities to prioritize actions, associated cognitions, and the physiologic outcomes of care in HFPS. The research question addressed the relationship between common measures of knowledge
and the performance-related variables as measured using HFPS. Ericsson and Smith’s expert-performance approach (EPA) was the theoretical framework for the study.

Hauber et al. (2010) randomly drew participants from volunteers at a large college of nursing in a research university. The population was defined as the 280 undergraduate nursing students enrolled in the college of nursing. All participants were at the beginning of the third semester in a five-semester generic baccalaureate-nursing program. Each student had completed a semester of fundamental nursing education and one semester of adult health nursing courses that included both laboratory and clinical experiences. The sample of 15 nursing students included 13 females; 11 participants were white, 2 were African-American, and 2 were Hispanic. Their mean age was 23.4 years (SD = 1.8).

Reliability was not reported on the instruments used. Simple descriptive statistics were used to analyze the demographic data. Cognition was determined by using knowledge-related measures, including grades from previously completed courses as well as standardized tests. Prioritization of interventions was evaluated from video recordings of the simulation and physiologic logs from the simulators. Grade point averages (GPAs) and scores on standardized examinations were used as measures of knowledge (Hauber et al., 2010).

Bivariate correlation was used to determine the relationship between the common physiologic variable as a reflection of performance and examination score and course grades as measures of knowledge. The common physiologic variable revealed a significant but indirect correlation with the Fundamentals course grade ($r = -0.540, p < 0.05$). The common physiologic variable showed a significant and direct correlation with the Adult Health I (AHI) grade ($r = 0.542, p < 0.05$). Students who excelled in the AHI
course also demonstrated significantly higher overall GPAs ($p < .05$). No differences were reported in performance in other areas (Hauber, 2010).

Hauber et al. (2010) contend that the findings provoke thought. The use of HFPS provides students with a means of deliberate practice that refines performance though error correction and repetition without risk to patients. Information obtained from simulation experiences can also be used to analyze students in the clinical settings. HFPS may lead to better instructional design and ultimately provide new practitioners with habits that may improve their own practice.

Consistent with the call for changes in nursing education as described by Hauber et al. (2010), Piscotty et al. (2011) identified that the community-at-large is demanding that improved quality and safety in clinical care be addressed at the baccalaureate level of nursing education. Piscotty et al. conducted a study to determine if a student-led simulation project, integrating the six Quality and Safety Education for Nurses (QSEN) competencies, would lead to increased student quality and safety knowledge, skills, and attitudes (KSA). The six QSEN competencies are patient-centered care, teamwork and collaboration, evidence-based nursing practice, safety, quality improvement, and informatics. Bandura’s social cognitive theory was used as the framework for this study.

Piscotty et al. (2011) implemented a quasi-experimental pretest and posttest design using a convenience sample of students. Inclusion criteria were that the students had to be in one of two leadership and management courses in a Bachelor of Science in Nursing (BSN) program at a Midwestern public university. There two groups were comprised of a total of 141 participants. One group was made up of a cohort of traditional nursing students enrolled in a four year undergraduate BSN program ($N = 97$); the other
group consisted of 44 students in a 12-month accelerated second-degree BSN program. A total of 131 students completed both the pretest and posttest. The mean student age was 25.7 years ($SD = 6.45$) in the traditional group and 32.1 years ($SD = 7.3$) in the accelerated group. The breakdown of female and male participants was similar in each group. There were 87 (89.7%) females and 10 (10.3%) male students in the traditional group and 39 (88.6%) females and 5 (11.4%) males in the accelerated group. The self-reported mean GPA for the traditional group was 3.34 ($SD = .22$) in contrast to the accelerated group’s mean GPA of 3.51 ($SD = .16$) on a 4-point scale.

