EFFECTS OF THE USE OF HUMAN PATIENT SIMULATORS ON COGNITIVE SKILLS AND CONFIDENCE LEVELS OF NURSING STUDENTS

A RESEARCH PROPOSAL

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Abstract

RESEARCH SUBJECT: Effects of the use of human patient simulators on cognitive skills and confidence levels of nursing students

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Typical classroom and clinical settings do not adequately prepare nursing students to care for patients experiencing an acute myocardial infarction (MI). Human patient simulators (HPS) are a tool which can be used to provide practice of nursing and clinical decision-making skills. The purpose of this study is to compare the effects of classroom lecture and the use of HPS in teaching nursing care specific to an acute MI on nursing students’ cognitive skills and confidence levels. This is a replication of a study by Brannan, White, and Bezanson (2008). The organizing framework is experiential learning. This study will be conducted at a small university on the East Coast. A convenience sample of 100 junior-level students will be used, 50 students from the fall semester of its introductory medical/surgical nursing course and 50
from the spring semester of this same course. Methods of
data collection are to include the Acute Myocardial
Infarction Questionnaire and the Confidence Level tool,
administered to each group of students as both a pretest
and posttest. The results of the study will benefit
nursing faculty in determining the effectiveness of using
HPS as a learning tool with their students.
Chapter I

Introduction

The amount of knowledge required for nurses to function in today’s complex healthcare environment goes beyond what can be taught in a classroom (Galloway, 2009). Nursing competence requires a connection to be made between didactic theory and clinical performance (Galloway). The use of simulation can provide such a connection, assisting in preparation of nursing students to be professional and proficient in practice (Harder, 2010).

According to Solem and Stuart (2010), the amount of clinical exposure influences a graduate nurse’s ability to use decision making skills in the workplace. Nurses need to be able to analyze, prioritize, and perform multiple tasks in their role (Solem & Stuart). These functions in the clinical setting are developed through experience (Solem & Stuart). However, many nurses are not able to obtain as much clinical experience as needed during the transition from student to professional nurse. This lack of experience may contribute to high turnover rates. For example, the
results from 352 respondents to the Survey of Nurses’
Perceptions of First Job Experience in Nevada showed that
30% of new nurses left their first job in the first year
and 57% left within two years (Bowles & Candela, 2005).
High turnover rates together with high retirement rates
combine to create an environment without experienced nurses
who can provide the necessary training and support needed
by new nurses (Solem & Stuart).

Today, there is increased competition among schools of
nursing for clinical sites (Kline, Hodges, Schmidt,
Wezeman, & Coye, 2008). Increases in the number of hospital
mergers and outpatient treatment centers result in a
smaller number of available clinical sites (Kline et al.).
At the same time, schools of nursing need to increase
enrollment due to interest and the nursing shortage (Kline
et al.). However, the numbers of nursing faculty continue
to decrease (Galloway, 2009). Simulation may provide an
alternative clinical situation for student learning.

The incorporation of human patient simulation (HPS) is
currently one of the most important issues in nursing
education (Schiavenato, 2009). HPS is a sophisticated
technology involving computerized manikins in adult,
pediatric, and infant sizes (Beyea & Kobokowich, 2004). The
technology uses computer software to support scenarios and replicate clinical findings (Beyea & Kobokowich). Most simulators can produce lung, heart, and bowel sounds, simulate pulses, provide physiological responses to interventions, and communicate verbally (Beyea & Kobokowich).

Using HPS in nursing education can provide several benefits to students. These benefits include the ability to experience rare events, the repetitive practicing of skills, allowing for errors to occur without harming any patients, developing critical thinking skills, increasing confidence levels, developing communication skills through debriefing, and practicing teamwork (Beyea & Kobokowich, 2004). Nurses have to be able to make decisions when a patient is becoming unstable (Galloway, 2009). Practicing this type of scenario through simulation can increase nurses’ knowledge and confidence (Galloway).

However, simulators are expensive. The cost for a simulation manikin can range from $30,000 to $200,000 depending on its options and the manufacturer (Durham & Alden, n.d.). Additional cost and time requirements include supplies, maintenance, space for the simulator, and training of faculty (Durham & Alden). With these potential
investments, research is needed which can provide justification for the use of HPS.

**Background and Significance**

The idea of simulation in the medical field has been around since ancient times. Ayurvedic medicine in India and ancient Chinese medical practices most likely used some form of simulation (Schiavenato, 2009). Early civilizations probably used some form of simulation for practice and demonstration (Schiavenato). Simulation in Western medicine can be traced back to early anatomists such as Herophilus in 300 B.C. (Schiavenato).

According to Rosen (2008), simulation technology is currently used by a variety of industries, such as the military, transportation, and aviation. The first crude flight simulator was first introduced in 1929 (Rosen). Flight simulation has advanced to include computer graphics and hydraulics (Rosen). Its use has been found to be cost effective through improving safety (Rosen).

Modern simulation in the medical field started in the 1960s with the introduction of manikins such as Resusci-Anne for cardiopulmonary resuscitation, Sim One for anesthesiology, and Harvey for cardiology (Schiavenato, 2009). Technologically-advanced simulation has been used in
medical schools since the 1980s; advanced simulation in nursing schools has been documented in the 1990s (Nehring & Lashley).

According to Galloway (2009), multiple types of simulation are used in nursing education. Role playing involves students and/or instructors acting out a scenario. The use of standardized patients involves the hiring of actors to portray patients with specified conditions and symptoms. Partial task trainers are equipment designed to teach a specific skill, and complex task trainers add a computer connection to enhance the interaction. The most advanced form of simulation in nursing is the high-fidelity human patient simulator, HPS. HPS involves the use of computer technology in a manikin which enables it to provide a realistic response to interventions. HPS can be used to assist nurses in becoming more proficient in performing infrequently utilized skills as well as functioning more effectively in different settings and emergency situations (Galloway).

