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Impact of debriefing sessions following viewing of recorded high fidelity simulation scenarios on knowledge acquisition, self-confidence, and satisfaction: a quasi-experimental study

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THE IMPACT OF DEBRIEFING SESSIONS FOLLOWING VIEWING OF RECORDED HIGH FIDELITY SIMULATION SCENARIOS ON KNOWLEDGE ACQUISITION, SELF-CONFIDENCE, AND SATISFACTION: A QUASI-EXPERIMENTAL STUDY

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ABSTRACT

Zulkosky, Kristen D. *The Impact of Debriefing Sessions Following Viewing of Pre-Recorded High Fidelity Simulation Scenarios on Knowledge Acquisition, Self-Confidence and Satisfaction: A Quasi-Experimental Study.* Published Doctor of Philosophy dissertation, University of Northern Colorado, 2010.

The role of the nurse educator is complex and it is imperative that educators design pertinent learning activities including implementation of innovative teaching strategies while using the latest pedagogical techniques, and evaluating that learning occurred. This study utilized a quantitative, quasi-experimental, comparison group, crossover design and compared teaching strategies using simulation in the classroom. The purpose of the study was to determine if fourth semester Associate of Science in Nursing students who participated in debriefing sessions after watching recorded high-fidelity simulation scenarios in a nursing class obtained higher examination scores than those who received the same content through traditional lecture format with case studies. The participants also reported their satisfaction with the teaching methods used in the classroom and their feelings of self-confidence in learning the new material. The study sample included 63 participants in two different groups for the first portion of the study and 50 participants for the second portion. After analyzing the descriptive data, there were no significant differences identified between the two study groups. Each of the three hypotheses was tested on two different occasions through the crossover design of the study. Results revealed a significant higher cardiac examination score for the group of participants who received the lecture and case studies for the cardiac content. However, there were no significant differences on the exam scores of hypoperfusion content when comparing the two groups. Both groups of participants reported a significantly higher satisfaction and self-confidence score with the lecture and case study teaching strategy. This study utilized an active teaching strategy for a group of participants who were accustomed to a lecture format classroom and they continued to prefer that type of teaching strategy. Perhaps a few changes to the simulation experience would change the students' perceptions. Further research needs to be conducted to assess outcomes with using simulation in the classroom to evaluate its worth to nursing education.

Key words: simulation, knowledge acquisition, satisfaction, self-confidence, teaching strategy, debriefing

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CHAPTER I

INTRODUCTION

Background

Nurse educators are challenged daily to provide quality education to students in the classroom setting as well as in the clinical arena. Many issues stifle the nursing educational process. In the classroom, information transfer suffers because of time limitations and increased numbers of students in a class. In clinical settings, issues such as the shortage of clinical sites and the lack of patients due to shortened hospital stays exist. To ensure that an adequate number of competent nurses will be available to meet future industry needs, educators must utilize innovative means to enhance the teaching and learning process. The purpose of this chapter is to discuss the background surrounding the educators' role of teaching students within an active learning paradigm including the need to design varied learning experiences. In addition, this chapter will discuss the effectiveness of different teaching strategies to help inform educators as to which strategies provide an optimal environment to meet learning outcomes.

Teaching and learning is a complex and dynamic process. The paradigm shift away from the teacher and the teaching process to the learner and the learning process has been taking place for the past few decades. The learning paradigm recognizes that the chief agent in the process is the learner, however, faculty have an important, contributing role in the learning process (Vandeveer, 2009). Faculty are responsible for "creating environments and experiences that bring students to discover and construct knowledge for themselves" (Barr & Tagg, 1995, p. 21). Within this learning paradigm exists the learning environment and learning experiences that are all learner centered and learner controlled. It is a collaborative process in which trust is established between the teacher and the learner (Schaefer & Zygmont, 2003) and where the teacher acts as senior learner and the student as junior learner (Vandeveer). The focus is on the needs of the learner rather than the knowledge to be delivered. The learner is encouraged to ask questions, make inferences, and be creative (Schaefer & Zygmont). In contrast, the teacher-centered paradigm has the faculty as the chief controlling agent who provides instruction with the expectation of transferring knowledge to students (Vandeveer). Typically, the teacher tends to focus on one predominant teaching method and tries to teach too much content in one class period (Schaefer & Zygmont).The student's role is a passive receiver who takes in the information and recalls it for an examination (Vandeveer).

Teaching includes the process of determining objectives, gathering instructional materials, planning the learning activities and then evaluating that learning took place (E. O. Bevis, 1989). However according to Bevis (2000) the role of the teacher needs to change.

> The teacher's main purpose, beyond the minimal activity of ensuring safety, is to provide the climate, structure, and the dialogue that promote praxis. The teacher's role is to design ways to engage the student in the mental processes of analysis of cues until patterns are seen that provide paradigms for practice. Furthermore, the teacher's role is to raise questions that require reading, observation, analysis, and reflection upon patient care (p. 173).

Through critical reflection, the learner is able to challenge assumptions regarding beliefs, values, actions, and decisions, which are important for the development of critical thinking. The steps of critical reflection include recalling experiences, actions taken and decisions made and then thinking about the experience while analyzing, and considering potential changes that could have been made. Through this reflection process, which is also learner-centered, the learner realizes that knowledge is never static and therefore enables the learner to think critically when dealing with difficult situations in unique ways (D. A. Schön, 1987).

For nurse educators it becomes challenging to choose the best way to teach and empower students for learning through a learner-centered environment. Rowles and Russo (2009) acknowledge that teachers need to consider completing several steps when designing various learning experiences. The first step is to decide on the learning outcomes and then consider ways to create a classroom environment that encourages all students to become involved in the content and to participate in the learning experience. The teacher then needs to select a particular teaching strategy that fits with the content and is feasible for the amount of time available, room size, number of students, time and money costs and the learning styles of the students. Next, the teacher needs to consider how much time is needed for the activity and what tools are needed to complete the lesson plan. The tools include instructional media such as a computer as well as the classroom itself. Perhaps the teacher wants the chairs to be organized in a circle and not utilize a podium. During the lesson, the teacher needs to include frequent formative evaluations to assess the students' understanding of the content. Educators also need to find out if the strategy was organized and planned effectively in order to promote student learning. Finally, the teacher needs to plan for closure by providing a summary of the lesson. These are the steps necessary when designing lesson plans (Rowles & Russo).

Technology has provided educators with an arsenal of products to consider when planning a lesson. These tools augment the learning experience and help students become successful with their educational experience. One of the latest additions from the technology sector has been simulation learning. While simulation has been available and utilized for many years by the aviation and nuclear power fields, it is a relatively new training platform in healthcare. Simulators are now used to assist the training of medical and nursing students, as well as anesthesia providers and emergency medical technicians (Haskvitz & Koop, 2004).

A human patient simulator (HPS) is a manikin developed to physiologically model a human being. It exhibits many clinical signs such as heart sounds, lung sounds, pupil dilatation, and palpable pulses. It also permits invasive procedures such as catheterization of the urinary bladder and intravenous cannulation (Haskvitz & Koop, 2004; Multak, Euliano, Gabrielli, & Layon A, 2002). The HPS provides an active learning environment while controlling the clinical situation. It is an attempt to create realistic scenarios while eliminating the risks associated with live patients (Beamson & Wiker, 2005; Wilson, Shepherd, Kelly, & Pitzner, 2004). It is not a replacement for clinical experiences but rather an augmentation to the didactic and clinical component (Spunt, Foster, & Adams, 2004).

Through the implementation of simulation in education, opportunities exist for nurse educators to create an environment focused on learner-centered principles (Jeffries & Rogers, 2007; P. Jeffries, Clochesy, & Hovancsek, 2009). The “role of the nurse educator is not to teach, but to promote learning and provide an environment conducive to learning, to create the teachable moment rather than just waiting for it to happen" (Bastable, 2008, p. 13).

Methods such as case scenarios, simulations of actual clinical situations requiring decision-making skills, role-playing with actors, and critiquing a video of clinical performances are examples of active learning activities. These activities encourage students to make appropriate connections between didactic concepts while also engaging students in the learning process (P. R. Jeffries, 2005). By actively involving the student in the learning process through simulation, it becomes an active learning approach. Through this approach, the educator role shifts from the producer of information to simulation designer, coordinator, and facilitator. Through these changes, the educational paradigm shifts from teacher centered to learner centered (Bastable, 2008). A simulation experience affords students the opportunity to critically analyze their actions, critique the clinical decisions of others and reflect on what they learned (Hovancsek, et al., 2009).

Problem Statement

Many unanswered questions must be addressed to validate the worth of using an HPS in nursing education. The simulator provides students with interactive learning scenarios to apply theoretical concepts and practice skills in a safe and controlled environment. The students are challenged to set appropriate priorities and make correct decisions while utilizing critical thinking skills. The ultimate goal for the students is to gain knowledge and confidence in the simulated setting in order to apply the experience to the clinical setting while caring for actual patients. Although use of an HPS in nursing education is in its infancy, it appears to offer a promising opportunity to augment the nurse education process (Alinier, Hunt, Gordon, & Harwood, 2006; Beamson & Wiker, 2005; P. Jeffries & Rizzolo, 2006; Lasater, 2007; Steadman, et al., 2006). However, there is a paucity of nursing research that documents the effects of using an HPS in the classroom setting (Kardong-Edgren, Lungstrum, & Bendel, 2009; Rush, Dyches, Waldrop, & Davis, 2008).

Purpose of Study

The purpose of this study was to determine if fourth semester Associate of Science in Nursing (ASN) students who participated in a structured debriefing session after watching recorded high-fidelity simulation scenarios in a nursing class (a) obtained higher test scores than those who received traditional lecture format with case studies and (b) were more satisfied and confident with the in-class teaching strategy than those who complete pencil and paper case studies. The study compared student outcomes on: (a) multiple choice test questions and (b) satisfaction and self-confidence through the use of the Student Satisfaction and Self-Confidence in Learning Scale.

Research Questions and Hypotheses

Q1 Is there a difference in mean test scores of ASN students who watch recorded high fidelity simulation with debriefing compared to ASN students who receive the same content through traditional classroom lecture format using PowerPoint and case studies?

H1: There will be no differences in mean test scores on the multiple-choice examination between ASN students who watch recorded high fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led traditional lecture format and case studies in the classroom.

Q2: Is there a difference in satisfaction scores of ASN student who watch recorded high fidelity simulation with debriefing compared to ASN students who receive the same content through traditional classroom lecture format using PowerPoint and case studies?

H2: There will be no differences in mean scores on the Student Satisfaction scores between ASN students who watch recorded high-fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led, traditional lecture format and case studies in the classroom.

Q3: Is there a difference in Self-Confidence with Learning scores of ASN student who watch recorded high fidelity simulation with debriefing compared to ASN students who receive the same content through traditional classroom lecture format using PowerPoint and case studies?

H3: There will be no differences in mean scores on the Self-Confidence with Learning Scale between ASN students who watch recorded high-fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led, traditional lecture format and case studies in the classroom.

Theoretical and Operational Definitions

Associate Degree of Science in Nursing(ASN) is an academic degree that is conferred by a two-year college after the prescribed course of study in nursing has been successfully completed (Answers Corporation, 2009). Students in this research study were enrolled in their last nursing didactic course in an ASN program.

Teaching Strategies refers to the activities that teachers use when teaching students. Teachers select instructional activities that are congruent to the learning objectives for the class (Scheckel, 2009). Examples of teaching strategies include lecture, algorithms, debate, case study, demonstration, games, dialogue, concept mapping, reflection, role play and simulation (Rowles & Russo, 2009). The teaching strategies used in this study included lecture, reflection, and simulation activities.

Traditional lecture is a teaching strategy that a teacher uses to present content verbally with or without the addition of visual aids or handouts. It is time efficient to use when covering complex concepts (Rowles & Russo, 2009). In this study, the teacher utilized this format of presenting content to the students with the use of PowerPoint handouts.

Case Studies are an "in-depth analysis of a real life situation as a way to illustrate class content. It applies didactic content and theory to real life, simulated life or both" (Rowles & Russo, 2009, p. 247). In this study, the teacher incorporated case studies into the traditional lecture during class as a teaching strategy.

Simulation is defined as the "act of pretending, imitation or the representation of the behavior or characteristics of one system through the use of another system such as a computer program" (Encyclopedia Britannica Inc., 2009). For this study, simulation was used as a teaching strategy.

Written tests are methods for assessing learning outcomes. There are a variety of items that can be contained in written tests such as true-false, matching, short-answer, and multiple-choice items. Multiple choice items contain two parts: "the stem which is either a question or an incomplete statement and the distracters which are the options from which to select the correct answer" (Twigg, 2009, p. 437). Nursing students who successfully complete their nursing program need to take a standardized test known as the NCLEX-RN examination to apply for a license to practice as a Registered Nurse. The majority of the NCLEX-RN examination consists of multiple-choice items. In this study, students will complete 26 multiple-choice items at a scheduled time. Nursing faculty developed the multiple choice test questions used in this study based on Bloom's taxonomy of educational objectives.

Simulator is a tool used to create an interactive clinical scenario through the use of computer programs (Rothgeb, 2008).

Human patient simulator is a manikin developed to physiologically model a human being. It exhibits many clinical signs such as heart sounds, lung sounds, pupil dilatation, and palpable pulses (Haskvitz & Koop, 2004; Multak, et al., 2002).

Fidelity refers to the level in which a simulation mimics reality. There are three levels of fidelity: high moderate, and low (Jeffries & Rogers, 2007). High fidelity is the most sophisticated, computerized mannequin that can mimic functions such as reactive pupils, realistic airway, chest excursion, pulses, bowel sounds and realistic skin (Medical Education Technologies, 2009; Nehring, Lashley, & Ellis, 2002; Rothgeb, 2008; Schoening, Sittner, & Todd, 2006). In moderate fidelity, “the chest looks real, and breath sounds can be heard but the chest does not rise and fall (Jeffries & Rogers, 2007, p. 28). A low fidelity simulator is “a mannequin that does not contain any extra features such as breath and heart sounds” (Jeffries & Rogers, p. 28). In this study, a high fidelity simulator was used to record the scenario that was viewed in the classroom.

High fidelity simulation scenario is a replication of an event using a high-fidelity simulator as a teaching strategy. In this study, various patient scenarios encompassing cardiac and hypoperfusion content were designed. Due to the acuity of the patient situations, a high-fidelity simulator was used to mimic reality. The study included four recorded cardiac scenarios and four hypoperfusion scenarios. The scenarios included a description of the patient including a chief complaint. Diagnostic results were reported. A faculty actor completed an assessment of the patient while implementing appropriate nursing inventions. Debriefing was integrated at various points of the scenario. The scenarios were recorded using nursing faculty as the actors and then played during class.

Duration of the simulation scenario lasted no more than 15 minutes. The rest of the 50-minute class was used for debriefing.

Debriefing/guided reflection is a method used to elicit feedback from learners after participating in an experiential exercise. It gives the learner the opportunity to assess what transpired, what decisions were made, and the outcome of those events. It should occur during or immediately after the experience. Debriefing is used in simulation experiences and the session is led by a facilitator (Jeffries & Rogers, 2007; P. Jeffries, et al., 2009). In this study, the debriefing process occurred at scheduled times both during and after the learners watch the recorded simulation scenario. A debriefing guide with planned questions based on the learning objectives was used during the debriefing session. The learners received a packet with the debriefing questions. The students answered some of the questions in a large group and then in small groups.

Facilitator- A facilitator enables the discussion to take place while providing support and encouragement to the learners (Jeffries & Rogers, 2007). The facilitator makes certain that the discussion focuses on the learning outcomes and application of the concepts to practice (Rauen, 2001) through Socratic questioning (Decker, 2007) and reflection. In this study, the teacher in the class was the facilitator for the debriefing sessions in both sections of the sample. She assisted in the development of the recorded simulation scenarios and the debriefing guides used in the research study.

Simulation methodology- Methodology is defined as the "a body of practices and procedures used by those who work in a discipline or engage in an inquiry" (TheFreeDictionary, 2009). The underlying principles determine how the methods or tools of scientific investigation are utilized when using simulation as a teaching strategy.

Regardless of the level of simulation utilized, all simulation experiences are based on learning objectives. Key elements needed to achieve the learning objectives include an introduction to the experience, the actual experience, and a debriefing session.

The introduction includes a discussion about the active learning classroom environment and the objectives of the simulation experience. The actual experience includes cognitive skills such as recall of prior knowledge, application of new knowledge, problem solving, and collaboration with classmates. The debriefing session engages the learners to reflect on the scenario and concludes with a summary of events surrounding the simulation experience.

Debriefing methodology-The goal of the debriefing process is to include higher order thinking skills such as analysis, synthesis, and evaluation. The thinking process should permit the learner to move from thinking about the simulation experience to action and future solutions which makes it an active process (Jones & Alinier, 2009). The debriefing process in the research study began with viewing a recorded high-fidelity simulation scenario. The facilitator asked general knowledge questions to the entire group such as what assessment findings indicate this patient has this particular diagnosis. This was conducted in a non-threatening manner and gave all participants a common starting point. Participants took notes during the debriefing sessions and while watching the scenarios. As the scenario progressed, participants were asked higher order thinking questions such as evaluate the nurse’s actions in the video and what should the priorities of the nurse be in this scenario. The facilitator summarized key points at the end of the debriefing session.

Summary

The role of the nurse educator is complex and it is imperative that nurse educators are able to facilitate learning in both classroom and clinical settings. Educators need be knowledgeable about the content they teach, develop appropriate learning objectives, design pertinent learning activities including implementation of innovative teaching strategies while using the latest pedagogical techniques, and evaluate that learning occurred. Educators should utilize best practices documented in the literature and when little is known about a concept, conduct research to create new knowledge. This research study compared teaching strategies in the classroom to determine if one was more beneficial than the other was. One strategy incorporated an HPS while the other used a combination of lecture and case studies. The underpinnings of this study are found in two theoretical frameworks, The Nursing Education Simulation Framework and The Reflection Simulation Framework. These will be discussed in Chapter 2 along with a review of pertinent literature.

CHAPTER II

REVIEW OF LITERATURE

Introduction

This chapter discusses the relevant literature that pertains to this research study. The two theoretical frameworks that guide this study, The Nursing Education Simulation Framework (NESF) and The Reflective Simulation Framework, will be reviewed and discussed. The second section of this chapter discusses the major concepts related to this study including simulation usage in nursing education, knowledge acquisition through simulation, reflection process after simulation and self-confidence gains after using simulation. This chapter concludes with a discussion about the potential contributions that this study offers to the body of nursing science.

Theoretical Frameworks for the Study

Theoretical frameworks are defined as "collections of interrelated concepts that depict a piece of theory that is to be examined as the basis for research studies" (Houser, 2008, p. 163). The frameworks serve as the underpinnings that guide research studies. This research study is built on two frameworks, the Nursing Education Simulation Framework and the Reflective Simulation Framework. Both of these frameworks include important simulation concepts that are integral to this study.

The Nursing Education Simulation Framework

The NESF was developed and then tested in the National League for Nursing/Laerdal Simulation Study. According to Jeffries and Rogers (2007), the framework is a useful guide when implementing and evaluating simulation activities. The framework identifies five main conceptual components; teacher factors, student factors, educational practices, simulation design characteristics and expected student outcomes (See Figure 2.1 for NSEF).

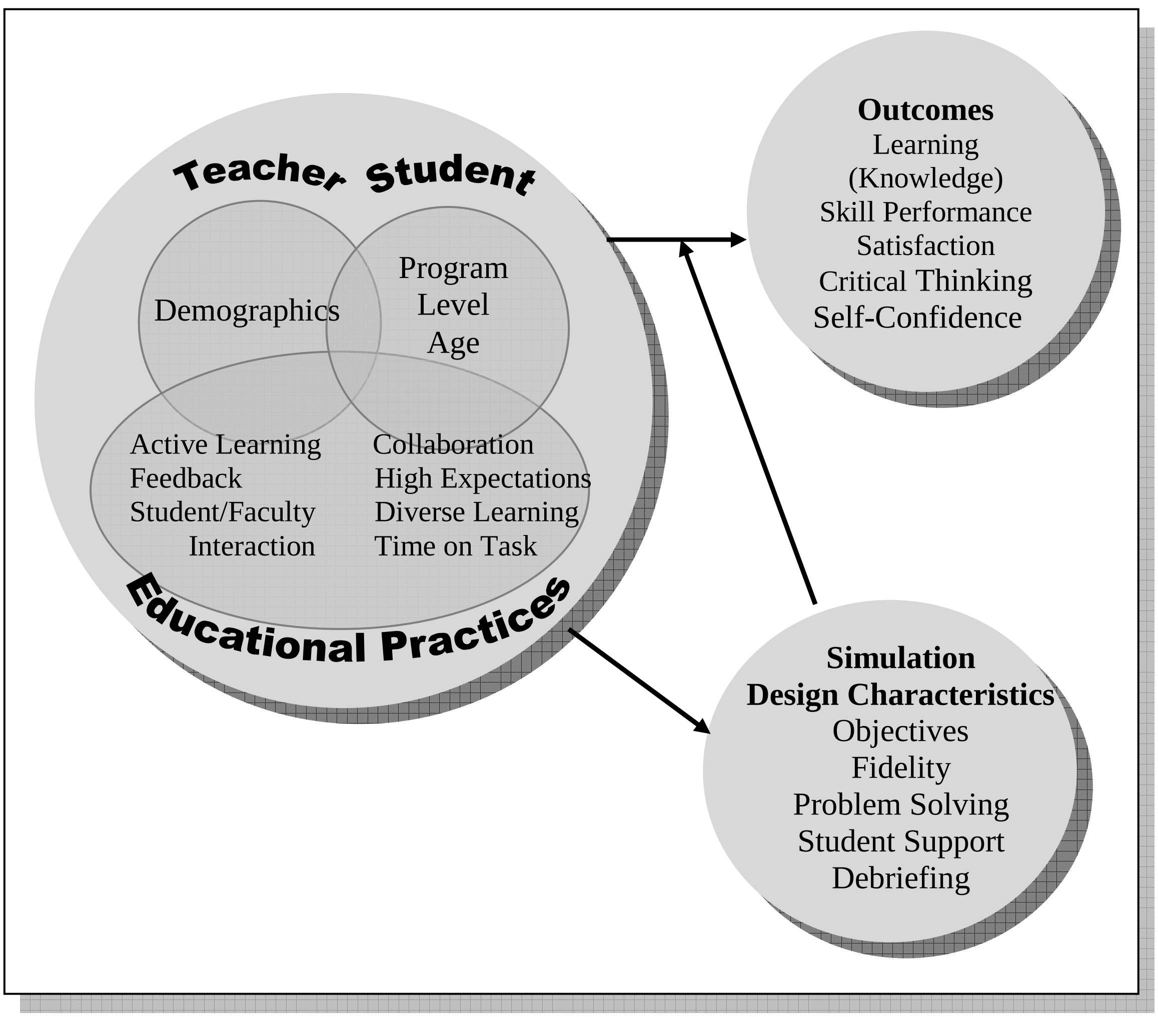

Figure 2.1. Nursing Education Simulation Framework (Jeffries & Rogers, 2007). (Adapted with permission).

The Teacher

One of the framework components includes the teacher, also known as the facilitator and evaluator. The role includes being student-centered, providing support and encouragement to the learner throughout simulation (Jeffries & Rogers, 2007; Rothgeb, 2008). During the simulation, the teacher is an observer while the students are the active learners. The facilitator also guides the debriefing period at the conclusion of the experience. It is important for the teacher to feel comfortable with this teaching strategy including designing the simulation scenario, using the technology and understanding the role of facilitator and evaluator. Teacher demographics including years of experience, age of teacher, and clinical expertise are assumed to be associated with how comfortable the teacher feels about using this teaching strategy (Jeffries & Rogers). The teacher role is no longer teacher-centered but rather student-centered and this is a paradigm shift leading to a new pedagogy for some faculty (Rothgeb).

The Students

Another component in the framework includes the students. During simulation experiences, students are expected to be responsible for their learning including knowing the ground rules for the experience. This includes understanding what activities are being planned and what role the student needs to take in order to support learning and decrease anxiety. Students can assume an observational or active role in simulation experiences. The roles are defined by the teacher at the start of the experience depending on the desired learning outcomes and can be rotated throughout the simulation (Jeffries & Rogers, 2007).

Cioffi (2001) described two methods of presenting information during clinical simulations, response-based and process-based. In response-based methods, the student is not an active participant and has no control over the data presented. Two examples of this are providing the students with written case notes of a real patient which is standardized for all students and having the students be observers during a simulation experience which entails not talking or participating in the decision-making process of the scenario (Jeffries & Rogers, 2007). In the process-based method, the student plays an active role, gathers information about the patient, and makes decisions based on the situation. Examples include patient role-plays, video-taped vignettes and interactive human patient simulator scenarios (Cioffi).

Students may also evaluate and reflect on their own performances and whether learning outcomes have been achieved. This may be completed using a self-evaluation tool. Like the teacher role, the student concept also contains variables that may affect the overall perception of the simulation experience. These include students' age and prior healthcare experience prior to their formal education (Jeffries & Rogers, 2007).

Educational Practices

The third component of the framework is the educational practices, which incorporates active learning, diverse learning styles, collaboration, and high expectations.

Active learning. Engaging students in the learning process is critical in simulation because it enhances students' critical thinking. Active learning also allows the educator to assess the student's abilities to problem solve and make decisions. Providing feedback is an example of active learning and is important to include into simulation scenarios. It is important to allow the learner to think, make decisions, and reflect on actions before feedback is given. If not, the learner may rely on the teacher for instructions on what actions to take in a situation (Jeffries & Rogers, 2007).

Diverse learning styles. The simulation environment can incorporate activities that meet the needs of different learning styles such as visual, kinesthetic, auditory, and tactile. For example, the realistic environment of the simulation laboratory will meet the needs of visual learner. The kinesthetic learner can complete psychomotor skills and utilize equipment while the auditory learner may communicate with other healthcare providers. Finally the tactile learner may assess the patient's lungs, heart and pulses to satisfy that learning style (Jeffries & Rogers, 2007).

Collaboration. Another key point in this component is the need to provide an arena that is conducive to sharing and exchanging information between the student and teacher. This will permit the student to feel comfortable to ask questions that will enhance learning. The teacher should provide constructive feedback to the student to foster learning while also gathering feedback from the learner about the simulation experience. The teacher can address concerns raised while promoting the learner to be active in the learning process (Jeffries & Rogers, 2007).

High expectations. Simulation experiences with high levels of expectations often have positive results (Jeffries & Rogers, 2007). Critical care nurses who worked with human patient simulators felt the training was helpful because they were pushed to expand their competency level while working in a safe environment. They were able to review videos showing both good and bad decisions that were made and helped them learn what should be done in a clinical setting which empowered them to achieve greater learning (Vandrey & Whitman, 2001).

Simulation Design Characteristics

The fourth component in the NSEF is simulation design characteristics and includes five features; objectives, fidelity, problem solving, student support and reflecting learning. The features must be considered when developing a simulation.

Objectives. Clear learning objectives are imperative with simulation experiences. They need to reflect the purpose of the simulation and identify expected learner behaviors. The teacher needs to review objectives before the scenario starts and during the debriefing period to validate if they were met (Jeffries & Rogers, 2007).

Fidelity. Fidelity is the degree to which a simulator corresponds to the actual environment in terms of physical and functional characteristics, in other words mimics reality. There are three levels of simulators: high, moderate, and low (Jeffries & Rogers, 2007; Rothgeb, 2008). High-fidelity simulators are computerized mannequins that are developed to physiologically model a human being. It exhibits many clinical signs such as heart sounds, lung sounds, pupil dilatation, and palpable pulses. It also permits invasive procedures such as catheterization of the urinary bladder and intravenous cannulation (Haskvitz & Koop, 2004; Multak, et al., 2002; Rothgeb). In a moderate-fidelity simulator the breath sounds may be heard but the chest does not rise and fall while a low-fidelity simulator is static without motion and has no assessment features such as lung and heart sounds. Depending on the objective of the assignment, the teacher needs to utilize the appropriate level of fidelity (Jeffries & Rogers; Rothgeb).

In addition to choosing the correct level of fidelity, it is important that the simulation scenarios mimic a true clinical experience. When the situation is believable, the students assigns more worth to it and therefore is more vested in the learning process which affects outcomes (Hawkins, Todd, & Manz, 2008).

