HIGH FIDELITY SIMULATOR USE IN NURSING EDUCATION: EFFECTS ON CONFIDENCE LEVELS AND COGNITIVE SKILLS

A RESEARCH PAPER
SUBMITTED TO THE GRADUATE SCHOOL
IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE
MASTER OF SCIENCE

BY

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MAY 2014
# TABLE OF CONTENTS

TABLE OF CONTENTS............................................................................................................. i

ABSTRACT..................................................................................................................................... iii

CHAPTER I: INTRODUCTION

Introduction............................................................................................................................... 1

Background and Significance ................................................................................................. 1

Problem Statement.................................................................................................................... 3

Purpose of Study ....................................................................................................................... 3

Theoretical Framework ............................................................................................................ 3

Research Questions ................................................................................................................... 4

Definition of Terms .................................................................................................................. 4

Limitations ............................................................................................................................... 5

Assumptions ............................................................................................................................. 5

Summary .................................................................................................................................... 6

CHAPTER II: REVIEW OF LITERATURE

Introduction............................................................................................................................... 7

Organization of Literature ...................................................................................................... 7

Summary of Literature ............................................................................................................. 24

CHAPTER III: METHODOLOGY

Introduction............................................................................................................................... 27

Research Questions ................................................................................................................... 27

Setting, Population, and Sample ............................................................................................ 27

Protection of Human Subjects ............................................................................................... 28
Procedures ......................................................................................................................... 28
Instrumentation .................................................................................................................. 29
Design .................................................................................................................................. 30
Data Analysis ....................................................................................................................... 30
Summary .............................................................................................................................. 30
REFERENCES ..................................................................................................................... 32
ABSTRACT

RESEARCH PAPER: High Fidelity Simulator Use in Nursing Education: Effects on Confidence Levels and Cognitive Skills

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DATE: May, 2014

Traditional clinical practice opportunities in nursing education may not provide a full range of experiences for development of cognitive skills and confidence. High fidelity simulator (HFS) use may be an effective method for providing experiential learning in clinical practice in nursing education (Brannan, White, & Bezanson, 2008). The purpose of this study is to compare the effectiveness of two teaching methods, a traditional classroom lecture and the use of HFS, on cognitive skills and confidence when instructing junior nursing students about acute myocardial infarction. This study is a modified replication of Brannon et al. (2008). The framework for the study is Kolb’s Experiential Learning Theory (1984). Junior level nursing students will be sampled from a Midwestern university adult health nursing course. A convenience sample will include spring and fall participants in the course. The study is a quasi-experimental, pretest and posttest comparison group design. Confidence level will be measured using a questionnaire developed by Madorin and Iwasiw (1999) and adapted by Brannon et al. (2008). Cognitive skills will be measured using parallel forms of the Acute Myocardial Infarction Questionnaire (AMIQ) developed by Brannon et al. (2008). The findings from this study will contribute to the growing body of knowledge related to HFS use in nursing education.
Chapter I
Introduction

The United States Department of Labor estimates an employment projection increase of 26% in jobs for registered nurses from 2010 to 2020. This projection is based on the prediction that the large population of aging baby boomers will require more medical care, an increase in preventive care, and advances in technology enabling treatment for a broader spectrum of health problems (Bureau of Labor Statistics, 2012). As nurse educators step up to the challenge of this growing need, they seek to provide opportunities to prepare students for nursing practice.

In a landmark study supported by the Carnegie Foundation for the Advancement of Teaching, authors identified key areas of needed improvement in nursing education to meet the needs in an ever changing and complex health care system (Benner, Sutphen, Leonard, & Day, 2010). Recommendations for changes include development of methods to keep students focused on the patient’s experience, including use of simulation exercises to help students integrate knowledge and skills. It was also recommended that simulation exercises be used as part of assessment of student performance (Benner, et al. 2010).

Background and Significance

Historically, high fidelity simulation (HFS) was first used as an educational strategy in airline pilot training in the late 1930s. The safe environment allowed controlled scenarios used for measurement and development of competency. Eventually, schools of medicine and dentistry borrowed these principles of simulation use in education, specifically in the areas of critical care, emergency medicine, surgery and anesthesia (Hyland & Hawkins, 2009).

HFS use in nursing education has its basic roots in the use of “Mrs. Chase”, a simple mannequin first created and used in 1911 at the Hartford Hospital Training School in
Connecticut. This low fidelity simulator was eventually reproduced and used in other nursing programs through the 1950s. Advancement of technology led to development of higher fidelity simulators in the 1960s, such as the product commonly used for training in cardiac compression (Hyland & Hawkins, 2009).

In current nursing education, limited clinical opportunities, decreased length of patient stay, and safety considerations have led to the need to consider alternatives to traditional teaching methods. The result has been an increase in simulation use, including HFS, in nursing curricula. HFS is described as “an approach to experiential learning using life-sized manikins with actual physiological and pharmacological responses, and sophisticated interactive capability in realistic scenarios” (Yuan, Williams, & Fang, 2012). Current applications for HFS use in nursing education include development of critical thinking, cognitive skills, organizational skills, clinical skills, student satisfaction, and self-confidence (Alfes, 2011; Bambini, Washburn, & Perkins, 2009; Brannan, White & Bezanson, 2008; Lewis & Ciak, 2011; Partin, Payne, & Slemmons, 2011; Schlairet & Pollock, 2010; Smith & Roehrs, 2009; Traynor, Gallagher, Martin, & Smith, 2010).