With the increasing popularity of simulation in education, the need for studies evaluating its effectiveness has become essential (Harder, 2010). Today, some states allow up to 25% of nursing clinical time to be
taught using simulation (Jeffries, 2009). Further research is needed on the use and implementation of HPS. Based on the findings, the amount of time allotted to simulation-based learning may continue to increase (Jeffries).

An exploratory study by Elfrink, Kirkpatrick, Nininger, and Schubert (2010) demonstrated significant knowledge acquisition by students through the use of HPS. Students reported more confidence in prioritization, delegation, and team work following simulation experience (Kaplan & Ura, 2010). The students in this study were so satisfied with the simulation experience that they expressed the desire to continue this practice each week (Kaplan & Ura).

Although student satisfaction and confidence have been high, there are still questions about whether knowledge and motor skills gained through the use of HPS are retained. Immediate gains in knowledge acquisition were not maintained by students in the Elfrink et al. study (2010). A study by Shepherd, McCunnis, Brown, and Hair (2010) showed improvement in affective skills following simulation, but no difference in the students’ cognitive or motor skills. Smith and Roehrs (2009) demonstrated that improved confidence in students and satisfaction with the
experience were related to the simulation design incorporating learning objectives and problem solving. Given the variations among study findings, future studies regarding the use of HPS for improving student knowledge and confidence are warranted.

Specifically, Horan (2009) suggested that additional research is necessary on the outcomes of using HPS on the development of critical thinking. Critical thinking involves interaction, and merely listening to lecture or watching a procedure does not lead to its development (Horan). In addition, it is important for students to be involved in simulation to enable the development of confidence in the delivery of nursing care (Horan).

Statement of the Problem

Typical classroom and clinical settings do not adequately prepare nursing students to care for patients experiencing critical health events such as an acute myocardial infarction (MI) (Brannan, White, & Bezanson, 2008).

Purpose of the Study

The purpose of this study is to compare the effects of classroom lecture and the use of HPS in teaching nursing care specific to an acute MI on junior-level nursing
students’ cognitive skills and confidence levels. This is a replication of a study by Brannan et al. (2008).

Research Questions

1. Will baccalaureate students who receive the human patient simulation instructional method regarding nursing care of patients experiencing an acute MI demonstrate greater levels of cognitive skill in the nursing care of those patients than students who receive instruction using the classroom lecture method?

2. Will baccalaureate students who receive the HPS instructional method regarding nursing care of patients experiencing an acute MI express greater levels of confidence in the nursing care of those patients than students who receive instruction using the classroom lecture method?

Conceptual Framework

The conceptual framework focuses on the definition of experiential learning. Simulation is a method of experiential learning. Its use is applicable to healthcare and nursing education. Experiential learning related to the use of HPS allows students to participate in decision making and to practice clinical skills in a realistic
setting (Brannan et al., 2008). According to these authors, this concept further permits the assimilation and application of learned material.

*Definition of Terms*

**Experiential Learning**

Experiential learning is a process by which the learner generates knowledge, skill, and value from direct experiences (Anderson, 2006).

**Human patient simulation**

Human patient simulation is the use of interactive, computerized manikins to replicate patient functions and clinical conditions (Brannan et al., 2008).

**Cognitive skills**

Cognitive skills refer to nursing knowledge of acute myocardial infarction as demonstrated through pre- and post-testing scores on this topic (Brannan et al., 2008).

**Confidence**

Confidence is defined through a self-assessment score based on the ability to perform nursing care for a patient experiencing an acute myocardial infarction (Brannan et al., 2008).
Limitations

One of the limitations of this study is that the students would not be randomly assigned to the lecture and HPS groups (Brannan et al., 2008). Another limitation is that no follow-up evaluation would occur with the students after providing direct patient care in the clinical setting to determine confidence levels at that time (Brannan et al.). Two additional limitations include the small sample size and the short period of time for the study.

Assumptions

This study would occur based on the following assumptions.

1. All of the students can read and write in English.
2. The students will put forth effort to participate and learn the material presented, regardless of the teaching method.
3. HPS and traditional classroom lecture can both cover the material effectively.
4. The participants will answer the questions on the study instruments honestly.

Summary

HPS is a teaching strategy which is relatively new to nursing education. Based on both its potential benefits and
costs, further research is necessary to determine its effectiveness in this area. The purpose of this study is to compare the effects of classroom lecture and the use of HPS in teaching nursing care specific to an acute MI on junior-level nursing students’ cognitive skills and confidence levels. It will be a replication of a study by Brannan, et al. (2008). The conceptual framework will focus on the definition of experiential learning. The results of the study will benefit nursing faculty in determining the effectiveness of using HPS as a learning tool with their students.
Chapter II

Literature Review

Typical classroom and clinical settings do not adequately prepare nursing students to care for patients experiencing an acute myocardial infarction (MI). The human patient simulator (HPS) is a tool which can be used to provide practice of nursing and clinical decision making skills. The purpose of this study is to compare the effects of classroom lecture and the use of HPS in teaching nursing care on junior-level nursing students’ cognitive skills and confidence levels. Specifically, the material will focus on care related to patients experiencing an acute myocardial infarction (MI). This quasi-experimental study is a replication of a study by Brannan et al. (2008).

Organization of Literature

The literature review consists of two parts. The first part is a description of the conceptual framework supporting the proposed study. The second part reviews both classic and current studies relating to the use of
simulation in nursing education. The literature is
organized as follows.