Piscotty et al. (2011) developed two instruments to test the effectiveness of the simulation project. An 18-item self-inventory scale was developed to measure students’ self-rated knowledge, skills, and attitudes (KSAs) in reference to the QSEN competency areas. A 7-point Likert-type scale ranging from 1 (strongly disagree) to 7 (strongly agree) was used to rate the students’ KSAs. A second instrument was used to test students’ actual KSAs in the six QSEN competency areas. This instrument was a 36-question multiple choice and true-or-false test. Cronbach’s alpha was used to test for internal consistency of both the self-rating scores and the knowledge tests. The traditional and accelerated groups’ scores were nearly the same for self-rating scores, but the test scores for each group were different. Although the self-rating scales were noted to have satisfactory reliability ($\alpha = .91$ to .92), reliability for the knowledge test was questionable with an alpha coefficient for the traditional group test of .43 and .68 for the accelerated group test. Further evaluation of the knowledge test using Kuder-Richardson-20 resulted in similar questionable results. Results from the knowledge test must be interpreted with caution based on the lack of acceptable reliability.
The two groups were compared with regards to their scores. Paired-samples \( t \)-tests were conducted to evaluate the effect of simulation within the traditional group’s self-rating scores. Mean scores increased in all competency areas. A highly significant increase (\( p < .001 \)) was found for all competency scores except for attitude scores. Attitude scores were just slightly less significant (\( p = .017 \)). The accelerated group paired-sample \( t \)-tests results for inventory scores were significantly increased overall (\( p = .011 \)) as were scores for each of the KSAs: knowledge (\( p = .014 \)) skills scores (\( p = .013 \)), teamwork and collaboration (\( p = .043 \)), quality improvement (\( p = .003 \)), and safety (\( p = .017 \)). Evaluation of quality and safety test scores demonstrated that the accelerated group had a significant increase in the students’ knowledge (\( p = .027 \)) and safety (\( p = .03 \)) scores. The traditional groups also showed a statistically significant increase in students’ knowledge (\( p = .001 \)) and safety (\( p = .028 \)) scores. These scores should be interpreted with caution, particularly for the traditional group. There was an unexplained significant decrease (\( p = .015 \)) in the traditional student skills scores (Piscotty et al. 2011).

The findings supported the first hypothesis that the student-led simulation project would improve students’ overall self-ratings of quality and safety competencies in both traditional and accelerated students. The second hypothesis was not fully supported. The simulation project was not effective in improving students’ objective overall safety and quality scores. Piscotty et al. (2011) showed that traditional teaching methods provided content in learning, whereas simulation may provide the context of learning. Combining traditional learning with simulation can be more powerful than if used separately.
High-fidelity versus traditional learning experiences in nursing education

Simulation training enables experiential learning in a safe environment (Alinier, Hunt, Gordon, & Harwood, 2006). Researchers state that further investigation is needed to establish that skills acquired in a simulation environment are conveyable to real patient care and that simulation is cost-effective. Alinier et al. used a quasi-experimental pre- and post-test design to examine the value of simulation in nursing education. Students from three consecutive cohorts \((n = 344)\) in their second year of a Diploma in Higher Education in Adult Nursing program were randomly assigned to either the experimental or control group. Out of the population of 344 students, 133 (38.7%) initially volunteered to participate in the Objective Structured Clinical Examination (OSCE) and 99 (28.8%) completed the second OSCE. The participants had an average age of 29.9 (SD = 8.7); the average age of the students who dropped out was 28.6 (SD = 9.4). Female students compromised 88.7% of the sample.

The OSCE is a type of assessment that has several short exercises through which students rotate for a specific amount of time. Students had 5 minutes per station with a 1-minute timeframe to rotate to the next station. The first OSCE represented the student’s first exposure to simulation. A second OSCE was done after a 6-month exposure to simulation and was used to determine students’ skills and competence. Alinier et al. (2006) state that OSCEs are recognized as a highly reliable and valid assessment method for assessing the practical skills of healthcare students.

Alinier et al. (2006) reported a 48.18% average on performance in the first OSCE. In comparing the experimental group to the control group it was found that the experimental group obtained higher marks than the control group. The experimental
group scored 61.71% compared to the control groups 56.00% after the second OSCE. There was a 7.18 increase in percentage points (95% CI 5.33 – 9.05) for the control group and a 14.18 increase in percentage points (95% CI 12.52 – 15.85) for the experimental group after the second OSCE. This 7.0 percentage difference (95% CI 4 – 9.5) is highly significant (d.f. = 97, \( p < .001 \)) suggesting a positive effect of simulation on clinical performance.

Perceptions of stress and confidence were measured with a 5-point Likert scale (1 = not stressful; 5 = very stressful). The control group’s average score was 3.0; the experimental group scored 3.4 on the 5 point scale. These differences did not approach statistical difference (Mann-Whitney U-test: perception of stress \( p = .562 \); confidence \( p = .819 \)). This suggests that highly technological simulation-based training did not have an effect on student perceptions of stress or confidence (Alinier et al., 2006).

Alinier et al. (2006) study results support the use of simulation in nursing education. Simulation should be used appropriately and as an educational tool that enhances quality of learning. High-fidelity simulation allows students to gain a minimal knowledge base of technical and non-technical skills prior to using the skills in an actual practice setting.