Problem solving. The teacher needs to choose the correct level of complexity of the simulation experience based on the learner's abilities and the learning objective. It is important not to overload the learner with too much information but rather provide a challenging situation with attainable goals (Jeffries & Rogers, 2007).

Student support. The teacher needs to assist the learner during simulation experiences. The difficulty lies with knowing how much support should be given and when it should be given. Student support during the simulation needs to be provided in the form of cues and not answers. A cue can come from another individual within the scenario, a lab report, a phone call, or the acting patient. Enough information should be given that allows the learner to continue with the simulation but not prohibit the decision making process (Jeffries & Rogers, 2007).

Reflective thinking/debriefing. One of the core components of the simulation experience is the debriefing session (P. R. Jeffries, McNelis, & Wheeler, 2008). Immediate reflection is imperative during debriefing to examine what happened and what was learned. It needs to occur immediately after the simulation so information can be recalled accurately. The learner should reflect on the actions, decisions, communication, and objectives of the simulation experience. The teacher should facilitate the debriefing by focusing on specific topics for discussion related to the learning objectives while also emphasizing appropriate, safe nursing care and decision making (Jeffries & Rogers, 2007; Rothgeb, 2008).

Outcomes

The final component in the framework is the outcomes. Prior to the start of simulation outcomes are identified and then evaluated at the end of the experience. Outcome objectives should include items such as knowledge learned, skills performed, the students' perception of the learning experience, and measuring their level of confidence (Jeffries & Rogers, 2007). This research study assessed for knowledge gained, satisfaction, and self-confidence with the teaching strategy. Simulation experiences are complex and multifaceted. The NSEF includes five major components that guide this simulation research study. However, the concept of reflection is a large part of this study and the second framework for this study focuses on the philosophical underpinnings of reflection.

Reflective Simulation Framework

After participating in a simulation activity it is important to reflect on the action taken during the scenario and the outcomes of the actions on the patient (Alinier, 2008). The goal of the session is to promote reflective thinking and for learning and discourse to occur in a non-threatening and organized manner (P. R. Jeffries, et al., 2008). Donald Schön (1983; 1987) contributed to the understanding of reflection by explaining that our knowledge is often implied without expressing it. "Our knowing is *in* our action. The workday life of the professional depends on tacit knowing-in-action." (D. Schön, p. 49). He describes the competent professional as someone who can recognize phenomena and make judgments without stopping and thinking but rather making decisions subconsciously. However, both ordinary and professional practitioners often need to think about what they are doing even while they are doing it. Schön identified this as reflection-in-action. This is comparable to the phrases “thinking on your feet” and “learning by doing” (p.54). Conversely, reflection-on-action involves thinking about a situation after it happened. This method involves consciously thinking about a situation to reevaluate it and decide how it could have been done differently.

Both of Schön’s reflection concepts are illustrated in the following situation. Baseball pitchers often study their successful pitching habits and try to repeat them every time they pitch. During a game, they want to feel the way they did when they pitched a winning game. They notice how they have been pitching to the batter and how well it has been working. Based on those thoughts they may change how they are pitching during the game. They reflect on the patterns of action and the situations in which they are performing. This example shows how they are reflecting *on* action and also reflecting *in* action (D. Schön, 1983; D. A. Schön, 1987). Both of these concepts are necessary during simulation scenarios to enhance the learning process by discovering new knowledge that can be applied to future situations.

These same reflection concepts are found in the Reflective Simulation Framework (See figure 2.2 for the Reflective Simulation Framework). The framework was developed to provide structure, guide the student’s simulation session, and help foster a deep learning experience. The framework consists of six dimensions which incorporates reflection before the simulation scenario and continues through the simulation and finally after the simulation experience (Alinier, 2008).

Figure 2.2. Reflective Simulation Framework (Alinier, 2008). (Adapted with permission).

Elaboration on the six dimensions is explained further in the next few paragraphs to provide clarity of the model and identify Schön's influence on the model.

Planned action. This is also referred to as reflection BEFORE action. As part of the orientation to simulation, students can receive a copy of the model and other educational materials before the simulation begins. It can also be sent to the learner before the session to provide some familiarity with the learning objectives and the simulation (Alinier, 2008).

Apply and embed. This dimension acknowledges the learner's previously learned knowledge that can be applied during the simulation scenario. This is also known as "reflection in a live situation" in the model (Alinier, 2008).

Simulation activity. This is identified as reflection IN action otherwise known as thinking while doing (Alinier, 2008). Schön (1983) described this as the way in which practitioners solve problems by conducting a conscious analysis of what they are experiencing and why their actions are working or not working effectively.

Feedback and review. This occurs after the simulation session is over and is also acknowledged as reflection ON action. The feedback comes from peers, teachers, and facilitators. The learners should monopolize the discussion while taking responsibility for their own growth and development as a professional (Alinier, 2008). Schön (1983) explained this concept as enabling the learners to explore their own actions and the actions of the group. In the process, the learners will develop ideas about how they want to practice. In addition, during this feedback session, the teacher is responsible to summarize the important points and provide a "take home message" for the learners. This is an important part of this feedback session (Alinier, 2008, p. 747).

Self-appraisal. This is also part of the reflection ON action but the teacher elicits feedback from the students regarding their positive and negative aspects of their performance. This session requires the learner to reflect and gain a deeper personal understanding of their performance. This discussion needs to be conducted in a positive manner to encourage participants to learn from their mistakes and change their behavior next time (Alinier, 2008).

Identify learning needs. This component is identified as action ON reflection. It is recommended that faculty meet and debrief after a simulation session. If a student evaluation tool was used, the comments should be reviewed to evaluate the students' perception of the simulation session. This data can be used to revise the simulation experience based on the student's feedback and identified learning needs (Alinier, 2008).

The Reflective Simulation Framework focuses heavily on the concept of reflection and starts before the simulation experience. Reflecting on experiences in the simulation laboratory may be easier to do rather than in a real clinical environment because events in clinical happen quickly without allowing time for reflection. Reflection is a key component to the learning process involving simulation (Alinier, 2008).

Review of Literature

Simulation Background

Simulation is defined as the act of pretending, imitation or the representation of the behavior or characteristics of one system through the use of another system such as a computer program (Encyclopedia Britannica Inc., 2009). A simulator is a tool used to create an interactive clinical scenario through the use of computer programs (Rothgeb, 2008). Nursing education has used a variety of simulation experiences to educate students on different concepts and procedures including how to give an injection by using an orange as an injection site. In the 1950's students were introduced to Mrs. Chase, a life-sized mannequin that resembled a human being, to practice assessment skills. In the next decade, the Harvey model was developed to include heart and lung sounds (Nehring, et al., 2002; Peteani, 2004; Schoening, et al., 2006).

Simulation was also developed and utilized for airplane pilots to improve competency and provide training for different flying conditions (Nehring, et al., 2002). The first computerized simulation mannequin, Sim One, was developed in 1969 and used in schools of anesthesia to teach concepts and practice concepts of endotracheal intubation (Peteani, 2004). Nursing has used various forms of simulation such as computer simulation, interactive videos, manikins, real individuals to act as patients through the decades (Wong, et al., 2008). Now nurse educators have the opportunity to use high-fidelity human patient simulators (HPS) to provide students with realistic learning experiences in a safe environment (Day, 2007; Nehring, et al.; Peteani; Rothgeb, 2008; Schoening, et al., 2006). However, it is imperative to note that simulated patient scenarios should not take the place of a nurse-patient/family relationship that develops in actual nursing units (Day, 2007).

A high-fidelity HPS is equipped with features such as reactive eyes, realistic airway, chest excursion, pulses such as carotid, radial, brachial, popliteal and pedal, heart sounds, lung sounds, bowel sounds, realistic skin, interchangeable genitalia, and urinary output. Procedures such as intubation, cricothyrotomy, pericardiocentesis, chest tube placement, and intravenous insertion can be performed. Patient monitoring includes arterial blood pressure, left ventricular pressure, central venous pressure, cardiac output, 5-lead EKG, and SpO_2 (Medical Education Technologies, 2009; Nehring, et al., 2002; Rothgeb, 2008; Schoening, et al., 2006).

Simulation experiences are needed in nursing education to help with the lack of clinical sites, low census in certain clinical areas, and nursing faculty shortage. Simulation can provide similar clinical experiences in a safe environment. Students can have their knowledge tested, demonstrate skills, and practice decision-making while not harming an actual patient. Students can also practice communication techniques with the simulator, family members and other team members (Rothgeb, 2008).

Students represent a wide range of ages, personal life experiences, and talents. Many students are accustomed to using computers, internet, MP3 players, simulated computer games, and personal digital assistants. Students expect more hands-on experiences and modern tools to help with their learning process. Educators need to revise their teaching styles to meet the needs of the learners including integrating technological enhanced teaching strategies (Rothgeb, 2008).

Nursing programs are spending thousands of dollars on this technology however there is a paucity of sound research studies that address student outcomes when using the HPS. Literature was reviewed to examine simulation studies that have measured the following concepts: usage of simulation, knowledge acquisition, reflection, and self-confidence.

Simulation Usage in Nursing Education

Human patient simulators provide a learner-center, interactive environment while providing learners with various domains of learning, including cognitive, psychomotor, and affective. In addition, the simulation experiences can be developed by discussing simple to complex nursing situations. It can be used to illustrate normal and abnormal physical assessment findings or it can be used to show how blood pressure can be affected by certain pathophysiological conditions. The HPS can be adapted for various settings including a simulated living room or a hospital room. It can be used in all nursing courses including medical-surgical, pediatrics, obstetrics, mental health, acute care, and community. The majority of the literature discusses usage of an HPS in the clinical setting (Alinier, et al., 2006; Cioffi, Purcal, & Arundell, 2005; Day, 2007; Nehring, et al., 2002; Parr & Sweeney, 2006; Peteani, 2004; Rothgeb, 2008; Schoening, et al., 2006).

Nehring and Lashley (2004) conducted an international survey to examine the usage of the simulator, the training of faculty and staff, and how the HPS was utilized when evaluating competency. The authors sent 66 surveys to nursing programs that purchased the HPS through Medical Education Technologies, Inc. (METI). The 34 nursing schools that completed the survey included 33 schools from the United States and one from Japan. Results related to curricular information showed that the HPS was used mostly for advanced medical-surgical courses. Seventy-five percent of the respondents reported utilizing the HPS less than 10% in the curriculum. HPS was most often used in courses such as physical assessment and critical events. The authors reported that 93.8% of the schools indicated that 25% or less of their faculty use HPS. Competency evaluation of students was conducted with the HPS in the areas of knowledge synthesis, of technical skills and management of critical events. The authors also reported that 41.9% of the schools thought such competency evaluation should be used in undergraduate programs while 34.6% thought it should be used in graduate programs (Nehring & Lashley). This study did not clarify whether the HPS was utilized as a teaching strategy in clinical or in the classroom but it discussed using it for physical assessment that is clinical usage. The proposed study is different in that it will study outcomes after using recorded simulation scenarios in the classroom.

Knowledge Acquisition

Jefferies and Rizzolo (2006) conducted a prominent national, multi-site, multi-method research study which involved developing the simulation framework, exploring the relationship among the theoretical concepts, and testing the outcomes within the framework. The multi-phase study placed nursing students in one of three simulation groups, paper/pencil case study simulation, hands-on simulation experience with static mannequin or hands-on simulation with a high-fidelity patient simulator. The study looked for differences in outcomes such as knowledge, self-confidence, satisfaction, and judgment performances among the three different groups of students. Results found that debriefing was the most important simulation design feature. There were significant differences between the pre and posttest scores indicating that learning took place, however, there were no significant knowledge gains among the three groups of students who were in the different simulation groups. The students in the high fidelity group were more satisfied with their learning experience than the other two groups of students. In addition the students in the high fidelity and static mannequin reported greater confidence when caring for a postoperative adult patient than did the paper/pencil group (P. Jeffries & Rizzolo, 2006).

Beamson and Wiker (2005) explored the benefits and limitations of using the HPS for one actual day of clinical experience. They conducted an exploratory, descriptive study, which involved two groups of students, their instructors and three different patient scenarios. A brief survey, using a Likert-type scale from four to one was utilized for the experience and showed that student perceptions were positive. The mean score of 3.31 was obtained when students were asked if the HPS increased their knowledge of differences in patients' responses to medications. The mean score was 3.13 when asked if they increased their knowledge of medication side effects. When asked open-ended questions most students reported an increased level of confidence in their skills. They also had favorable comments regarding the ability to perform realistic assessments with integration of abnormal findings such as heart murmurs and adventitious breath sounds. The students also reported using critical thinking skills to implement a plan of care based on the assessment findings (Beamson & Wiker). While this study showed that students perceived the simulation to be a positive experience and that they felt they had gained knowledge and confidence with skills, no quantitative data was collected on knowledge acquisition and self-confidence, or critical thinking to verify these qualitative findings.

Another research study looked at medical students instead of nursing students. Steadman et al. (2006) asked the question whether simulation (HPS) is superior to interactive problem based learning (PBL) for teaching acute care assessment skills to medical students. Thirty-one fourth year medical students participated in the study. They were randomized to either the HPS or PBL group. Critical care skills were evaluated on all students on the first day of the study. Two blinded investigators evaluated the students to be certain that the groups had equivalent acute care skills. The students then learned about dyspnea in their group. On day five, each student was tested on a unique dyspnea scenario. Results showed that the HPS group performed significantly better than the PBL group in their final assessment (Steadman, et al.). While this study had favorable simulation outcomes, it focused on assessment skills.

Recording and discussing clinical scenarios is another method of delivering content to students. In China, students watched eight clinical vignettes to determine if this teaching strategy promoted nursing students' critical thinking abilities in managing different clinical situations. A pre-test-post-test design was utilized. The students completed the California Critical Thinking Skills Test to assess critical thinking knowledge and a nursing knowledge test that focused on the analysis, synthesis, and evaluation levels of the cognitive domain of learning. The knowledge test determined the students' critical thinking knowledge for each of the topics in the recorded vignettes. Results showed a significant improvement from the pre-test post-test knowledge scores but not in the critical thinking scores (Chau, et al., 2001). While this study focused only on critical thinking, it measured knowledge acquisition of critical thinking skills using recorded vignettes.

A study conducted in the United Kingdom examined the effectiveness of simulation scenarios in nursing students' clinical skills and competence (Alinier, et al., 2006). The researchers used a pre-test post-test design with 99 undergraduate students. All students completed the Objective Structured Clinical Examination (OSCE) before the study began and then repeated it six month later. Between the examination times, the experimental group completed 6 hours of simulation experiences focusing on patient care and clinical skills while the control group did not receive simulation. Results showed that the experimental group obtained higher scores than the control group. The results of this study showed that simulation experiences are beneficial when educating nursing students but it important to consider that other variables such as actual clinical experiences may have influenced these results (Alinier, et al.).

There are very few articles including research studies in the literature that utilize an HPS in the classroom. A qualitative study measured critical thinking skills in RN to BSN students who participated in a two hour recorded simulation class instead of a traditional lecture on cardio-respiratory assessment. The participants viewed the video either by educational television or by online instruction through a DVD. The researchers paused the video throughout the viewing to permit time for interactive questions. Students who watched it by a DVD discussed the questions over the next week online. The researchers used Scheffer and Rubenfeld's unique nursing conceptualization to analyze the critical thinking skills of the distance RN to BSN students. The two main categories in this model are classified as habits of the mind and skills. Results showed that all critical thinking 'habits of the mind' and 'skills' appeared among RN to BSN students during the simulation experience (Rush, et al., 2008). This is the second study that saw favorable results with showing videos in the classroom, one using high-fidelity simulation and the other one using only faculty as actors.

Two simulation studies within the literature compared test scores between two groups of students who used high, medium, or low-fidelity simulation. In the first study (Kardong-Edgren, et al., 2009), nursing students in a Bachelor of Science program participated in a study that compared student knowledge and retention measured by paper and pencil test. The participants were in one of three groups, 50-minute cardiac lecture only, 50-minute cardiac lecture and 30 minutes of medium-fidelity simulation or 50-minute cardiac lecture and 30 minutes of high-fidelity simulation. All participants completed a pretest before the lecture which was the same test given two weeks later and again six months later. The simulation scenario was based on the American Heart

Association algorithm on acute coronary syndrome. The students were placed in groups of five and were randomly placed in either the medium-fidelity or high-fidelity simulation room. The same two instructors ran all of the scenarios for the participating students. Results showed that all three groups showed a significant increase in mean post-test 1 scores and a significant decrease in mean scores from post-test 1 to post-test 2. The results were not significant between the different types of simulators used. The researchers noted that a limitation to this study was that the students were new to this learning modality and maybe prior simulation experience is necessary for students to demonstrate learning. In addition, the control group formed study groups and increased their study time to compensate for the lack of simulation experience (Kardong-Edgren, et al.). This study provides suggestions for improving research using similar methods.

A second study by Hoadley (2009) compared results of two Advanced Cardiac Life Support (ACLS) classes on measurements of knowledge and resuscitation skills. The participants included physicians, nurses, emergency medical technicians, respiratory therapists and advanced health care providers. The participants were randomly assigned to a low-fidelity or high-fidelity simulation group. Results showed no significant correlation between post-test and skills test scores for the two different fidelity groups however there was a significant difference in the mean test scores for the control and experimental groups. Hoadley noted one limitation to the study was the method of the debriefing sessions. Both groups had the same type of debriefing sessions and perhaps that facilitated learning and not the level of fidelity. Future studies could compare no debriefing sessions to a group with debriefing sessions (Hoadley).

In the final study (Brannan, White, & Bezanson, 2008) that measured knowledge acquisition with the use of an HPS, the researchers compared the effects of two teaching modalities to teach cardiac content to junior-level baccalaureate nursing students. One group of students (n=53) received a two hour traditional lecture and the other group of students (n=54) received two hours of simulation consisting of an evolving case study including five stations and a 10 minute debriefing session. The students were divided into groups of 8-10 to rotate through the stations. One faculty member remained present to guide the students in the first four stations. In the final station, it included interaction with the HPS. Following the simulation experience the faculty held a 10-minute debriefing session with each group of students. Results showed that students who received the simulation instead of the traditional lecture achieved significantly higher posttest scores than did the students who received traditional lecture teaching modality (Brannan, et al.). While this study had favorable outcomes, the authors needed to utilize additional faculty to help with the simulation experience. Having faculty available to help teach the didactic portion of nursing classes is not cost-effective, feasible, or appropriate in the midst of a nursing faculty shortage, which is a limitation of this study.

Assessing knowledge acquisition through examinations. Higher education institutions in the United States are feeling pressure to provide quality education that is accessible and affordable while also documenting student learning outcomes. The U.S. Department of Education (2006) "recommends America's colleges and universities embrace a culture of continuous innovation and quality improvement which includes developing new pedagogies, curricula and technologies to improve learning" (p. 21). One recommendation for postsecondary institutions include measuring and reporting student learning outcomes such as test scores, certification and licensure attainment, time to degree, and graduation rates to the public. These measures indicate how students' skills have improved over time (U.S. Department of Education). In order to fulfill the demands of the Department of Education, research is vital to document the implementation of new pedagogies within educational programs while documenting learning through examinations.

According to Napoli and Raymond (2004) it is difficult to motivate students to do well on tests when they know the results have no impact on their grades. Students need to give up their time to take examinations that have no personal meaning leading to resentment. The researchers studied the influence of both graded and non-graded exams on the internal reliability measurement. They also looked for differences between the mean exam scores of the students who took the graded exam compared to the non-graded exam. Results showed the graded exam produced a higher reliability score ($r = .71$) while the non-graded test produces a lower reliability ($r = .29$). In addition, the students who took the graded exam obtained significantly higher scores with a mean of 64% while the students who took the non-graded exam had a mean score of 43%. The authors concluded that "when scores on assessment measures are linked to course outcomes, students will be motivated to maximally perform and their scores can serve as reliable indicators of learning or mastery of the content" (Napoli & Raymond, p. 926).

Wolf and Smith (1995) found similar results when they researched the effects of different test consequences on students' test performance. They separated students into two groups based on consequential or non-consequential testing conditions. Tests that have direct consequences for students to complete are classified as 'consequential. In contrast, non-consequential test conditions are classified when the test results have no implications for the students taking the examination. In the study, the one group of students was told the test was part of their course grade and the other group was told the test does *not* count for their grade. All students completed a one-hour exam in a child development class. Results showed that the students performed better on the test that counted for their grade compared to the one that did not. It was posited that when a student takes an exam that has a personal affect, the student may be more motivated to put forth a stronger effort than those who take exams without consequences (Wolf & Smith).

In a more recent study by Sundre and Kitsantas (2004), they conducted a similar study where undergraduate students were asked to take one test that counted towards their grade (consequential) and one that did not (non-consequential). Findings showed that test results for the non-consequential group were lower compared to scores of the consequential group. The authors concluded that low motivation led to low test performance for the non-consequential exam. These three studies all concluded that students perform better when they take exams that have personal meaning to them. In the current study, the students took one 26-item examinations that counted into their final grade in hopes of obtaining more accurate and reliable data.

Reflection-Instructional Approach

The word debrief as defined by Merriam-Webster (Merriam-Webster Online, 2009a) means to carefully review upon completion or to interrogate usually upon return in order to obtain useful information. This concept is also used after an experiential learning exercise which is defined as a “task or activity involving participants that is designed to generate live data and experiences that can be used to teach concepts, ideas, or behavioral insights” (Warrick, Hunsaker, Cook, & Altman, 1979, p. 92). Part of the learning exercise includes a debriefing session where the majority of the responsibility for achieving the desired goals rests. This is where the concepts, theories, ideas, values, and impersonal insights are discussed and verified. “Debriefing is the key to making an experiential learning exercise a meaningful experience because it is designed to synergize, strengthen, and transfer learning from the experiential exercise” (Warrick, et al., pp. 91-92).

Debriefing objectives. The objectives of the debriefing period include the following points.

1. Identify various perceptions and attitudes about what happened.

2. Link the exercise to specific theory and skill-building techniques.

3. Develop a common set of experiences for further thought.

4. Provide participants feedback on their involvement and behavior.

5. Establish classroom climate including trust, comfort and purposefulness (Warrick, et al., 1979).

Debriefing methodology. The debriefing process can be classified as either structured, spontaneous or a combination of both. During a structured session, the teacher has a pivotal role in guiding the discussion and keeping the discussion focused. This type of debriefing should be used when a learning experience requires participants to engage in a specific task with clear expectations of the activity (Warrick, et al., 1979). This form of debriefing is similar to simulation debriefing known as *formal debriefing* and may utilize full audio and video recording. The debriefing session takes place away from the simulator in another room. The teacher begins the debriefing with a video clip or a statement about a problem area to elicit student feedback which facilitates the learning process (Stillsmoking, 2008).

In a second method of debriefing, spontaneous free-form debriefing, the teacher permits the participants to control the session, which leads to less predictable learning outcomes. This form of debriefing works well with exercises that are ambiguous and involves only some of the participants (Warrick, et al., 1979). This type of debriefing is related to *informal simulation debriefing* which takes place over the simulated patient either during a break or at the end of the scenario. This may be dependent on the teaching style, lack of space, or time (Stillsmoking, 2008).

Simulation debriefing. The debriefing concept is also used as a part of simulation experiences as a reflective learning process and is a teaching strategy (Cantrell, 2008). “Simulation is a means to come to the debriefing” (Stillsmoking, 2008, p. 538). Unfortunately simulation debriefing is often overlooked (P. R. Jeffries, 2005) but it is a way for faculty and students to reexamine the clinical encounter, reflect on student performance, receive teacher feedback (Savoldelli, et al., 2006) and cultivate the growth of clinical reasoning and judgment skills (Dreifuerst, 2009). Debriefing occurs after the simulation scenario (Cantrell) and reinforces the “positive aspects of the simulation experience while encouraging reflective learning, which allows the participant to link theory to practice and research, think critically, and discuss to intervene professionally in very complex situations” (P. R. Jeffries, p. 101). Participants discuss the process, outcomes and applicability of the scenario to actual clinical situations while also discussing relevant teaching material (Cantrell; P. R. Jeffries).

Simulation debriefing research. There are a few published research studies related to simulation debriefing despite the thoughts that debriefing is a vital component of the teaching- learning process (Cantrell, 2008; Decker, 2007; Dreifuerst, 2009; P. Jeffries & Rizzolo, 2006; Pamela R. Jeffries, 2006; Kuiper, Heinrich, Matthias, Graham, & Bell-Kotwall, 2008; Rothgeb, 2008; Savoldelli, et al., 2006; Warrick, et al., 1979).

Cantrell (2008) conducted a qualitative research study that evaluated the benefit of a structured debriefing session on students' learning after the students completed three pediatric simulation scenarios. The participants included eleven senior-level students who agreed to have their performance videotaped during each simulation. Immediately after the simulations, the students received oral debriefing sessions. Two weeks later the students took part in a structured debriefing session using the videotaped to provide feedback about their performance. The researcher conducted two qualitative focus group interviews each lasting one hour to assess whether the students who perceived the structured debriefing sessions as more valuable than the oral debriefing that occurred immediately after the simulation scenarios.

Results of the study found that students believed that debriefing immediately after the simulation scenario enhanced their learning was more beneficial than waiting two weeks and reviewing the videotape. The timing of the debriefing was important because the experience was "fresh in their mind and they were still engaged in the learning activity" (Cantrell, 2008, p. e21).

Recording simulation scenarios and using the videotape can be a useful adjunct to the debriefing process to provide an objective record of the events and provide a means of self-assessment for the learner. However, videotape feedback is not routinely used in simulation. A recent study by Savoldelli, et al. (2006) investigated the value of the debriefing process during simulation by comparing changes in nontechnical performance of anesthesia residents who received either no feedback, instructor oral feedback only or videotape-aided instructor oral feedback during debriefing. Forty-two anesthesia residents participated in the study and were randomly assigned to one of three groups. Individually they all completed an eight-minute scenario (pretest) and played the role of primary anesthesiologist. The control group did not receive any verbal feedback before completing a second scenario (posttest). The second group reflected on their performance from the first scenario and how it may be improved. The teachers provided constructive comments regarding cognitive and behavioral skills but not the technical skills. The second group then completed the second scenario. The third group completed the first scenario and then reviewed parts of videotape to reflect on the cognitive and behavioral aspects of their performance. After debriefing, the third group completed the second scenario. The videotapes from all three groups were later reviewed and rated using a validated scoring system (Savoldelli, et al.).

Results showed that the nontechnical skills of the control group did not improve however, the oral feedback and videotape group showed significant improvement. In addition, there was no difference is scores between the oral and video-assisted feedback groups. The results show the importance of debriefing after simulation because without it simulation seems to offer little benefit to the learner (Savoldelli, et al., 2006).

Self-Confidence and Simulation

Self-Confidence is defined as the "belief in one's power and abilities" (Merriam-Webster Online, 2009b). Being self-confident is an important trait for nurses to exude in their practice. Davidhizar (1993) summed up one reason nurses should be self confident in this statement, "Nurses who are confident in their skills and values do not have to *act* powerful, they *are* powerful" (p. 218). This insightful statement is essential for nurse educators as they educate learners to be competent, confident practitioners. White (2009) identified two additional consequences of the concept self confidence: "Intrinsic return: Establishment of autonomy and Extrinsic return: Positive outcomes for others" (p. 111). The intrinsic rewards includes better performance, developing full potential, collaboration, successful practice, power, risk-taking, motivating/reassuring others and autonomy. The second benefit of being self-confident includes the extrinsic reward of producing better outcomes for others. In nursing practice, one of the goals is achievement of positive patient outcomes. Because of the intrinsic and extrinsic rewards of self-confidence, nurse educators need to find creative ways to instill this concept into the beginning practitioner.

Within the simulation literature several articles were reviewed that measured self-confidence with most having favorable outcomes. Cioffi, Purcal and Arundell (2005) conducted a study to determine if midwifery students who receive simulation arrive at assessments decisions more quickly, make more inferences and report a higher level of confidence than the students who receive traditional lecture material. The self-reported confidence levels were significantly higher in the group of students who participated in two simulation scenarios. Goldenberg, Andrusyszyn and Iwasiw (2005) conducted a descriptive study (n = 22) and found increased confidence levels after students completed simulated patient teaching situations.