1. Conceptual framework: Experiential learning
2. Analysis of HPS as a teaching method
3. Effects of HPS on knowledge, confidence, and anxiety
4. Effects of HPS on critical thinking and clinical judgment
5. Use of HPS to provide experience for emergency situations

Conceptual Framework: Experiential Learning

According to Anderson (2006), experiential learning is “a process through which a learner generates knowledge, skill, and value from direct experiences” (p. 287). The focus is on the process of learning rather than the teaching (Anderson). Simulation is a method of experiential learning. In the health care setting, simulation can be defined as “the use of scenarios to expose providers to a variety of simulated conditions or patients to enable participants to broaden their skills and knowledge base” (Underberg, 2003, p. 31). High-fidelity simulation can be used to realistically replicate patient conditions, to practice clinical skills, to provide patient interaction, and to allow for individual and group evaluation
(Underberg). The concept of experiential learning as it relates to simulation forms the framework for this study.

Analysis of HPS as a Teaching Method

As HPS is a relatively new technology in nursing education, its uses in teaching need to be examined. According to Bearnson and Wiker (2005), more research is needed on alternative methods of teaching in nursing, particularly the use of human patient simulators (HPS). These authors conducted a descriptive study to explore the benefits and limitations of using HPS as a substitute for an actual clinical experience.

This exploratory descriptive study took place at Brigham Young University in Utah. A convenience sample of first-year baccalaureate nursing students was used. The students were in their fifth week of a postoperative clinical rotation. Therefore, the HPS experience was focused on caring for a postoperative patient in severe pain. Sample size and demographic information were not reported by Bearnson and Wiker (2005).

After participation in a two-hour HPS session, the students completed a survey. The survey, developed by the researchers, consisted of four positive statements with responses on a Likert scale of 1-4 (1 indicating strong
disagreement and 4 indicating strong agreement) and three open-ended questions. Half of the students also completed journal entries about the experience. The instrument was not tested for validity or reliability.

The results revealed the mean scores to be 3.00 for increased confidence in medication administration, 3.06 for increased ability to administer medications safely, 3.13 for increased knowledge of medication side effects, and 3.31 for increased knowledge of differing patient responses (Bearnson & Wiker, 2005). The students made constructive responses to the open-ended questions, including learning the importance of an assessment, recognizing abnormal findings, and developing critical thinking related to planning patient care. The students were in agreement that the HPS experience was positive.

Bearnson and Wiker (2005) concluded that HPS was useful in simulating a clinical patient experience. This method of teaching may offer another option in baccalaureate nursing programs. The authors recommended additional studies to determine the most effective ways to utilize this technology.

The use of advancing technology in nursing education can also assist faculty who desire to improve learning
opportunities for their students. A study by Feingold, Calaluce, and Kallen (2004) sought to evaluate student and faculty perceptions regarding the use of computerized patient simulators for teaching and assessment in clinical scenarios. The simulation involved a patient with COPD, multiple abnormal assessment findings, and a deteriorating condition. No framework was noted in this study.

The convenience sample was composed of 65 senior-level baccalaureate nursing students. The majority of the students were Caucasian, female, age 23-30, and had a GPA of 3.1 or higher. The inclusion criterion was enrollment in two consecutive semesters of the Advanced Acute Care of the Adult course during the time of the study. The faculty members involved included three full-time professors of this course and another faculty member from the intermediate level course. The simulations were performed using SimMan in the Patient Care Learning Center.

For this descriptive exploratory study, Feingold et al. (2004) developed a 20-question satisfaction survey tool using a Likert scale of 1-4, with 1 indicating strong disagreement and 4 indicating strong agreement. The students completed this survey following their simulation experience. Three subscales were created to summarize the
major themes of realism, transfer, and value. Faculty completed a 17-item survey using the same Likert scale. The study was approved by the institutional review board.

Upon reviewing the surveys from the students, the value subscale was found to have the highest level of agreement (mean = 3.04) and transferability had the lowest level of agreement (mean = 2.52) (Feingold et al., 2004). The majority of the students found the experience to be realistic, valuable, adequate in testing clinical and decision-making skills, and an enhancement to learning. Unexpected findings were that only around half of the students thought the experience increased their confidence, clinical competence, or ability to function in an actual clinical environment. In contrast, all of the faculty members felt the simulation was realistic, effective for teaching, and adequate for preparing students to function in the clinical setting.

The results of this study suggest that the use of computerized simulation can be effective for both students and faculty members. The authors do not recommend replacing actual clinical experiences with simulated ones. More research is needed to determine the best methods of
transferring learning from the simulation to the clinical environment.

Effects of HPS on Knowledge, Confidence, and Anxiety

HPS can be used as a tool to increase student knowledge and confidence and reduce anxiety levels prior to actual clinical experiences. However, there are gaps in the literature comparing knowledge gained by traditional and simulated clinical experiences. Multiple studies have addressed this area of focus.

Schlairet and Pollock (2010) compared the effects of simulated clinical experiences with traditional clinical experiences on acquisition of basic nursing skills. Educational best practices were used to design the simulated learning experience. Undergraduate students enrolled in a nursing fundamentals course were approached to participate in the 2x2 cross-over intervention study. The inclusion criterion was enrollment in one of two consecutive semesters of this course. The study was approved by the university institutional review board. All of the eligible students elected to participate resulting in a convenience sample of 74 baccalaureate nursing students. The participants ranged in age from 18-44 years and the majority was Caucasian women.
A 25-question, 100-point multiple choice knowledge test drawn from appropriate chapters of a nursing licensure exam review textbook was administered using a pretest/posttest design. The pretest was administered prior to any intervention. Two posttests were given, one following the traditional clinical experience and one following the simulated experience. Internal consistency reliability coefficients (KR-20) were noted to be within an acceptable range for each administration of the test.