Grady et al. (2008) state that simulation has been used in health care for both formal and clinical education and that it offers a realistic hands-on medium for acquiring basic skills. The purpose of this study was to evaluate whether basic nursing procedure training in high fidelity versus low-fidelity mannequins results in differential skill acquisition and perceptions of simulator utility. Grady et al. formulated two hypotheses. The first hypothesis tested whether training with a reactive simulator would provide a
better experience than a static simulation experience. Student performance on nasogastric tube insertion and indwelling urinary catheter insertion in addition to the students’ self-reported attitudes towards the difference in mannequin fidelity was used to compare the two. The second hypothesis tested was whether gender influenced simulation-based training. There was no clear framework listed for this study.

Grady et al. (2008) enrolled 52 students who were in their first year of nursing school. Thirteen students either failed to sign the consent or did not complete all of the training sessions. Twenty-seven students were women and twelve were men. Two experimental groups were used. Group 1 was taught nasogastric tube insertion on a high-fidelity mannequin and indwelling catheter insertion with a low-fidelity mannequin; group 2 was taught in the opposite manner. At the end of the semester, students were randomly assigned to be tested on one procedure on day 1 and then the other procedure day 2.

A skills checklist by Taylor, Lillis, and LeMone was used to ascertain if each skill was being performed correctly. In order for observers to have fixed criteria to rate each participant’s performance, a tool to describe the range of behavior from 1 (poor performance) to 7 (superior performance) was developed for each skill. A 21-item observer-based performance assessment instrument was developed for the nasogastric tube insertion and a 15-item instrument for the urinary catheter insertion (Grady et al., 2008). A posttraining questionnaire and a postevaluation questionnaire were developed as a self-reporting tool. The post-training 8-item questionnaire measured student attitudes with a 5-point Likert-type scale (1 = strongly disagree; 5 = strongly agree). A multifaceted instrument looking at the students’ assessment of their performance was
used for the postevaluation questionnaire. This questionnaire was a 6-item 5-point Likert-type response scale, one yes/no/uncertain-type item, and two open-ended items.

Grady et al. (2008) assessed interrater reliability for each of the procedures. Interrater reliability for the nasogastric tube insertion was .99 and .96 for the urinary catheter insertion. The coefficient alpha for nasogastric tube insertion was .93 and .84 for urinary catheter insertion. Post-training questionnaire reliability was .88 indicating high instrument reliability.

Higher performance was achieved with high-fidelity mannequins compared to low-fidelity mannequins \([F (1, 37) = 3.22, p < .05]\). Students reported that high-fidelity mannequins provided a more realistic environment \([t (37) = 1.57, p < .10]\); provided more realistic feedback to their actions \([t (37) = 2.43, p < .05]\); responded in a way that helped them learn the procedures \([t (37) = 3.51, p < .01]\); and was almost as good as a live patient \([t (37) = 1.37, p < .10]\) (Grady et al., 2008).

The second analysis was done to determine the effects of training on attitudes with regards to gender. The observer-based instrument showed no overall performance difference between genders. There was marginal significance in the interaction between mannequin fidelity and gender \([F (1, 37) = 1.83, p < .10]\), suggesting that female students did not benefit as much as male students. Male students did have higher performance scores than females, but only in the high-fidelity mannequin condition \([t (37) = 1.69, p < .05]\), as shown by simple effects analysis. The self-report questionnaire showed that men had a more positive overall attitude toward high-fidelity mannequin technology than females \([F (1, 37) = 5.01, p < .05]\) (Grady et al. 2008).
Grady et al. (2008) concluded that their findings were consistent with the literature indicating that the introduction of simulation technology supports improved learning. Gender response to high-fidelity training showed men were more responsive which also correlates with the current literature. Perhaps most importantly, students reported that the training provided more realistic feedback which helped them better learn the procedures.

Human Patient Simulation (HPS) affords students the ability to participate in clinical decision making, practice skills, and observe outcomes from clinical decisions in a non-threatening way. Brannan et al. (2008) conducted a study to compare the effectiveness of two instrumental methods to teach specific nursing education content. An interactive approach using the HPS method was compared with traditional classroom lecture. The researchers hypothesized that the use of HPS would enhance students’ cognitive skills as well as confidence levels. There was no clear framework given for this study.

The Brannan et al. (2008) study took place at a state university with a total of 107 baccalaureate nursing students in either the fall or spring semester of their junior year. The only inclusion criterion for the study was enrollment in the adult health nursing course. Two groups were determined. Group 1 was made up of 53 students enrolled in the fall adult health course and who received the traditional lecture method of instruction. Group 2 consisted of 54 students in the spring adult health course receiving instruction using the HPS method. Group 1 students received a traditional 2-hour traditional lecture presented by the researchers. Group 2 students did not receive lecture. They were divided into groups of 8 to 10 students and rotated through five stations, where students worked
on vignettes over a 2-hour period. There was a fifth station where students interacted with the manikin. A 10-minute debriefing followed the HPS experience.