The National Council of State Boards of Nursing surveyed nursing programs across the United States related to simulation use. While findings indicated that simulation is increasingly used in nursing programs, 81% respondents indicated that more should be incorporated in the curriculum (Kardon-Edgren, Willhaus, Bennett, & Hayden, 2012). While the educational trends continue to favor use of HFS in nursing education, many factors need to be considered, including thousands of dollars to purchase and maintain each simulator, time to train faculty to use and develop simulation scenarios, and proper allocation of space for optimal use (Howard, Ross, Mitchell, & Nelson, 2010). In addition to logistical factors of including HFS in nursing
curriculum, educational outcomes need to be considered. While current literature provides evidence that simulation is an effective educational strategy, continued research is needed to evaluate transfer of learning outcomes to clinical settings, and comparison of educational outcomes of HFS use with traditional experiences (Weaver, 2011; Yaun et al., 2012).

Problem Statement

Nursing students need to acquire cognitive skills and confidence to be effective in clinical practice. Students are facing an increasingly complex environment in which to learn. Clinical practice opportunities with patients may not provide a full range of experiences for development of cognitive skills and confidence. Clinical practice may require experiential learning outside the classroom or traditional clinical settings. HFS use can provide a bridge to clinical practice (Brannan, et al. 2008).

Purpose of Study

The purpose of this study is to compare the effectiveness of two teaching methods (traditional classroom lecture and the use of HFS) on cognitive skills and confidence when instructing nursing students about acute myocardial infarction (AMI). This study is based in the conceptual framework of Kolb’s Experiential Learning Theory, which supports experiential learning as a way for nursing students to assimilate and apply concepts in patient care settings (Brannan et al., 2008).

Theoretical Framework

This study is based on Kolb’s Experiential Learning Theory. According to Kolb (1984), characteristics of experiential learning include six propositions:

1. Learning is best conceived as a process, not in terms of outcomes.

2. Learning is a continuous process grounded in experience.
3. The process of learning requires a resolution of conflicts between dialectically opposed modes of adaptation to the world.

4. Learning is a holistic process of adaptation to the world.

5. Learning involves transactions between the person and the environment.

6. Learning is the process of creating knowledge. (p. 26-36)

According to Kolb (1984), experiential learning is a cycle involving four learning modes; a concrete experience, reflective observation, abstract conceptualization, and active experimentation. Kolb summarizes learning as “the process whereby knowledge is created through the transformation of experience” (Kolb, 1984 p. 38). Use of HFS in nursing education is one way knowledge can be created through clinical experiences.

Research Questions

1. Is there a difference in acquisition of confidence in junior level baccalaureate nursing students using two different educational strategies, traditional classroom lecture and use of HFS in a clinical laboratory?

2. Is there a difference in acquisition of cognitive skills of junior level baccalaureate nursing students using two different educational strategies, traditional classroom lecture and use of HFS in a clinical laboratory?

Definitions of Terms

Cognitive Skill: Conceptual

Cognitive skill refers to the ability to gain knowledge from experience and information. In this study, cognitive skill refers to the knowledge in main content domains related to nursing care of a patient with AMI including diagnostic evaluation, pathogenesis, prevention, recovery and discharge teaching (Brannan et al., 2008)
Cognitive Skill: Operational

Cognitive skill will be measured by using the Acute Myocardial Infarction Questionnaire: Cognitive Skills test (AMIQ) in two parallel forms, given as pretests and posttests. Each version has 20 multiple-choice questions. Scores may range from 0-20, with higher scores indicating higher levels of cognitive skill.

Confidence: Conceptual

Confidence is a perceived measure of belief in ability to succeed. It is a crucial element in nursing education and practice. Confidence is dependent on contextual background and setting (Perry, 2011).

Confidence: Operational

Confidence will be measured using the Confidence Level tool (CL), given as a pretest and a posttest. The CL tool has 34 questions with a Likert scale ranging 1 (completely lacking confidence) to 4 (very confident). Scores may range from 34 to 136, with higher scores indicating higher confidence.

Limitations

This study is limited by convenience sampling and lack of random assignment to different groups (traditional lecture or HFS experience). Another limitation is the lack of available information on the validity of the tool measuring confidence level. Although this study is a replication, the generalizability of the findings from this study alone may be limited by the fact that the study will be conducted in a single setting.

Assumptions

1. Increases in self-confidence correlate with improved practice skills.
2. Increased knowledge acquired in the laboratory setting translates into improved
practice in the clinical setting.

Summary

Nursing educators are challenged to provide meaningful learning experiences to students. Limited available clinical settings have led to increase HFS use in nursing education. This study will use Kolb’s experiential leaning theory as a framework to replicate Brannan et al. study (2008) to compare the effectiveness of traditional lecture and HFS use on cognitive skills and confidence. The findings will contribute to the evidence related to the impact of HFS use on learning outcomes in nursing education.
Chapter II

Literature Review

Introduction

Nursing students need clinical opportunities that facilitate positive learning outcomes. With limited practice opportunities with patients, nurse educators are challenged to provide experiential educational opportunities to meet the needs of students. High fidelity simulator (HFS) use is an educational strategy that provides opportunities beyond traditional classroom and clinical placements.

Organization of Literature

This literature review consists of nursing studies investigating the use of HFS in nursing education. Selected studies examined perceptions and outcomes that include consideration of confidence and cognitive skills in relation to HFS use. Quantitative and qualitative designs were used to examine perceptions and outcomes associated with this educational strategy.

With limited clinical placement opportunities, nursing educators are utilizing simulation lab experiences to provide practice opportunities. Simulation experiences can be useful to teach skills in a controlled setting without risk to patients. As nursing educators increase the use of simulation as a teaching method, related learning outcomes need to be examined (Lewis & Ciak, 2011).

Lewis and Ciak (2011) conducted a study to investigate HFS use as an educational strategy. The authors examined learning outcomes associated with simulation use in nursing education. The purpose of the study was to examine simulation use and its impact on nursing students’ self-confidence, satisfaction, cognitive learning, and critical thinking.