Knowledge score differences between the two groups were statistically equivalent adding support for the use of simulated clinical experiences as an equivalent pedagogical method. Significant differences \((p < .05)\) in knowledge gain were found from pre-test to post-test #1, post-test #1 to post-test #2 and pre-test to post-test #2 for both traditional and simulation groups (Schlairet & Pollock, 2010). However, the low overall scores in both arms of the study were of concern and suggested the need for longer interventions. Based on these findings, educators may want to consider using simulated clinical experiences in addition to or as a replacement for traditional clinical experiences. Further research on simulated clinical
experiences and knowledge acquisition is needed (Schlairet & Pollock, 2010).

Both knowledge and confidence were studied by Brannan et al. (2008). These authors conducted a study to compare the effectiveness of two instructional methods on nursing students’ cognitive skills and confidence levels. The authors hypothesized that the students receiving instruction via the HPS method would demonstrate greater levels of cognitive skills and confidence than students receiving traditional instruction. The conceptual framework utilized was based on experiential learning.

A convenience sample of 107 junior-level baccalaureate nursing students at Kennesaw State University was recruited for this study. As part of the quasi-experimental design, 53 students received traditional teaching methods and 54 students received instruction using the HPS. Demographically, 71% of the students were Caucasian, 19% were African American, and 8% were Hispanics, Asians, or other. In addition, 94% of the participants were female. The only inclusion criterion was enrollment in the adult health nursing course during the fall or spring semester of the study.
The instruments used for the study included the Acute Myocardial Infarction Questionnaire (AMIQ), the Confidence Level Tool (CLT), and a demographic data form (Brannan et al., 2008). The AMIQ was a 20-item multiple choice questionnaire measuring cognitive knowledge relating to diagnosis, pathology, and nursing care of patients experiencing an acute myocardial infarction. Higher scores indicated greater cognitive skill. The two forms of the AMIQ were found to be reliable (r = .59, p = .02) and internally consistent (Spearman-Brown coefficient = .74) prior to the study. The CL tool was developed by Madorin and Iwasiw (1999) and adapted for use in this study (Brannan et al., 2008). It consisted of 34 questions, with scores ranging from 34-136 points. Each question was answered using a Likert scale of 1-4, with 1 representing a lack of confidence and 4 representing complete confidence. The developers of the tool reported a reliability coefficient of .89.

The findings revealed that students who received HPS instruction achieved significantly higher AMIQ scores than students who received traditional instruction (t = 20, df = 79, p = .05). Although CL scores were higher following both HPS and traditional instruction, these increases were not
significant ($t = -1.74, df = 81, p = .09$). There were no statistically significant differences in demographic or educational characteristics among the students (Brannan et al., 2008).

These results suggest that the use of HPS can be an effective teaching strategy for acquiring knowledge in combination with traditional instruction. Brannan et al. (2008) suggested that further research be done on ways to properly integrate this technology to achieve desired learning outcomes.

Student confidence was also the focus of a study by Bambini, Washburn, and Perkins (2009). The purpose of their study was to evaluate the effectiveness of simulated clinical experiences as a method to increase the self-efficacy of nursing students in their first clinical course. The framework for the study was based on Bandura’s theory of self-efficacy. The authors posed three research questions:

1. Do simulated experiences increase the self-efficacy of students preparing to enter the obstetrics clinical setting?

2. What are students’ perceptions of the simulated clinical experience?
3. What effect does previous experience working with patients have on students' perceived levels of confidence in their clinical skills? (p. 79)

In this study by Bambini et al. (2009), a convenience sample of 112 baccalaureate students at a midsized college of nursing in the Midwest was used. The students were in their first clinical semester, and the study took place over four semesters. A quasi-experimental repeated measures design was used. Participation was voluntary, and half of the eligible students based on their course enrollment ultimately participated. The mean age of the participants was 24.85 years, 57% of them had previous health care experience, and 26% had a previous degree.

The instrumentation used by Bambini et al. (2009) consisted of three surveys: a pretest, posttest, and follow-up survey. Each of these instruments had six questions which utilized a 10-point scale to rate confidence, with a score of 1 meaning no confidence and a score of 10 meaning very confident. The posttest and follow-up survey also contained three open-ended questions. Content validity was determined by faculty members with expertise in obstetrical nursing and/or education. The open-ended questions were used to further enhance validity.
Prior to a postpartum simulation, a pretest was administered. The posttest was given after the simulation, and the follow-up survey was completed after the first day of clinical. The overall findings showed that the students had significant increases in self-efficacy and confidence. The self-efficacy pretest mean was 28.66, the posttest mean was 42.14, and overall self-efficacy was significant at $p < .01$ (Bambini et al., 2009).

Qualitative analysis revealed that students valued the simulation. Communication, confidence, and clinical judgment emerged as common themes in the students’ comments.

This study provides support for the use of clinical simulation prior to actual clinical experiences. Bambini et al. (2009) suggested further research should be conducted on the abilities of students to provide safe and prioritized care in a simulated patient environment.

Anxiety levels may also be affected by the use of HPS prior to clinical experiences. Bremner, Aduddell, and Amason (2008) conducted a study to examine the effects of using HPS on the levels of anxiety of nursing students who were in their first clinical experience. The study also
explored the relationships among anxiety levels, learning styles, and coping styles.

This experimental study utilized a convenience sample of 149 sophomore-level BSN students at a nursing school in the southeastern United States. The participants were predominantly female with an average age of 28, and they were in their first clinical experience. The students were randomly divided into an experimental group \((n = 71)\) which received education using HPS, and a control group \((n = 78)\) which received traditional instruction. This study was conducted over two consecutive semesters.