Another study by Schoening, Sittner and Todd (2006) examined nursing students' perceptions of a preterm labor simulation scenario. The authors created a 10-item evaluation tool using a 4-point Likert scale to measure perceptions. The students were asked questions regarding meeting the simulation scenario objectives and if they felt more confident in the clinical setting. In addition, the students completed a weekly reflective journal describing their experience with the simulator. The results showed a mean score of 3.71 for the self-confidence measurement. Furthermore, the journals contained frequent comments related to gaining confidence through this teaching strategy.

Brown and Chronister (2009) examined the effects of simulation activities on critical thinking and self-confidence in an electrocardiogram nurse course. The researchers provided weekly simulation activities (150 minutes total) in addition to the 350 minutes of didactic class for the treatment group (N=70) while the control group (n = 70) received 400 minutes of didactic instruction. Self-confidence was measured through a researcher-developed five-item tool with a 5-point Likert scale. Self-confidence measures showed no significant differences between the treatment and control groups. The week following data collection, the control group participated in 100 minutes of simulation learning and debriefing and completed the confidence tool. Results showed statistically significant increases on the scores which supports the idea that students show improved self-confidence following simulation activities. Researchers thought the simulation activities were too brief to have a significant effect on the outcomes measured (Brown &

Chronister). In the dissertation study, the students participated in 300 minutes of simulation activities including a majority of the time debriefing.

Brennan, White and Bezanson (2008) measured self-confidence after two groups of students received either traditional lecture or a simulation experience. The authors modified a pre-existing confidence tool for use in their student. Results of the confidence levels were not found to be significantly different for the students who used the HPS compared to the students who received traditional lecture. However, both groups of students showed considerable gains in their posttest measuring self-confidence. It is hypothesized that the students in both groups believed they met the learning objectives for the class experience (Brannan, et al.).

Potential Contributions to Nursing Science

The role of the nurse educator is complex and “integrates the art and science of nursing and clinical practice into the teaching-learning process” (Finke, 2009, p. 11). It is imperative that nurse educators are knowledgeable and competent considering the vital role they have in shaping and educating the future nurses of tomorrow. Being knowledgeable includes not only being a content expert but also utilizing best teaching and learning practices to facilitate positive student learning outcomes. With the evolving change in the learning paradigm from being teacher-centered to student-centered, educators need to develop new ways to present content to students. This includes knowing what is available while also creating new knowledge for the nursing profession. This research builds on the existing simulation research previously conducted. After reviewing the literature, it is apparent that there were still many unanswered questions in relation to the outcomes and benefits of implementing high-fidelity simulation within nursing curricula. The use of simulation as an adjunct to clinical has been studied but the use of simulation in the classroom remains virtually unexplored. This study provides educators with the option to substitute traditional lecture with the integration of high-fidelity simulation video clips within the classroom. This teaching strategy has several potentials benefits for nursing education. First, considering the current faculty shortage, simulated video clips offer a way to liberate additional faculty from having to be present during the classroom setting. Furthermore, this strategy reaches a wider audience of students at one time and encourages consistent learning experiences for students who are not guaranteed to be exposed to everything that they learn in a classroom setting out in a real clinical setting.

Summary

This chapter discussed the two theoretical frameworks used in this study, the Nurse Education Simulation Framework and the Reflective Simulation Framework. Both serve as the underpinnings of the proposed research study. The review of literature focused on concepts and research studies pertinent to the proposed study. Simulation research studies in nursing education were also discussed and analyzed. More specifically several studies were discussed that assessed knowledge acquisition using an HPS. In addition, because the debriefing process is a key component that will be emphasized this concept was discussed. Simulation debriefing research was also reviewed. Finally, the literature surrounding self-confidence and simulation was reviewed because of the role this concept has in the proposed research study. After reviewing the simulation literature, it was found that there was a lack of simulation research pertaining to the classroom setting which led to the research problem.

The following chapter discusses the methodology of this study. The quantitative, quasi-experimental study utilized a cross over design while comparing mean scores of a multiple choice examination, self-confidence and satisfaction scores of nursing students who participated in debriefing after viewing recorded high-fidelity simulations in the classroom to those who received traditional lecture format with paper and pencil case studies. The researcher provides additional information on the study setting, population, sampling procedure, power analysis, ethical considerations, data collection procedures, instrumentation, data analysis and threats to internal validity.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this study was to determine if fourth semester Associate of Science in Nursing (ASN) students who participated in structured debriefing sessions after watching recorded high-fidelity simulation scenarios in a nursing class (a) obtained higher test scores than those who received traditional lecture format with case studies and (b) were more satisfied and confident with the teaching strategy compared to students who received the same content through traditional lecture with pencil and paper case studies. The study compared (a) mean test scores from two multiple-choice tests and (b) mean scores from the Student Satisfaction and Self-Confidence in Learning Scale between the two previously identified teaching modalities.

The following paragraphs discuss the research design including design type, study setting, population, sampling procedures, power analysis, ethical considerations, data collection procedures, and instrumentation. The chapter also includes data analysis procedures and threats to internal validity. Finally, results of a pilot study are reviewed.

Research Design

This study utilized a quantitative, quasi-experimental, comparison group design. Houser (2008, p. 295) defines a quasi-experimental study as one of cause and effect which is similar to an experimental design but does not randomize subjects into groups

Subjects are divided into either an experimental or comparison group and the differences between the groups are measured.

This study determined if the independent variable, integration of recorded simulation scenarios with debriefing in the classroom, had an effect on the dependent variables, content knowledge, satisfaction, and self-confidence. The outcomes were measured by two multiple-choice tests and completion of a satisfaction and self-confidence tool on two separate occasions. The experimental group and the comparison group of students received the same content in the classroom but the experimental group debriefed after watching recorded high fidelity simulation scenarios while the comparison group received traditional lecture format with pencil and paper case studies.

In addition, this study used a crossover design. A crossover design permitted each subject to receive the treatment at a scheduled time throughout the study. An advantage of a crossover design is that it “ensures the highest possible equivalence among the subjects exposed to different conditions” (Polit & Beck, 2010, p. 229). In addition, a crossover design is extremely powerful when “the treatment effects are immediate and short-lived” as in the case with in-class recorded simulation scenarios (Polit & Beck, p. 229).

The first group of students, section one, was the experimental group in the first part of the study. They viewed and debriefed on four pre-recorded simulation scenarios during a didactic class at the beginning of the semester while the other group, (section two) received the same content through traditional lecture format with case studies. Near the end of the semester, section two viewed and debriefed on four pre-recorded simulation scenarios while section one received the same content through traditional lecture format with case studies. The same nursing faculty member integrated the video simulation scenarios followed by debriefing into the classroom to both sections while two different faculty members taught the traditional lecture classes with case studies.

Setting

This study was conducted at a single purpose degree granting college. The four-year private college is committed to providing education to those interested in the healthcare field. The college is located in a small sized northeastern city in the United States. The ASN program is designed to prepare students with the principles and skills necessary to assume a beginning professional nurse position. The setting was chosen because it was a convenient population for the researcher.

Population

The subjects in the study were nursing students in their fourth and final semester of an ASN program. The majority of the population were Caucasian, female, and between the ages of 18-27.

Inclusion criteria for the study sample included:

- Fourth semester senior associate degree nursing students enrolled in their final nursing didactic course focused on adult clients with crisis and complex problems. The subjects were 18 years of age or older and were willing to provide informed consent and participate in the study.

Exclusion criteria for the study sample included:

- Students who did not attend class on the day the data were collected or who did not stay for the duration of the class were excluded from the study. Attendance was taken at the start of class and after break periods.

Sampling Procedure

A non-probability, convenience sample of nursing students was asked to participate in this study. The researcher verbally explained the purpose of the study on the first day of class to fourth semester senior ASN nursing students. The researcher then discussed the study purpose again before the class period that used the recorded simulation scenarios and lecture with case studies. The course enrollment was 78 students however the students were separated into two sections based upon spring registration. The use of high fidelity simulation scenarios is currently integrated into all of the clinical courses within the nursing curriculum at the college but not in all of the didactic courses. The goal was to begin simulation integration into the didactic courses starting in the fall 2009.

According to Houser (2008) the “best way to reduce bias in a convenience sample is to assign subjects to groups randomly once they have been recruited” (p. 224). While this option was not available in this study, a flip of a coin was used to determine which group of students would serve as the experimental group for the first phase of the study. Based on the coin toss section one was the experimental group for the first half of the study while section two was the experimental group for the second half of the study. Students who declined to participate still received the recorded video simulation scenarios in the classroom as this was part of the routine class and they also completed the multiple-choice examination but they did not complete the study instruments.

The sampling procedure is depicted in Figure 3.1 and shows how each section of students served not only as the experimental group during the study but also the comparison group.

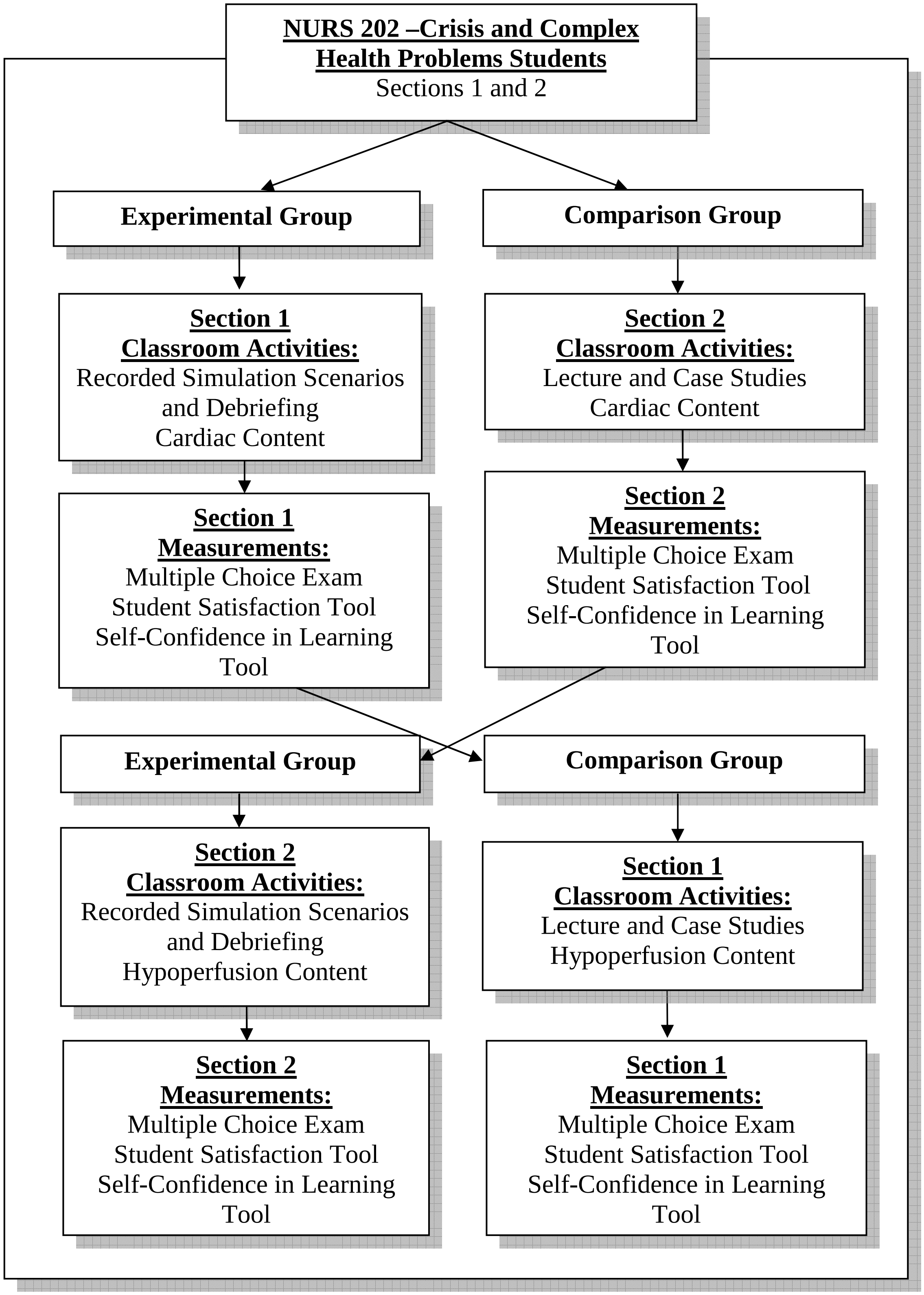

Figure 3.1 Sampling procedure

Figure 3.1 depicts how section one participants began the study as the experimental group and attended a four-hour class while watching and debriefing about recorded cardiac high-fidelity scenarios. Concurrently, section two participants received four hours of the same cardiac content via traditional lecture format with the use of PowerPoint slides and paper and pencil case studies. Both groups took the same multiple choice examination questions, the student satisfaction tool, and the self-confidence in learning tool. During week ten of the semester, the groups switched and section two became the experimental group. They attended a four class and watched recorded hypoperfusion high-fidelity scenarios while section one received the same content in traditional lecture format using PowerPoint slides and case studies. Again, both groups completed the same multiple choice examination questions, the student satisfaction tool, and the self-confidence in learning tool.

At the start of the fall semester, the researcher discussed the research study during course orientation. Students had the option to participate by completing the consent forms (See Appendix A for Consent Form) as required by the Institutional Review Boards (IRB) of the University of Northern Colorado (UNC) (See Appendix B for UNC IRB forms) and Lancaster General College of Nursing and Health Sciences (LGCNHS) research committee (See Appendix C for Research Application). While the researcher solicited and provided information about the study, a non-course nursing faculty member collected the consent forms to maintain confidentiality.

Power Analysis

When conducting studies, researchers are looking for differences between groups, relationships between variables or effects of experimental treatments. This research study compared two teaching modalities while looking for differences between mean test scores. In order to maximize the likelihood of finding a difference it is important to conduct a statistical power analysis (Batterham & Atkinson, 2005; Gall, Gall, & Borg, 2007). A power analysis is defined as “a procedure for studying the likelihood that a particular test of statistical significance will be sufficient to reject a false null hypothesis” (Gall, et al., p. 143). The probability of committing a Type II error, otherwise known as a false-negative conclusion, is referred to as β and can be estimated through a power analysis (Polit & Beck, 2010).

Statistical power is defined as “the probability that a particular test of statistical significance will lead to rejection of a false null hypothesis” (Gall, et al., p. 143). Power is the complement of beta, which equals 1- β. The standard criterion for an acceptable risk for a Type II error is 0.20 therefore it is ideal to use a sample size that gives a minimum power of 0.80 (Polit & Beck, 2010).

When conducting a power analysis there are four factors that are considered including sample size, level of significance, directionality, and effect size (Gall, et al., 2007). Determining how many subjects should be included in a study is a major issue when conducting and evaluating quantitative research. There are no simple equations to determine this, however, the larger the sample, the smaller the sampling error (Polit & Beck, 2010). In experimental studies it is recommended that there are at least 15 participants in each group to be compared (Gall, et al.). To review, the hypothesis tested was that mean scores for section one will equal mean scores of group two. The multiple-choice examination contained 26 questions and the scores were considered significant if there was a difference of at least 5% or 1.3 questions. Alpha was set to equal 0.05 and the assumed standard deviation was one. Minitab 15 software was used to estimate the minimum sample size of 12 subjects in each group shown in table 3.1.

Table 3.1

Power and Minimum Sample Size (2-sample t test)

Difference	Sample Size	Target Power	Actual Power
1.3 or 5%	12	0.8	0.802079

The same sample size is for each group

A large sample size is favorable because statistical power automatically increases with sample size. "The larger the sample, the smaller the difference, relationship, or effect needed to reject the null hypothesis" (Gall, et al., 2007, p. 143). With a sample size of 40 instead of 12, the power increased from 0.80 to 0.99 as shown in Table 3.2.

Table 3.2

Power and Sample Size of 40 (2-sample t test)

Difference	Sample Size	Power
1.3 or 5%	40	0.999580

The same sample size is for each group

The second factor within a power analysis is determining the level of significance. This predetermined number known as a *p* value represents when the null hypothesis will be rejected. "Statistical power can be increased by lowering the level of significance needed to reject a null hypothesis" (Gall, et al., 2007, p. 143). For example, it is easier to reject a false null hypothesis for a *p* value set at 0.10 than 0.05. While a *p* value of 0.10 increases statistical power it also increases the risk of a Type I error (a false positive), but it might uncover a potentially important difference, relationship, or effect that would have been unnoticed if the *p* value was set at 0.05 (Gall, et al.). For this study, the significance of level was set at 0.05.

The third factor within a power analysis is directionality. This refers to "the fact that observed differences and relationships can go in two directions" (Gall, et al., 2007, p. 143). This study compared two teaching modalities to discover if there were differences in mean test scores. However, if it is known prior to the study that one treatment cannot possibly be better than the other this will increase statistical power because a one-tailed test of statistical significance is needed (Gall, et al.). There was no evidence to suggest that the results would only be one direction therefore a two-tailed test was needed.

Effect size is the fourth factor within a power analysis. This is defined as "an estimate of the magnitude of the difference, relationship, or effect in the population being studied" (Gall, et al., 2007, p. 143). Polit and Beck (2010) note that while the *p* value determines whether the results are valid, the effect size can suggest whether they are important. "The most accurate prediction of effect size is obtained from past and related studies involving a similar intervention and the same outcome variable or from one's own preliminary studies or pilot work" (Batterham & Atkinson, 2005, p. 156). The simulation literature contains two studies that looked for improvement in test scores after experiencing simulation. These studies were reviewed to determine what effect size was used. Neither study showed a significant increase in knowledge scores (Hoadley, 2009; Kardong-Edgren, et al., 2009). Hoadley (2009) showed an increase of 2.67% with an effect size of 5%. The second study determined effect size to be 0.51 and was unable to show a significant change in test scores between the simulation groups and control group (Kardong-Edgren, et al.).

It is also important to choose an effect size based on expert opinion or data. Based on the review of literature, consultation of a statistician and the author's pilot study it was determined that the effect size would be an increase of 5% in mean test scores. For the 26-item exam, this equates to a 1.3 difference in mean scores.

Ethical Considerations

Risks to subjects were limited and included the following:

1. discomfort with new teaching strategy in the classroom,
2. anxious about test questions affecting grade,
3. final grade,
4. possible breach of confidentiality if identifiers are discovered.

Discomfort with New Teaching Strategy in the Classroom

All students were exposed to an HPS by the time they were in their final semester of the nursing program. Simulation is integrated in the curriculum in every clinical nursing course but not in the classroom setting. However integrating simulation into the classroom was a goal for the nursing program starting in the fall of 2009. Students were exposed to four recorded simulation scenarios instead of traditional lecture with case studies in their final nursing course. Traditional lecture includes students being passive learners in the classroom setting. The teacher frequently uses PowerPoint slides and dominates the class while reviewing the content on the slides. There is very little interaction unless a student asks a question. Because the recorded simulation scenarios were a different teaching modality than the typical traditional lecture style format the students may not like the new format because it involved group work and more active learning strategies including debriefing after watching the videos. Some instructors previously implemented other active learning strategies such as games and watching video clips therefore lessening the anxiety felt by the students in the study.

In order to lessen the discomfort the students may feel with this teaching modality, the students were not singled out during the simulation experience. They had the opportunity to answer questions in a large group discussion format. They also worked in small groups to analyze the simulation scenarios and that did not involve being singled out.

Anxious about Test Questions Affecting Grade

Students may feel anxious when they receive a new teaching modality in the classroom. Many faculty members try various teaching methods in the classroom to help the students learn and understand new content. The students are still tested on the content despite the change in teaching modality.

Every student viewed four videotaped simulation scenarios instead of four hours of traditional lecture. For every one hour of theory, the student received 6.5 multiple choice test questions; therefore, the student received 26 multiple-choice questions on the unit exam covering the content received during the class with the video simulation experiences.

The total theory points in the course were 865 points. At the end of each unit of content, the students received a 120-point test. There were five 120-point tests and one 150-point final examination in the course. In addition, there were quizzes and a presentation for a total of 115 points. The 26 points from the simulation class equated to 3% of their final grade. Knowing this information should have helped decrease the anxiety felt about the simulation scenario affecting their grade.

Final Grade

Educators incorporate various teaching strategies to meet the different learning styles of students in hopes of having favorable outcomes in the classroom during an examination and in the clinical environment. This study compared different teaching strategies to assess for changes in knowledge acquisition through a multiple-choice test. The test questions were calculated in the students' final grade. The option of not including the test questions into the final grade brings to the forefront another issue where students do not study the content that will be tested because they know it will not count into their grade. Studies have demonstrated that students are less inclined to study the content when they are informed that their overall course grades will not be impacted by the grade they receive on the examination (Napoli & Raymond, 2004; Sundre & Kitsantas, 2004; Wolf & Smith, 1995). The consent form reminded students that all content, despite what teaching strategy is utilized, is tested on during examinations.

Possible Breach of Confidentiality if Identifiers are Discovered

Measures were taken to decrease the potential breach in confidentiality. The researcher who was not a member of this course discussed the research study during class orientation. All students received a consent form even if they did not participate. A nursing faculty member not assigned to teach in the course collected the consent forms including those who declined to participate. By having all students return their forms, the students did not know who participated in the study. The faculty member collecting the consents was the only person in the course who knew who participated in the study.

The researcher created packets containing the consent form, demographic tool and the satisfaction and self-confidence with learning tool. Each of the tools within the packet contained the same research identification number. The non-course faculty member collected all of the tools and created a master roster containing the student's name and unique research number. That faculty member kept the master key of identifiers and consent forms in a locked cabinet in her locked office. She returned the demographic forms and satisfaction and self-confidence tools to the researcher. The non-course faculty member was also responsible for providing the mean test grades to the researcher by using the list of research identification numbers.

Since test scores were compared between the sections of students, total anonymity was not possible. Students were informed of the goal of confidentiality and the procedures taken to maintain confidentiality.

Data Collection

Procedure

After obtaining approval from the LGCNHS College Research Committee (See Appendix D for LCGNHS Approval Letter) and the University of Northern Colorado Institutional Review Board, the researcher verbally invited the students to be a part of the research study. The students were asked to complete and return the consent form, satisfaction and self-confidence tool at the end of class after participating in the integrated simulation classes.

Overview of Nursing 202 course structure. The following is a summary of Nursing 202, Crisis and Complex Health Problems. It was a 7-credit class including 105 theory hours. The course was designed to expand and refine prior medical-surgical concepts previously learned. Advanced concepts and principles related to the care of clients across the life span including acute care issues were covered in this course. In addition, students acquired knowledge of pathophysiology and nursing care of clients with mental health issues.

On the first day of class, students received a packet of course materials including a syllabus, hourly guide, and course packet. The syllabus contained information including the course description, course faculty names, evaluative methods, textbooks, course objectives, class requirements, and select nursing and college policies. The hourly guide contained the following information; class dates, scheduled topics, facilitator, required readings, project and quiz due dates. The course packet contained PowerPoint slides and handouts such as study guides, case studies, and illustrations that were used in the classroom for the entire semester.

There were two sections of the Nursing 202 course. Section one met for four hours on both Monday and Tuesday for class while section two met for four hours on both Thursday and Friday for class. Two separate faculty teams taught the content in the course. For the study, a section one faculty member facilitated the two simulation scenarios to the experimental groups, one four-hour class on cardiac concepts for section one and one four-hour class on hypoperfusion concepts for section two. However, the comparison group had two different faculty members teach the cardiac content and hypoperfusion content mainly through traditional lecture delivery with case studies.

The following is a description of a typical class for Nursing 202 students. Students receive reading assignments prior to class but do not always prepare for class by completing the assignment. Students attend class and review PowerPoint slides with the faculty member facilitating the class. There are various teaching methods utilized but the majority of the time is spent through traditional lecture format.

Detailed description of video simulation scenarios integrated into class. The researcher and the section one faculty member facilitating the simulation integrated classes created and recorded eight simulation scenarios based on the didactic content for Nursing 202. The first four scenarios covered cardiac concepts including cardiac surgery, hemodynamic monitoring, cardiac tamponade, aortic aneurysms. The second four scenarios reviewed different kinds of hypoperfusion states including hypovolemic, cardiogenic, neurogenic, anaphylactic, and septic shock. The scenarios were patient situations based on the content being taught through traditional lecture format (See Appendix E for Cardiac Surgery Scenario)

The scenarios were developed and rehearsed in the simulation laboratory by nursing faculty. The faculty provided input into the scenarios after they were created and revisions were made based on the feedback. The scenarios were recorded before class and the faculty played various roles in the scenarios. The recorded scenario length varied depending on the content and lasted between 5-15 minutes.

The participants watched the scenarios in class and then participated in a debriefing session. During viewing of the scenarios, the facilitator paused the scenario and asked pre-determined questions based on the learning objectives for each scenario. The facilitator asked general knowledge questions to the entire group such as what assessment findings indicated this patient had this particular diagnosis. This was conducted in a non-threatening manner and gave all participants a common starting point. Participants took notes during the debriefing sessions. As the scenario progressed, participants were asked higher order thinking questions. Examples of questions included a discussion of the nurse's priority in the situation, recognition of potential post-operative complications, management of potential complications, identification of appropriate discharge teaching, and evaluation of patient teaching. The participants continued watching the scenario while taking notes on what they observed. After the simulation scenario was viewed in its entirety, the participants broke into smaller groups and answered questions provided by the facilitator. The participants had approximately 15 minutes to discuss the questions within their small group. The facilitator then reconvened the class while providing correct answers and summarizing key points at the end of the final 20-minute debriefing session. (See Appendix F for debriefing guide).

At the end of the video simulation integrated class, the participants completed the Demographic Survey Tool (See Appendix G for Demographic tool) and the Student Satisfaction and Self-Confidence in Learning Scale Tool created by the National League for Nursing (See Appendix H for the Self-Confidence and Satisfaction Tool). The participants in the comparison group also completed the NLN Student Satisfaction and Self-Confidence in Learning Scale Tool. Therefore, because all participants were in the experimental group and comparison group on two different occasions they completed NLN satisfaction and self-confidence tool twice.

Instrumentation

The three instruments used for this study were:

1. Demographic Survey: This 10-item demographic tool developed by the researcher gathered subject data including gender, age, ethnicity, highest degree earned, employment and human patient simulator experience. The information was used to determine if there are statistically significant differences in the results of the examination questions between the experimental group and the comparison group. The data were also used to assess for variances between the groups to verify if the groups were similar in characteristics.

2. Written examination questions: The participants completed two multiple-choice examinations containing 26 items each during the study. The multiple choice examination questions were obtained from a variety of sources including multiple textbook test banks. The 26-item examination was part of a larger scheduled 120-item unit examination. The 120-item examination was administered during a two-hour class period. The two 26-item examinations were used to evaluate cognitive knowledge of the cardiac and

hypoperfusion content. Several faculty members reviewed the 26-item exam for content validity to determine if the questions measured the class content. All four nursing content experts agreed that the items were appropriate for the class content.

A software package, ParSCORE, was utilized to develop the student rosters, score the examinations and generate an item analysis report containing information about reliability and effectiveness of the items on the test.“The single best measure of the effectiveness of an item is item discrimination. It measures how well an item discriminated between those who have mastered the material and those who have not” (Scantron World Headquarters, 2003, p. 10). The point biserial correlation coefficient (PBCC) “measures the correlation between the correct answer on an item and the total test score of a student. The PBCC identifies items that correctly discriminate between high and low groups as defined by the test as a whole” (Scantron World Headquarters, p. 10).

When interpreting the PBCC, the higher the number usually means the better the item description and the better the test question. “A positive value indicates that candidates who answered the item correctly scored relatively high on the scale as a whole. A negative value indicates that candidates who answered correctly scored relatively low on the scale as a whole. Discrimination measures how well an item can differentiate between high scoring and low scoring candidates. Items that do not differentiate well may not be producing useful psychometric information” (Cambridge assessment network, 2008).The following criteria on figure 3.2 was used to evaluation test questions (Scantron World Headquarters, 2003).

PBCC	Interpretation
.30 and above	Very good item
.20 to .29	Reasonably good item
.09 to .19	Marginal item
Below .09	Poor item

Figure 3.2. Point Biserial Correlation Coefficient Interpretation

The item analysis also provided a reliability coefficient referred as Kuder Richardson (KR-20). This relates to how consistent the subjects' responses are among the questions on an instrument. The goal is to figure out how homogeneous is the instrument (Erickson & Wentling, 1988; Polit & Beck, 2010). For a good classroom test, the reliability coefficient should be 0.70 or higher (Scantron World Headquarters, 2003).