Both groups were required to complete a pretest using the Acute Myocardial Infarction Questionnaire which consisted of a Cognitive Skills Test (AMIQ) and a Confidence Level tool (CL). The groups also completed a demographic data form. Posttests were administered after completion of the instructional method using the same AMIQ and CL tools. Parallel forms of the AMIQ were developed by the authors to measure students’ level of cognitive skills in nursing care of acute myocardial infarction. The two versions consisted of a 20-item multiple-choice questionnaire with scores ranging from 0 to 20. Higher scores indicated higher cognitive skills. Prior to the study, the researchers piloted the two forms of the AMIQ with 16 nursing students. The two parallel forms were found to be reliable measures of the same content ($r = 0.59, p = .02$). The Spearman-Brown reliability coefficient of .74 indicated that the forms were internally consistent (Brannan et al., 2008).

The CL tool developed by Madorin and Iwasiw measures the effects of computer-assisted instruction on the confidence level of baccalaureate nursing students specific to surgical nursing practice. This 34-item questionnaire consists of four subscales measuring student confidence in each of the aspects of the nursing process. A Likert-type scale ranging from 1 (completely lacking in confidence) to 4 (very confident) was used. Scores ranged from 34 to 136. A reliability coefficient of .89 was originally reported for the scale. Brannan et al. (2008) reported an internal consistency of the CL tool ranged from a Cronbach’s alpha of .95 to .97 for both groups in pretesting and post testing. Descriptive
statistics were used to describe sample characteristics. Education and demographic characteristics for both groups were similar.

The findings supported the hypothesis that students receiving HPS instructional method would achieve higher AMIQ posttest scores than the students who received traditional lecture ($t = 2.0, df = 79, p = .05$). The second hypothesis was not supported. Confidence levels were not found to differ significantly between student groups ($t = -1.74, df = 81, p = .09$) (Brannan et al., 2008).

This study supports the hypothesis that the HPS method produces knowledge gains related to acute myocardial infarction content in junior-level baccalaureate nursing students. Brannan et al. (2008) stated the lack of significant findings related to confidence levels was possibly due to the measurement of confidence levels in a single context. The findings did support the use of HPS teaching methods for presenting complex concepts. The use of HPS enables students to have a more interactive learning experience whereas traditional methods allow for more limited student-teacher interaction.

Although there are positive components to traditional teaching methods in nursing, faculty are always looking for more effective teaching methods. Brannan et al. (2008) study concludes that learner-centered strategies may be more useful for student learning because such strategies actively engage students, require decision making, and result in realistic patient responses to students’ interventions.

Concerns about nursing students’ skill acquisition have also been expressed by a national review of nursing and midwifery students in Great Britain. This assessment demonstrated that standards were not being met specifically in relation to nursing skills, communication, and medication administration. Simulation was identified as a teaching
strategy to better prepare students for practice. Shepherd et al. (2010) conducted a study to provide evidence for the selection of appropriate teaching methods. The purpose of this study was to compare nursing students’ performance in role play versus the use of high-fidelity manikins. There was no clear framework indicated for this study.

The longitudinal study was quasi-experimental in design; qualitative data were also collected from the participants. The setting was a Scottish university. Shepherd et al. (2010) used problem solving scenarios to compare students’ performance in measuring and assessing vital signs. The inclusion criterion was that students had to be in their final year of a three-year adult nursing program. Twenty-eight third-year students agreed to participate. The participants were divided into site A (n=18) and site B (n=10). Students completed self-assessments of confidence and anxiety before and after the simulation exercise and were assessed while doing vital signs without the use of automated equipment. Upon completion of patient assessment, students were asked questions regarding knowledge and understanding, problem solving and decision making. The assessment was related to measuring and assessing vital signs. Site A used a volunteer patient whereas site B used a high-fidelity manikin. After six months of clinical practice students were assessed again using the same scenario. Fifteen students from site A and nine from site B for a total of twenty-four students completed the six-month assessment.

Evaluation of the students’ performance within the cognitive, motor, and affective domains was obtained by using a validated assessment tool developed by the University of Scotland. A total of 100% was possible (motor: 25%, affective: 25%, knowledge and understanding: 25%, and decision and problem solving: 25%). Using student self-assessments, Shepherd et al. (2010) determined that there was no difference in anxiety or
confidence of participants between groups. An analysis of covariance was used to determine if anxiety or confidence had any significant effect on test scores. It was determined that there was no significant difference between sites \[F (1, 24) = .03, \ p = .863\]. A non-parametric Mann-Whitney test was used to retest the difference due to small sample sizes.