Three instruments were used in this study. The first was a researcher-designed questionnaire by Bremner et al. (2008) to collect demographic information along with a 20-question pretest/posttest evaluation of the content in the experience. The second instrument was the Self Assessment Inventory, consisting of 45 questions on a Likert-type scale to measure learning style and coping measures. Content validity was determined by a panel of subject matter experts. Reliability for the Self Assessment Inventory was acceptable (Cronbach’s alpha = .91). The third tool was the State-Trait Anxiety Inventory (STAI) which consisted of 40 statements, 20 to measure anxiety in
general as a pretest and 20 to measure anxiety in the moment as a posttest. This posttest was also repeated one week after the students’ first actual clinical experience. Scores could range from 20-80, with 39-40 indicating a significant level of clinical anxiety. Validity and reliability were noted to have been documented in previous literature.

The findings from the study showed a short-term reduction in anxiety in both groups (Bremner et al., 2008). Results from the STAI varied by semester. In the fall semester, mean scores for the students indicated a reduction in anxiety that was not sustained. STAI scores for the HPS group were 43.8 for the pretest, 39.8 for the first posttest, and 45.52 for the second posttest. The mean scores for the students in the non-HPS group were 47.21 for the pretest, 39.71 for the first posttest, and 46.37 for the second posttest. In the spring semester, mean scores suggested that anxiety was relieved between the pre-test and first post-test, but again this was not sustained. Mean scores for the students in the HPS group were 37.94 for the pretest, 35.17 for the first posttest, and 41.94 for the second posttest. The mean scores for the students in the non-HPS group were 40.24 for the pretest, 37.19 for the
first posttest, and 45.07 for the second posttest. Findings from the Self Assessment Inventory indicated no significant relationships among learning styles, coping styles, and anxiety.

These results indicated that students were satisfied with simulation instruction and that the use of HPS may have been beneficial in reducing initial anxiety levels in students. However, this reduction in anxiety appeared to be short term and was not maintained over time. Student satisfaction with the simulation was high as demonstrated by a total of 84% of the students rating the experience as very good to excellent, and 97% feeling that HPS should be included in the nursing curriculum (Bremner et al., 2008).

This study adds to the body of evidence underlying the use of HPS to reduce students’ anxiety levels. The findings suggest that students may experience less anxiety during their first clinical experiences if those experiences are preceded by a HPS laboratory practice session. However, this reduction in anxiety may only be short-lived. Other strategies may be needed to prevent a return to high anxiety levels. Bremner et al. (2008) recommended further studies be conducted relating HPS to student learning
styles as well as its effectiveness in improving patient safety.

**Effects of HPS on Critical Thinking and Clinical Judgment**

The use of HPS may enhance student critical thinking and clinical judgment. Ravert (2008) examined the differences in student critical thinking based on three types of instruction: HPS, scenario group discussions, and traditional education. A secondary purpose was to determine the moderating effect of the students’ preferred learning style. Kolb’s theory of experiential learning and learning styles served as a framework for the study.

A convenience sample of 40 undergraduate BSN students in their first medical-surgical nursing course at Brigham Young University participated in this study. The participants were divided into an HPS group ($n = 12$), a non-HPS group ($n = 13$), and a control group ($n = 15$). The students were primarily Caucasian women with an average age of 21.25 years and an average GPA of 3.65. Students were eligible to participate if they were enrolled in the course.

As described by Ravert (2008), multiple tools were used to measure critical thinking and learning style. One of the instruments used was the 75-item California Critical
Thinking Disposition Inventory (CCTDI) with a 6-point Likert scale to demonstrate agreement. Another instrument was the 34-item, multiple-choice California Critical Thinking Skills Test (CCTST). These critical thinking tools were administered as a pretest and a posttest to the students. A Learning Style Inventory consisting of 12 items was also utilized. The questions consisted of sentence completion to identify learning style according to Kolb’s theory. The reliability and validity of these tools had been previously reported.

Each of the groups experienced an increase in critical thinking scores related to disposition and skill (Ravert, 2008). The two experimental groups showed a moderate effect size in critical thinking disposition scores while the control group had a large effect size. Both experimental groups showed large effect size on critical thinking skills scores, while the control group had a moderate effect size. There were no statistically significant differences in critical thinking scores noted between groups due to the small sample size. In addition, learning style was not a moderating factor in student learning.

Findings suggest that the use of HPS may be one of several pedagogies that are helpful in increasing the
critical thinking skills of nursing students. Although critical thinking disposition is difficult to change, critical thinking skills may be influenced by HPS as well as by other in-depth approaches. Offering a choice of learning experiences to students may increase their critical thinking skills. Ravert (2008) suggested further research should be conducted using a larger, more diverse sample. Another recommendation was to use instruments designed specifically for nursing education. Follow-up studies correlating the use of HPS to outcome measures such as licensure exam passing rates and job performance were also suggested.

High-fidelity simulation (HFS) is an instructional method with the potential for teaching such skills as clinical judgment. A qualitative study by Lasater (2007) was performed to examine the HFS experiences of students and the effects of these experiences on the development of clinical judgment. The study utilized the Lasater interaction model of clinical judgment development.

The study enrolled a convenience sample of 48 junior-level nursing students enrolled in the winter term course of Nursing Care of the Acutely Ill Adult in 2004. Enrollment in the course during this time period was the
inclusion criterion. The setting was the clinical laboratory at Oregon Health & Science University School of Nursing. The HFS replaced one day of clinical per week. Out of the 48 participants, 39 were observed during the simulations. These observed students were eligible to participate in a focus group.