Lewis and Ciak (2011) used a quasi-experimental design with a convenience sample
derived from students in a course focused on pediatrics and obstetrics in a diploma school of nursing. The study was conducted over four different semesters, with a total of 63 students participating. Cognitive knowledge was measured prior to the simulation experiences with a 20 question multiple-choice pretest devised for this study. Students then participated in eight simulation scenarios in one day. Following the simulation experiences, students took a posttest identical to the pretest. Student satisfaction with simulation and confidence with applying simulation skills to the clinical setting were measured using a tool developed by the National League for Nursing (NLN). NLN’s Student Satisfaction and Self-Confidence in Learning Tool includes 13 items assessing self-confidence (8 questions) and satisfaction (5 questions) with a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Reliability was reported as Cronbach alpha of .94 for satisfaction and .87 for self-confidence. In addition, a test from the Assessment Technologies Institute (ATI) was used to measure critical thinking. Reliabilities for the ATI Nursing Care of Children and Maternal Newborn test were reported as Cronbach alphas of .65 for the area of nursing care of children and .68 for the area of maternal-newborn nursing. In addition to the 63 participants in the simulation experience, the ATI test was administered to one other group of students that did not experience the simulation. The standardized test scores from the ATI test were compared in the two groups (Lewis & Ciak, 2011).

A paired t-test was used to compare pretest and posttest scores. For the students in the fall group (n = 9): pretest M = .661, posttest M = .883 (t = -6.50, df = 8, p = .000). For students in the winter group (n = 14): pretest M = .650, posttest M = .786 (t = -6.82, df = 13, p = .000). For students in the summer group (n = 28): pretest M = .661, posttest M = .827 (t = -10.50, df = 27, p = .000). For students in the next fall group (n = 12): pretest M = .695, posttest (one student did not complete the posttest in this group) M = .855 (t = -4.94, df = 10, p = .001). For all students
combined \((n = 63)\), pretest \(M = .664\) and posttest \((n = 62)\), \(M = .823\). Results from this study indicate a significant gain in knowledge between the pretest and posttest \((p < .005)\) (Lewis & Ciak, 2011).

Descriptive statistics were used to report positive findings from the NLN tool measuring satisfaction and self-confidence following the simulation experience. Results for satisfaction were reported from a 5-point scale. For students in the fall group \(M = 4.51\), winter group \(M = 3.57\), summer group \(M = 4.71\), and next fall group \(M = 4.53\) with an overall satisfaction mean for all groups combined of 4.33. Self-confidence results for students in the fall group were reported as \(M = 4.36\), winter group \(M = 3.96\), summer group \(M = 4.59\), and next fall group \(M = 4.48\) with an overall \(M = 4.35\) (Lewis & Ciak, 2011).

Specific results were not reported from the ATI exam given to students who participated in the simulation experience and to a control group of students who did not participate. The authors reported that ATI results for some critical thinking areas were higher for the participating group than the control group, while the opposite was true for other areas. From these results, they indicated that no definite conclusions regarding critical thinking and experience with simulation could be drawn from this study (Lewis & Ciak, 2011). The authors concluded that HFS use as an educational strategy leads to student satisfaction, and self-confidence, and improvement in knowledge (Lewis & Ciak, 2011).

Alfes (2011) conducted a quasi-experimental study to compare the effectiveness of two learning methods (simulation and traditional laboratory demonstration method) on nursing students’ self-confidence and satisfaction with learning methods among beginning nursing students. The convenience sample for this study was drawn from a baccalaureate nursing program. The only inclusion criterion was being a first semester nursing student enrolled in a
foundations course \( n = 63 \). Demographic characteristics of the sample included gender with 82.5% female and 17.5% male, and race with 76.2% white/7.9% African-American/12.7% Asian/3.2% Latino. Age ranged from 18-27 years. Students were assigned to one of two groups. The control group \( n = 34 \) received traditional demonstration, and the experimental group \( n = 29 \) included the simulation experience (Alfes, 2011).

The study is based in the conceptual framework of Kolb’s Experiential Learning Theory. Kolb advocates a variety of learning experiences in a variety of settings. Kolb’s theory supports Alfes’ study of the effectiveness of simulation experiences as a learning strategy for nursing students.

Three research questions were posed:

1. When learning comfort care measures, is there a difference in satisfaction with learning between students in a traditional lab and students participating in a simulator experience?

2. Is there a relationship between self-confidence and satisfaction with learning after traditional lab or simulator experiences?

3. Is there a change in self-confidence of students following either traditional or simulation learning experiences? (Alfes, 2011, p. 89-90).

Self-confidence and satisfaction with learning were measured using the National League for Nursing’s Student Satisfaction and Self-Confidence in Learning questionnaire (2005). This instrument was administered as a pretest and posttest. All items were rated with a 1 - 5 Likert-type scale. It included subscales of satisfaction with current learning and self-confidence in learning. Reliability was reported with a Cronbach’s alpha coefficient of .94 for the satisfaction with learning subscale, and .87 for the self-confidence in learning subscale (Alfes, 2011).
Findings indicated students who participated in the experimental group (simulation) were more self-confident [$t(61) = -2.00, p = .05 (M = 32.48, SD = 3.83)$] than students in the control group ($M = 30.74, SD = 3.10$). There was a positive correlation between satisfaction with learning and self-confidence ($r = .70, p < .01$). Change occurred in the level of confidence of students using both traditional and simulation laboratory experiences. Students in the traditional lab group were significantly more confident after the experience [$t(33) = 3.70, p < .01 (M = 3.15, SD = 0.74)$] than before the experience ($M = 2.65, SD = 0.74$). Students in the simulation group were also more confident [$t(28) = 3.29, p < .01$] after the experience ($M = 3.76, SD = 0.83$) than before ($M = 3.14, SD = 1.22$). Results indicated a statistically significant increase in self-confidence after instruction using both the traditional and simulation laboratory experiences.