3. Student Satisfaction and Self-Confidence in Learning Scale: This tool is published by the National League for Nursing (NLN). It is a 13-item instrument designed to measure student satisfaction (five items) with the simulation activity and self-confidence in learning (eight items) using a five-point Likert scale. "Content validity was established by nine clinical experts in nursing" (National League for Nursing, 2007, p. 1). Reliability was tested using Cronbach's alpha: satisfaction = 0.94; self-confidence = 0.87 (National League for Nursing, 2007).

Data Analysis

To review, the purpose of this study was to determine if fourth semester ASN students who participated in a structured debriefing session after watching recorded high-fidelity simulation scenarios in a nursing class obtained higher test scores, reported higher satisfaction scores and felt more self-confident with the in-class learning experience compared to students who received traditional lecture format with case studies. The study was a quantitative, quasi-experimental, comparison group design. In addition, the study used a crossover design, which permitted all students to be in both the experimental and comparison group once throughout the study. As a comparison group, the students received didactic content in the form of lecture with case studies while the experimental group received the content through recorded simulation scenarios and debriefing sessions.

H1: *Testing for a Significant Differences in Mean Test Scores on Multiple Choice Examination*

Data analysis was conducted utilizing Minitab 15. The researcher tested for differences in the mean scores from the multiple-choice examination between the experimental group and the comparison group. The multiple-choice examination contained one correct answer and the other responses were incorrect. Histograms of the multiple choice examination scores were analyzed and inspected for a normal distribution. The data were found to be non-normal therefore; the Mann-Whitney *U* test was used to assess for mean score differences between the experimental group and the comparison group.

It was also important to determine if extraneous variables had an impact on the study (Houser, 2008). A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of independent variables, age, gender, educational level, healthcare experience, simulation experience, and clinical cardiac experience on the dependent variables, cardiac and hypoperfusion scores as measured by the 26-item multiple choice tests.

H2: *Testing for a Significant Difference in Student Satisfaction*

In this study, students were asked to rate their satisfaction with current learning by completing the NLN tool satisfaction. Students completed the tool at the conclusion of the didactic classes including both the recorded simulation with debriefing class and the lecture with case studies class. By completing it after both classes, the results were compared to see if one method of teaching was preferred over the other.

The NLN satisfaction survey is a Likert-type tool using a 5-point scale measuring the degree of agreement or disagreement with the statements about satisfaction with learning and self-confidence in obtaining the needed instruction. The responses ranged from *1 Strongly Disagree with the statement to 5 Strongly Agree with the statement.* The students also responded *Undecided if they did not agree or disagree with the statement*. Histograms were developed for each research variable and inspected for a normal distribution. If the data were non-normal, the ordinal data from this tool were tested using the Mann-Whitney *U* test to assess for differences in rank on the ordinal variables between the experimental group and the comparison group. If the histogram demonstrated a normal distribution a *t*-test was performed to test for statistical significance of a difference between the mean test scores of the two groups of students (Polit & Beck, 2010).

H3: *Testing for a Significant Difference in Self-Confidence with Learning Scores*

In this study, students were asked to rate their attitude toward their self-confidence in obtaining instruction they needed by completing the NLN tool Self-Confidence in Learning tool. As previously stated, students completed the tool at the conclusion of the didactic classes to compared results between teaching modalities.

The data were analyzed in the same fashion by first visualizing a histogram to determine normality and the need for a non-parametric test such as the Mann-Whitney *U* test if the data were non-normal. If the histogram demonstrated normality then a *t*-test was performed to test for statistical significance of a difference between the mean test scores of the two groups of students (Polit & Beck, 2010).

Threats to Internal Validity

A main goal of research was to determine whether the intervention actually caused the desired outcome. However, the intervention may not be the only possible influence on the research outcomes. Internal validity is defined as "the confidence that an experimental treatment or condition made a difference and that rival explanations were systematically ruled out through study design and control" (Houser, 2008, p. 295). It was important for the researcher to control for factors that may jeopardize the validity of the study. The following is a review of the common threats to internal validity and how the researcher planned to minimize them.

Historical

The study was introduced to the students during orientation of a 15-week semester. The first pre-recorded simulation integrated class was viewed two weeks later and the second and final simulation integrated class occurred 10 weeks later. Therefore, data were collected at two different time periods during the semester with 10 weeks between collections. Section one received the simulation class during week two while section two received the simulation class during week 12. There was no way to predict if something catastrophic would occur during those 10 weeks but the time period was relatively short.

Maturation

The content covered in both simulation integrated classes was new to the students and was taught in the classroom prior to this semester. However, ten weeks transpired between the two simulation integrated classes so there were opportunities for exposure to the class content while obtaining practical clinical experiences. This potential threat applied to both the experimental and comparison group, which should have equalized the benefit. To assess for knowledge gained through clinical experiences, the multiple choice examinations included four non-graded questions inquiring if the student had clinical experiences related to the content presented in class. By including the questions in the examination, it captured clinical experiences that the students may have encountered since the content was taught in class.

Testing

The subjects in this study only took a post-intervention test. They did not have the opportunity to see the test questions before the scheduled examination date. The threat related to familiarity of the test questions was not a factor in this study.

One section of students took the examination several days before the second group of students. There were 26 test questions that were the same based on the content in the simulation scenarios. There was a threat that the students who took the examination first would tell the second group of students what was on the examination. This situation rarely happens because the students know test questions are reviewed based on how many students get it wrong. If the test question was answered correctly by the majority of students than the test question was not eliminated or modified in any way.

Instrumentation

This threat may occur when the instrument or data collection procedure changes in the study. It can also be a threat if more than one person is collecting the data (Houser, 2008). Neither of these conditions happened in this study. The demographic survey, satisfaction tool, and self-confidence tool was collected by one individual and then given to the researcher after creating a master list with identifiers. This same procedure occurred after the section two completed the simulation class.

Treatment

There is a chance that the subjects may react to a treatment, even if it does not produce a desired effect. This is called the placebo effect and it can jeopardize internal validity because the subjects are aware they are involved in a study and they perform differently (Houser, 2008). Changes may occur in the study but not because of the treatment but because subjects know they are involved in a study. This is also known as the Hawthorne effect (Polit & Beck, 2010). All of the participants in this study received the treatment, which should have decreased the chance that the results were related to the treatment effects. In addition, because the multiple-choice examination was part of their grade the students were motivated to study the content.

Multiple Treatment Effects

When several treatments are employed in a study it is difficult to determine which treatment or combination of treatments had an effect on the results (Houser, 2008). This study provided only one experimental treatment, watching recorded simulation scenarios within the classroom.

Selection Effects

A selection threat results when there are preexisting differences between groups when subjects are not randomly assigned to groups (Polit & Beck, 2010). The two sections of students were created when the students registered for the nursing didactic course in the prior semester. There was a potential threat that the two groups of students were different, however, the students completed a demographic survey, which was statistically analyzed for differences among the group. In addition, both groups of students received the intervention at different times and both groups acted as the comparison group through the crossover research design.

Experimental Mortality

The threat of attrition may occur if subjects change their mind after signing the consent form that they want to participate in the study. It may also occur if the students do not attend class or if they do not stay for the entire four-hour class. Class participation was highly encouraged throughout the nursing program and this was reinforced in this nursing class. Only a few students left class early, which necessitated the need to not collect and analyze their data. However, several students in both sections did not attend the second class period during the second part of the study when data were collected therefore the sample size decreased and this could not be prevented.

Experimental Treatment Diffusion

When the treatment is viewed as highly advantageous, there is a chance that the control group may seek the same treatment. If the groups are in close proximity of each other during the experiment this may occur (Gall, et al., 2007). Both sections of students received simulation scenarios instead of traditional lecture for one of their four-hour classes. While the content was different, both sections experienced the treatment. In addition, both groups of students had minimal contact with each other because they had different class days. When one group of students was in class, the other group of students was in clinical and not in the college building. In addition, the researcher posted the pre-recorded simulation scenarios online for the students to view after the research study was completed for any student who wanted to see what scenarios they did not receive.

Compensatory Rivalry by the Comparison Group

Compensatory rivalry can occur if the comparison group believes they are in competition with the experimental group, which leads to the comparison group increasing their efforts just to be more competitive. This is also known as contamination or the *John Henry effect* (Gall, et al., 2007; Polit & Beck, 2010). There was a chance this could occur because the students answered the same test questions and the results were compared. However, the comparison group did not know when the experimental group received the simulation scenarios in class, which therefore it decreased the chance of the comparison group performing beyond their usual level of performance. In addition, these students were informed that the grade from the multiple-choice exam affected their grade; therefore, both groups equally performed to the best of their abilities.

Resentful Demoralization of the Comparison Group

If the comparison group believes they are not receiving a advantageous treatment they may become discouraged and score lower on the posttest (Gall, et al., 2007). Because all students received four hours of simulation scenarios instead of traditional lecture format, the subjects should not have felt as though they missed a desirable treatment. In addition, because the test scores were part of their final grade the students were motivated to score well on the multiple-choice examinations.

Pilot Study Results

A quantitative, quasi-experimental, comparison group design was used for the pilot study. It was conducted using a convenience sample of fourth semester, ASN students to compare two teaching modalities, traditional lecture and debriefing after watching recorded simulations. The purpose was to determine if there were any differences in mean test scores using a six-item multiple-choice examination to assess content knowledge. The experimental group viewed a 15-minute recorded hypoperfusion scenario, participated in group discussions and then completed a discussion and debriefing session for 35 minutes while the comparison group received the same content through traditional lecture content with a discussion of one pencil and paper case study in a 50-minutes class.

After obtaining permission through the LGCNHS research committee, the students were informed about the study and completed a consent form indicating their acceptance of the study. They also completed a demographic tool. The course coordinator stored the consent forms in her office in a locked cabinet while the researcher collected the demographic tools. The experimental group included 16 participants while the comparison group included 34 participants. The comparison group was enrolled in the day nursing program while the experimental group was enrolled in the evening and weekend nursing program. The same instructor taught the content for both of these groups of students.

Descriptive Data

Demographic tools and consent forms were collected at the end of class. The demographic tool required responses to six questions. Through this information, the researcher was able to assess for differences among the groups. For the comparison group, 34 participants completed the demographic tool but only 33 completed an informed consent. Without an identifying number on the tool the researcher was unable to determine what tool should be discarded therefore, all of the completed tools were analyzed. The demographic description follows in Tables 3.3 and 3.4.

Age. In this pilot study of 50 students, the mean age for the comparison group was 28.65 years (SD = 6.48) while the mean age for the experimental group was 36.67 years (SD = 9.36). The range of ages for the comparison group was 20 to 47 years and the range for experimental group was 21 to 56 years. When a two-sample *t*-test was conducted, mean ages between the comparison and experimental groups were significantly different; $t = -3.47$, $p = 0.001$.

GPA. The mean GPA for the comparison group was 3.25 (SD = 0.3961) while the mean GPA for the experimental group was 3.09 (SD = .3768). When a two-sample *t*-test was conducted mean GPAs between the comparison and experimental groups were not significantly different; $t = 1.35$, $p = 0.183$.

Table 3.3

Sample Interval Variable Characteristics-Pilot Study

Characteristics	Comparison Group	Experimental Group
Age (Years)		
Mean	28.65	36.67
Standard Deviation	6.48	9.36
Range	20-47	21-56
GPA		
Mean	3.25	3.09
Standard Deviation	0.3961	0.3768
Range	2.28-3.86	2.39-3.73

Gender. Of the 50 participants, 6 (12 %) were male and 44 (88%) were female. The comparison group consisted of 2 (5.9%) males and 32 (94.1%) female and the experimental group had 4 (25%) males and 12 (75%) females. A Chi-Square analysis revealed no significant differences between the gender of the comparison and experimental groups, $\chi 2 = 3.485$, df = 1, $p = 0.062$. In addition, because of the small sample size, a Fisher's exact test was conducted which also did not find significant significance, $p = 0.074$.

Previous degree. Half of the 50 participants reported having a prior degree. Further analysis showed that the comparison group had 14 (41%) participants with a prior degree and 20 (59%) without a prior degree. In the experimental group, 11 (69%) participants reported obtaining a prior degree while 5 (31%) participants did not have a prior degree. No significant differences were found between the groups concerning a prior educational degree earned; $\chi 2 = 3.270$, df = 1, $p = 0.066$. The Fisher's exact test also did not find a significant difference between the groups regarding prior degrees; p = 0.1283.

Previous healthcare experience. Of the 50 participants 39 (78%) reported prior healthcare experience. The comparison group had 27 (79.4%) participants with health care experience and 7 (20.6%) without experience. Within the experimental group there were 12 (75%) participants with healthcare experience and 4 (25%) without healthcare experience. No significant difference was found between groups relating to healthcare experience; $\chi2 = 0.121$, df = 1, $p = 0.727$. A Fisher's exact test was also conducted which did not find a significant difference between groups relating to healthcare experience; p = 0.7278.

Previous simulation experience. Among the 50 participants 31 (62%) cited previous simulation experience while 19 (38%) acknowledged no simulation experience. The comparison group contained 31 (91.1%) participants with simulation experience and 3 (8.8%) without simulation experience. The 16 participants in the experimental group all reported (100%) having no prior simulation experience. A significant differences was found between the groups relating to simulation experience $\chi2 = 38.390$, df = 1, p = 0.000. The Fisher's exact test also showed a significant difference; p = 0.000.

Table 3.4

Frequencies of Nominal Variables-Pilot Study

Characteristics	Comparison *n* (%)	Experimental *n* (%)	Total *n* (%)
Gender			
Male	2 (5.9)	4 (25)	6(12)
Female	32 (94.1)	12 (75)	44(88)
Previous Degree			
Yes	20 (59)	5 (31)	25 (50)
No	14 (41)	11 (69)	25 (50)
Healthcare Experience			
Yes	27 (79.4)	12 (75)	44 (88)
No	7 (20.6)	4 (25)	6 (12)
Simulation Experience			
Yes	3 (8.8)	0 (0)	19 (38)
No	31 (91.1)	16 (100)	31 (62)

Data Analysis and Results

It is imperative for researchers to utilize statistical procedure to organize, interpret and communicate numeric information (Polit & Beck, 2010). The pilot study data were analyzed using Minitab 15 statistical software. In this study, alpha was set at 0.05 which is the minimal acceptable alpha for scientific research (Polit & Beck). The confidence interval (CI) is the “range of values within which a population parameter is estimated to lie, at a specified probability of accuracy” (Polit & Beck, p. 550). For this study, the CI was set at 95%. The *p* value is the “probability that the obtained results are due to chance alone: the probability of a Type I error” (Polit & Beck, p. 562) For this study, results of tests with a p value < 0.05 are considered significantly significant.

Two-sample t-test (comparison of means between groups). The *t*-test is a common statistical test used to determine statistical significance between the means of two groups (Polit & Beck, 2010). For this study, the comparison and experimental groups were tested using a multiple-choice test during a scheduled examination time. The entire test consisted of 120 questions however only six items pertained to the content within the pilot study.

Results of mean test scores between groups showed a statistically significant difference between the experimental group and the comparison group; $t = 2.85$, df = 48, $p = 0.006$. The comparison group mean score was 4.65 (SD = 1.07) with scores ranging from 2-6. The experimental group mean test score was 3.56 (SD = 1.59) with scores ranging from 1-6.

Kuder-Richardson (KR-20)—Reliability Coefficient. Internal consistency is “an approach to estimating test score reliability that involves examination of the individual items of the test” (Gall, et al., 2007, p. 202) . Several statistical formulas quantitatively estimate the reliability of an exam. The Kuder-Richarson formula 20 (KR-20) calculates a reliability coefficient based on the number of test items, the proportion of the responses to an item that are correct, the proportion of responses that are incorrect and the standard deviation of the scores (Erickson & Wentling, 1988). KR-20 is a measure of internal consistency when tests use dichotomous choices such as yes vs. no or incorrect vs. incorrect. Values can range from 0.00-1.00 with high values indicating the examination is a homogeneous test. The KR-20 is affected by difficulty, spread in scores and length of the examination. Longer exams will receive an elevated score (Cortina, 1993). The internal consistency using the KR-20 formula for the pilot study was 0.4840. While this is not an ideal value, the short length of the test impacted the results.

Point biserial correlation coefficient (PBCC). Additional analysis included examining the PBCC for each individual test question. The PBCC data for each question is found in table 3.5. The higher the number the better the item description and the better the test question. Any PBCC greater than 0.20 is a reasonably good question. The comparison group PBCC found that 4 (67%) questions were above 0.20 and the experimental group had 3 (50%) questions that were above 0.20. There was only one item (Questions 5) that scored less than .20 in both groups.

Table 3.5

Point Biserial Correlation Coefficient-Pilot Study

Test Question	Comparison Group Correct Response (%)	PBCC	Experimental Group Correct Response (%)	PBCC
Question 1	100	0.00	93.75	0.51
Question 2	72.73	0.50	31.25	0.35
Question 3	78.79	0.31	75	-0.16
Question 4	42.42	0.34	18.75	-0.11
Question 5	93.94	0.19	75	0.05
Question 6	63.64	0.33	50	0.23

Limitations

There were several limitations of the pilot study. These include factors related to the sample characteristics and size, short intervention period, test length and missing identifiers on demographic tool. The experimental group attended their didactic class in the evening and had clinical experiences during the weekend. The comparison group attended class and clinical during the day on weekdays. The experimental group took their exam in the evening while the comparison completed their exam in the morning. It is unknown whether the time of the day influenced the results of the pilot study.

The sample was a convenient sample and the size of the experimental group was 50% smaller than the comparison group. It would have been better to have similar sample sizes for the comparison and experimental group. Based on the demographic data the participants in the experimental group had a mean age that was significantly higher than the comparison group. In addition, they reported no prior simulation experience. Either one of those differences could have affected the results.

It is important to recognize that the experimental group only had one hour of a different teaching modality than the comparison group. This may have not been enough time to make a difference in knowledge acquisition since the rest of the class was conducted through traditional lecture.

Another limitation for the pilot study was the small number of questions used in the evaluation process. The test only consisted of six questions, which may not be enough questions to notice a significant change related to the intervention. In addition, the way the test was constructed was different for the two groups because two different faculty assembled the examination. The test for the comparison group had the six hypoperfusion questions positioned consecutively together. In contrast, the experimental group had the six test questions randomly dispersed in the test. This may have affected the students as they answered the randomly placed questions because they were not focused on one subject at a time.

The final limitation was an oversight on the part of the researcher. The demographic tools were not labeled with a random identifier to link with the mean test score with the study participant's demographic data. Therefore, the data needed to be analyzed as an aggregate.

Summary

The demographic data showed there were significant age and simulation experience differences between the comparison and experimental group. The results of the study also showed a significant difference in the test scores between the experimental and comparison group. The experimental group did not however score higher on the multiple choice examination questions. There are several potential reasons for this including age differences, additional simulation experience for the comparison group and order of test items. The dissertation built on this pilot study expanded the number of debriefing experiences the students received. In addition, the dissertation tested the students' knowledge with two 26-item multiple-choice tests. Additional measurements were obtained including satisfaction with the teaching modality and self-confidence in learning.

The next chapter will present and analyze the data from the dissertation study. Student outcomes were measured by a written multiple-choice test. The NLN Student Satisfaction and Self-Confidence in Learning Scale instrument was also used to compare students’ perceptions of satisfaction and confidence with the in class simulation experiences and the traditional lecture with paper and pencil case studies. The demographic data will be discussed and analyzed to determine possible influence on the data results.

CHAPTER IV

PRESENTATION AND ANALYSIS OF THE DATA

The purpose of this study was to determine if fourth semester Associate of Science in Nursing (ASN) students who participated in structured debriefing sessions after watching recorded high-fidelity simulation scenarios in a nursing didactic class obtained higher test scores than those who received traditional lecture format with case studies. In addition, the study investigated whether the students were more satisfied and confident with the simulation teaching strategy compared to students who received the same content through traditional lecture with pencil and paper case studies. The study compared mean test scores from a 26-item multiple-choice test and mean scores from the National League for Nursing (NLN) Student Satisfaction and Self-Confidence in Learning Scale between the two groups of students with the two different teaching modalities. The NLN tool was used to gather the students' perceptions of the various teaching modalities. This chapter reviews the demographic data of the study and analyzes it to assess for differences between the two groups of students. In addition, the chapter reviews the study hypotheses and the statistical findings.

Characteristics of the Sample

The sample for this study included fourth semester ASN nursing students at a single-purpose nursing and health sciences college located in a northeastern city in the U.S. The students were enrolled in a course with content focused on acute care and mental health concepts. To review, this study used a cross over design that permitted both groups of students to experience two different teaching modalities using simulation at two different times during the semester. The group of students was divided into two sections depending on their preference for class days. Section one students received the recorded cardiac simulation scenarios with debriefing in September 2009 while section two received the traditional lecture with cardiac case studies. In November 2009, the crossover took place and section one students received the traditional lecture with the hypoperfusion case studies while section two received the recorded hypoperfusion simulation scenarios with debriefing. Each teaching modality was utilized over a four-hour class period.

For the sample, there were 39 students enrolled in section one and all but one of those students consented to participate in the study. In comparison, 39 students were enrolled in section two and 25 of those students consented to participate. The total sample for the first part of the study was 63 participants. In the second part of the study, the sample size deceased to 50 participants due to participants not attending class and illnesses. Further explanation of the sample and data collection follows.

Power

Statistical power is defined as “the probability that a particular test of statistical significance will lead to rejection of a false null hypothesis” (Gall, et al., p. 143). Power is the complement of beta, which equals 1- β. The standard criterion for an acceptable risk for a Type II error is 0.20 therefore it is ideal to use a sample size that gives a minimum power of 0.80 (Polit & Beck, 2010).

When conducting a power analysis there were four factors that were considered including sample size, level of significance, directionality, and effect size (Gall, et al., 2007). For this study, the level of significance (α) was set at 0.05 with an assumed standard deviation of one. To review, the hypothesis tested was that mean exam scores for section one will equal mean exam scores of section two. Based upon a review of similar research studies it was determined that the mean exam scores were considered significant if there was a difference of at least 5% when comparing the mean scores between the groups. For this study, when using the 5% difference in mean test scores the result would be a difference of 1.3 questions for the 26-item exam. In other words, if mean score for one group was 80% and the mean score for the other group was 87%, the results would be significant.

With the above known data, Minitab software estimated the minimum sample size to be 12 subjects in each group to obtain a power of 0.80. However, the study sample included 38 participants in section one and 25 participants in section two. When conducting a power analysis for this study, a two-sample *t*-test was used with the testing mean 1 equal to mean 2 (versus not equal) and the calculating power for mean 1 equal to mean 2 + difference. The sample size for section one and section two provided a power of 0.999317 and 0.985968 respectively which validated that the sample size was adequate for the study. In the second part of the study when the groups crossed over and received a different teaching strategy less participants attended class due to illness and to study for a future examination. The sample size for section one was 30 and the sample size for section two was 20, which provided a power of 0.995465 and 0.958827 respectively. Power values achieved validated an adequate sample size for the study.

Descriptive Data

Demographic information collected at the beginning of either the recorded simulation scenarios or the traditional lecture class permitted the researcher to assess for differences between the sections. When the participants consented to partake in the study in September, they completed a 10-item demographic tool. The research assistant collected the consent forms and demographic tools and created a master roster containing the student's name and unique research number. The assistant kept the master key of identifiers and consent forms in a locked cabinet in her locked office but returned the demographic tools with identifier noted on the form to the researcher. The research assistant also collected GPA information from the students' online academic record and reported it to the researcher using the identifier. In addition, on testing day the participants reported through four multiple-choice test questions if they had clinical experiences related to the topics taught in class for the study. The research assistant collected the participants' responses regarding their clinical experiences and gave the results to the researcher using the identifier. A summary of demographic data of the study's sample follows in Tables 4.1 and 4.2.

Age

In this study over two-thirds (68.3%) of the 63 participants reported their age between 18 and 27 years of age while 31.8% reported their age between 28 and 57 years of age. Further analysis showed both sections had similar age categories with section one having 68.4% of the participants between the ages of 18 and 27 and section two had 68% of the participants between the ages of 18 and 27. A chi-square analysis revealed no significant differences between the two sections of students, $\chi2(1) = 0.001$, $p = 0.972$. In addition, because of the smaller individual cell counts for some of the age groups, a Fisher's exact test was conducted which also did not find significant significance, $p = 1.0$.

Gender

Of the 63 participants, six (9.5 %) were male and 57 (90.5%) were female. Section one consisted of four (10.5 %) males and 34 (89.4%) females and section two had two (8.0%) males and 23 (92%) females. A chi-square analysis revealed no significant differences between the two sections of students, $\chi 2(1) = 0.112$, $p = 0.738$. In addition, because of the smaller sample size of males, a Fisher's exact test was conducted which also did not find significant significance, $p = 0.736$.

Ethnicity

The sample of 63 participants included two African-Americans (3.2%), 57 Caucasians (90.4%), two Hispanics (3.2 %), and two identified as "other" (3.2%). Within section one, the participants reported their ethnic background and there were two African-Americans (5.3%), 34 Caucasians (89.4%), one Hispanic (2.6%), and one "other" (2.6%). Section two had 23 Caucasians (92%), one Hispanic (4.0%) and one "other" (4.0%). Due to the low numbers of non-Caucasians in the sample, the group was divided into Caucasians and Non-Caucasians to assess for differences between the two sections. No significant relationship was found; $\chi 2(1) = 0.112$, $p = 0.736$ when a chi-square test was calculated comparing ethnic diversity between the two section of participants.

Previous degree

One-third of the 63 participants reported having a prior degree. Further analysis showed that section one had 13 (34.2%) participants with a prior degree and in section two, nine (36.0%) participants reported obtaining a prior degree. No significant differences were found between the sections concerning a prior educational degree earned; $\chi2(1) = 0.021$, $p = 0.884$ ($p = 1.000$, Fisher's exact test).

Previous healthcare experience

Of the 63 participants, 47 (74.6%) reported prior healthcare experience. Section one had 26 (68.4%) participants with health care and section two had 21 (84%) participants with healthcare experience. No significant difference was found between groups relating to healthcare experience; $\chi2(1) = 0.1932$, $p = 0.165$ ($p = 0.2387$, Fisher's exact test).

Previous simulation experience

Among the 63 participants, 100% reported previous simulation experience in either clinical, classroom or both. Further analysis showed that section one reported that 24 (63.2%) participants experienced simulation in the classroom. In section two, 16 (64%) participants reported using simulation in the classroom. No significant difference was found between groups relating to classroom simulation experience; $\chi2(1) = 0.005$, $p = 0.946$.

Previous clinical cardiac experience

The participants were asked if they cared for a patient in clinical as a student nurse related to the four cardiac scenarios used in the study. Among the 63 participants, 20 (32.2%) reported previous clinical cardiac experience as a student nurse. Further analysis showed that section one reported that 11(29%) participants had cardiac clinical experience. In section two nine (36%) participants reported having cardiac clinical experience. No significant difference was found between groups relating to cardiac clinical experience; $\chi 2(1) = 0.344$, $p = 0.558$.

Previous clinical hypoperfusion experience

The participants were asked if they cared for a patient in clinical as a student nurse related to the hypoperfusion scenarios used in the study. Among the 50 participants, 29 (58.0%) reported previous clinical hypoperfusion experience as a student nurse. Further analysis showed that section one reported that 16 (53.3%) participants had hypoperfusion clinical experience. In section two 13 (65%) participants reported having hypoperfusion clinical experience. No significant difference was found between groups relating to hypoperfusion clinical experience; $\chi 2(2) = 0.686$, $p = 0.710$.