All participants were video recorded in order to obtain qualitative data. Qualitative findings demonstrated that students appropriately questioned vital signs, recognized that vital signs were significant and understood that deterioration in patient status was exhibited by vital signs. Student indecision in choosing the equipment to measure vital signs as well as manual dexterity differed. Affective communication varied between students. Some participants had difficulty initiating conversation. Researchers found students demonstrated poor manual dexterity when trying to take a manual blood pressure, including improper placement of blood pressure cuff or incorrect use of the stethoscope. Students also showed an inability to locate the radial and brachial pulse. There is cause for concern since measuring vital signs is crucial to ascertaining patients’ physiological status. Shepherd et al. (2010) state that role play is useful when rehearsing communication, and students using role play exhibited higher scores in the affective domain in phase 2 of the study.

Shepherd et al. (2010) concluded that both role play and simulation showed similar outcomes in terms of scores for each group. Role play achieved higher results in the affective domain. The study did show that students had a difficult time in relation to knowledge and understanding, and decision making and problem solving. Different forms of simulation should be employed based on the outcomes desired. Another concern is that
the study was done with a small sample size. It would be advantageous to replicate this study with a higher number of participants.

The effect of simulated clinical experience on student knowledge outcomes has yet to be established by research (Schlairet & Pollock, 2010). Studies showing knowledge gain by undergraduate nursing students following simulated clinical experiences versus traditional clinical experiences are scarce. Schlairet and Pollock conducted a study to test two hypotheses. The first was that basic nursing care concepts can be taught in an undergraduate fundamental nursing course using clinical simulation as well as by the use of traditional clinical experiences. The second hypothesis tested was that simulated clinical experiences followed by traditional clinical experiences, as an intervention sequence, teach basic nursing care concepts as well as traditional experiences followed by simulation. There was no clear framework stated for this study.

Schlairet and Pollock (2010) invited baccalaureate students enrolled in a nursing fundamentals course during two consecutive semesters to participate. Random assignment into either the simulated-traditional or traditional-simulated group was used. The sample consisted of 74 participants ranging in age from 18 to 44 years. The participants were predominately women (86%), Caucasian (68%), and traditional students with no prior education after high school. Three participants were excluded due to missing data or extreme scores. The simulated clinical experiences scenarios reflected clinical diversity and had increasing complexity. The traditional clinical experiences took place in a skilled long-term care setting and consisted of conventional assignment of students to individual patients for traditional nursing care. At the end of experience,
students in traditional experiences attended a typical postconference. Students that participated in simulated clinical experiences participated in faculty-guided debriefings.

All students participated in an orientation to the study and a completed a pretest. After their respective clinical experience, students completed knowledge posttest 1 and then went into the opposite learning experience. After their second learning experience, the entire group was debriefed by the faculty and a second posttest was completed.

Schlairet and Pollock (2010) used a 100-point scale knowledge test for both posttests. These tests consisted of 25 multiple-choice questions randomly chosen from appropriate sections of an NCLEX-RN® study book. Internal consistency reliability coefficients were reported to be within an acceptable range across all administrations of the knowledge test.

Chi-square analysis of the demographic variables revealed no significant differences between semester groups. T-tests were used to test for significant differences between pretests, posttest 1 and posttest 2 scores. There were significant knowledge score differences from pretest (mean = 60.05, $SD = 9.30$) to posttest 1 (mean = 62.68, $SD = 8.54$, $t = -2.48$, $p = .015$, $df = 70$); posttest 1 (mean = 62.68, $SD = 8.54$) to posttest 2 (mean = 64.78, $SD = 9.35$, $t = -2.24$, $p = .028$, $df = 70$); and pretest (mean = 60.11, $SD = 9.32$) to posttest 2 (mean = 64.61, $SD = 9.39$, $t = -3.54$, $p = .001$, $df = 69$). The difference between the groups’ posttest 1 knowledge scores was .49 (95% CI = -3.58 to 4.56), determined by the observed differences between simulated and traditional clinical experiences. The score for the observed difference between the simulated-traditional group and the traditional-simulated group for posttest 2 knowledge scores was -0.33 (95% CI = -4.77 to 4.11). The results were statistically equivalent suggesting that it did not matter which experience the student had first (Schlairet & Pollock, 2010).
The data obtained from Schlairet and Pollock (2010) suggest that simulated experiences benefit undergraduate students as well as traditional clinical experiences. A steeper positive incline in scores after the simulated clinical experience was seen when compared to the traditional clinical experience as the first intervention. These findings support the question on whether nurse educators should include simulation in conjunction with traditional clinical teaching, however future research should ascertain if these results are generalizable to other training procedures. Further research should also be done to be certain that skills learned in simulation will be transferred to the clinical environment. These findings provide some of the first evidence that simulated clinical experiences can be as effective as traditional clinical experiences in increasing knowledge of fundamental nursing concepts.