Results indicated no significant difference [$t(61) = 1.92, p > .05$] in the satisfaction with learning between the experimental group ($M = 20.83, SD = 3.38$) and the control group ($M = 19.44, SD = 2.34$). Both groups reported higher satisfaction following the different learning experiences (Alfes, 2011).

Alfes (2011) concluded that self-confidence is enhanced with the use of simulation in nursing education. Students more satisfied with learning are more confident. The results of this study support simulator use in nursing education as an effective teaching strategy.

Historically, educational strategy in nursing education has included a variety of simulation experiences. Smith and Roehrs (2009) conducted a descriptive study to examine two outcomes, student satisfaction and self-confidence, in relation to HFS use in nursing education.

Jeffries’ nursing simulation framework was used in the design, implementation, and evaluation of simulation in this study. The framework has five major components: student demographics, teacher factors, simulation design characteristics, educational practices, and
outcomes. Each component is associated with one or more variables. In Jeffries’ framework, variables in the outcome component include learner satisfaction, self-confidence, knowledge, skill performance, and critical thinking. Smith and Roehrs (2009) examined learner satisfaction and self-confidence, both outcome variables in the framework. The study also examined the correlation between two other major components of the framework: student demographics and simulation design characteristics.

The authors posed five research questions:

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

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

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

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

5. Is there a difference in demographic characteristics of BSN nursing students and reports of satisfaction and self-confidence after an HFS experience? (Smith & Roehrs, 2009, p. 75).

The target population was nursing students enrolled in a BSN program in the western part of the United States. Enrollment in the first medical/surgical course in the program was the only inclusion criterion. The convenience sample of 68 students was drawn from possible 72 students enrolled in the class. Ninety percent were female, with an average age of 23.4 years (SD = 5.4).
Sixty-nine percent had no prior experience in a health care setting (Smith & Roehrs, 2009).

Smith and Roehrs (2009) used three instruments. The National League for Nursing (NLN) developed two of the instruments, the Student Satisfaction and Self-Confidence in Learning Scale and the Simulation Design Scale (SDS). The Student Satisfaction and Self-Confidence in Learning Scale includes 13 items (including two subscales) and is self-reported by participants using 5-point Likert scales (1 = strongly disagree to 5 = strongly agree). The satisfaction subscale has a reported Cronbach’s alpha of .94, and the self-confidence subscale has a reported Cronbach’s alpha of .87. The Simulation Design Scale (SDS) is a self-report using a 5-point Likert scale. It includes 20 items including subscales (objectives, support, problem-solving, feedback, and fidelity) with a reported Cronbach’s alpha of .92. Both instruments were reviewed by nursing experts for content validity. They were administered as a posttest following an HFS experience. In addition, the researchers designed a demographic instrument. This was used to describe the sample and to examine possible correlation of participants’ demographics to satisfaction and self-confidence (Smith & Roehrs, 2009).

Findings were associated with each research question. Research question 1: With an overall mean score $M = 4.5$ ($SD = 0.5$) on the student satisfaction subscale of the first NLN instrument, the findings suggested that students were very satisfied with HFS use as a teaching method. There was no significant difference between students with or without previous experience with this kind of patient. Research question 2: $M = 4.2$ ($SD = 0.4$) for the self-confidence subscale of the NLN instrument. This suggested that students felt confident in clinical abilities after the HFS experience. There was no significant difference in self-confidence based on prior experience. Research question 3: The SDS scores on all of the subscales indicated positive feelings about all five variables in the simulation design characteristics. Research
question 4: There were no significant correlations found between simulation design characteristics and satisfaction and self-confidence together. Further analysis revealed that objectives, a variable in the simulation design characteristic category, alone significantly contributed to satisfaction (p < .01). Problem solving, another variable in the simulation design characteristic category, was found to alone significantly contribute to self-confidence (p < .01).

Research question 5: No significant correlations were found between demographic characteristics and satisfaction or self-confidence (Smith & Roehrs, 2009).

Smith and Roehrs (2009) concluded that use of HFS can increase student satisfaction and confidence. Simulation design characteristics affect satisfaction and self-confidence. Appropriate planning and implementation of HFS use in nursing education leads to positive learning outcomes.

Traynor et al. (2010) conducted a descriptive study to explore students’ experiences and outcomes using HFS in a clinical laboratory setting. The study took place at Queens University in Belfast. The population included all nursing students in the final clinical placement (n = 156). The only inclusion criterion was enrollment in the final clinical placement. The convenience sample included 90 students (58%) who volunteered to be part of the study (Traynor et al., 2010).

Concepts considered in this study were organizational skills, clinical skills, diagnostic skills, confidence, and value of HFS as a learning experience. A 20-item questionnaire was developed by the researchers to measure the value of the HFS scenarios in development of organizational skills, clinical skills, diagnostic skills, confidence, and usefulness as a learning experience. Reliability and validity of the instrument were not reported. The questionnaire was administered to each student following each of three HFS scenario experience. A five point
Likert scale was used to measure each response (1 = strongly agree to 5 = strongly disagree). In addition, qualitative data were collected using one additional open-ended question asking students for comments about the HFS experience.

Seventy-seven students (85.6%) agreed that the HFS experience helped develop organizational skills. Eighty-seven students (96.7%) agreed that the HFS experiences facilitated skill development. Eighty-seven students (96.7%) agreed that the HFS scenarios were a safe and useful way to test diagnostic skills. Seventy-three students (81%) agreed that the HFS experience increased confidence. All except one student (98.9%) agreed that the HFS scenarios were valuable learning experiences (Traynor et al., 2010).