Table 4.1

Frequencies of Nominal Variables

Characteristics	Section One *n* (%)	Section Two *n* (%)	Total *n* (%)
Age			
18-22	15 (39.5)	8 (32.0)	23 (36.5)
23-27	11 (28.9)	9 (36.0)	20 (31.7)
28-32	6 (15.8)	3 (12.0)	9 (14.3)
33-27	1 (2.6)	3 (12.0)	4 (6.3)
38-42	1 (2.6)	2 (8.0)	3 (4.8)
43-47	1 (2.6)	0 (0)	1 (1.6)
48-52	2 (5.2)	0 (0)	2 (3.2)
53-57	1 (2.6)	0 (0)	1 (1.6)
	$X^2(1) = 0.001$, $p = 0.972$		
Gender			
Male	4 (10.5)	2 (8.0)	6 (9.5)
Female	34 (89.4)	23 (92.0)	57 (90.5)
	$X^2(1) = 0.112$, $p = 0.738$		
Ethnicity			
African-American	2 (5.3)	0 (0)	2 (3.2)
Asian/Pacific Islander	0 (0)	0 (0)	0 (0)
Caucasian (Non-Hispanic)	34 (89.4)	23 (92)	57 (90.4)
Hispanic	1 (2.6)	1 (4.0)	2 (3.2)
Other	1 (2.6)	1 (4.0)	2 (3.2)
	$X^2(1) = 0.112$, $p = 0.736$		
Previous Degree			
No	25 (65.8)	16 (64.0)	43 (68.3)
Yes	13 (34.2)	9 (36.0)	20 (31.7)
	$X^2(1) = 0.021$, $p = 0.884$		
Healthcare Experience			
No	12 (31.6)	4 (16.0)	16 (25.4)
Yes	26 (68.4)	21 (84.0)	47 (74.6)
	$X^2(1) = 0.1932$, $p = 0.165$		
Simulation Experience			
No	0 (0)	0 (0)	0 (0)
Yes	38 (100)	25 (100)	63 (100)
Classroom Simulation			
No	14 (36.8)	9 (36)	23 (36.5)
Yes	24 (63.2)	16 (64)	40 (63.5)
	$X^2(1) = 0.005$, $p = 0.946$		
Cardiac Clinical Experience			
No	27 (71)	16 (64)	43 (68.2)
Yes	11 (29)	9 (36)	20 (31.7)
	$X^2(1) = 0.344$, $p = 0.558$		
Hypoperfusion Clinical Experience			
No	14 (46.7)	7 (35)	21 (42.0)
Yes	16 (53.3)	13 (65)	29 (58.0)
	$X^2(2) = 0.686$, $p = 0.710$		

*Significance found at $p < 0.05$. No statistical significance found.

GPA

The mean GPA for the 63 participants was 3.22 (SD 0.3825). The range was 2.28-3.95. The mean GPA for section one (n = 38) was 3.23 (SD = 0.380) while the mean GPA for section two (n = 25) was 3.20 (SD = 0.393). When conducting a Levene's test for equality of variances, section one and section two were found to be statistically equivalent in variance, $F = 0.93$, $p = 0.834$. When a two-sample *t*-test was conducted, mean GPAs between the two groups were not significantly different; $t\,(50) = 0.35$, $p = 0.730$.

Table 4.2

Interval Variable Characteristics

Characteristics	Section One	Section Two	Total
GPA			
Mean	3.23	3.20	3.22
Standard Deviation	0.380	0.393	0.3825
Range	2.3-3.95	2.28-3.79	2.28-3.95
	$t\,(50) = 0.35$, $p = 0.730$		

*Significance found at $p < 0.05$. No statistical significance found.

Data Analysis

After data collection, the data were analyzed using Minitab software, version 15.0, and SPSS version 11.5. Normality, reliability, and point biserial concepts will be further reviewed. Research study hypotheses results are discussed in addition to the various statistical tests that were performed to analyze the data.

Normality

Normal is a term used to describe “a symmetrical, bell-shaped curve, which has the greatest frequency of scores in the middle, with smaller frequencies toward the extremes (Pallant, 2007, p. 57). The normal bell curve is the “most important distribution in statistics for three reasons” (Munro, 2005, p. 75). Even though most distributions are not perfectly normal, most variables have normal distributions. In addition, many statistical procedures require that populations are normally distributed to yield reliable results (Houser, 2008; Munro). Finally, the “normal distribution is a probability distribution and is used to answer questions about the likelihood of getting various particular outcomes when sampling from a population” (Munro, p. 75). For this study, statistics were assessed for normality during data analysis before choosing between parametric and non-parametric statistical procedures. The results of the normality tests indicated two sets of normal data and four sets of non-normal data and will be further discussed with the hypothesis results.

Equality of Variances

The variance is a “measure of variability that gives information about the spread of scores around the mean” (Houser, 2008, p. 371). If the variance is large, this indicates that the distribution of scores is spread away from the mean. In addition to the assumption of a normal distribution, parametric techniques assume that samples are obtained from populations of equal variances. In other words the “variability of scores for each of groups is similar” (Pallant, 2007, p. 204). In this study, the assumption of equal variances for the GPA variable was met. See Table 4.3 for data regarding Assumptions of Equal Variances and t-test for Equality of Means.

Table 4.3

Assumptions of Equal Variances and t-Test for Equality of Means

Variable	F	*p*	*t*	df	*p* (2-tailed)
GPA[a]	.059	.809	.349	61	.728

[a] = 63.

No statistical significance found.

t-Test and Mann Whitney U Test (Comparison of Means Between Groups)

When research questions compare two groups of people on a dependent variable, a *t*-test is used to assess the difference between the mean scores of two independent groups. The use of the *t*-test depends on three major assumptions. First, the two groups are independent of each other, which imply that a subject can only contribute one score to one of the two groups. Second, the distribution of the dependent variable is normal. If the data are skewed significantly, the *t*-test results may be invalid. Finally, the variances of the dependent variable for the two groups are similar. This assumption is known as the homogeneity of variance (Munro, 2005). When these assumptions are violated, the Mann Whitney *U* test is utilized. This is a “nonparametric statistic used to test the differences between two independent groups, based on ranked scores” (Munro, p. 559). For this research study both statistical procedures were utilized depending on whether the assumptions were met for using a *t*-test. The data for each hypothesis was analyzed to see if it met these assumptions. The results will be discussed in a later section.

Analysis of Variance (ANOVA)—Testing Differences with Three or More Groups

When research questions are comparing more than two groups, ANOVA is the appropriate statistical procedure. Analysis of variance compares the variance *between* the different groups, which is assumed to be a result of the independent variable, with the variability *within* each group, which is assumed to be due to chance (Pallant, 2007). For this study, the variance between the two sections of students was compared to the variance within each section to determine if it was significant. If the "variance between the sections exceeds the variance within the section, then it is assumed that differences between sections are real and attributable to the intervention" (Houser, 2008, p. 458). A p value of <.05 indicates that one of the group means is different and a post-hoc test is needed. However, if the *p* value is >.05, the group difference are due to standard error and no additional testing is necessary (Houser). The statistical question answered by the ANOVA test for this study is whether group means (age, gender, educational level, healthcare experience, simulation experience, clinical cardiac, and hypoperfusion experience) differ from each other. Results of these statistical tests follow in a later discussion.

Cronbach's Alpha (Coefficient Alpha)—Internal Reliability

The internal reliability is "the extent to which an instrument is consistent within itself as measured with the alpha coefficient statistic" (Houser, 2008, p. 252). Cronbach's alpha is widely used to measure stability within an instrument (Houser) and when some tests have several possible answers that are neither right nor wrong. Cronbach's alpha's normal range is between .00 and +1.00 but should have a value of .7 or greater to ensure the instrument is stable and has a higher internal consistency. (Gall, et al., 2007). If the

Cronbach's alpha is high then evidence exists that the test items measure the same construct however if the value of alpha is low then the items have little in common.

Cronbach's alpha was used to measure internal consistency for the NLN Student Satisfaction and Self-Confidence in Learning Scale used for this study. The tool was designed to measure student satisfaction (five items) and self-confidence in learning (eight items) after completing two simulation activities on different occasions by using a five-point Likert scale. Prior studies reported using the tool with the following reliability results: satisfaction = 0.94; self-confidence = 0.87 (National League for Nursing, 2007). For the first part of the study, which was cardiac content, the alpha coefficients were found to be 0.9037 and 0.7964 for the Satisfaction and Self-Confidence subscales, respectively. For the second part of the study, which was the hypoperfusion content, the alpha coefficients were found to be 0.9123 and 0.8402 for the Satisfaction and Self-Confidence subscales, respectively. These results are higher than the commonly used benchmark value of 0.7 which suggests that the items measure the same constructs of satisfaction and self-confidence (Minitab, 2007). Table 4.4 depicts the results of the alpha coefficients for the NLN Satisfaction with Learning and Self-Confidence in Learning Tool.

Table 4.4

Cronbach's Alpha (Coefficient Alpha)—Internal Reliability

Content	Satisfaction	Self-Confidence
Cardiac	0.9037	0.7964
Hypoperfusion	0.9123	0.8402

Kuder-Richardson (KR-20)—Reliability Coefficient

Internal consistency is "an approach to estimating test score reliability that involves examination of the individual items of the test" (Gall, et al., 2007, p. 202). Several statistical formulas quantitatively estimate the reliability of an exam. The Kuder-Richarson formula 20 (KR-20) calculates a reliability coefficient based on the number of test items, the proportion of the responses to an item that are correct, the proportion of responses that are incorrect and the standard deviation of the scores (Erickson & Wentling, 1988). KR-20 is a general indicator of test quality and is a measure of internal consistency. It reflects the extent to which a test would yield the same result if re-administered with no effect from the first administration (Kehoe, 1995; McGahee & Ball, 2009). Otherwise stated, it is "accuracy or power of discrimination" (Kehoe, p. 1). It is used when tests use dichotomous choices such as yes vs. no or incorrect vs. incorrect. Values can range from 0.00-1.00 with high values indicating the examination is a homogeneous test. The KR-20 is affected by difficulty, spread in scores and length of the examination. Longer exams will receive an elevated score (Cortina, 1993). Examinations with over 50 items should yield a KR-20 of over 0.8 but short tests with 10-15 items may have values of 0.5 which is satisfactory (Kehoe). However, a KR-20 greater than 0.50 is considered adequate for a nursing examination because of the multiple concepts and topics usually covered within the exam (McGahee & Ball).

For the first part of this study, the internal consistency using the KR-20 formula for the 26-item cardiac examination for section one who received the recorded simulation scenarios was 0.12 and the reliability coefficient (KR-20) for section two who received the cardiac lecture with case studies was 0.55. For the second part of the study, the internal consistency using the KR-20 formula for the hypoperfusion content for section two who received the recorded simulation scenarios was 0.36 and the reliability coefficient (KR-20) for section one who received the hypoperfusion lecture with case studies was 0.65. However, it is noteworthy to mention that the reliability for section two increased from 0.36 to 0.50 when the same test was analyzed with all students in class and not just those who consented to the research study. Results of the reliability coefficients are found on Table 4.5.

Table 4.5

Kuder-Richardson (KR-20)—Reliability Coefficient

Content	Simulation	Lecture/Case Study
Cardiac	0.12	0.55
Hypoperfusion	0.36	0.65

There are various reasons why reliability scores of test differ. McDonald (2002) identified nine factors that may affect reliability: quality of the test items, item difficulty, item discrimination, homogeneity of the test content, homogeneity of the test group, test length, number of examinees, speed, test design, administration, and scoring. However, low reliability coefficients are most often due to three factors “an excess of very easy (or hard) items, poorly written items that do not discriminate, or violation of the precondition that the items test a unified body of content” (Kehoe, 1995, p. 1). Discussion of these three factors follows.

Excess of very easy or hard items. Parscore, a test-scoring software, was used to obtain correct group responses, point biserial correlation coefficients and the reliability scores through a detailed item analysis report. The proportion of students who correctly answered items on a test affects its discrimination power (Kehoe, 1995). For the first part of the study, section one viewed the recorded cardiac simulation scenarios. Section one’s test scores ranged from 65%-96% with a mean score of 81.46%. Three (11.5%) questions were answered 100% correctly, eight (30.8%) questions were answered 90-99% correctly, four (15.4%) were answered 80-89% correctly, four (15.4%) were answered 70-79% correctly, three (11.5%) were answered 60-69% correctly, two (7.7%) were answered 50-59% correctly, and two (7.7%) were answered 40-49% correctly. Table 4.4 depicts the breakdown of correct group responses for the cardiac examination.

One indicator of item difficulty includes analyzing the total percentage of students who answer a test question correctly. “The greater the percentage of students answering a question correctly, generally, the easier that question is” (McGahee & Ball, 2009, p. 167). Upon closer analysis section one’s cardiac test, 15 (58%) of the questions were answered correctly by greater than 85% of the participants in section one. Kehoe (1995) reports that on a good test, most items will be answered correctly by 30-80% of the test-takers, anything higher than 85% will have a reduced power to discriminate. This examination had a fair amount of easier test questions but it did not have more than 85% of the test-takers answer the questions correctly.

Section two received the teaching strategy using lecture with cardiac case studies in the first part of the study. Their test scores ranged from 69% to 100% with a mean score of 86.2%. Eight (30.8%) questions were answered 100% correct, seven (27%) were answered 90-99%, five (19%) questions were 80-89% correctly, four (15%) were answered 60-69% correctly, and one (3.8%) were answered 50-59% correctly and one (3.8%) were answered 40-49% correctly. Within section two, 18 (69%) questions were answered correctly by greater than 85% of the test-takers, which is within the desired range of 30-80%. The data from the cardiac examination shows that both section one and section two had a higher proportion of students who correctly answered the test questions but not more than 85% therefore, it did not affect its discrimination power.

Table 4.6

Correct Group Responses-Cardiac Examination

Correct Group Response	Section One Test Questions Simulation	Section Two Test Questions Lecture
100%	3 (11.5%)	8 (30.8%)
90-99%	8 (30.8%)	7 (27.0%)
80-89%	4 (15.3%)	5 (19%)
70-79%	4 (15.3%)	0 (0%)
60-69%	3 (11.5%)	4 (15%)
50-59%	2 (7.7%)	1 (3.8%)
40-49%	2 (7.7%)	1 (3.8%)

For the second part of the study, section two viewed the recorded hypoperfusion simulation scenarios. Section two's test scores ranged from 62%-88% with a mean score of 73.7%. Five (19.2%) questions were answered 100% correct, four (15.4%) questions were answered 90-99% correctly, four (15.4%) were answered 80-89% correctly, three (11.5%) were answered 70-79% correctly, five (19.2%) were answered 60-69% correctly, two (7.7%) were answered 50-59% correctly, one (3.8%) was answered 30-39% correctly, and two (7.7%) were answered 20-29% correctly. Upon closer analysis, only 12 (46%) of the questions were answered correctly by greater than 85% of the participants in section one. The proportion of students answering items correctly (or incorrectly) by a large proportion of examinees (more than 85%) has markedly reduced power to discriminate. A good test contains items that will be answered correctly by 30-80% of the test-takers but anything higher than 85% will have a reduced power to discriminate. The percentage of questions answered on the hypoperfusion examination correctly falls within the desirable range but shows this test was more difficult than the cardiac test (Kehoe, 1995). Table 4.5 depicts the breakdown of correct group responses for the hypoperfusion examination.

Section one received the teaching strategy using lecture with hypoperfusion case studies in the second part of the study. Their test scores ranged from 54% to 96% with a mean score of 77.2%. Two (7.7%) questions were answered 100% correctly, eight (30.8%) were answered 90-99% correctly, five (19%) questions were 80-89% correctly, four (15.4%) were answered 70-79% correctly, two (7.7%) were answered 60-69% correctly, two (7.7%) was answered 50-59% correctly, and one (3.8%) was answered 40-49% correctly, one (3.8%) was answered 30-39% correctly, and one (3.8%) was answered 20-29% correctly. Within section one there were only 12 (46%) questions that were answered correctly by greater than 85% of the test-takers, which is within the desired range of 30-80%. The data from the hypoperfusion examination shows that both section one and section two had a lower proportion of participants who correctly answered the test questions compared to the cardiac examination however, it was still between the 30%- 80% threshold therefore not affecting its discrimination power.

Table 4.7

Correct Group Responses-Hypoperfusion Examination

Correct Group Response	Section One Test Questions Simulation	Section Two Test Questions Lecture
100%	5 (19.2%)	2 (7.7%)
90-99%	4 (15.4%)	8 (30.8%)
80-89%	4 (15.4%)	5 (19%)
70-79%	3 (11.5%)	4 (15.4%)
60-69%	5 (19.2%)	2 (7.7%)
50-59%	2 (7.7%)	2 (7.7%)
40-49%	0 (0.0%)	1 (3.8%)
30-39%	1 (3.8%)	1 (3.8%)
20-29%	2 (7.7%)	1 (3.8%)

Test Discrimination-Point Biserial Correlation Coefficient (PBCC). It is important to evaluate the extent to which test items discriminate among students to determine between those who have mastered the material and those who have not. For each test item "the primary indicator of its power to discriminate students is the correlation coefficient reflecting the tendency of students selecting the correct answer to have high scores" (Kehoe, 1995, p. 1). This coefficient is calculated and noted on the Parscore item analysis as the point-biserial correlation and is used to judge item quality (McGahee & Ball, 2009). The coefficient should be positive, indicating that students answering correctly tend to have higher test scores. In addition, negative values indicate that students selecting these choices tend to have lower test scores (Kehoe; McGahee & Ball). Discrimination measures how well an item can differentiate between high scoring and low scoring candidates. The higher the number the better the item discriminates between those students who did well on the exam and those who did not (McGahee & Ball). Items that do not differentiate well may not be producing useful psychometric information (Cambridge assessment network, 2008). Any PBCC greater than 0.20 is a reasonably good question (Scantron World Headquarters, 2003).

The results of the cardiac examination for section one's PBCC found that 12 (46%) questions were above 0.20 and 14 (54%) questions were rated as not acceptable as shown in Table 4.8. Included in the unacceptable test questions were three questions that had 100% correct group responses. Section two had 14 (54%) questions that were acceptable questions and rated above 0.20 and 12 (46%) items that were rated as unacceptable. Included in the 12 questions that should be revised were eight items that had 100% correct group responses.

Table 4.8

Point Biserial Correlation Coefficient-Cardiac Examination

PBCC	Section One Test Questions Simulation	Section Two Test Questions Lecture
.30 and above	8 (31%)	12 (46.2%)
.20 to .29	4 (15.3%)	2 (7.7%)
.09 to .19	4 (15.3%)	0 (0%)
Below .09	10 (38.5%)	12 (46.2%)

The results of the hypoperfusion examination for section one's PBCC found that 21 (81.0%) questions were above 0.20 and five (19%) questions were rated as not acceptable as shown in Table 4.7. Included in the unacceptable test questions were two questions that had 100% correct group responses. Section two had 14 (54%) questions that were acceptable questions and rated above 0.20 and 12 (46%) items that were rated as unacceptable. Included in the 12 questions that should be revised were five items that had 100% correct group responses.

Table 4.9

Point Biserial Correlation Coefficient-Hypoperfusion Examination

PBCC	Section One Test Questions Simulation	Section Two Test Questions Lecture
.30 and above	14 (54.0%)	9 (34.6%)
.20 to .29	7 (27.0%)	5 (19.2%)
.09 to .19	0 (0.0%)	2 (7.7%)
Below .09	5 (19.0%)	10 (38.4%)

When comparing the unacceptable test items for both sections on the cardiac examination there were seven of the same items that had a PBCC of less than .20. All of those questions had a 90-100% correct group response, which indicates it was an easy question for both sections. This equates to 27% of the test and that may have affected the reliability. In addition, McDonald (2002) acknowledges that a well written test may still obtain a low reliability coefficient because a class may have a homogenous group of high-achieving students.

When comparing the unacceptable test items for both sections on the hypoperfusion examination there were four of the same items that had a PBCC of less than .20. All of those questions had an 85-100% correct group response, which indicates it was an easy question for both sections. This equates to 15% of the test and that may have affected the reliability because of the difficulty of the exam.

Testing a unified body of content. The first examination administered in the study was a 26-item multiple-choice test containing the same cardiac questions for both sections of students. The content in the 26-item exam included the following cardiac topics: cardiac surgery, hemodynamic monitoring, cardiac tamponade, and thoracic and aortic aneurysms. While the examination had four different topics they were all cardiac related which resulted in the students being tested on a unified body of content. The second examination administered in the study was also a 26-item multiple-choice test containing the same hypoperfusion questions for both sections of students. The test included the following hypoperfusion topics: hypovolemic, cardiogenic, septic, neurogenic, and anaphylactic shock. Despite the different topics, they all related to states of being hypoperfused and tested the students on a unified body of content. In addition to the 26-item examination, the participants also completed a 94-item examination covering content taught during the same time period as the study material. Therefore, the students had to study a variety of topics. The results of the three study hypotheses are discussed in the next section of this chapter.

Results

It is imperative for researchers to utilize statistical procedures to organize, interpret and communicate numeric information (Polit & Beck, 2010). For this study, alpha was set at 0.05 which is the minimal acceptable alpha for scientific research and the confidence interval was set at 95% (Polit & Beck). The *p* value is the "probability that the obtained results are due to chance alone: the probability of a Type I error" (Polit & Beck, p. 562) For this study, results of tests with a *p* value < 0.05 are considered significant. Data analysis was conducted for the three study hypotheses and the results follow.

> H1 There will be no differences in mean test scores on the multiple-choice examinations between ASN students who watch recorded high fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led traditional lecture format and case studies in the classroom.

For the first hypothesis, the researcher assessed if the data from the multiple choice cardiac and hypoperfusion examinations met the assumptions of normality to determine which statistical test was appropriate to analyze the data. A normality test, Anderson-Darling (A-D) statistic, was conducted utilizing Minitab software. This statistic measures how well the data follow a particular distribution. If the *p* value is less than 0.05, then the null hypothesis is rejected meaning the data is from a normal distribution (Minitab, 2007). Results of the normality test for the cardiac examination showed that the A-D statistic = 0.863, *p* = 0.025. This test rejected the null hypothesis that the data came from a normal distribution therefore necessitating the need to use a nonparametric test to analyze the mean examination scores. Results of the normality test for the hypoperfusion examination showed that the A-D statistic = 0378, *p* = 0.396. This test accepted the null hypothesis that the data came from a normal distribution therefore necessitating the need to use a parametric test to analyze the mean hypoperfusion examination scores.

The Mann-Whitney *U* (MWU) test was utilized to assess statistical significances in the cardiac examination scores for students participating in the two teaching modalities, recorded simulations with debriefing and lecture with case studies. Section one participated in the recorded simulations with debriefing while section two had lecture with case studies for the cardiac content. Section one's mean examination score was 21.24 (SD = 1.87; median = 21.0) with scores ranging from 17-25. Section's two mean examination score was 22.44 (SD = 2.29; median = 23.0) with scores ranging from 18-26. The MWU test revealed significant differences between the median cardiac scores between the two groups; $U = 1068.0$, $p = 0.0362$. These results show that the lecture with case studies group scored significantly higher than the recorded simulation with debriefing group.

For the hypoperfusion content, section one had lecture with case studies while section two participated in the recorded simulations with debriefing. Section one's mean examination score was 20.07 (SD = 3.07; median = 20.0) with scores ranging from 14-25. Section's two mean examination score was 19.15 (SD = 2.37; median 19.0) with scores ranging from 16-23. Results of mean test scores between sections did not show a significant difference between section one and section two; $t = 1.13$, $p = 0.265$.

Additional analysis of section one and section two group data follows. Analysis of the cardiac examination scores was also conducted differentiating section one and section two groups' mean and median test results. For the cardiac examination, section one had 11 participants with clinical cardiac experience who had a mean test score of 22.27 (SD=2.00; median = 23.0). Section two had nine participants with clinical cardiac experience and their mean cardiac exam score was 22.11 (SD=2.67; median = 23.0). The MWU test was utilized to assess statistical significances of cardiac test scores between the students with clinical cardiac experience. Results of median cardiac test scores between sections did not show statistically significant difference between section one and section two; *U* = 114.5, *p* = 0.9693.

Additional analysis of the hypoperfusion examination scores was also conducted differentiating section one and section two groups' mean and median test results. For the hypoperfusion examination section one had 13 participants with clinical hypoperfusion experience who had a mean test score of 19.75 (SD=3.13; median = 20.0). Section two had 13 participants with clinical hypoperfusion experience and their mean cardiac exam score was 18.92 (SD=2.40; median = 19.0). Results of mean hypoperfusion test scores between sections did not show statistically significant difference between section one and section two; *t* = 0.78, *p* = 0.440.

Further analysis comparing differences between participants with healthcare experience and median examination scores follows. Section one had 26 participants with healthcare experience and their mean cardiac score was 21.50 (SD = 2.04; median = 22.0). Section two had 21 participants with healthcare experience and their mean cardiac test score was 22.38 (SD = 3.30; median = 23.0). Conducting a MWU test, results of median cardiac test scores between sections did not show statistically significant differences between section one and section two; *U* = 562.0, *p* = 0.1836.

For the hypoperfusion content, section one had 21 participants with healthcare experience and their mean hypoperfusion score was 19.33 (SD = 2.83; median = 19.0). Section two had 17 participants with healthcare experience and their mean hypoperfusion test score was 19.06 (SD = 2.41; median = 19.0). Results of median hypoperfusion test scores between sections did not show statistically significant difference between section one and section two; *t* = 0.32, *p* = 0.753.

In sum, the mean and median scores for the cardiac and hypoperfusion examinations of the two sections were compared for significant differences. Section two, who experienced lecture with case studies in the first part of the study, scored higher on the cardiac exam than section one who participated in recorded simulation scenarios with debriefing. For the hypoperfusion content, section one experienced lecture with case studies and they had a higher mean exam score than section two who experienced the recorded simulation scenarios although it was not statistically significant. There were statistically significant differences between section one and section two for the cardiac content therefore hypothesis one was not supported.

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of independent variables, age, gender, educational level, healthcare experience, simulation experience, and clinical cardiac experience on the dependent variables, cardiac and hypoperfusion scores as measured by the 26-item multiple choice tests. Table 4.10 depicts the breakdown of participants' descriptive statistics and mean scores of cardiac and hypoperfusion examinations.

Table 4.10

ANOVA—Descriptive Statistics—Cardiac test and Hypoperfusion test

Characteristics	Cardiac M *n = 63*	Cardiac SD	Shock M *n = 50*	Shock SD
Age:				
18-22	21.53	2.170	19.34	2.99
23-27	21.85	2.207	20.21	2.46
28-32	21.00		22.00	
33-37	23.75	.957	18.67	2.080
38-42	21.67	1.528	17.00	
43-47	21.00		25.00	
48-52	19.50	.707	18.00	4.24
Total	21.70	2.107	19.70	2.82
Gender:				
Female	21.54	2.053	19.65	2.93
Male	23.17	2.229	20.25	0.95
Total	21.70	2.107	19.70	2.82
Education Level:				
High School	21.68	2.126	19.35	2.96
Associate	21.00	1.414	19.75	1.71
Bachelors	21.88	2.335	21.00	2.49
Masters	23.00		17.00	
Total	21.70	2.107	19.70	2.82
Healthcare Experience:				
Yes	21.89	2.139	19.21	2.62
No	21.13	1.962	21.25	2.99
Total	21.70	2.107	19.70	2.82
Simulation Experience:				
Clinical	21.48	1.951	19.87	1.93
Classroom	22.67	2.338	18.67	2.42
Both	21.58	2.136	19.89	3.37
Total	21.65	2.081	19.73	2.84
Clinical Experience:				
Yes	22.20	2.262	19.38	2.80
No	21.47	2.016	20.14	2.85
Total	21.70	2.107	19.70	2.82

The results from the one-way between-groups ANOVA for the cardiac content follows in Table 4.11. A review of the results for the six independent variables follows. Participants were divided into seven groups according to their age (Group 1: 18-22 years: Group 2: 23-27 yrs; Group 3: 28-32 yrs; Group 4: 33-37 yrs; Group 5: 38-42 yrs; Group 6: 43-47 yrs; and Group 8: 47-52 yrs). Results of the Levene's test of homogeneity of variances for the cardiac score and age groups was F (4, 56) = 1.665, p = .171 indicating the variance in cardiac scores was the same for each of the seven age groups. In addition, there was no statistically significant difference at the $p < .05$ level in the cardiac mean scores for the seven age groups: F (6, 56) =1.092, p = .379.

For the independent variable, gender, participants were divided into two groups (Group 1: female and Group 2: male). Results of the Levene's test of homogeneity of variances for the cardiac score and gender groups was F (1, 61) = .053, p = .819 indicating the variance in cardiac scores was the same for each of the two gender groups. In addition, there was no statistically significant difference in the cardiac mean scores for the two gender groups: F (1, 61) =3.342, p = .072.