Schlairet and Pollock (2010) provided evidence that clinical simulation can be just as effective in increasing knowledge in fundamental nursing concepts as traditional clinical experiences. Even though nursing education literature addresses the use of high-fidelity simulation with more advanced students, little information is available about the use of this strategy for teaching basic nursing skills to beginning students. Research needs to be conducted by nurse educators to determine the efficacy of beginning nursing students within the clinical laboratory setting. Alfes (2011) conducted a quasi-experimental study to compare the use of simulation versus a traditional learning method to promote self-confidence and satisfaction with learning among beginning nursing students. Kolb’s experiential learning theory was the conceptual framework for this study.
The study took place in a university simulation laboratory and focused on the population of first-semester baccalaureate nursing students enrolled in a foundation of practice course. A convenience sample of 63 first-semester baccalaureate nursing students was obtained for the study with the only inclusion criterion being enrollment in the foundation of practice course. The students were randomly assigned to either a traditional demonstration group (N = 34) or a high-fidelity simulation group (N = 29). The sample included 52 female (82.5%) and 11 male (17.5%) participants. Ethnic background was varied, with the sample having 76.2% white, 7.9% African American, 12.7% Asian, and 3.2% Latino students. Participants ranged in age from 18 to 27 years; the majority of students (58.7%) were 18 years of age (Alfes, 2011).

The National League for Nursing’s Student Satisfaction and Self-Confidence in Learning questionnaire was used to evaluate self-confidence and satisfaction. The instrument is divided into two subscales: satisfaction with current learning and self-confidence in learning. All items were rated using a Likert-type scale with 1 being low and 5 being high. Total scores could range from 13 to 65. Jeffries reported reliability for the questionnaire by with Cronbach’s alpha coefficients of .94 and .87 for the satisfaction with current learning and self-confidence in learning subscales, respectively (Alfes, 2011).

Alfes (2011) found that the students exposed to the high-fidelity simulation were significantly more self-confident than students who participated in the more traditional simulation approach \[t (61) = -2.00, p = 0.05\]. The mean confidence score for the high-fidelity group was 32.48 (SD = 3.83) out of a possible score of 40 compared with a mean score of 30.74 (SD = 3.1) for the traditional group. There were no significant differences
between groups in satisfaction with learning. Alfes attributed this finding to the use of active learning strategies used in both groups. A significant positive relationship between self-confidence and satisfaction ($r = .70, p < .01$) was found with the more confident students being more satisfied with learning. A final research question compared self-confidence levels before and after the learning strategy. Students in both groups were significantly more self-confident following their learning experience ($p < .001$). Mean scores for the demonstration group improved from 2.65 (SD = 0.74) to 3.15 (SD = 0.74); an improvement in mean scores from 3.14 (SD = 1.22) to 3.76 (SD = 0.83) occurred in the simulation group (Alfes). These findings are consistent with the nursing literature supporting the use of simulation as a valid pedagogical strategy. This study also demonstrates a positive relationship between self-confidence and satisfaction in learning. This study also suggests that if students are given an opportunity to participate in a level-appropriate laboratory experience, traditional or simulated, their level of self-confidence may increase due to active participation and the ability to practice the new skill in a supportive environment with feedback from their instructor.

These findings are consistent with the nursing literature supporting the use of simulation as a valid pedagogical strategy. This study also demonstrates a relationship between self-confidence and satisfaction in learning. Alfes (2011) suggests that if students are given an opportunity to participate in a level-appropriate laboratory experience, whether traditional or simulated, their level of self-confidence may increase as a result of active participation. The ability to practice new skills in a supportive environment with feedback from their instructor may also add to increased self-confidence.
Alfes (2011) concluded that results from this study support the use of simulation experiences with beginning students. With the technological advances in the health care field, nursing faculty need to find ways to enhance student learning and maintain student satisfaction and self-confidence. This study demonstrates the positive effects of incorporating interactive learning methods that challenge students at their current competency level.

Summary

High-fidelity simulation in undergraduate nursing education is becoming an increasingly effective technique to teach student skills. The literature has shown that high-fidelity simulation increases students’ confidence, skills, quality of care, knowledge, and patient safety. These findings support Tanner’s clinical judgment model of noticing, interpreting, responding, and reflecting. The literature review revealed that students’ stated perception of high-fidelity simulation does increase the students’ clinical reasoning skills and patient safety.