The authors analyzed qualitative data obtained from the open-ended question. Five themes emerged from the HFS experience as described in the students’ comments: realistic nature of the HFS, benefits from active learning, opportunity to experience autonomy as a practitioner, importance of theory in practice, and benefits of the safe environment of HFS experience. Students who participated in the HFS scenarios in this study believed they benefitted from the experience (Traynor et al., 2010).

Traynor et al. (2010) concluded that HFS use with nursing students creates realistic learning environments. Simulations are beneficial to students and are a valuable way to help students develop confidence and proficiency in clinical education.

In response to previously described educational challenges, nurse educators incorporate simulation in clinical training. Studies have described positive outcomes associated with simulation use in nursing education. However, studies comparing knowledge outcomes of traditional and simulator clinical experiences are limited. Schlairet and Pollock (2010) conducted a study using a quasi-experimental design to compare the knowledge outcomes of traditional
clinical experience and simulation clinical experience, and the difference in the outcomes based on the order of the clinical experiences (traditional then simulation, or simulation then traditional).

The authors hypothesized that HFS use is as effective as traditional clinical experiences in teaching basic nursing care concepts, and that instruction including simulated clinical experience followed by traditional experience is as effective in teaching nursing care concepts as the reversed order of instruction. Literature supports educational best practices, including use of HFS as part of various pedagogic methods to promote knowledge acquisition in nursing education (Schlairet & Pollock, 2010).

The population for this study included nursing students enrolled in a fundamentals nursing course for two consecutive semesters ($n = 74$). The convenience sample included all 74 students who volunteered to participate in the study. Random assignment was done to one of the different groups (simulation followed by traditional clinical experience, or traditional followed by simulation clinical experience). The ages ranged from 18-44 years of age, 86% were women, 68% were Caucasian, and 88% were traditional students. Three of the participants’ results were excluded related to incomplete data or extreme scores (Schlairet & Pollock, 2010).

The researchers created a scale to measure knowledge that consisted of 25 multiple choice questions chosen from an NCLEX-RN study book. The researchers used the scale as a pretest, posttest 1 (with first clinical experience being simulation or traditional), and posttest 2 (given after second clinical experience, simulation or traditional). Reliability was reported as internal consistency coefficients (KR-20) and was reported as being in an acceptable range across test administrations although the actual statistic was not provided (Schlairet & Pollock, 2010).
Significant knowledge gain between pretest, posttest 1, and posttest 2 was found using the t-test: from pretest \((M = 60.05, SD = 9.30)\) to posttest 1 \((M = 62.68, SD = 8.54, t = -2.48, p = .015, df = 70)\); from posttest 1 \((M = 62.68, SD = 8.54)\) to posttest 2 \((M = 64.78, SD = 9.35, t = -2.24, p = .028, df = 70)\) and pretest \((M = 60.11, SD = 9.32)\) to posttest 2 \((M = 64.61, SD = 9.39, t = -3.54, p = .001, df = 69)\). The observed difference between the two clinical groups as a single intervention on the posttest 1 knowledge score was 0.49, within the 95% confidence interval of -3.58 to 4.56. This analysis revealed that there was no significant difference in knowledge gain at posttest 1 between groups (one having simulation first and one having traditional clinical experience first). Examining the sequence of intervention between the two groups, the difference between the groups for the posttest 2 knowledge scores was -0.33, within the 95% confidence interval of -4.77 to 4.11, indicating no significant difference in the posttest 2 scores between the two groups who had opposite order of simulation and traditional clinical experiences. These findings support both hypotheses (Schlairet & Pollock, 2010).

Schlairet and Pollock (2010) concluded that positive learning outcomes occur with utilization of simulation in nursing education. HFS use is as effective as traditional clinical experiences in teaching basic nursing care concepts. Instruction including simulated clinical experience followed by traditional experience is as effective in teaching nursing care concepts as the reversed order of instruction.

Nursing students need experiences to prepare for care of patients in real clinical settings. Simulation use in nursing education is one educational method that provides opportunities for experiential learning and repetitive practice in a safe environment. Bambini et al. (2009) conducted a study to examine learning outcomes of simulation use in nursing education.

Bambini et al. (2009) used Bandura’s theory of self-efficacy as a framework to examine
simulation use as an educational modality. Self-efficacy is an indicator for the level of preparation for successful accomplishments. In nursing, perceptions of self-efficacy can translate into success in practice. The purpose of this study was to examine the use of simulated clinical experiences in nursing education and its effect on students’ self-efficacy, and to explore the students’ perceptions of the simulation experience. The authors identified 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 level of confidence in their clinical skills? (Bambini et al., 2009 p.79)

The authors used an integrated, quasi-experimental repeated measures design in the study. A convenience sample was drawn from baccalaureate nursing students in the first semester of a maternal-infant clinical course. The study took place over 4 semesters and included 112 students who completed the pretest and posttest before and after a required simulation experience in the course. The mean age of the students was 24.85 years. Fifty-seven percent had previous experience working in health care (Bambini et al., 2009).

Three instruments were used to evaluate self-efficacy related to obstetric nursing care. They were administered as a pretest (before the simulation experience), posttest (after the simulation experience) and as a follow up survey. Each consisted of six questions related to individual skills associated with a postpartum exam using a rating scale to measure self-efficacy, with 1 (not at all confident) to 10 (very confident). In addition to the six questions, the posttest and follow up surveys included three open-ended questions. These instruments were developed
for this study by the researchers. Reliability was established by internal consistency (Cronbach’s alpha of the pretest = .817, posttest = .858). Obstetric nursing and education faculty determined content validity (Bambini et al., 2009).