For the independent variable, educational level, participants were divided into four groups (Group 1: high school; Group 2: Associate; Group 3 Bachelors; and Group 4; Masters. Results of the Levene's test of homogeneity of variances for the cardiac score and educational levels was F (2, 59) = 1.000, p = .374 indicating the variance in cardiac scores was the same for each of the four educational levels. In addition, there was no statistically significant difference in the cardiac mean scores for the educational levels: F (3, 59) =.337, p = .798.

The fourth independent variable, healthcare experience, participants were divided into two groups indicating whether or not they had healthcare experience. Results of the Levene's test of homogeneity of variances for the cardiac score and healthcare experience groups was F (1, 61) = .324, p = .571 indicating the variance in cardiac scores was the same for each of the two healthcare experience groups. In addition, there was no statistically significant difference in the cardiac mean scores for the two healthcare experience groups: F (1, 61) =1.604, p = .210.

The fifth independent variable, simulation experience, participants were divided into three groups (Group 1: clinical only; Group 2: class only; Group 3 both clinical and class). Results of the Levene's test of homogeneity of variances for the cardiac score and simulation experience groups was F (2, 59) = .032, p = .968 indicating the variance in cardiac scores was the same for the three simulation experience groups. In addition, there was no statistically significant difference in the cardiac mean scores for the three simulation experience groups: F (2, 59) =.810, p = .450.

The final independent variable, clinical cardiac experience, divided participants into two groups indicating whether they experienced cardiac experience during clinical time. Results of the Levene's test of homogeneity of variances for the cardiac score and clinical cardiac experience groups was F (1, 61) = .511, p = .478 indicating the variance in cardiac scores was the same for the two clinical cardiac experience groups. In addition, there was no statistically significant difference in the cardiac mean scores for the clinical cardiac experience groups: F (1,61) =1.679, p = .200.

Table 4.11

ANOVA—Descriptive Statistics, Between, Within Groups—Cardiac test

Characteristics		Sum of Squares	df	Mean Square	F	*p*
Age:						
	Between	28.834	6	4.806	1.092	.379
	Within	246.435	56	4.401		
	Total	275.270	62			
Gender:						
	Between	14.296	1	14.296	3.342	.072
	Within	260.974	61	4.278		
	Total	275.270	62			
Education Level:						
	Between	4.642	3	1.547	.337	.798
	Within	270.628	59	4.587		
	Total	275.270	62			
Healthcare Experience:						
	Between	7.052	1	7.052	1.604	.210
	Within	268.218	61	4.397		
	Total	275.270	62			
Simulation Experience:						
	Between	7.060	2	3.530	.810	.450
	Within	257.133	59	4.358		
	Total	264.194	61			
Clinical Experience:						
	Between	7.372	1	7.372	1.679	.200
	Within	267.898	61	4.392		
	Total	275.270	62			

*Significance noted at $p < 0.05$. No statistical significance found.

The results from the one-way between-groups ANOVA for the hypoperfusion content follows in Table 4.12. The following is a summary for the hypoperfusion content; hypoperfusion scores and age, F (6,43) = 1.236, p = .307; hypoperfusion scores and gender, F (1, 48) = .162, p = .689; hypoperfusion scores and education level, F (3, 46) = 1.275, p = .294; hypoperfusion scores and healthcare experience, F (1, 48) = 5.165, p = .028 hypoperfusion scores and simulation experience, F (2, 46) = .472, p = .626; hypoperfusion scores and clinical hypoperfusion experience, F (1, 48) = .889, p = .350.

A statistically significant difference was found with healthcare experience and hypoperfusion test scores. Participants without healthcare experience had the highest mean hypoperfusion scores of 21.25 (SD = 2.99) compared to those participants with healthcare experience with mean scores of 19.21 (SD = 2.62). The effect size, calculated using eta squared, was 0.09 indicating a moderate effect (Pallant, 2007). This result was not obtained when analyzing the cardiac test scores and healthcare experience. None of the other results showed a statistically significant difference in mean hypoperfusion scores between age, gender, education level, simulation experience, or hypoperfusion clinical experience.

Table 4.12

ANOVA—Descriptive Statistics, Between, Within Groups- Hypoperfusion test

Characteristics	Sum of Squares	df	Mean Square	F	*p*
Age:					
Between	57.458	6	9.576	1.236	.307
Within	333.042	43	7.745		
Total	390.500	49			
Gender:					
Between	1.31	1	1.315	0.162	.689
Within	389.185	48	8.108		
Total	390.500	49			
Education Level:					
Between	29.985	3	9.995	1.275	.294
Within	360.515	46	7.837		
Total	390.500	49			
Healthcare Experience:					
Between	37.934	1	37.934	5.165	.028*
Within	352.566	48	7.345		
Total	390.500	49			
Simulation Experience:					
Between	7.801	2	3.901	0.472	.626
Within	379.750	46	8.255		
Total	387.551	48			
Clinical Experience:					
Between	7.101	1	7.101	.889	.350
Within	383.399	48	7.987		
Total	390.500	49			

*Significance noted at p < 0.05. No statistical significance found.

H2 There will be no differences in mean scores on the Student Satisfaction scores between ASN students who watch recorded high-fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led, traditional lecture format and case studies in the classroom.

The satisfaction with learning subscale of the Student Satisfaction and Self-Confidence in Learning tool allowed participants to rate how satisfied they were with the learning that took place using a form of simulation in the classroom. For the second hypothesis, descriptive statistics were used to explain and summarize the data. Overall, the study sample of 63 for the first part of the study was moderately satisfied with a mean score of 3.36 with the two different teaching strategies using a form of simulation (recorded high-fidelity scenarios and paper and pencil case studies) for the cardiac content. The range of mean item scores was found to be 3.30 to 3.50. For the second part of the study, the sample of 44 was slightly more satisfied with a mean score of 3.87 with the two different teaching strategies for the hypoperfusion content. The range of mean item scores was found to be 3.77 to 3.98, which were also slightly higher than the first part of the study. Table 4.13 summarizes the participants’ responses for the cardiac content and Table 4.14 summarizes the participants’ responses for the hypoperfusion content.

Table 4.13

Descriptive Statistics—Satisfaction with Learning Using Simulation Scale for Cardiac Content

Item Number	Minimum	Maximum	M	SD
Satisfaction[a]				
1	1	5	3.48	.936
2	1	5	3.50	.971
3	1	5	3.43	.985
4	1	5	3.30	1.00
5	1	5	3.14	1.14

[a] = 63.

Table 4.14

Descriptive Statistics—Satisfaction with Learning Using Simulation Scale for Hypoperfusion Content

Item Number	Minimum	Maximum	M	SD
Satisfaction[a]				
1	1	5	3.82	1.02
2	2	5	3.91	.741
3	1	5	3.98	.927
4	1	5	3.77	1.03
5	1	5	3.82	1.08

[a] = 44.

For the second hypothesis, the researcher assessed if the data from the student satisfaction tool met the assumptions of normality to determine which statistical test was appropriate to analyze the data. A normality test from Minitab software using the Anderson-Darling (A-D) statistic was used. Results of the normality test for the satisfaction with the teaching modalities for the cardiac content showed that the A-D statistic = 0.936, $p = 0.017$ and for the hypoperfusion content the A-D statistic = 1.507, *p* = < 0.005. This test rejected that the null hypothesis that the data came from a normal distribution therefore necessitating the need to use a nonparametric test to analyze the satisfaction scores.

The MWU test was utilized to assess for statistical significances in the student satisfaction scores for students participating in the two teaching modalities, recorded simulations with debriefing and lecture with case studies for the cardiac and hypoperfusion content. For the first part of the study, section one participants received the recorded simulations with debriefing while section two had lecture with case studies for the cardiac content. Section one's mean satisfaction score was 3.03 (SD = 0.888; median = 3.2) with scores ranging from 1-5. Section's two's mean satisfaction score was 3.84 (SD = 0.551; median = 3.8) with scores ranging from 1-5. Results of median satisfaction scores between sections showed a statistically significant difference between section one and section two; $U = 949.5$, $p = 0.0002$. The lecture and case study group was more satisfied with their teaching modality than the simulation with debriefing group. Hypothesis two was not supported for the cardiac content.

For the second part of the study, section two participants received the recorded simulations with debriefing while section one had lecture with case studies for the hypoperfusion content. The lecture and case study group's (section one) mean satisfaction score was 4.198 (SD = 0.462; median = 4.0) with scores ranging from 3-5. The recorded simulation scenario group's (section two) mean satisfaction score was 3.34 (SD = 1.02; median = 3.4) with scores ranging from 1-5. Results of median satisfaction scores between sections showed a statistically significant difference between section one and section two; $U = 743.0$, $p = 0.0011$. Once again, the lecture and case study group was more satisfied with their teaching modality than the simulation with debriefing group. Hypothesis two was also not supported for the hypoperfusion content. Table 4.15 provides section statistics, including section means, standard deviations, medians, and statistical significance for the cardiac and hypoperfusion content.

Table 4.15

Satisfaction with Learning Scores-Section One and Section Two for Cardiac Content and Characteristics of Section One and Section Two for Hypoperfusion Content

Subscale/Section	*n*	M	SD	Mdn	*p*
Sat.-Cardiac					
Section One[a]	38	3.03	0.888	3.20	
Section Two[b]	25	3.84	0.551	3.80	0.00*
Sat.-Hypoperfusion					
Section One[c]	27	4.20	0.462	4.00	
Section Two[d]	17	3.34	1.020	3.40	0.00*

[a] = simulation. [b] = lecture/case study. [C] = lecture/case study. [d] =simulation.
*Significance noted at $p < 0.05$.

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of independent variables, age, gender, educational level, healthcare experience, simulation experience, and clinical cardiac and hypoperfusion experiences on the dependent variables, cardiac and hypoperfusion satisfaction scores as measured by the NLN 5-item Likert type satisfaction with learning tool. Table 4.16 depicts the breakdown of participants’ descriptive statistics and mean scores of satisfaction with learning for the cardiac and hypoperfusion content.

Table 4.16

ANOVA Descriptive Statistics—Satisfaction with Learning Scale

Characteristics	Cardiac Satisfaction M[a]	Cardiac Satisfaction SD	Shock Satisfaction M[b]	Shock Satisfaction SD
Age:				
18-22	3.364	.8666	4.064	.5708
23-27	3.280	.8395	3.663	.9402
28-32	3.000		4.200	
33-37	3.700	1.1605	3.133	1.803
38-42	4.133	.4163	4.200	
43-47	3.200			
48-52	2.400	.8485	4.200	.2828
Total	3.356	.8629	3.868	.8340
Gender:				
Female	3.320	.8956	3.852	.8613
Male	3.700	.3033	4.067	.2309
Total	3.356	.8629	3.867	.8339
Education Level:				
High School	3.362	.8035	3.898	.8457
Associate	3.080	.5762	4.050	.6608
Bachelor	3.387	1.1014	3.690	.9311
Masters	4.0		4.200	
Total	3.356	.8639	3.867	.83394
Healthcare Experience:				
Yes	3.557	.7779	3.775	.8759
No	2.766	.8502	4.180	.6070
Total	3.356	.8629	3.867	.8339
Simulation Experience:				
Clinical	3.322	.7574	3.824	.8541
Classroom	3.6671	.6772	4.000	.6164
Both	3.274	.9307	3.988	.7141
Total	3.330	.8437	3.924	.7508
Clinical Experience:				
Yes	3.530	.7713	3.83	.974
No	3.276	.8894	3.87	.574
Total	3.356	.8629	3.85	.831

[a]*n* = 63. [b]*n* = 44.

The results from the one-way between-groups ANOVA for the cardiac and hypoperfusion content satisfaction follows in Table 4.17 and 4.18. Results of the Levene's test of homogeneity of variances for the satisfaction scores for the cardiac (n = 63) and hypoperfusion content (n = 44) and the six independent variables (age, gender, education level, healthcare experience, simulation experience, and clinical cardiac experience) were all > 0.05 indicating the variances in satisfaction scores was the same for each of the six variables.

The following is a summary for the cardiac content; for Satisfaction with Learning and age, F (6, 56) = .979, p = .448; Satisfaction with Learning and gender, F (1, 61) = 1.053, p = .309; Satisfaction with Learning and education level, F (3, 59) = .353, p = .787; Satisfaction with Learning and healthcare experience, F (1, 61) = 11.803, p = .001; Satisfaction with Learning and simulation experience, F (2, 59) = .543, p = .584; Satisfaction with Learning and clinical cardiac experience, F (1, 61) = 1.190, p = .280.

A statistically significant difference was found with healthcare experience and satisfaction with learning score for the cardiac content. Participants with healthcare experience had the highest mean satisfaction scores of 3.557 (SD = .7779) compared to those participants without healthcare experience with mean scores of 2.766 (SD = 0.8502). The actual difference in mean scores between the groups was large. The effect size, calculated using eta squared, was 0.16 indicating a large effect (Pallant, 2007).

The following is a summary for the hypoperfusion content; for Satisfaction with Learning and age, F (5,38) = 1.033, p = .413; Satisfaction with Learning and gender, F (1, 42) = .056, p = .813; Satisfaction with Learning and education level, F (3, 43) = .452, p = .717; Satisfaction with Learning and healthcare experience, F (1, 42) = .054, p = .818

Satisfaction with Learning and simulation experience, $F(2, 40) = .642$, $p = .532$; Satisfaction with Learning and clinical hypoperfusion experience, $F(1, 41) = .025$, $p = .874$. None of these results showed a statistically significant difference in mean Satisfaction with Learning scores between age, gender, education level, healthcare experience, simulation experience, or hypoperfusion clinical experience.

Table 4.17

ANOVA Descriptive Statistics—Satisfaction with Learning Scale, Between, Within Groups-Cardiac Content

Characteristics	Sum of Squares	df	Mean Square	F	*p*
Age:					
Between	4.383	6	.730	.979	.448
Within	41.780	56	.746		
Total	46.162	62			
Gender:					
Between	.783	1	.783	1.053	.309
Within	45.379	61	.744		
Total	46.162	62			
Education Level:					
Between	.813	3	.271	.353	.787
Within	45.349	59	.769		
Total	46.162	62			
Healthcare Experience:					
Between	7.484	1	7.484	11.803	.001*
Within	38.678	61	.634		
Total	46.162	62			
Simulation Experience:					
Between	.784	2	.392	.543	.584
Within	42.633	59	.723		
Total	43.417	61			
Clinical Experience:					
Between	.884	1	.884	1.190	.280
Within	45.279	61	.742		
Total	46.162	62			

*Significance noted at $p < 0.05$. No statistical significance found.

Table 4.18

ANOVA Descriptive Statistics—Satisfaction with Learning Scale, Between, Within Groups-Hypoperfusion Content

Characteristics	Sum of Squares	df	Mean Square	F	*p*
Age:					
Between	3.545	5	.709	1.022	.418
Within	26.360	38	.694		
Total	29.905	43			
Gender:					
Between	.128	1	.128	.181	.673
Within	29.776	42	.709		
Total	29.905	43			
Education Level:					
Between	.613	3	.204	.279	.840
Within	29.292	40	.732		
Total	29.905	43			
Healthcare Experience:					
Between	1.267	1	1.267	1.859	.180
Within	28.637	42	.682		
Total	29.905	43			
Simulation Experience:					
Between	.287	2	.143	.245	.784
Within	23.390	40	.585		
Total	23.667	42			
Clinical Experience:					
Between	.018	1	.018	.025	.874
Within	28.996	41	.707		
Total	29.014	42			

*Significance noted at $p < 0.05$. No statistical significance found.

H3 There will be no differences in mean scores on the Student Self-Confidence in Learning scores between ASN students who watch recorded high-fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led, traditional lecture format and case studies in the classroom.

The self-confidence subscale of the Student Satisfaction and Self-Confidence in Learning tool allowed participants to rate how confident they felt in obtaining the instruction they needed using simulation activities. For the third hypothesis, descriptive statistics were used to explain and summarize the data. Overall, the study sample of 62 (one incomplete survey) for the first part of the study was moderately self-confident with a mean score of 3.67 with the two different teaching strategies using a form of simulation (recorded high-fidelity scenarios and paper and pencil case studies) for the cardiac content. The range of mean item scores for the cardiac content was found to be 2.85 to 3.80. For the second part of the research, the study sample of 44 was slightly more self-confident with a mean score of 3.87 for the hypoperfusion content. The range of mean item scores for the hypoperfusion content was found to be 2.375 to 4.875. Table 4.9 summarizes the participants’ responses for the cardiac content and Table 4.20 summarizes the participants’ responses for the hypoperfusion content.

Table 4.19

Descriptive Statistics—Self-Confidence in Learning Using Simulation Scale for Cardiac Content

Item Number	Minimum	Maximum	M	SD
Self-Confidence[a]				
1	1	5	2.85	1.02
2	1	5	3.38	1.09
3	1	5	3.53	1.14
4	1	5	3.59	.966
5	1	5	4.11	.851
6	1	5	4.33	.510
7	1	5	3.72	.772
8	1	5	3.80	.786

[a]*n* = 62.

Table 4.20

Descriptive Statistics—Self-Confidence in Learning Using Simulation Scale for Hypoperfusion Content

Item Number	Minimum	Maximum	M	SD
Self-Confidence[a]				
1	1	5	3.44	.908
2	1	5	3.95	.872
3	1	5	3.79	.833
4	2	5	3.93	.856
5	2	5	4.09	.868
6	2	5	4.28	.630
7	2	5	3.81	.764
8	1	5	3.70	1.06

[a]*n* = 44.

For the third hypothesis, the researcher assessed if the data from the student satisfaction tool met the assumptions of normality to determine which statistical test was appropriate to analyze the data. Results of the normality test for the self-confidence in learning with the teaching modalities for the cardiac content showed that the A-D statistic

= 0.614, *p* = 0.105. This test accepted the null hypothesis that the data came from a normal distribution therefore necessitating the need to use a parametric test to analyze the mean satisfaction scores. However, the results of the normality test for the self-confidence in learning with the teaching modalities for the hypoperfusion content showed that the A-D statistic = 1.035, *p* = 0.009 which required the use of a nonparametric test such as MWU test.

The *t*-test was utilized to assess for statistical significances in the self-confidence scores for students participating in the two teaching modalities, recorded simulations with debriefing and lecture with case studies for the cardiac content. Section one participated in the recorded simulations with debriefing while section two had lecture with case studies for the cardiac content. Section one's mean examination score was 3.43 (SD = 0.539; median = 3.3) with scores ranging from 1-5. Section's two mean examination score was 4.00 (SD = 0.487; median = 4.0) with scores ranging from 1-5. Results of mean self-confidence scores showed a significant difference between section one and section two; $t = -4.38$, $p = 0.000$. Hypothesis two was not supported for the cardiac content.

For the second part of the study, section one had lecture with case studies while section two participants received the recorded simulations with debriefing teaching strategy for the hypoperfusion content. Section one's mean self-confidence score was 4.101 (SD = 0.405; median = 4.1) with scores ranging from 2-5. Section's two mean self-confidence score was 3.52 (SD = .646; median = 3.6) with scores ranging from 1-5. Results of median self-confidence scores showed a statistically significant difference between section one and section two; $U = 745.5$, $p = 0.0009$. Hypothesis three was also not supported for the hypoperfusion content. Table 4.21 provides section statistics, including section means, standard deviations, medians and statistical significance for the cardiac and hypoperfusion content.

Table 4.21

Self-Confidence in Learning Scores-Section One and Section Two for Cardiac Content and Hypoperfusion Content

Subscale/Section	*n*	M	SD	Mdn	*p*
SC-Cardiac					
Section One[a]	38	3.43	0.539	3.25	
Section Two[b]	25	4.00	0.487	4.00	0.00*
SC-Hypoperfusion					
Section One[c]	27	4.10	0.405	4.13	
Section Two[d]	17	3.52	0.646	3.63	0.00*

[a] = simulation. [b] = lecture/case study. [C] = lecture/case study. [d] =simulation.
*Significance noted at $p < 0.05$.

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of independent variables, age, gender, educational level, healthcare experience, simulation experience, and clinical cardiac experience on the dependent variables, cardiac and hypoperfusion self-confidence scores as measured by the NLN 8-item Likert type self-confidence with learning tool. Table 4.22 depicts the breakdown of participants' descriptive statistics and mean scores of self-confidence with learning for the cardiac and hypoperfusion content.

Table 4.22

ANOVA Descriptive Statistics—Self-Confidence in Learning Scale

Characteristics	SC Cardiac M[a]	SC Cardiac SD	SC Shock M[b]	SC Shock SD
Age:				
18-22	3.6914	.59057	4.0476	.44454
23-27	3.6000	.61452	3.7176	.64764
28-32	3.3750		4.1250	
33-37	4.0000	.71443	3.4167	1.12731
38-42	3.9167	.14434	4.0000	
43-47	3.1250			
48-52	3.0625	.08839	3.8125	.08839
Total	3.6587	.58768	3.8746	.58133
Gender:				
Female	3.6382	.60166	3.8689	.60140
Male	3.8542	.42143	3.9524	.14976
Total	3.6587	.58768	3.8746	.58133
Education Level:				
High School	3.6616	.51330	3.9145	.58046
Associate	3.4000	.44546	4.0313	.54367
Bachelors	3.7109	.79937	3.7045	.63805
Masters	4.0000		4.000	
Total	3.6587		3.8746	.58133
Healthcare Experience:				
Yes	3.7819	.56233	3.8634	.64869
No	3.2969	.52017	3.9125	.26385
Total	3.6587	.58768	3.8746	.58133
Simulation Experience:				
Clinical	3.6413	.53341	3.8015	.62353
Classroom	3.8333	.43780	3.9250	.38120
Both	3.6023	.62301	3.9991	.48275
Total	3.6391	.57130	3.9124	.53074
Clinical Experience:				
Yes	3.6688	.56962	3.8743	.67083
No	3.6541	.60247	3.8603	.44827
Total	3.6587	.58768	3.8688	.58691

[a]*n* = 63. [b]*n* = 44.

The results from the one-way between-groups ANOVA for the cardiac and hypoperfusion content follows in Table 4.23 and 4.24. Results of the Levene's test of homogeneity of variances for the self-confidence scores for the cardiac and hypoperfusion content and the six independent variables (age, gender, education level, healthcare experience, simulation experience, and clinical cardiac experience) were all > 0.05 except educational level with cardiac content indicating the variances in satisfaction scores was the same for each of the six variables. For the educational level variable, a robust test of equality of means, Brown-Forsythe, was used and reported below.

The following is a summary for the cardiac content; for Self-Confidence in Learning and age, F (6, 56) = .979, p = .880; Self-Confidence in Learning and gender, F (1, 61) = .730, p = .396; Self-Confidence in Learning and education level, F (2, 23.663) = .505, p = .610; Self-Confidence in Learning and healthcare experience, F (1, 61) = 9.208, p = .004; Self-Confidence in Learning and simulation experience, F (2, 59) = .407, p = .667; Self-Confidence in Learning and clinical cardiac experience, F (1, 61) = .008, p = .927.

A statistically significant difference was found with healthcare experience and self-confidence in learning score for the cardiac content. Participants with healthcare experience had the highest mean self-confidence scores of 3.7819 (SD = .56233) compared to those without healthcare experience who had mean scores of 3.2969 (SD = 0.52017). The actual difference in mean scores between the groups was large. The effect size, calculated using eta squared, was 0.13 indicating a large effect (Pallant, 2007).

The following is a summary for the hypoperfusion content; for Self-Confidence in Learning and age, F (5, 38) = 1.033, p = .413; Self-Confidence in Learning and gender, F (1, 42) = .056, p = .813; Self-Confidence in Learning and education level, F (3, 40) = .452, p = .717; Self-Confidence in Learning and healthcare experience, F (1, 42) = .054, p = .818; Self-Confidence in Learning and simulation experience, F (2, 40) = .642, p = .532; Self-Confidence in Learning and clinical hypoperfusion experience, F (1, 41) = .006, p = .940. No statistically significant difference in mean Self-Confidence in Learning scores was found between age, gender, education level, healthcare experience, simulation experience, and clinical hypoperfusion experience.

Table 4.23

ANOVA Descriptive Statistics—Self-Confidence in Learning Scale, Between, Within Groups-Cardiac

Characteristics	Sum of Squares	df	Mean Square	F	*p*
Age:					
Between	1.845	6	.307	.880	.516
Within	19.568	56	.349		
Total	21.413	62			
Gender:					
Between	.253	1	.253	.730	.396
Within	21.159	61	.347		
Total	21.413	62			
Education Level:					
Brown-Forsythe		df1, 2 df2, 23.6			
Healthcare Experience:					
Between	2.808	1	2.808	9.208	.004*
Within	18.604	61	.305		
Total	21.413	62			
Simulation Experience:					
Between	.271	2	.136	.407	.667
Within	19.638	59	.333		
Total	19.910	61			
Clinical Experience:					
Between	.003	1	.003	.008	.927
Within	21.410	61	.351		
Total	21.413	62			

*Significance noted at $p < 0.05$. No statistical significance found.

Table 4.24

ANOVA Descriptive Statistics—Self-Confidence in Learning Scale, Between, Within Groups- Hypoperfusion Content

Characteristics	Sum of Squares	df	Mean Square	F	*p*
Age:					
Between	1.738	5	.348	1.033	.413
Within	12.793	38	.349		
Total	14.532	43			
Gender:					
Between	.019	1	.019	.056	.813
Within	14.512	40	.351		
Total	14.532	43			
Education Level:					
Between	.477	3	.159	.452	.717
Within	14.055	40	.351		
Total	14.532	43			
Healthcare Experience:					
Between	.019	1	.019	.054	.818
Within	14.513	42	.346		
Total	14.532	43			
Simulation Experience:					
Between	.368	2	.184	.642	.532
Within	11.463	40	.287		
Total	11.831	42			
Clinical Experience:					
Between	.002	1	.002	.006	.940
Within	14.465	41	.353		
Total	14.467	42			

*Significance noted at $p < 0.05$. No statistical significance found.

Additional Findings

In addition to the data collected from the cardiac, hypoperfusion exams, and the NLN tools, the participants were asked to complete an optional two-question survey after experiencing both teaching modalities in the classroom. The first question asked was which teaching modality they preferred and the second question asked if they completed the assigned textbook readings. A summary of the survey finding follows in Tables 4.25 and 4.26.

Preferred Teaching Strategy

Of the 44 participants who completed the optional survey, the majority (75%) preferred lecture with case study to debriefing after watching recorded simulation scenarios as a teaching strategy used in the classroom. Section one just finished the case study strategy when completing the optional survey and 93% (n = 25) preferred lecture with case study. Section two just finished recorded simulation scenarios when completing the optional survey and 47% (8) preferred lecture with case study in the classroom. A chi-square analysis revealed significant differences between the two sections of students, $\chi2(2) = 15.625$, $p = 0.000$.

Required Readings

Of the 44 participants, completing the survey only three (6.8%) reported they completed all of the textbook readings prior to class. Section one had one participant (3.7%) while section two had 2 participants (11.8%) who read the textbook readings before attending class on the second day of the research study. A chi-square analysis revealed no significant differences between the two sections of students who completed their assigned readings, $\chi2(2) = 2.081$, $p = 0.353$.

Table 4.25

Frequencies of Nominal Variables

Characteristics (End of Study)	Section One *n* (%)	Section Two *n* (%)	Total *n*(%)
Preferred Teaching Strategy:			
Lecture/Case Study	25 (93.0)	8 (47.0)	33 (75.0)
Recorded Simulations	0 (0)	8 (47.0)	8 (18.0)
Both	2 (7.0)	1 (6.0)	3 (7.0)
Total	27 (100)	17 (100)	44 (100)
Required Readings:			
All of it	1 (3.7)	2 (11.8)	3 (6.8)
Some of it	8 (29.6)	7 (41.1)	15 (34.1)
None of it	18 (66.6)	8 (47.0)	26 (59.1)
Total	27 (100)	17 (100)	44 (100)

Table 4.26

Chi Square Results of Optional Survey

Characteristics (End of Study)	X^2	*DF*	*p*
Preferred Teaching Strategy	15.625	2	0.000*
Required Readings	2.081	2	0.353

*Significance noted at $p < 0.05$. No statistical significance found.

Differences Between Lecture/Case Study Teaching Strategy

Additional analysis was conducted to assess for differences between the dependent variables for the lecture/case studies teaching strategy. Results are found in Table 4.27. Because there were two teachers who taught using the lecture strategy while the same teacher used the simulation teaching strategy it was important to identify if there were differences between the outcomes of the two different teachers who used the same teaching strategy.