A focus group of eight non-traditional students was formed to discuss the simulation following the experience. These eight students volunteered to participate and all of them were able to meet at the same time. Lasater (2007) identified five major codes from themes of the students’ comments: Strengths and limitations of HFS, increase of anxiety as well as learning and awareness, desire for more feedback, value of student connections, and general recommendations.

According to Lasater (2007), the most frequently mentioned strengths of the HFS were as an integrator of learning and the ability to deliver a breadth of experience. The students expressed the value of learning from working together as well as from other students’ simulation experiences. HFS did tend to produce anxiety in students, but they also admitted that the use of HFS increased their learning.
It was noted that the HFS had inherent limitations, such as a lack of nonverbal cues and always having a female voice. The students also indicated a desire for more direct feedback from the simulator during the process. It was determined that debriefing was essential to learning, and observers need to be actively engaged.

HFS offers students the opportunity to integrate learning as well as to advance clinical judgment skills. However, more research is necessary to determine if the use of HFS can develop clinical judgment. Lasater (2007) also recommended future HFS studies with a more culturally diverse group of students.

Sears, Goldsworthy, and Goodman (2010) examined clinical judgment in practice. The purpose of this study was to determine the effectiveness of clinical simulation laboratories in contributing to safe medication administration in the clinical setting by second year baccalaureate nursing students.

The quasi-experimental study used a randomized, control group, post-test only design. Fifty-four second-year BSN students who were scheduled to be in medical/surgical or maternal/child clinical environments were randomly selected from a sampling frame of students...
who volunteered to participate. The students were randomly divided into 3 treatment groups and 3 control groups. Students in the treatment groups experienced several hours of medication administration simulation prior to the start of their clinical rotation.

Instructors collected information for each actual or near-miss medication error committed by students in the clinical area. The data collection form was adapted for use from a survey previously developed by one of the authors (Sears et al., 2010). Data regarding which medication right was violated, severity of the error, and contributing factors to the error were collected. Face and content validity of this tool were confirmed by multiple experts. Inter-rater reliability of the rating was established through meetings with the clinical instructors prior to the study.

The results demonstrated that, overall, students who had previous simulation experience made fewer medication errors during their clinical time (Sears et al, 2010). There were 24 errors committed by the control groups (N = 30 students) as compared to 7 errors by the experimental groups (N = 24 students). Using a chi-square test assuming
a Poisson distribution to compare the error rates, the difference was significant at $p < .001$.

Based on these findings, simulation in nursing education may be an effective way to reduce the number of medication errors by student nurses. Future research is recommended by these authors to replicate this study on a larger scale.

*Use of HPS to Provide Experience for Emergency Situations*

HPS can be useful in providing experience for rarely experienced situations such as patient emergencies. Childs and Sepples (2006) developed and implemented a simulated learning experience related to identification of cardiac alterations and appropriate interventions. Student satisfaction was used as the outcome measure. An additional goal was to determine the reliability and validity of the Educational Practice Scale for Simulation (EPSS) and the Simulation Design Scale (SDS). This study was conducted in collaboration with the Nation League for Nursing (NLN) and the Laderal Corporation as part of a larger national study. The NLN/Laderal simulation model served as the framework.

This study took place in the learning resource center (LRC) at the University of Southern Maine. A convenience sample of 55 BSN senior-level students participated. The
simulation was planned in the LRC as part of their capstone course. No additional information was provided related to demographic data or inclusion criteria.

During the course of the study, the students rotated through four stations of clinical scenarios, with the mock code using HPS as the final station. The students completed evaluation forms after each station. The EPSS consisted of 16 questions using a rating scale of 1-5 to determine the presence and importance of educational methods in the experience. The SDS consisted of a 20-item scale to evaluate the design of the simulation. In addition, a researcher-developed instrument using a 13-item scale was given to rate feelings, confidence, and usefulness of the HPS. The students were also asked to rank the four stations in order of preference.

According to Childs and Sepples (2006), the students rated the experience positively. Feedback, objectives, collaboration, active and diverse learning, and high expectations were found to be the highest-rated features. The mock code was rated as the best station. Both the EPSS and the SDS were found to be reliable and valid instruments. Additional information regarding this
reliability and validity is to be published in the larger study.

Simulation experiences can be effective for student learning and for achieving course outcomes. As it was discovered, these experiences require careful planning and implementation. The results of the larger NLN/Laderal study may help to determine how to design and implement simulations for optimal student benefits (Childs & Sepples, 2006).

Another study focused on the use of HPS to simulate emergencies for acutely deteriorating patients. Gordon and Buckley (2009) conducted this study to determine the effectiveness of high-fidelity simulation on graduate medical-surgical nursing students’ abilities and confidence to respond to patient emergencies.

This descriptive study consisted of a convenience sample of 50 graduate nursing students enrolled in a medical-surgical course at an Australian university. The mean age of the participants was 34.1 years. The majority of the students were registered nurses in a medical/surgical specialty. The inclusion criterion was enrollment in a specific graduate nursing course during the
time of the study. Each of the potential students agreed to participate.

The tool used in the study was a questionnaire administered both before and after the simulation activity. It consisted of 14 questions, each using a Likert rating scale of 1-4, with 1 indicating not and 4 indicating a lot. The Cronbach alpha correlation coefficient was .94 for the pretest and .91 for the posttest (Gordon & Buckley, 2009).

The students participated in a variety of clinical scenarios focused on decision making and hands-on skills. Following the simulation, student responses related to leadership, communication, and technical skills demonstrated improvement in their ability and confidence levels. Specific paired t-test results showed significantly increased ability to recognize an unstable patient \((p = .02)\), identify priorities \((p < .001)\), and correct airway and circulation abnormalities \((p < .001)\). The results also indicated increased confidence in multiple emergency leadership and team roles \((p < .001)\). Debriefing was identified as the most useful aspect of the experience (Gordon & Buckley, 2009).