Quantitative data analysis of the pretest and posttest scores was conducted to determine self-efficacy as reported by the participants. The six individual skill items on the survey were analyzed with resulting significant increase in confidence measured for each item: assessing vital signs ($p < .01$), breasts ($p < .01$), fundus ($p < .001$), lochia ($p < .001$) and in providing patient education ($p < .001$). Using a t-test analysis, the authors compared the summation self-efficacy scores for the means of the pretest and posttest. Results indicate a significant increase in reported self-confidence following the simulation exercises ($p < .01$). The authors reported that demographic variables (age, previous work experience) did not affect results, although no statistics were provided. Only 20 of the 112 participants completed the follow up survey. Because of the poor response to that portion of data collection, the authors eliminated data analysis of the follow-up survey (Bambini et al., 2009).

Qualitative data analysis was conducted by adapting Glaser and Strauss’ constant comparison method. The researchers separately reviewed the participants’ answers to the open ended questions in the posttest, and identified conceptual categories. They worked together to identify three themes of learning that resulted from the clinical simulation experience: communication, confidence, and clinical judgment (Bambini et al., 2009).

Bambini et al. (2009) concluded that simulation leads to increased self-efficacy in clinical performance. In accordance with Bandura’s theory, increased self-efficacy translates into success in practice. Simulation use is an effective method in nursing education that can facilitate students’ development in the care of patients (Bambini et al., 2009).
Partin et al. (2011) conducted a phenomenological study to describe nursing students’ perceptions of learning experiences using HFS in education related to obstetrics. The framework for the study was Benner’s novice-to-expert model by incorporating concepts of the continuum of skill and knowledge acquisition into the simulations. The primary research question asked was if the integration of HFS use in clinical nursing education enhances students’ satisfaction with learning. (Partin et al., 2011).

The convenience sample was drawn from the target population of 60 students enrolled in a maternal-child course in an Associates of Science in Nursing (ASN) program. Students were in two of four clinical groups associated with the course. All students had HFS experiences as part of clinical rotations in addition to experience in a hospital with real patients in the fall and spring in the second year of the program. The sample of volunteer participants included 49 students who completed the audiotaping part of the study. (Partin et al., 2011).

The participants were asked to record descriptions of the experience of participating in the simulation portion of clinical rotations. The guiding question was “whether the integration of experiential learning and acute observation in a simulated clinical learning experience enhances student satisfaction with conceptual learning” (Partin, et al., 2011, p. 186). Students were asked to include any relevant descriptive information, positive or negative. Each student was given an audio recorder and a private space to record comments. The students’ responses were transcribed by the instructors for analysis. All audiotapes were reviewed by the authors to get a general sense of the responses. The verbatim transcripts were then analyzed using Colaizzi’s method to identify common perceptions and themes in the responses (Partin et al., 2011).

Three main themes emerged from the analyzed data.

1. Non-threatening environment: Students reported decreased anxiety and increased
confidence by learning in the simulation environment.

2. Enhancement of learning: The atmosphere in the simulation environment promoted critical thinking by allowing a slow pace, opportunity for repetition, and faculty presence to answer questions.

3. Feeling prepared for practice: Students appreciated interactive learning in the simulation environment to feel better prepared for caring for real patients (Partin et al., 2011).

In addition to the three main themes identified, Partin et al. (2011) described the overwhelmingly positive responses to the simulation learning experiences. Other than some reported dissatisfaction with clinical group size larger than six students, there were no reported negative comments about the simulation clinical experience. Integration of simulator use in clinical nursing education was found to enhance students’ satisfaction with learning.

Partin et al. (2011) concluded that HFS use is a valuable part of clinical nursing education. Increase in confidence, enhanced learning, and a sense of increased preparation contribute to high satisfaction with HFS use in nursing education. The findings support the belief that simulation experience provides a safe environment to practice, helps facilitate learning, and prepares students for clinical practice.

Students are facing an increasingly complex environment in which to learn. Clinical practice opportunities with patients may not provide a full range of experiences for development of cognitive skills and confidence. Clinical practice may require experiential learning outside the classroom or traditional clinical settings.

Brannan et al. (2008) conducted a study to compare the effectiveness of two teaching methods (traditional classroom lecture and the use of HFS) on cognitive skills and confidence
when instructing junior nursing students about acute myocardial infarction (AMI). The study took place at WellStar College of Health and Human Service, Kennesaw State University. The convenience sample included all \((n = 107)\) junior level students in the baccalaureate nursing program; 53 were enrolled in the fall semester of the adult heath course (Group 1-traditional lecture group), and 54 were in the same course in the spring (Group 2-HFS group). The only criterion for participation in the study was enrollment in the adult health nursing course at WellStar College as a matriculated nursing student in one of the semesters that the study took place. This study is based in the conceptual framework of Kolb’s experiential learning theory, which supports experiential learning as a way for nursing students to assimilate and apply concepts in patient care settings (Brannan et al., 2008).

Brannan et al. (2008) posed the research question: Are there differences in acquisition of cognitive skills and confidence levels of nursing students that varies with two teaching methods, one group using traditional classroom lecture and the other group using HFS? The researchers hypothesized that instruction with HFS would be more effective than classroom lecture in the acquisition of both cognitive skills and confidence.

Three instruments were used in this study. Brannan et al. (2008) developed the Acute Myocardial Infarction Questionnaire (AMIQ) Cognitive Skills test. Form A was used with Group 1, and form B was used with Group 2. This instrument, composed of 20 multiple-choice items, measured levels of cognitive skills related to nursing care of patients with AMI. Two experienced educators with expertise in care of patients with AMI’s agreed on the categorization and confirmed the content validity of the instrument in both forms. A pilot test was used to assess reliability of the two forms. Pearson r correlation efficient was used to correlate items of the instrument \((r = .59)\). In addition, internal consistency was confirmed with a Spearman-Brown
reliability coefficient of .74. This questionnaire was given as a pretest and posttest.