Nursing students’ perceptions of and satisfaction with high-fidelity simulation including how simulation influences student outcomes and learning styles were identified in studies done by Feingold et al. (2004), Smith and Roehrs (2009), Fountain and Alfred (2009), and Sportsman et al. (2011). Feingold et al. found that interactive experiences reinforced clinical objectives, tested clinical skills and decision making and prepared students to perform in real clinical settings. Students reported an increase in confidence and clinical competence. Smith and Roehrs study findings added to the body of simulation knowledge showing increased student satisfaction and self-confidence as outcomes of HFS. Fountain and Alfred showed how high-fidelity simulation influences
student outcomes and learning styles. Fountain and Alfred study showed that individuals with solitary and social learning styles both benefited from HFS. Sportsman et al. demonstrated that students were satisfied with HFS learning experience and allowed students with different learning styles to apply new information in a non-threatening way.

Hauber et al. (2010) and Piscotty et al. (2011) studies showed how HFS is being used to change traditional nursing education methods. The authors showed HFS provides students with a means of deliberate practice that refines performance through error correction and repetition without risk to patients. Piscotty et al. showed that traditional teaching methods provided content in learning, whereas simulation may provide the context of learning. Combining traditional learning with simulation can be more powerful than if used separately.

Alinier et al. (2006), Brannan et al. (2008), Grady et al. (2008), Schlairet and Pollock (2010), Shepherd et al. (2010), and Alfes (2011) studies supported the value of HFS in nursing education. Alinier et al. study supported HFS being used appropriately as an educational tool and Shepherd et al. study supported simulation being used based on outcomes desired. Alfes demonstrated the positive effects of incorporating interactive learning methods by use of HFS. Self-confidence was shown to increase when participating in HFS. Brannan et al. showed positive outcomes of HFS learning versus traditional learning. HFS provides better student outcomes because such strategies actively engage students in realistic patient responses to students’ interventions. Schlairet and Pollock demonstrated an increase in student knowledge of fundamental nursing content when exposed to HFS versus traditional learning. Grady et al. concluded that
HFS showed positive outcomes. Skills acquired through HFS came from realistic procedures and feedback.

The literature review showed most studies being conducted at universities or at universities in conjunction with a hospital simulation lab. Multiple tools were used to examine the numerous variables and data were collected related to student perceptions regarding HFS. Study frameworks included those of Tanner’s Clinical Judgment Model, Jeffries Nursing Education Simulation Framework, Baramee and Blegen Model, The Multiple Intelligences Learning Theory by Gardner, Ericsson and Smith’s Expert-Performance Approach Theory, Bandura’s Social Cognitive Theory, and Kolb’s Experimental Learning Theory. The collection of evidence supported positive student perceptions and learning outcomes from HFS. There is a gap in the literature search showing the difference in self-confidence and satisfaction between traditional skills laboratory instruction and simulation experiences. More research needs to be obtained to determine the benefit of HFS versus traditional clinical learning. Larger samples need to be observed as well as confidence levels are tested for a third time at actual clinical sites. Lastly, faculty needs to observe students delivering care. This research needs to be done to ascertain if simulation learning experiences transfer to the bedside.
Chapter 3

Methods and Procedure

Introduction

The ability for students to deliver care in a safe manner in today’s high-risk complex health care environment is limited primarily due to the complexity of patient scenarios presenting themselves during students’ clinical rotations. High-fidelity patient simulation (HFPS) affords students the ability to practice skills and apply nursing knowledge in a safe environment. There is little information available about the effectiveness of this strategy to help beginning students learn basic nursing skills. This proposed study is a partial replication of Alfes’ (2010) study. The purpose of this study will be to explore the perceptions of beginning nursing students and the implementation of HFPS into an existing course. This chapter describes the methods and procedures for the study.

Research Questions

1. Is there a difference in level of self-confidence between students receiving traditional skills laboratory instruction and students participating in a simulation experience
2. Is there a difference in satisfaction with learning between students receiving traditional laboratory instruction and students participating in a simulation experience?

3. Is there a relationship between student self-confidence and satisfaction with learning following a traditional or simulated skills laboratory experience?

4. Is there a change in students’ level of self-confidence following a traditional or simulation learning experience?

Population, Sample and Setting

Drawn from a population of first-semester baccalaureate nursing students, a single convenience sample of 185 first-semester baccalaureate nursing students will be obtained. The single inclusion criterion for participation in the study is that the individual must be enrolled in a foundation of practice course. Students will be randomly assigned to either the control group or the experimental group after arriving for their scheduled laboratory session at a Midwestern university’s school of nursing.