The Mann-Whitney *U* (MWU) test was utilized to assess statistical significances in the cardiac and hypoperfusion examination scores, satisfaction, and self-confidence in learning scores for participants participating in the lecture/case studies teaching modalities. Section two had lecture with case studies for the cardiac content in September while section one had lecture with case studies for the hypoperfusion content in November. Section two's median cardiac examination score was 23.0 while section's one median hypoperfusion examination score was 20 for the lecture/case studies teaching modality. The MWU test revealed significant differences between the median cardiac scores between the two groups; $U = 859.5$, $p = 0.0068$. These results show that the cardiac lecture with case studies group scored significantly higher on the multiple-choice content examination than the hypoperfusion with case studies group.

For the satisfaction scores, the Mann-Whitney *U* (MWU) test was also utilized to assess statistical differences in the satisfaction scores for participants participating in the lecture/case studies teaching modality. Section two's median cardiac satisfaction score was 3.8 while section's one median hypoperfusion satisfaction score was 4.0. The MWU test revealed significant differences between the median satisfaction scores between the two groups; *U* = 520, *p* = 0.0082. These results show that the hypoperfusion lecture with case studies group had significantly higher satisfaction scores than the cardiac with case studies group.

For the self-confidence scores, the Mann-Whitney *U* (MWU) test was also utilized to assess statistical differences in the self-confidence in learning scores for participants participating in the lecture/case studies teaching modality. Section two's median cardiac self-confidence score was 4.0 while section's one median hypoperfusion self-confidence score was 4.13. The MWU test did not reveal a significant difference between the median self-confidence scores between the two groups; *U* = 614.5, *p* = 0.3843. These results did not reveal significant differences between the self-confidence scores between the two groups of participants who had the lecture with case studies as a teaching modality.

Table 4.27

Comparison of Cardiac and Hypoperfusion Lecture Teaching Strategy on Dependent Variables

Dependent Variables	Cardiac Lecture Mdn Scores Section two *n = 25*	Hypoperfusion Lecture Mdn Scores Section one *n* = 30	Significance
Knowledge	23.0	20.0	0.0068*
Satisfaction	3.8	4.00	0.0082*
Self-Confidence	4.0	4.13	0.3816

*Significance noted at $p < 0.05$. No statistical significance found.

Summary of the Findings

The study consisted of a sample of 63 fourth-semester ASN students who participated in a four-hour class consisting of watching recorded high-fidelity simulation scenarios with debriefing and a four-hour class consisting of lecture with paper and pencil case studies. One group of participants began the study receiving the simulation scenarios while the other group received the lecture and case studies. The groups crossed over and each received the other teaching strategy therefore allowing both groups to receive both types of teaching strategies during the study. Both groups were tested using the same 26-item multiple choice examination for the cardiac and hypoperfusion content. Both groups also completed the NLN Satisfaction and Self-Confidence in Learning tool after receiving both teaching strategies.

Results showed there were significant findings with all three tested hypotheses. For the cardiac content, hypothesis one showed there was a significant difference in mean cardiac test scores between the two groups with the lecture/case study group scoring higher. In addition, hypothesis two and three showed significant findings with satisfaction and self-confidence in learning scores higher with the participants who received lecture/case studies than those who received recorded simulation with debriefing. For the hypoperfusion content, hypothesis one showed no statistically significant findings between the two groups on their hypoperfusion examination scores. In addition, hypothesis two and three showed the same results as the cardiac content. The participants who received lecture/case studies had statistically significant higher satisfaction and self-confidence scores than those who received recorded simulation scenarios.

The next and final chapter will consist of an analysis of the study findings. It includes a discussion of the findings, implications for nursing education, limitations of the study, as well as recommendations for future research.

CHAPTER V

ANALYSIS AND RECOMMENDATIONS

The purpose of this chapter is to summarize, discuss, and analyze the study results. Included in this chapter are a summary of results, discussion of findings, limitations of the study, implications for nursing education, recommendations for future research, and conclusions.

Summary of Research Results

Teaching and learning is a complex and dynamic process. Over the past few decades, the paradigm shifted from the teacher and the teaching process to the learner and the learning process. The learning paradigm identifies that the chief agent in the process is the learner, however, faculty have a pivotal role in the learning process (Vandeveer, 2009, p. e21). Faculty are the ones who create the learning environment that allows students to discover and create knowledge for themselves (Barr & Tagg, 1995). Within this learning paradigm exists the learning environment and the learning experiences that are all learner-centered and learner-controlled. The focus revolves around the needs of the learner rather than the specific content to be delivered. The learner is encouraged to ask questions, make inferences, and be creative (Schaefer & Zygmont, 2003).

Through the implementation of simulation in education, opportunities exist for nurse educators to create an environment focused on learner-centered principles (Jeffries & Rogers, 2007; P. Jeffries, et al., 2009). The human patient simulator (HPS) provides students with interactive learning scenarios to apply theoretical concepts and practice skills in a safe and controlled environment. However, there is a dearth of nursing research that documents the effects of using HPS scenarios in the classroom setting (Kardong-Edgren, et al., 2009; Rush, et al., 2008).

Purpose of the Study

The purpose of this study was to determine if fourth semester Associate of Science in Nursing (ASN) students who participated in structured debriefing sessions after watching recorded high-fidelity simulation scenarios in a nursing didactic class obtained higher examination scores than those who received the same content through traditional lecture format with case studies. The participants also reported their satisfaction with the different teaching methods used in the classroom and their feelings of self-confidence in learning the new material. Outcome measurements included two 26-item multiple-choice tests and the National League for Nursing (NLN) Student Satisfaction and Self-Confidence in Learning Scale.

Design, Population, and Methodology

This study utilized a quantitative, quasi-experimental, comparison group design. In addition, this study used a crossover design that permitted each participant to receive the treatment at a scheduled time throughout the study.

The convenience sample was from a private, four-year college located in a small sized northeastern city in the United States with the population of 56,000. The participants were nursing students in their fourth and final semester of an ASN program. They were enrolled in a nursing didactic course that focused on adult clients with crises and complex problems. Participants were invited to participate in the study at the start of the simulation or lecture with case study class however; they were excluded from the study if they did not attend the entire four-hour class. The majority of the population were Caucasian, female, and between the ages of 18-27. Sixty-three of the 78 students enrolled in the didactic nursing course consented to participate in the research study. In the second part of the study after the crossover was implemented, there were 50 participants in the sample due to students not attending the entire class or not attending class due to illness. The 78 enrolled students were split into two sections based their preference for class days.

The first group of participants, section one, began the study as the experimental group and attended a four-hour class while watching and debriefing about recorded cardiac high-fidelity scenarios. Concurrently, the second group of participants, section two, began the study as the comparison group and received four hours of the same cardiac content via traditional lecture format with the use of PowerPoint slides and paper and pencil case studies. Both groups took the same multiple choice examination questions, the NLN Student Satisfaction and Self-Confidence in Learning tool during the same week. During week ten of the semester, section two became the experimental group and section one became the comparison group. The experimental group attended a four-hour class and watched recorded hypoperfusion high-fidelity scenarios while the comparison group received the same hypoperfusion content in traditional lecture format using PowerPoint slides and case studies. Again, both groups completed the same multiple choice examination questions and the NLN Student Satisfaction and Self-Confidence in Learning tool during the same week.

Research Findings

Demographic findings. Demographic data were collected at the beginning of the study. There were no significant differences found between the two groups related to the following variables; age, gender, ethnicity, previous degree, previous healthcare experience, previous simulation experience, previous clinical cardiac and hypoperfusion experience, and GPA. Results of the demographic data are summarized in Table 5.1.

Table 5.1

Demographic Variable Characteristics

Characteristics	Section One *n* (%)	Section Two *n* (%)	Sig.
Age:			
18-27	26 (68.4)	17 (68.0)	
27-57	12 (32.6)	8 (32.0)	0.972
Gender:			
Male	4 (10.5)	2 (8.0)	
Female	34 (89.4)	23 (92.0)	0.738
Ethnicity:			
Caucasian	34 (89.4)	23 (92.0)	
Non-Caucasian	1 (10.6)	1 (8.0)	0.736
Previous Degree:			
No	25 (65.8)	16 (64.0)	
Yes	13 (34.2)	9 (36.0)	0.884
Healthcare Experience:			
No	12 (31.6)	4 (16.0)	
Yes	26 (68.4)	21 (84.0)	0.165
Classroom Simulation:			
No	14 (36.8)	9 (36)	
Yes	24 (63.2)	16 (64)	0.946
Cardiac Experience:			
No	27 (71.0)	16 (64.0)	
Yes	11 (29.0)	9 (36.0)	0.558
Shock Experience:			
No	14 (46.7)	7 (35.0)	
Yes	16 (53.3)	13 (65.0)	0.710
GPA mean:	3.23	3.20	0.730

*Significance noted at $p < 0.05$. No statistical significance found.

Hypotheses one results. Hypothesis one stated that there would be no differences in mean test scores between participants who watched recorded high fidelity simulation scenarios with debriefing in the classroom and participants who received instructor-led traditional lecture format and case studies in the classroom. Results revealed significant differences between the cardiac scores between the two groups (p = 0.0362). Students who participated in the traditional lecture with case studies scored higher than students who viewed the simulation videos. In the second part of the study, the groups crossed over and each received the other teaching strategy. The lecture and case group had a higher mean but it was not a significantly different. Hypothesis one was not supported for the cardiac content but was supported for the hypoperfusion content.

Additional analysis was conducted to assess for test score differences between the students who had cardiac and hypoperfusion clinical experiences and healthcare experience. No differences in the cardiac or hypoperfusion test scores were found for the groups with cardiac and hypoperfusion clinical experience or healthcare experience.

A one-way between-groups analysis of variance (ANOVA) was conducted to explore the impact of independent variables, age, gender, educational level, healthcare experience, simulation experience, and clinical cardiac experience on the dependent variables, cardiac and hypoperfusion scores as measured by the 26-item multiple choice tests. None of the results showed a statistically significant difference in mean cardiac and hypoperfusion scores between the independent variables.

Despite being endorsed by nursing curricula, the effectiveness of using human simulation as a teaching modality is largely unknown (Cant & Cooper, 2009). The simulation research literature is sparse with studies comparing teaching strategies and measuring cognitive growth. Currently, eight quantitative nursing studies measured cognitive gain after using simulation. Four studies did not show cognitive gains (Hoadley, 2009; P. Jeffries & Rizzolo, 2006; Kardong-Edgren, et al., 2009; Scherer, Bruce, & Runkawatt, 2007) while four showed cognitive gains (Alinier, et al., 2006; Birch, et al., 2007; Brannan, et al., 2008; Shepherd, Kelly, Skene, & White, 2007). Within the Birch et al. (2007) study, there were cognitive gains reported but not statistically significant.

It is important to review the results of the studies that did not find cognitive gains to assess for similarities and differences to this dissertation study, which may help explain the study results. Jefferies and Rizzolo's (2006) study placed nursing students in one of three simulation groups. While they found differences between the pre and posttest scores after completion of a 40-minute simulation scenario, there were no significant differences when comparing the knowledge scores between the three groups. Scherer, Bruce, and Runkawatt (2007) compared a one-hour simulation teaching experience to a clinical seminar and measured knowledge gains of nurse practitioner students who managed a cardiac event. Results found no differences in knowledge test scores. Both of these studies provided one hour or less of simulation. Perhaps the short simulation scenario was part of the reason that no cognitive gain was found. Nevertheless, in the Birch et al. (2007) study, the participants received either four or eight hours of simulation when learning to care for patients with obstetrical emergencies. Both groups improved in their knowledge but did not reach a statistically significant level. Regardless of the time spent on a scenario the results still did not show a significance difference in cognitive gains.

Two additional simulation studies within the literature compared test scores between two groups of students who used simulation. In the first study (Kardong-Edgren, et al., 2009), nursing students participated in a study that compared student knowledge after experiencing a 50-minute lecture only, a 50-minute lecture and 30 minutes of medium-fidelity simulation or a 50-minute lecture and 30 minutes of high-fidelity simulation. Results showed that all three groups showed a significant increase in mean post-test scores but the results were not significant between the different types of simulators used. The researchers noted that a limitation to the study was that the students were new to the learning modality and perhaps prior simulation experience is necessary for students to demonstrate learning. The participants in the dissertation study all reported experiencing simulation in the clinical setting but 36% did not experience simulation in the classroom setting where the environment was more active than a passive lecture classroom environment.

Hoadley (2009) compared results of two Advanced Cardiac Life Support (ACLS) classes on measurements of knowledge. The participants were assigned to a low-fidelity or high-fidelity simulation group. While the high-fidelity group scored higher on the cognitive test, it was not statistically significant. Hoadley noted one limitation to the study was the method of the debriefing sessions. Both groups had the same type of debriefing sessions and perhaps that facilitated learning and not the level of fidelity (Hoadley). The debriefing process is a key component and feedback is perhaps the most important factor influencing learning (Cantrell, 2008; Decker, 2007; Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005; P. Jeffries & Rizzolo, 2006; Kuiper, et al., 2008; Savoldelli, et al., 2006; Warrick, et al., 1979). With that in mind, the researcher developed a structured debriefing guide for the scenarios used in the study for the faculty member facilitating the classroom session. Without being in the classroom during the debriefing sessions, it is not known how effective the interactions were between the teacher and students. This may have affected the study. It is important to find ways to deliver quality, effective education to students while using a cost-effective, feasible approach.

The three studies that found cognitive gains provided one to six hours of simulation. In the Alinier (2006) study, the experimental group completed six hours of simulation experiences focusing on patient care and clinical skills while the control group did not receive simulation. Results showed that the experimental group obtained higher scores than the control group. It is important to note that the experimental group had the advantage of receiving six hours of hands-on educational instruction that the control group did not. This may have affected the results of the study. In the Brannan et al. (2008) study, one group of students received a two hour traditional lecture and the other group of students received two hours of simulation consisting of an evolving case study. Results showed that students who received the simulation instead of the traditional lecture achieved significantly higher posttest scores than did the students who received traditional lecture teaching modality (Brannan, et al.). While this study had favorable outcomes, the authors utilized additional faculty to help with the simulation experience. Having faculty available to help teach the didactic portion of nursing classes is not cost-effective, feasible, or appropriate in the midst of a nursing faculty shortage, which was a limitation of this study.

In the third cognitive gain study, (Shepherd, et al., 2007) graduate nurses were randomly placed in one of three group; self-directed learning packet (SDLP) only, SDLP plus two 30-minute scenario-based PowerPoint workshops, or SDLP plus two 30-minute simulation education sessions using a low-fidelity simulator. The only difference between the scenarios was the simulation group had more hands-on experience compared to the PowerPoint workshops. The graduate nurses in the simulation group scored significantly higher on the patient assessment practicum than the other two groups. One limitation for this study was no baseline assessment skills test was completed before the intervention. However, with the randomization process it should have ensured the groups were similar. Despite providing only one hour of simulation, the study had significant results. This was far less simulation than the dissertation study provided but the assessment content was not new content for the graduate nurses while the cardiac and hypoperfusion content was new for the participants used in the dissertation study. In addition, the graduate nurses completed a hands-on scenario while the dissertation study used recorded scenarios.

Cant and Cooper (2009) reviewed 12 simulation studies that compared teaching strategies using simulation and other educational strategies while measuring knowledge, critical thinking, satisfaction, and self-confidence. They identified core simulation components used by the effective studies. The components included an applicable physical environment, curriculum-based scenarios, academic support throughout simulations, repeated exposure, and a 3-step simulation process including briefing, simulation and debriefing. While this dissertation study included most of those components, it included a recorded scenario therefore eliminating the hands-on role of the participants. It also did not include multiple faculty to help with the scenario management, which is not cost-effective or realistic in a classroom setting.

Hypotheses two results. Hypothesis two stated there would be no differences in the student satisfaction scores between participants who watched recorded high-fidelity simulation scenarios with debriefing in the classroom and participants who received instructor-led, traditional lecture format and case studies in the classroom. For the first part of the study, there was a significant difference found between the mean satisfaction with learning scores with the lecture group having a higher mean score ($p = 0.0002$). For the second part of the study, the lecture group's mean satisfaction score was also significantly higher than the simulation group's score ($p = 0.0011$). Therefore, hypothesis two was not supported for the cardiac or hypoperfusion content.

ANOVA was also conducted on the descriptive statistics and the NLN Simulation Satisfaction Scale. One statistically significant difference was found with healthcare experience and satisfaction with learning score for the cardiac content (p = .001). Participants with healthcare experience had the highest mean satisfaction scores compared to those participants without healthcare experience with mean scores. ANOVA was also conducted with the satisfaction scale for the hypoperfusion content. None of the results showed a statistically significant difference in mean satisfaction with learning scores.

Review of the simulation literature helps explain the dissertation results related to satisfaction with the teaching strategies. Smith and Roehrs (2009) studied factors that are associated with positives outcomes when using high-fidelity simulation in nursing education. Results identified design characteristics such as clear objectives and an appropriate challenge to solve correlated well with student satisfaction. The simulation scenarios used in the dissertation study identified learning objectives and provided a copy of the objectives within the handouts. The problems that needed to be solved during the scenarios were thought provoking but they were part of the course content. What made this teaching strategy challenging was having a group of students with minimal knowledge about the content. It was difficult to generate discussion when the participants were not prepared to discuss the problems presented in the scenarios. The classroom expectations changed for the study and the students were not prepared for the active teaching strategy, which may have influenced their level of satisfaction.

In Hoadley's (2009) ACLS study, she also measured and compared satisfaction scores of the participants who were randomly assigned to the low-fidelity or high-fidelity simulation group. Results showed no significant differences between the group's satisfaction scores. The researcher reported the largest difference was in the verbal responses she received pertaining to course satisfaction. The high-fidelity group stated they enjoyed using the HPS and that future classes should be taught using only the HPS.

Jefferies and Rizzolo (2006) conducted a study that placed 403 nursing students in one of three simulation groups and looked for differences in satisfaction scores among the three groups. The students in the high-fidelity group were more satisfied with their learning experience than the other two groups of students. The study used a case study and two forms of simulation as the three teaching strategies, which is similar to the dissertation study. The main difference is the participants in the dissertation did not receive a hands-on simulation experience like the aforementioned studies. However, the researcher does not believe hands-on scenarios would have changed the reported satisfaction levels due to the students not being prepared to discuss the class content.

Hypotheses three results. Hypothesis three stated there would be no differences in mean scores on the Student Self-Confidence in Learning scores between participants who watched recorded high-fidelity simulation scenarios with debriefing in the classroom and participants who received instructor-led, traditional lecture format and case studies in the classroom. For the first part of the study, the lecture and case study group's mean self-confidence score was higher than the simulation scenario group's mean self-confidence score. Results of mean self-confidence scores showed a statistically significant difference between groups (p = 0.000). For the second part of the study, the lecture and case study group's mean self-confidence score was also higher than the simulation scenario group's mean self-confidence score. Results of median self-confidence scores showed a statistically significant difference between groups ($p = 0.0009$). Hypothesis three was not supported for the cardiac or hypoperfusion content.

ANOVA was also conducted on the descriptive statistics and the NLN Simulation Self-Confidence Scale within and between groups; only one statistically significant result was found between or within the two sections of participants for the cardiac content. The significant difference was found with healthcare experience and self-confidence in learning score for the cardiac content (p = .004). Participants with healthcare experience had the highest mean self-confidence scores compared to those without healthcare experience. ANOVA was also conducted with the self-confidence scale for the hypoperfusion content. None of the results showed a statistically significant difference in mean Self-Confidence in Learning scores.

Again, the literature helps explain the dissertation results because there are several research studies that found both an increase and a decrease in self-confidence scores when using simulation as a teaching strategy. Several studies measured self-confidence with simulation activities and reported having favorable outcomes. Cioffi, Purcal and Arundell (2005) found that midwifery students who received two simulation scenarios reported a higher level of confidence than the students who receive traditional lecture material. Goldenberg, Andrusyszyn and Iwasiw (2005) found increased confidence levels after students completed simulated patient teaching situations. Conversely, Brown and Chronister (2009) examined the effects of simulation activities on self-confidence in an electrocardiogram nurse course. Self-confidence measures showed no significant differences between the treatment and control groups. In fact, the control group showed statistically higher confidence score than the experimental group. Brennan, White and Bezanson (2008) measured self-confidence after two groups of students received either traditional lecture or a simulation experience. Results of the confidence levels were not found to be significantly different for the two groups. However, both groups of students showed considerable gains in their posttest measuring self-confidence. All of the above studies utilized a hands-on approach to the simulation scenarios. Perhaps the students would have felt more confident with learning the material if they had an active role in the scenario however, they did not report that finding when asked about their preferred teaching strategy in an optional survey.

The researcher asked the participants for additional feedback to help explain the results of the study. After the participants received both teaching strategies in the classroom, they completed an optional two-question survey about their preferred teaching strategy and completion of required readings for the classroom experience. Of the 44 participants who completed the survey, 75% preferred lecture with case study to debriefing after watching recorded simulation scenarios as a teaching strategy used in the classroom. After having finished the lecture with case study teaching strategy when completing the survey, that group reported that 25 (93%) participants preferred lecture with case studies and two participants (7%) enjoyed both teaching strategies. The second group completed the survey after receiving recorded simulation scenarios. They reported that eight (47%) participants preferred lecture with case study in the classroom, eight (47%) preferred the recorded simulations and one (6%) enjoyed both teaching strategies. Results revealed significant differences between the two groups of students and their preferred classroom teaching strategy (p = 0.000).

Both groups of students provided several reasons why they preferred a certain teaching strategy in the classroom. The participants who completed the lecture and case studies last provided several reasons why they liked the lecture with case study strategy over the recorded simulations. (See Table 5.2 for the Participants' Reported Advantages and Disadvantages of Teaching Strategies). The majority of the participants (55.5%) stated they could apply what they learned in class to the case studies. In addition, 36% of the participants stated they were able to learn the material first and then discuss it and 33% stated they had PowerPoint slides to use as a guide to study for the exam. Additional comments included feeling less rushed in discussing the case studies, appreciating that more details were included in the case study, and having the ability to walk through and critically think about the case study. One participant reported, "I did not prepare for the simulation, otherwise I may have liked it better".

The participants in the group who just finished the recorded simulations were split on which teaching strategy they preferred. (See Table 5.2 for the Participants' Reported Advantages and Disadvantages of Teaching Strategies). The participants who preferred the lecture with case studies gave the following reasons for their choice: 50% liked having the PowerPoint slides, preferred having the lecture first, and then thinking through the case studies, and thought the simulation scenarios went too fast and were hard to follow. The ones who preferred the simulation scenarios reported the following reasons for liking the simulation scenarios: liked the hands-on learning, thought it was more interesting, believed the visual aspect of the scenarios was enjoyable to them, and thought the interactions made them think more deeply. One participant who liked the simulation scenarios better still requested that PowerPoint handouts be provided.

Table 5.2

Participants' Reported Advantages and Disadvantages of Teaching Strategies

Teaching Strategy	Advantages	Disadvantages
Lecture/Case Studies	Immediate application Learned material and then did case studies Like PowerPoint slides Critically think about case study	
Simulation Scenarios	Hands on learning More interesting Visually appealing Needed to think deeply	Scenarios went too fast Did not prepare Felt rushed

The second question on the survey asked the participants if they completed all of the required readings. Of the 44 participants, completing the survey only three (6.8%) reported they completed all of the textbook readings prior to class. One group had one participant (3.7%) while the other group had two participants (11.8%) who read the textbook readings before attending class on the second day of the research study. There were no significant statistical differences found between the two groups of students who completed their assigned readings. The participants offered several reasons why they did not complete the required readings including the following: family issues, lack of time due to amount of clinical hours, and a preference to read after the class period had concluded. Additional discussion of the findings follows.

Discussion of Findings

This study was designed to determine whether ASN students who participated in debriefing sessions after watching recorded simulation scenarios obtained higher examination scores than those who received traditional lecture format with case studies. The participants also reported their satisfaction with the different teaching methods used in the classroom and their feelings of self-confidence in learning the new material.

To review, results showed a statistically significant higher cardiac examination score for the group of participants who received the lecture and case studies for the cardiac content. The lecture and case study group for the hypoperfusion content had a higher mean examination score however; the results were not statistically significant. Both sections of participants reported statistically significant higher satisfaction and self-confidence scores with the lecture and case study teaching strategy. Based on the study results, the researcher considered additional possible reasons for the significant findings by reviewing the Nursing Education Simulation Framework (NSEF) in relation to the recorded simulation scenario teaching strategy.

The simulation scenarios used in the study were developed based on the NSEF principles. The framework's five main conceptual components include the following; teacher factors, student factors, educational practices, simulation design characteristics and expected student outcomes (Jeffries & Rogers, 2007). The teacher for the simulation scenarios was a content expert and comfortable with using this teaching strategy. She facilitated the debriefing sessions and created a learner-centered environment. The participants were provided handouts with the class objectives included. They were given a reading assignment prior to class but they were not required to verify that they completed it. The scenarios were appropriate for their final semester in the nursing program.

The educational practices within the framework include active learning, diverse learning styles, collaboration, and high expectations. The recorded simulation scenarios were a form of active learning. The participants were engaged in the scenarios throughout the four-hour class period. The participants visualized the scenarios and then discussed them in both a small and large group setting. It permitted participants to think and reflect on the scenarios. The scenarios were pre-recorded and did not include hands-on practice with skills but participants could watch experienced nurses perform the skills. The debriefing sessions allowed the participants to share and exchange information between each other and the teacher. The students asked questions and had difficult concepts clarified. Finally, there were high expectations for the participants in this class. These expectations were different from those previously held in prior classes. The participants in this study were exposed to a variety of teaching strategies throughout their nursing educational process. However, the vast majority of the time spent in the classroom was in a traditional, instructor-led lecture format with PowerPoint handouts therefore this teaching strategy was not the norm for these participants.

The fourth component in the NSEF is simulation design characteristics and includes five features; objectives, fidelity, problem solving, student support and reflecting learning (Jeffries & Rogers, 2007). These features were considered when developing the simulation scenarios. Each simulation scenario had objectives that were written on the first page of the handouts. A high-fidelity HPS was used to make the environment and scenario as realistic as possible. The scenarios were complex due to the content presented. Students were supported during the debriefing process.

The first hypothesis stated there would be no differences in test scores between the two teaching strategies; recorded simulations and lecture with case studies. Both groups of participants scored higher with the lecture and case studies and one of those results were significant. There may be several reasons why the participants scored higher on two separate occasions. First, while the majority of participants previously experienced simulation in the classroom it was not in the recorded format. They actively participated in a live scenario. In addition, it was obvious through teacher observations and students self-reporting that they did not complete the reading assignment prior to class. This hindered the teacher when attempting to debrief on a situation that was new for the participants. In addition, the expectation of having read the assignment prior to the simulation was assumed, but no consequence was enforced. On the contrary, the participants in the lecture and debriefing group did not need to read because the material was presented to them verbally and reinforced with PowerPoint handouts. At the end of class, they completed the case studies with their newly acquired knowledge from the lecture.

For the second and third hypotheses, results also included a statistically significant higher level of satisfaction and self-confidence with the lecture and case study teaching strategy than the recorded simulation scenarios strategy for both the cardiac and hypoperfusion content. The NLN satisfaction and self-confidence with learning tool has been used in prior simulation studies and has found students to be satisfied and self-confident after using simulation (Cioffi, et al., 2005; P. Jeffries & Rizzolo, 2006). This study found opposite results that may be a result of implementing a different teaching strategy than the participants were accustomed to in the classroom.

Two-thirds of the participants in both groups experienced simulation in the classroom but not in the recorded scenario format. The participants expected PowerPoint handouts during the simulation scenario experience despite getting handouts that needed to be completed during the viewing of the simulation scenarios. The answers were found in the scenarios and discussed during a debriefing session but the students preferred handouts with completed answers. The participants were not comfortable with their new active role in the classroom because they were familiar with being passive learners. The results of the study should not lead to abandonment of this teaching strategy but rather lead to modification of this teaching strategy. This strategy incorporates principles of a learning environment where the learner is encouraged to ask questions, make inferences, and be creative (Schaefer & Zygmont, 2003). A key component was missing in this process of a learner-centered environment and that was the learner taking accountability to read the assigned readings prior to the teaching strategy. The participants preferred to be “spoon-fed” the information first and then asked questions. By not reading prior to class, it made it difficult to facilitate a debriefing session when participants did not have background knowledge. In addition, the handouts used in the simulation scenarios needed to be completed by the participant through observing the scenario and participating in the debriefing sessions. This was a new expectation for the participants that may have caused them to feel less satisfied and self-confident. Recommendations for future research address these concerns.