The authors also used a Confidence Level tool (CL) that was adapted from a CL tool developed by Madorin and Iwasiw for use with nursing students in a different content area. This adapted questionnaire measured the students’ self-reported confidence related to the nursing process. This tool had 34 items comprised of four subscales based on the nursing process. A Likert scale ranging from 1 (lacking confidence) to 4 (very confident) measured confidence. The original tool had a reported reliability coefficient of .89. This questionnaire was also given as a pretest and posttest. The third instrument was a demographic data form that included ethnicity, gender, age prior nursing experience (general and cardiac), and grade in first nursing course (Brannan et al., 2008).

The findings were reported as pretest and posttest scores for both groups and were compared using a t-test. Hypothesis 1 was supported by the findings from the AMIQ posttest; the HFS group scored significantly higher than the lecture group. \( t = 2.0, p = .05 \) indicating that the HFS method of instruction was more effective than traditional lecture method in the acquisition of cognitive skills related to nursing care of a patient with AMI. Hypothesis 2 was not supported; the findings from the CL test indicated significant increase in confidence levels of the students before and after instruction by both methods (HFS vs. lecture, \( t = -1.74, df = 81, p = .09 \)), but the differences in gain of confidence were not significant between the two groups (Brannan et al., 2008).

Brannan et al. (2008) concluded that teaching strategies with nursing students involving active engagement with HFS may be more useful than the traditional lecture environment for acquiring cognitive skills for complex content. Confidence levels increased by using both teaching strategies, but were not enhanced by use of HFS.
Summary of Literature

The literature review summarizes studies evaluating learning outcomes associated with HFS use in nursing education. The selected studies had a focus on confidence and cognitive skills, and also included satisfaction, critical thinking, and students’ phenomenological perceptions of HFS use in the clinical setting. The studies revealed significant findings regarding HFS use in nursing education.

The stated problems for all of the studies included statements regarding the changing nature of clinical nursing education. Limited available clinical settings, in combination with changes in patient admission patterns and a nursing educator shortage, create a challenge for nurse educators to provide meaningful experiential opportunities. Traditional clinical settings are no longer the only teaching strategies utilized. To provide pertinent HFS experiences in clinical nursing education, it is important for educators to understand associated learning outcomes.

While several studies did not identify a specific framework, others studies identified four different theoretical frameworks. Benner’s novice to expert theory was used by Partin, et al. (2011); Bandura’s theory of self-efficacy was used by Bambini et al. (2009). Jeffries nursing simulation framework grounded Smith and Roehrs’ (2009) study. The studies conducted by Alfes (2011) and Brannan et al. (2008) identified Kolb’s experiential learning theory as the foundation for their research.

Convenience samples of nursing students enrolled in a particular course were used in all of the selected studies. Some studies used participants from a course offered in one term; other studies used participants from the same course in more than one term. Sample size ranged from $n = 49$ to $n = 112$. Samples included different levels of students in bachelors degree programs, one associates of science degree program, and one diploma program in nursing. While using
convenience samples is a limitation in a study, it is a practical and typical sample type used in nursing research.

Study designs varied in the selected literature. The highest level of research most commonly used in these studies was quasi-experimental design. In each of these studies, groups were not randomly assigned, a typical limitation in nursing research. One study used an integrated quasi-experimental design with repeated measures that had an additional qualitative component in the form of an open-ended question. Lower levels of evidence came from one study that used descriptive design with an additional qualitative component of an open-ended question, and another that used descriptive correlational design. Finally, one study used a qualitative approach with a phenomenological design.

Different tools were used to measure variables in the selected studies. Most of the studies incorporated more than one tool for measurement of different variables. Five of the studies incorporated tools that were created or adapted by the researchers to use in their studies, some without reported reliability or validity. Two studies utilized tools to collect basic demographic data. One study used an Assessment Technologies Institute test to measure critical thinking. One study used the National League for Nursing’s (NLN’s) simulation design scale. The only tool that was used in more than one study was NLN’s student satisfaction in learning and self-confidence in learning scale, with established reliabilities.

Data analysis using t-test comparisons led to findings in quasi-experimental components of the studies. Qualitative findings came from identification of themes of responses to open ended questions. Simple descriptions of findings with correlational data lead to findings in the descriptive components of the studies.

Findings from these studies include increased knowledge, increase confidence, and
satisfaction associated with HFS in clinical education. While most researchers found that HFS use led to significantly higher degrees of knowledge gain, confidence, and satisfaction compared to traditional teaching methods, others found the benefits to be similar with HFS use and traditional teaching methods. One study found a high level of satisfaction with HFS use, but it was no different than satisfaction with traditional methods. One study found that knowledge was gained with HFS use, but not significantly different than traditional methods. Another study found an increase in confidence with HFS use, but not significantly different from traditional teaching methods. Although this literature search did not focus on critical thinking, this limited literature review did not reveal clear findings related to critical thinking and HFS use.

The authors of the studies summarized in this literature review concluded that HFS is an effective educational method for clinical education in nursing. HFS use can lead to improvements in learning outcomes of student satisfaction, self-confidence and knowledge gain. Recommendations for further research include further evaluation of HFS use, including comparison to traditional methods, related to critical thinking, satisfaction, self-confidence, and knowledge gain. This includes evaluation of the translation of learning outcomes measured in the laboratory setting to real patient care settings. This may be achieved by replication of current studies, incorporating random assignment to groups, and by adding an additional measure of variables in a real-patient setting following HFS use in a laboratory setting.
Chapter III

Methodology

Introduction

In changing educational and health care settings, nurse educators are challenged to use teaching strategies that provide students with learning experiences that lead to positive outcomes. Increased confidence and cognitive skills are two learning outcomes associated with teaching strategies. Traditional clinical practice and lecture settings may not provide a full range of opportunities for students to develop confidence and cognitive skills. Use of high fidelity simulators (HFS) in nursing education is one way to provide experiential learning outside of traditional strategies. The purpose of this study is to compare learning outcomes of confidence and cognitive skills related to two different teaching methods, traditional classroom lecture and use of HFS in a clinical setting. This study is a replication of Brannan et al.’s (2008) study.