This study demonstrated support for the use of simulation in nursing education to improve patient outcomes
in clinical emergencies. Research on the capabilities of nurses during actual patient emergencies could provide further support for the use of simulation as part of a nursing curriculum.

Along these same lines, Bruce, Scherer, Curran, Urschel, Erdley, and Ball (2009) noted that few nursing students have the opportunity to experience patient crises during their time in school. In addition, little information has been reported in regards to human patient simulation (HPS) with undergraduate and graduate students. Therefore, these authors conducted a study to determine the effectiveness of HPS use on the knowledge, confidence, and clinical competence of graduate students and the knowledge levels of undergraduate students in the management of a cardiac arrest. Bandura’s theory of self-efficacy was used as a basis for the study.

The participants in this study were a convenience sample of 11 adult and acute care NP students and 107 BSN students enrolled in a complex acute care nursing course during the second semester of their senior year. Of the NP students, 9 of them were female, the mean age was 37 years, and they had practiced for a mean of 8.9 years. The mean
age of the BSN students was 24.7 years. The study took place at the University of Buffalo School of Nursing.

Several instruments were used in this quasi-experimental study (Bruce et al., 2009). A knowledge test consisting of 10 multiple choice questions was administered to both NP and BSN students as a pretest and a posttest. The Confidence Scale consisted of 16 items, each with a Likert rating scale of 1-5, 1 indicating not at all and 5 indicating very much. This tool was administered in the format of a pretest and a posttest only to the NP students. The Student Competency Scale consisted of 26 faculty-scored items to evaluate NP student performance during the simulation. Two forms of the evaluation instrument were administered. The NP form consisted of 12 items and 4 open-ended questions. The BSN form had 10 items and the same 4 open-ended questions. The items were measured with a Likert rating scale of 1-5, using the ratings described above. Demographic information was also collected. The instruments were developed by the researchers, and no information was provided regarding their validity or reliability.

Following the simulation of a cardiac arrest, Bruce et al. (2009) reported immediate knowledge scores increased significantly for both NP students ($t = -11.35$, $p = .000$).
and BSN students \( (t = -2.62, \ p = .010) \). This increase was not sustained over time \( (t = 1.24, \ p = .218) \). Non-significant increases were also noted in confidence scores \( (t = -1.45, \ p = .177) \) and performance scores \( (t = .54, \ p = .621) \). Both groups of students rated the experience as positive \( (4.2/5.0 \) for NP students, \( 4.4/5.0 \) for BSN students).

The use of HPS in nursing education has the potential to enhance experiences, including the development of knowledge, confidence, leadership, collaboration, and skills related to patient crises. Recommendations from Bruce et al. (2009), along with input from the participants, are to conduct further studies to determine the frequency and timing of HPS training sessions, and to incorporate a more rigorous research design.

Summary of Literature

Advancements in technology are continually being made. One such technology, human patient simulation (HPS), has applications in nursing education. HPS can be used by faculty as an alternative method of clinical teaching. Its use offers students a form of experiential learning which can improve knowledge, confidence, critical thinking, and
clinical judgment, as well as provide exposure to a wider range of patient conditions.

Feingold et al. (2004) and Bearnson and Wiker (2005) evaluated the effectiveness of HPS in teaching. The results of the study by Feingold et al. showed that HPS provides a valuable learning experience for students as well as an effective teaching method for faculty. Bearnson and Wiker added to the research findings by demonstrating positive student responses to a simulated clinical experience. All of these authors recommend further studies to determine effective methods to use HPS for learning.

Human patient simulation has been found to have a positive effect on student knowledge, confidence, and anxiety. Schlairet and Pollock (2010) demonstrated that knowledge acquisition following the use of HPS instruction is comparable to traditional classroom instruction. They noted that further research is necessary to assess knowledge acquisition through the use of simulation. Brannan et al. (2008) illustrated how the use of HPS can improve both knowledge and confidence levels following its use. Confidence related to the use of HPS needs additional research as confidence levels also increased using traditional teaching methods. Bambini et al. (2009)
provided evidence for the effectiveness of HPS in increasing student self-efficacy. Bremner et al. (2008) showed the effectiveness of HPS in reducing anxiety related to clinical experiences. This reduction in anxiety was not shown to be sustained; and therefore, would be another focus for future research.

The effects of using HPS have been shown to increase critical thinking and clinical judgment in students. The results of the study by Ravert (2008) illustrated that student critical thinking scores increased when using both HPS and traditional teaching methods. According to Lasater (2007), the use of HPS integrated learning and advanced clinical skills, and it has the potential to improve clinical judgment. Sears et al. (2010) demonstrated the application of improved clinical judgment through their study on the use of HPS in reducing medication errors. All of these studies noted the need for replication with a larger sample size.

HPS also provides the capability to offer a wide range of experiences for students. In the study by Childs and Sepples (2006), a simulation was created to provide experience in managing cardiac arrhythmias and a mock code. It was found to be effective for achieving student learning
and course outcomes. It was noted that no follow up was provided in an actual clinical setting. Gordon and Buckley (2009) and Bruce et al. (2009) described the use of HPS as a way to provide scenarios of patient emergencies. The results of both of these studies showed positive experiences with HPS in terms of improving student knowledge, confidence, and skills. Further studies were recommended to establish the frequency and timing of HPS and to determine if the effects are maintained in the clinical setting.