Protection of Human Subjects

This study will be submitted to the institutional review board of Ball State University (IRB) for approval prior to enrollment of subjects. The study will adhere to ethical research principles. Students’ names will be removed from the data which will be coded by laboratory session and learning strategy to maintain anonymity. Data will be stored on a password protected computer and forms will be kept in a locked cabinet in the school of nursing department to minimize any risk of breach in security. Participation is voluntary and students may refuse to participate without implication for their course grade. The researcher will not be an instructor for the course from which the sample is
drawn. Each participant will receive a cover letter with full disclosure of the study including participants’ rights as research subjects. They will be asked to sign an informed consent document.

Procedure

After receiving IRB approval, the research project will be introduced to the university faculty and Director of the School of Nursing for approval. The lead researcher will request demographic data from the office of student admissions. As students start arriving to their scheduled laboratory session, the lead researcher will assign them randomly by having the students draw cards either labeled A (control group) or B (experimental group). All students will be asked to complete a three-item data sheet indicating their current semester in nursing school and any prior health care experience. In addition, students will be asked to rate their level of confidence for assessing and delivering comfort care measures to their patient experiencing pain using a 5-point Likert scale ranging from 1 (not confident) to 5 (very confident). These questionnaires will be turned into the lead researcher.

The control group will receive traditional demonstration and the experimental group will receive the simulation method about the topic of pain. The control group will be given a 10-minute demonstration and explanation of nursing interventions for caring for patients experiencing pain. The demonstration will include limiting visitors, dimming the lights, diversion, guided imagery, positioning for comfort, heat and cold therapy, elevating the involved extremity, and relaxation. The control group will be given 15 minutes to practice followed by a return demonstration period using low-fidelity
manikins. After return-demonstration, the students will have an informal 15-minute discussion period to ask and answer questions to the research aid.

The experimental group will be given a brief introduction to the simulation experience which will include watching a 5-minute faculty-produced video portraying a hospitalized patient experiencing pain 3 days after a total knee replacement surgery. After the video, students will be assigned randomly to the role of patient wife, nursing student, or observer for the simulation experience. Students will be given 15 minutes to role-play the comfort care scenario interacting with their patient played by SimMan™, a high-fidelity, interactive patient simulator. Students will be prompted as needed. SimMan™ will be programmed to verbalize complaints of pain, answer student questions and display a heart rate and blood pressure on the bedside monitor. The students will receive a 15-minute debriefing providing immediate feedback.

*Methods of Measurement*

Evaluation of self-confidence and satisfaction will be measured using the National League for Nursing’s Student Satisfaction and Self-Confidence in Learning questionnaire. The instrument uses a Likert-type scale ranging from 1 to 5 and divided into two subscales: satisfaction with current learning (items 1 to 5) and self-confidence in learning (items 6 to 13). Total scores could range from 13 to 65. Reliability was reported by Jeffries with Cronbach’s alpha coefficients of .94 and .87 for the satisfaction with current learning and self-confidence in learning subscales, respectively. Written permission will be obtained from the National League for Nursing to use the questionnaire.
Research Design

This study will use a quasi-experimental research design. The purpose of this type of design is to explain relationships, clarify why certain events happen, and examine causality between selected independent and dependent variables (Burns & Grove, 2009). A quasi-experimental research design is appropriate for this study because it will test the effectiveness of nursing interventions that can be implemented to affect the patient and family outcomes in nursing practice. Quasi-experimental research involves a lower level of control than experimental studies in at least one of three areas: (a) manipulation of the treatment or independent variable, (b) manipulation of the setting, and (c) selection of subjects. This design allows subjects to be selected on the basis of convenience and not randomly selected.

Intended Method for Data Analysis

An independent samples t test for equality of means will be used for the first research question evaluating self-confidence. This will be used to determine whether there is a statistically significant difference between the treatment and control groups. The second research question, satisfaction with learning, will also be evaluated using an independent t test for equality of means. The third research question evaluating the relationship between satisfaction and self-confidence in learning will be evaluated with bivariate analysis. Bivariate analysis will compare the summary values from the two groups. For the fourth research question comparing self-confidence levels before and after the learning strategy, independent t test will again be used. The independent t test is one of the most common parametric analyses used to determine significant differences between statistical measures of two samples (Burns & Grove, 2009).
Summary

In this chapter, the population, sample, and setting are defined. The specific variables to be examined are student satisfaction and self-confidence in using HFPS. A quasi-experimental research design will be used with the anticipated sample being all first semester baccalaureate nursing students enrolled in a fundamentals of nursing course. Data will be collected using the National League for Nursing’s Student Satisfaction and Self-Confidence in Learning questionnaire. Data will be analyzed using independent t tests and bivariate analysis. This study will replicate a previous study by Alfes (2011) and attempt to validate previous findings thus providing valuable further information which may lead to better learning outcomes for nursing students.
References