Research Questions

1. Is there a difference in acquisition of confidence of nursing students using two different educational strategies, traditional classroom lecture and use of HFS in a clinical laboratory?

2. Is there a difference in acquisition of cognitive skills of nursing students using two different educational strategies, traditional classroom lecture and use of HFS in a clinical laboratory?

Setting, Population, and Sample

To replicate the Brannan et al. (2008) study, this study will take place in a baccalaureate nursing program. The population for this study will be all nursing students enrolled in the nursing program at Ball State University. The anticipated convenience sample of 80-100 students will be drawn from this population of students taking the adult health course that covers
acute myocardial infarction. The only inclusion criterion for participation in the study is enrollment in this adult health course, in either fall or spring of the academic year in which the study will take place.

Protection of Human Subjects

This study will be submitted to Ball State University’s Institutional Review Board (IRB) for approval prior to conducting any research. Once approval is obtained, a description of the study will be given to all junior level students and they will be offered the opportunity to participate. Contact information of the researcher will be included in the study information. Participation will be voluntary and will have no influence on academic evaluation. All data will be coded to assure confidentiality. Participants may withdraw anytime during the study. There are no risks identified with participation. Benefits for all participants include making a contribution to the nursing profession in the quest for understanding the impact of HFS use on learning outcomes. Benefits for the students in the simulation group include experiential learning that may not be available in traditional clinical rotations.

Procedures

Following approval from the director of the school of nursing and the IRB, the researcher will coordinate with the instructor of the adult health class to meet with students during class time to describe the study, allow time for questions and answers, and invite students to participate. The researcher will make a plan with the instructor to distribute consent forms, and then collect completed forms. The study will be incorporated into the course and all students in the two semesters of the study will experience either the traditional lecture or the HFS experience as part of the course content. Participation in the study will include demographic data collection and pretests and posttests related to learning outcomes associated with traditional
lecture or use of HFS. Volunteer participants will fill out and return consent forms. The first semester of students will include the convenience sample in the group experiencing the traditional lecture related to care of a patient with an acute myocardial infarction (AMI). The second semester of students will include the convenience sample of students experiencing the educational strategy using HFS related to care of a patient with an AMI. Participating students may opt out of the study at any time.

Instrumentation

Three instruments will be used in this study. The first will be the Acute Myocardial Infarction Questionnaire: Cognitive Skills test (AMIQ) in two forms developed by Brannan et al. (2008). Form A will be used with the first semester of students in the traditional lecture group. Form B will be used with the second semester of students in the HFS group. This instrument will be used to measure levels of cognitive skills related to nursing care of patients with AMI. It has 20 multiple-choice items, and will be given as a pretest and again as a posttest following tradition classroom lecture on nursing care related to AMI. The reliability of the parallel forms was assessed using Pearson r correlation coefficient in a pilot test (r = .59, p = .02). Internal consistency was determined using the split-half method to assess agreement between the two forms (Spearman-Brown reliability coefficient = .74). Content validity of this tool was confirmed by two experienced educators with expertise in care of patients with AMI (Brannan et al., 2008).

Self-reported student confidence will be measured using the Confidence Level (CL) tool, adapted by Brannan et al. (2008) from a tool originally developed by Madorin and Ieasiw for use with nursing students in a different content area. The CL tool has 34 items comprised of four subscales based on the nursing process and uses a Likert scale ranging from 1 (lacking confidence) to 4 (very confident). Brannan et al. (2008) reported a reliability coefficient for the
original tool of .89. No validity was reported. Internal consistency of the adapted tool reportedly ranges from a Cronbach’s alpha of .95 to .97 for pretesting and posttesting across both groups. This tool will be used with both groups as a pretest and again as a posttest following either traditional classroom lecture or use of HFS related to nursing care of a patient with AMI. The third instrument used will be a demographic form indicating characteristics of the students including gender, age, ethnicity, and prior nursing experience.

**Design**

A quasi-experimental pretest and posttest comparison group design will be used for this study. An anticipated limitation will be the lack of random assignment to the two groups studied (traditional lecture and use of HFS). While this limitation is acknowledged, the structure of the nursing courses and the available participants makes it impractical to randomly assign students to the different groups.

**Data Analysis**

Descriptive statistics will be used to describe demographic characteristics of the sample. Using paired samples *t*-tests, pretest scores will be compared to posttest scores to determine if different instructional methods (traditional lecture or use of HFS) are significant in development of cognitive skills and self-reported confidence in relation to nursing care of patients with AMI. Multiple linear regression will be used to determine whether participation in the HFS group alone improves outcome scores. Significance level for data analysis will be set at .05.

**Summary**

This study will be conducted to evaluate the significance of two teaching strategies (traditional lecture and use of HFS) on nursing students’ confidence and cognitive skills related to the care of a patient with AMI. A quasi-experimental pretest and posttest comparison group
design will be used with students enrolled in an adult health course in a baccalaureate nursing program. Data will be collected using Brannan et al. (2008) Acute Myocardial Infarction Questionnaire: Cognitive Skills test and Brannan et al. (2008) adaptation of Madorin and Iwasiw’s Confidence Level test. Paired sample t-tests and multiple linear regression will be used to analyze the data. This research study will be a replication of Brannan et al. (2008) study. Results from this study will add to current evidence for the use of HFS compared with traditional classroom lecture. The results will also assist nursing educators as they plan educational strategies to benefit students in their programs.
References