HPS can be an effective teaching method in nursing education. However, these studies have demonstrated several areas of concern which require further research, including sample size, effectiveness, and sustainability of effects. Studies need to be focused on the specialty area of use for HPS in order to be applicable. In addition, multiple studies are required on the same topic to verify results. The results of this proposed study would provide further support for the use of HPS in teaching specific nursing care to increase student confidence and knowledge levels. It may also provide guidance to faculty who may be considering its use for this purpose.
Chapter III

Methodology and Procedures

Typical classroom and clinical settings do not adequately prepare nursing students to care for patients experiencing an acute myocardial infarction (MI) (Brannan et al., 2008). The literature has demonstrated several reasons for this, including reduced clinical time, ineffective nursing education, and lack of exposure to emergency situations. It has also been noted that there is a need for research into the use of HPS. HPS is a tool which can be used to provide practice of nursing and clinical decision-making skills.

The purpose of this study is to compare the effects of classroom lecture and the use of HPS in teaching nursing care specific to an acute MI on junior-level nursing students’ cognitive skills and confidence levels. This study will be a replication of the study by Brannan et al. (2008). The framework will be based on the concept of experiential learning.
This chapter will focus on the details of the study. Information regarding the research questions, population, sample, setting, protection of human subjects, procedure, instrumentation, design, and data analysis will be discussed.

Research Questions

1. Will baccalaureate students who receive the HPS instructional method regarding nursing care of patients experiencing an acute MI demonstrate greater levels of cognitive skill in the nursing care of those patients than students who receive instruction using the classroom lecture method?

2. Will baccalaureate students who receive the HPS instructional method regarding nursing care of patients experiencing an acute MI express greater levels of confidence in the nursing care of those patients than students who receive instruction using the classroom lecture method?

Population, Sample, and Setting

The population for the study will include junior-level nursing students at a small university near Baltimore, MD. A skills laboratory within the school of nursing will be used as the setting. This laboratory will contain at least
ten beds, including two with SimMan HPS manikins. Inclusion criteria will be enrollment in the introductory medical/surgical nursing course during the time of the study as well as a minimum age of 18 years old. The only exclusion criterion will be repetition of the course. A convenience sample of 100 students is anticipated, with 50 students from the fall semester and 50 students from the spring semester.

Protection of Human Subjects

This study will be submitted to the institutional review boards of Ball State University and the participating university for approval. Student participation will be voluntary and informed consent will be obtained. Participation or nonparticipation will not affect the students’ course grade. Anonymity will be maintained as no student names will be used on any of the data collection forms. No risks have been identified with participation in this study.

Procedure

After receiving approval from the institutional review boards, this proposed study will be reviewed with the head of the school of nursing and the faculty members of the course. Arrangements will be made for the researcher to
instruct the students using traditional lecture and HPS during a two-hour period. The same content would be covered in both methods. Students in the fall semester will receive instruction using the traditional lecture method and students in the spring semester will receive instruction using the HPS method. All of the students will use the same textbooks and study guides.

The students receiving traditional instruction will listen to the lecture with an opportunity to ask questions at its conclusion. The students receiving HPS instruction will be randomly divided into two equal groups. Each group will then be divided into five groups of five students each. These groups will rotate through five stations. Four of the stations will include scenarios, and the fifth station will involve interaction with the HPS manikin. This session will be followed by a faculty-facilitated ten-minute debriefing.

At the beginning of each semester, the researcher will provide full disclosure about the study to the students. Written consent will be obtained from students willing to participate. Students choosing not to participate will participate in the method of instruction, but no data will be obtained from them. Prior to the initiation of
instruction, a demographic data form and pretesting will be completed. Posttests will be administered immediately following the two-hour instructional period.

Design

This study will use a quasi-experimental pretest/posttest design. The independent variable is instructional method and the dependent variables are cognitive skill and confidence level.

Instrumentation

The Acute Myocardial Infarction Questionnaire (AMIQ) is a 20-question multiple choice exam developed by Brannan, White, and Bezanson (2008). Scores can range from 0-20. Higher scores indicate a greater level of understanding of nursing care for a patient experiencing an acute MI. Two different versions of the questionnaire would be utilized for the pretest and the posttest. The two versions of the exam will be evaluated by experienced medical-surgical nursing educators to confirm equivalency. Approval for use of the AMIQ will be obtained from these authors prior to its use.

The Confidence Level tool (CL) is a 34-item questionnaire utilizing a Likert rating scale of 1-4, with 1 indicating a lack of confidence and 4 indicating complete
confidence. The questions are based on subscales of the nursing process, such as assessment, diagnosis, planning, implementation, and evaluation. The number of questions is equally divided among these subscales. Scores can range from 34-136, with higher scores indicating a greater level of confidence. This instrument was adapted by Brannan et al. (2008) for use from a tool developed by Madorin and Iwasiw. Again, approval will be obtained for use of the CL in this study.

The students will also complete a demographic data form. The information collected would include age, gender, ethnicity, prior nursing experience, prior cardiac nursing experience, and grade in first nursing course.

Data Analysis

Statistical analysis of the data will be performed using the SPSS computer program. Descriptive statistics will be used to describe the characteristics of the sample. The mean and standard deviation will be determined for the HPS and lecture group pretests and posttests. Differences between the groups will be evaluated using t-tests. The significance level will be set at .05.
Summary

Using the concepts underlying experiential learning, this study will compare the effects of classroom lecture and the use of HPS on students’ cognitive skills and confidence levels. It will be based on the concept of experiential learning. The anticipated sample will consist of 100 junior-level students over two semesters. A pretest/posttest design will be used, with instruction occurring during a two-hour interval between tests. Data will be analyzed using descriptive statistics and t-testing. The results of this study will benefit nursing faculty in determining the effectiveness of using HPS as a learning tool with students to improve knowledge and confidence levels in the care of patients experiencing an acute MI.
References


Jeffries, P. R. (2009). Dreams for the future for clinical simulation. *Nursing Education Perspectives, 30*(2),