Limitations

There were several limitations of the study. These include factors related to the teachers, students, debriefing sessions, and examination.

Faculty Factors

One limitation of this study involved the faculty teaching the classes. The two groups of participants had a team of three teachers teaching the content in the class. During the study one teacher from each group taught in their non-assigned group to a class of students they did not know. There were no comments from the participants about this situation and the researcher does not believe it affected the findings.

In addition, two different teachers taught the lecture and case studies instead of having one consistent person. This situation changed late into the planning phase of the study and may have affected the findings but could not be avoided. A comparison to assess for differences between the cardiac and hypoperfusion median scores, satisfaction, and self-confidence with learning scores using the lecture/case studies teaching strategy was completed. Results showed significant differences between the cardiac and hypoperfusion exam scores and the satisfaction scores but not self-confidence scores. These results are consistent with the overall finding that the hypoperfusion examination was more difficult and had a lower mean score than the cardiac exam. The participants were also significantly more satisfied with the hypoperfusion lecture and case studies compared to the cardiac lecture. The cardiac case studies were developed for this study while the hypoperfusion case studies were utilized in prior classes. The hypoperfusion case studies were revised over time while the cardiac case studies were new. In addition, the teacher for the cardiac lecture class noted that she needed additional time to review the answers for cardiac case studies. It is hypothesized that the participants were not as satisfied because of the lack of time to complete the case studies. The teacher subsequently posted the answers to the case studies on Blackboard.

It is important to note that despite the difficult hypoperfusion examination scores the participants felt more satisfied and self-confident with learning the hypoperfusion content using lecture and case studies. This may have been a result of completing the satisfaction and self-confidence tool prior to taking the examination. Nevertheless, it did not matter which teacher they had for the lecture and case study, the participants were more satisfied and confident with that teaching strategy.

Another limitation includes both of the teachers who completed the lecture and case studies class had significantly more classroom teaching experience than the simulation scenario teacher. One may question if the lack of teaching experience affected the study and it may have but there was no statistically significant difference in the mean examination scores during the second part of the study. Conversely, the more inexperienced, younger teacher was very willing to commit to helping the researcher convert the classroom content into recorded simulation scenarios. She embraced utilizing simulation in the classroom despite the arduous process to create and record the simulation scenarios. This finding correlates with Hanberg's (2008) study that younger faculty are more likely to implement simulation technologies into the nursing curriculum. Therefore, the younger, more inexperienced teacher helped to facilitate the study that ultimately adds to the body of nursing knowledge.

Student Factors

Another limitation of the study involved student factors. The two groups of students had the same number enrolled; however, there were a larger number of participants who consented to the study from one of the groups. The researcher was familiar with some of the participants in one group from a separate clinical course. Those participants may have agreed to participate because they knew the researcher from another class. Despite the smaller sample size for one group it was still large enough to provide a power of 0.985968, which validated that the sample size was adequate for the study.

Unfortunately, when the second part of the study occurred it was at the end of the semester and students were becoming ill and not coming to class. Furthermore, there was an exam scheduled in the near future for one group and some of the participants decided not to come to class and stay home to study for the examination. The participants who did not attend all four hours of class were also excluded from the study. Despite the decrease in participants, the sample size for the second part of the study for one group was 30 and the sample size for the other group was 20. This provided a power of 0.995465 and 0.958827 respectively, which validated an adequate sample size for the study.

For the study, students were assigned textbook readings. For the cardiac content, the students had four different cardiac topics totaling 22 pages of readings and for the hypoperfusion content, the students' reading included 25 pages. The students were assigned readings since their first nursing course. Faculty expect students to read the assignment in preparation for classroom activities in hopes that it enhances content comprehension (Beeson & Aucoin, 2005; Ryan, 2006). The teachers in the study reported to the researcher that it was apparent that the students did not complete the readings. In addition, the participants reported on the survey at the end of the study that the vast majority did not complete the readings due to lack of time. Additional reasons for not completing readings found in the literature include students not valuing the readings as highly as the teacher lecture, being overwhelmed by the readings and wanting to know what they "need to know" in the readings (Beeson & Aucoin; Ryan). The researcher did not believe the readings were excessive for a four-hour class, however; this is something that could be changed in a future research study, and it will be discussed later.

Debriefing Sessions

An additional limitation of the study involved the debriefing sessions. The approach to the debriefing process may have affected the finding. The goal of the debriefing process was to reinforce the "positive aspects of the simulation experience while encouraging reflective learning, which allows the participant to link theory to practice and research, think critically, and discuss to intervene professionally in very complex situations" (P. R. Jeffries, 2005, p. 101). To review, debriefing occurred during and after watching the recorded simulation scenarios. The participants received handouts to take notes during the simulation scenario. There were blanks in certain areas to prompt the participant to take notes. However, many of the participants requested handouts, in the form of PowerPoint slides, with the answers included. In addition, there were debriefing questions contained in the handouts. The participants discussed the questions as a large group or in smaller groups during the class. The teacher then facilitated the discussion and reviewed the answers. Nonetheless, due to the participants' lack of content knowledge, it was difficult for the simulation teacher to have meaningful debriefing sessions when the participants had no background knowledge of the topics. This was a potential source of dissatisfaction for the participants because they were expected to reflect on a scenario that they had little or no knowledge about because most did not read the textbook before class. Furthermore, it is not known whether the teacher's ability to facilitate the debriefing process in a quality manner influenced the results of the study. In addition, participants verbalized difficulty hearing parts of the recorded scenarios. This was not discovered until after the simulation scenario class was over.

Cantrell (2008) found that students believed debriefing immediately after the simulation scenario enhanced their learning. The timing of the debriefing was important because the experience was "fresh in their mind and they were still engaged in the learning activity"(Cantrell, p. e21). Despite following these same guidelines, the participants had difficulty engaging in the debriefing process. Future studies could include incorporating completion of a worksheet due at the start of class validating the assignment to ensure students are adequately prepared to debrief.

Examination Factors

Another limitation of this study involved the written test, which was the cognitive outcome measurement of the cardiac and hypoperfusion content. The tests consisted of

26 multiple-choice questions. The questions were extracted from textbook test banks and five content experts reviewed them prior to administration. For the first part of the study, the internal consistency using the KR-20 formula for the 26-item cardiac examination for section one who received the recorded simulation scenarios was 0.12 and the reliability coefficient (KR-20) for section two who received the cardiac lecture with case studies was 0.55. Despite using the same test for both sections, one examination had an unacceptable reliability score. Based upon the high percentage of students answering many of the test questions correctly on the first examination it appears to be an easier exam. In addition, the Point Biserial Correlation Coefficients identified 12 items needing revised including several questions that had 100% correct group responses.

For the second part of the study, the internal consistency using the KR-20 formula for the hypoperfusion content for section two who received the recorded simulation scenarios was 0.36 and the reliability coefficient (KR-20) for section one who received the hypoperfusion lecture with case studies was 0.65. However, it is noteworthy to mention that the reliability for section two increased from 0.36 to 0.50 when the same test was analyzed with all students in class and not just those who consented to the research study. This examination had a higher reliability score but still had 12 test items that needed revisions. The mean score for this test for the simulation group was 73.7% and the lecture with case study group was 77%. The test was a difficult exam based on these numbers therefore the difficulty of items should not be increased but a potential solution for the low reliability score would be to revise some of test questions and increase the test length (McDonald, 2002).

Importance for the Nursing Education

Nurse educators have the responsibility of educating nursing students to be competent and able to provide safe care by using a large array of teaching modalities (Hicks, Coke, & Li, 2009). Human patient simulators provide a learner-center, interactive environment while providing learners with various domains of learning, including cognitive, psychomotor, and affective. Nurse educators have the opportunity to use human patient simulators to provide students with realistic learning experiences in a safe environment (Day, 2007; Hicks, et al.; Nehring & Lashley, 2004; Peteani, 2004; Rothgeb, 2008; Schoening, et al., 2006). Simulation experiences are needed in nursing education to help with the lack of clinical sites, low census in certain clinical areas, and nursing faculty shortage (Hicks, et al.). Students can have their knowledge tested, demonstrate skills, and practice decision-making while not harming an actual patient. Students can also practice communication techniques with the simulator, family members and other team members (Rothgeb).

Students represent a wide range of ages, personal life experiences, and talents. Many students are accustomed to using computers, internet, MP3 players, simulated computer games, and personal digital assistants. Students expect more hands-on experiences and modern tools to help with their learning process. Educators need to revise their teaching styles to meet the needs of the learners including integrating technological enhanced teaching strategies (Rothgeb, 2008). However, it is imperative that nurse educators conduct research to validate the worth of these technological modalities to add to the body of nursing knowledge.

The results of this study may help provide nursing faculty with a means to provide students in the classroom with an active teaching strategy that incorporates an HPS. A caveat is the large amount of time needed to develop this type of teaching strategy. However, once developed a quality recording can be used repeatedly, therefore permitting the faculty member additional time to modify other aspects of the course. Furthermore, students who miss class could also view the recorded simulations outside of class while filling in the handouts during that time. In addition, the students were more satisfied with traditional lecture and case studies than recorded simulation scenarios in the classroom. They preferred the teaching strategy they were most familiar with throughout their education experience. Perhaps a few changes to the simulation experience would change the students' perceptions and are discussed later in this chapter.

Recommendations for Further Research

When completing a literature review for this study, very few articles existed regarding using simulation in the classroom including assessing knowledge acquisition gained through simulation scenarios. There remains a vast array of potential research topics to be studied to identify the worth of a human patient simulator in nursing education.

Revising and Repeating Current Study

This study could be repeated by incorporating some changes including requiring completion of a worksheet prior to the start of class, modifying the handouts, revising some of the test questions and integrating actual simulation scenarios into the classroom instead of recorded scenarios.

The participants admitted to not preparing for class despite the assigned readings. By creating an assignment that requires the student to delve into the literature it may make a difference in the classroom interactions and outcomes. Ryan (2006) completed a study comparing examination results with three groups of students who had three different types of classroom assignments assigned prior to class. Assignments included required readings with planned quizzes, focused worksheets collected before class and worth 25% of their final grade, and focused worksheets collected before class with teacher comments also worth 25% of their grade. Findings indicated that the students who had the focused worksheet with teacher comments performed best on the midterm and final examination. This finding could be used as a strategy to "motivate students to read their textbooks and as a strategy to enhance textbook reading skills and comprehension" (Ryan, p. 139). These findings could be adapted and utilized in another study using simulation in the classroom.

The participants stated they wanted handouts that were more detailed. The handouts could be modified to include more answers but if the students come to class prepared to debrief they may not think they need completed PowerPoint slides. As discussed above several of the test questions on both examinations needed revised based on the PBCC. It is important not to increase the difficulty of the hypoperfusion examination due to the low mean test scores. Finally, it would be noteworthy to compare the recorded simulations to actual hands-on simulation scenarios and assess cognitive acquisition, satisfaction, and self-confidence with that teaching strategy.

Additional Research Topics

There is a large amount of research that needs completed to validate the worth and outcomes of using a human patient simulator in nursing education. Based on the findings from this study there are additional research topics that need explored. When is simulation appropriate? Is it better utilized for specific student populations or types of content? Should simulation be used judiciously when content is new to students? Under what conditions is simulation appropriate to use and when is it not? What set of skills are more important, being a content expert or debriefing expert? What types of educators should use simulation? Is the simulation process including debriefing methodology a treatment effect? What is the “best practice” to facilitate a debriefing session?

Further longitudinal studies are needed to verify if students can transfer skills and knowledge learned via simulation to real life patient care and if students they retain those skills (Flanagan, Clavisi, & Nestel, 2007; Hicks, et al., 2009). In addition, simulation research can focus on assessing clinical skill development. Can simulation be used effectively to learn skills? Theroux and Pearce (2006) used simulators instead of classmates to teach graduate nurse practitioners how to perform a pelvic examination. Findings included a decreased feeling of anxiety and increased feeling of self-confidence in performing examinations.

Another research topic that can be explored is decision-making skills. Can simulation be used to teach decision-making skills? Lowdermilk and Fishel (1991) found improvement in clinical decision-making skills after computer training on decision-making. This study could be modified using a human patient simulator. Effective communication is vital and essential to deliver high quality, safe patient care (Leonard, Graham, & Bonacum, 2004). It is imperative that nursing professionals communicate effectively with both patients and other healthcare providers. Communication skills could be practiced in a simulation environment. Utilizing recorded performance with feedback are critical components of education that can be done in a simulation setting (Flanagan, et al., 2007). In addition, communication with various cultural groups could be practiced and evaluated for effectiveness. To facilitate some of these research ideas, tools need to be constructed to measure the variables. Finally, with the high cost of purchasing a human patient simulator it would be amiss not to discuss evaluating the cost-effectiveness of simulation-based training compared to direct patient contact. Is nursing getting the return on the human patient simulator investment compared with alternatives? This research topic brings to the forefront the “difficulty in measuring the cost of delivery of simulation-based training, just as it is difficult to cost other forms of education, especially that which occurs in a clinical environment” (Flanagan, et al., p. 7).

Conclusions

The purpose of this study was to compare two teaching strategies; lecture with case studies and debriefing after watching recorded simulation scenarios and note differences in knowledge acquisition, feelings of satisfaction and self-confidence. For the first part of the study, the participants scored significantly higher on the 26-item multiple-choice exam with the lecture and case study teaching strategy. They also reported feeling more satisfied with the lecture with case study teaching strategy and felt more self-confidence in learning the content. When the study was repeated using a cross-over design, the participants again reported feeling more satisfied and self-confident with the lecture and case study teaching strategy. The results of the multiple-choice examination did not show a significant difference. This study utilized an active teaching strategy for a group of participants who were accustomed to a lecture format classroom. The students continue to prefer that type of teaching strategy. While these results do not support the concepts associated with a learner-centered environment there are still reasons not to discard those principles while still meeting the needs of students in a classroom setting. Further research must be conducted using simulation in the classroom to assess if these results can be replicated. It is important to assess outcomes of using simulation in the classroom to evaluate its worth to nursing education.

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APPENDIX A

Consent Form

UNIVERSITY of NORTHERN COLORADO

Research Identification Number ____________

Dear Nursing Student,

Teachers use various methods to help you learn in the classroom. You are being asked to participate in a study examining various teaching strategies used in this course. I also want to find out how you felt about different teaching strategies.

As a student in N202, you will receive class content scheduled on the course hourly guide and will be tested on the content. If you participate in the study, your average test score will be collected as a group and compared to the other sections' average test score. You will also complete a demographic survey once and a 13-item tool measuring satisfaction and self-confidence on two separate occasions. The time required to participate is about 15 minutes outside of class. If you decline to participate in the study, your test scores will not be included in the research data base and you will not complete the surveys. Your participation is voluntary. You may withdraw from this study at any time and withdrawal will have no influence on course grades.

Procedures are in place to help protect your confidentiality. The lead investigator, Kristen Zulkosky, will not be given any information about your participation, non-participation, or withdrawal from this study. You will be assigned a number in order to maintain confidentiality and a non-course faculty member will maintain the list of names of study participants.

There is no associated cost except the time it requires you to fill out the two surveys. The risk of participating in this study is not expected to be of greater degree than that experienced in your normal life. You may not experience any personal benefit from this research however, your participation may help teachers understand the effects of various teaching strategies.

Please sign below if you are willing to participate in this research. A copy of this form will be given to you to retain for future reference. If you have any questions or concerns about this study, please notify me or my research supervisor, Dr. Debra Leners, at (970)351-2293.

Sincerely,

Kristen Zulkosky, MSN, RN, CCRN

Kristen D. Zulkosky MSN, RN, CCRN
(717) 544-5511 ext 76957
kdzulkos@lancstergeneralcollege.edu

Your participation is entirely voluntary. You may decide not to participate in this study and if you begin participation, you may still decide to stop and withdraw at any time. Having read the above and having had an opportunity to ask any questions and seek clarification, please sign below if you would like to participate in this research. If you have any questions about your selection or treatment as a research participant, please contact the Sponsored Programs and Academic Research Center, Kepner Hall at the University of Northern Colorado, Greeley, Colorado 80639 or call 970-351-1907.

Full Name (please print)	Your Signature	Date

APPENDIX B

UNC IRB Application

UNIVERSITY of NORTHERN COLORADO

UNC INSTITUTIONAL REVIEW BOARD

Application Cover Page for IRB Review or Exemption

Select One:	X Expedited Review	______Full Board Review	___Exempt from Review
	Allow 2-3 weeks	Allow 1 month	Allow 1-2 weeks

Project Title: "The Impact of Debriefing Sessions Following Viewing of Recorded High Fidelity Simulation Scenarios on Knowledge Acquisition, Self-Confidence and Satisfaction: A Quasi-Experimental Study"

Lead Investigator Name: **Primary Investigator**

Name: Kristen Zulkosky, MSN, RN, CCRN

Telephone: (717) 544-5511 ex.76957

Department: Nursing, Doctoral Student

Email: natb30@comcast.net or

kdzulkos@lancastergeneralcollege.edu

Research Advisor (if applicable)

Name: Dr. Debra Leners

Department: Nursing, Professor

Telephone: (970) 351-1696

Email: Debra.Leners@unco.edu

Complete the following checklist, indicating that information required for IRB review is included with this application.

Included	Not Applicable	
__X____	_______	Copies of questionnaires, surveys, interview scripts, recruitment flyers, debriefing forms.
__X____	_______	Copies of informed consent and minor assent documents or cover letter. ***Must be on letterhead and written at an appropriate level for intended readers.***
__X____	_______	Letters of permission from cooperating institutions, signed by proper authorities.

CERTIFICATION OF LEAD INVESTIGATOR
I certify that this application accurately reflects the proposed research and that I and all others who will have contact with the participants or access to the data have reviewed this application and the Procedures and Guidelines of the UNC IRB and will comply with the letter and spirit of these policies. I understand that any changes in procedure which affect participants must be submitted to SPARC (using the Request for Change in Protocol Form) for written approval prior to their implementation. I further understand that any adverse events must be immediately reported in writing to SPARC.

Kristen D. Zulkosky *7/1/09*

Signature of Primary Investigator Date of Signature

CERTIFICATION OF RESEARCH ADVISOR (If Lead Investigator is a Student)
I certify that I have thoroughly reviewed this application, confirm its accuracy, and accept responsibility for the conduct of this research, the maintenance of any consent documents as required by the IRB, and the continuation review of this project in approximately one year.

Signature of Research Advisor Date of Signature

Date Application Received by SPARC: ____________________

SPARC/09/03

APPENDIX C

LGCNHS Research Application

LANCASTER GENERAL COLLEGE OF NURSING AND HEALTH SCIENCES

Research Committee

Research Application

Date: _June 9, 2009___________

Title of Project: _The Impact of Debriefing Following Viewing of Recorded High Fidelity Simulation Scenarios on Knowledge Acquisition, Self-Confidence, and Satisfaction: A Quasi-Experimental Study

Name of Principle Investigator (PI): ___Kristen D. Zulkosky_______________

Title/Position: ___Nursing Instructor_________________________________

Program: __Nursing____

Extension: __76957____

Name of Collaborator(s): This is a dissertation research study and the dissertation Chair is Deb Leners PhD.

Estimated Duration of Project: _August-November 2009____________________

Description of Human Subjects if applicable

* Number of subjects: __90_________________ Ages:__19-55_(estimated)____

* Gender [ ] Male [ ] Female [X] Both [ ] N/A

* Other characteristics related to project: _The subjects are enrolled in N202 Fall 2009__

Has this project been (or will be) reviewed by another research review committee?
[X] Yes [ ] No
If yes, please explain: University of Northern Colorado Institutional Review Board_August 2009

(If this project has already been reviewed and approved, please attach a copy of the approval letter.)
On a separate sheet of paper, please provide a project summary including the following components:
* Research question/hypothesis * Significance of study

* Brief Description
* Study Design
* Copy of Consent Form
* Materials required
* Copy of all tools that are to be used in the study
* Description of how subjects' rights will be protected

In order to conduct your research at the Lancaster General College of Nursing and Health Sciences, you will be required to present your project for review and approval to the Research Committee. If your project requires direct patient contact with the Lancaster General Hospital patients, your project will require review and approval from the Institutional Review Committee of the Lancaster General Hospital. During the duration of your project, you must submit a written report on your progress to the Research Committee Chairperson every three months and every time you need to alter your research methodology or there are adverse events involving subjects. Once completed, a summary of your findings must be submitted to the Research Committee. Throughout your project, you (& your designees) will maintain the privacy, confidentiality, and security of faculty, students, staff, patients and organizational data. Your signature below indicates you agree to these requirements.

__*Kristen D. Zulkosky*__________________ _June 3, 2009____
Signature of Applicant Date

Nursing Research Study

Kristen D. Zulkosky, MSN, RN, CCRN

Study Title

The Impact of Debriefing Sessions Following Viewing of Recorded High Fidelity Simulation Scenario on Student Knowledge Acquisition, Self-Confidence and Satisfaction: A Quasi-Experimental Study.

Background

The proposition of using a human patient simulator (HPS) in nursing education brings to the forefront many unanswered questions that must be addressed to validate its worth. The simulator provides students with interactive learning scenarios to apply theoretical concepts and practice skills in a safe and controlled environment. The students are challenged to set appropriate priorities and make correct decisions while utilizing critical thinking skills. The ultimate goal for the students is to gain knowledge and confidence in the simulated setting in order to apply the experience to the clinical setting while caring for actual patients. Although use of an HPS in nursing education is in its infancy, it appears to be a promising opportunity to augment the nurse education process. (Alinier, et al., 2006; Beamson & Wiker, 2005; P. Jeffries & Rizzolo, 2006; Lasater, 2007; Steadman, et al., 2006). However, there is a paucity of nursing research that documents the effects of using an HPS in the classroom setting.

Purpose of Study

The purpose of this study is to determine if fourth semester Associate of Science in Nursing (ASN) students who participate in a structured debriefing session after watching recorded high-fidelity simulation scenarios in a nursing class (a) obtain higher test scores than those who receive traditional lecture format with case studies and (b) are more satisfied and confident with the in class teaching strategy than those who complete pencil and paper case studies. The study will compare student outcomes on: (a) multiple choice test questions and (b) satisfaction and self-confidence through the use of the Student Satisfaction and Self-Confidence in Learning Scale.

Research Question/Hypotheses

Q1 Is there a difference in mean test scores of ASN student who watch recorded high fidelity simulation with debriefing compared to ASN students who receive the same content through traditional classroom lecture format using PowerPoint and case studies?

H1: There will be no differences in mean test scores on the multiple choice examination between ASN students who watch recorded high fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led traditional lecture format and case studies in the classroom.

Q2: Is there a difference in satisfaction scores of ASN student who watch recorded high fidelity simulation with debriefing compared to ASN students who receive the same content through traditional classroom lecture format using PowerPoint and case studies?

H2: There will be no differences in mean scores on the Student Satisfaction scores between ASN students who watch recorded high-fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led, traditional lecture format and case studies in the classroom.

Q3: Is there a difference in Self-Confidence with Learning scores of ASN student who watch recorded high fidelity simulation with debriefing compared to ASN students who receive the same content through traditional classroom lecture format using PowerPoint and case studies?

H3: There will be no differences in mean scores on the Self-Confidence with Learning Scale between ASN students who watch recorded high-fidelity simulation scenarios with debriefing in the classroom and ASN students who receive instructor-led, traditional lecture format and case studies in the classroom.

Brief Description

This study will determine if the independent variable, integration of recorded simulation scenarios in the classroom, has an effect on the dependent variables, content knowledge, satisfaction with current learning and self-confidence in learning. The outcomes will be measured by a 24-item multiple choice test and the National League for Nursing Student Satisfaction and Self-Confidence with Learning Scale. During the semester both groups of students will receive the same content with the exception that one four hour class will integrate recorded high fidelity simulation scenarios while the other group receives traditional lecture format and paper and pencil case studies.

Study Design

This study will utilize a quasi-experimental, comparison group design. In addition, this study will use a crossover design. A crossover design permits each subject to receive the treatment at a scheduled time throughout the study. An advantage of a crossover design is that it permits the highest possible similarity among the study participants exposed to different conditions. In addition, a crossover design is extremely powerful when the intervention effects are immediate and short-lived as in the case with viewing and debriefing about in-class recorded simulation scenarios.

The first group of students (section 1) will review four pre-recorded cardiac simulation scenarios during the beginning of the semester while the other group (section 2) will receive the same cardiac content through traditional lecture format. Near the end of the semester, section 2 will receive four pre-recorded hypoperfusion simulation scenarios while section 1 receives the same hypoperfusion content through traditional lecture format. The same nursing faculty member will integrate the video simulation scenarios followed by debriefing into the classroom to both sections while a different faculty member will teach the traditional lecture classes.

Copy of Consent Form

See attached.

Materials Required

Limited materials are required for this study and include: simulation laboratory to record the scenarios, faculty to serve as actors in the scenario, video of the simulation scenarios, the regularly scheduled unit exam, statistical software to analyze the data and a non-course faculty member to collect the consent forms.

Significance of Study

It is imperative that nurse educators are knowledgeable and competent considering the vital role they have in shaping and educating the future nurses of tomorrow. Being knowledgeable includes not only being a content expert but also utilizing best teaching and learning practices to facilitate positive student learning outcomes. With the evolving change in the learning paradigm from being teacher-centered to student-centered, educators need to develop new ways to present content to students. This includes knowing what is available while also creating new knowledge for the nursing profession. This proposed research will build on the existing simulation research previously conducted. After reviewing the literature, it is apparent that there are still many unanswered questions in relation to the outcomes and benefits of implementing high-fidelity simulation within nursing curricula. The use of simulation as an adjunct to clinical has been studied but the use of simulation in the classroom remains virtually unexplored. This study will provide educators with the option to substitute traditional lecture with the integration of high-fidelity simulation video clips within the classroom. This teaching strategy has several potentials benefits for nursing education. First, considering the current faculty shortage, simulated video clips offer a way to liberate additional faculty from having to be present during the classroom setting. Furthermore, this strategy reaches a wider audience of students at one time and encourages consistent learning experiences for students who are not guaranteed to be exposed to everything that they learn in a classroom setting out in a real clinical setting.

Tools

The tools include a researcher developed demographic survey (attached), 24-item multiple-choice test (in development), an NLN satisfaction and self-confidence tool (attached) and a consent form (attached).

Protection of Subjects

Measures will be taken to protect the subjects in this study and decrease the potential breach in confidentiality. The researcher who is not a member of this course will discuss the research study during class orientation. The researcher will again discuss the study with the students at the start of class before they view the first scenario. Students will be permitted to ask questions before the class starts. All students will receive an informed consent form, demographic tool and NLN satisfaction and self-confidence tool even if they choose not to participate in the study. The packets will stapled together and numbered. A faculty person outside of the course will collect the consent forms including those who decline to participate. By having all students return their forms, the students will not know who is participating in the study. The non-course faculty member collecting the consents will be the only person who knows who is participating in the study. The non-course faculty person will develop a roster containing the students' name and packet number and keep it in a locked cabinet in her office until data collection and analysis is complete. The consent forms will be removed from the packets and kept is a separate locked location. The non-course faculty person will provide test scores to the researcher by using the list of student identifiers. Collection of GPA scores will be obtained through the non-faculty person and given to the researcher. Tools will be shredded once the data analysis is complete.

Since test scores need to be compared between the sections of students, total anonymity is not possible. Students will be informed of the goal of confidentiality and the procedures taken to maintain confidentiality.

APPENDIX D

LGCNHS Approval Letter

Lancaster General
College of Nursing
& Health Sciences

June 18, 2009

Kristen Zulkosky, MSN, RN, CCRN
Doctoral Student
University of Northern Colorado
Department of Nursing

Dear Ms. Zulkosky,

Thank you for your interest in using the Lancaster General College of Nursing and Health Sciences as a site for your research in nursing education. The committee thought your proposal was well-written and well-conceived.

Following review of your proposal titled "The Impact of Debriefing Following Viewing of Recorded High Fidelity Simulation Scenario on Student knowledge Acquisition, Self-Confidence and Satisfaction: A Quasi-Experimental Study," it is my pleasure to inform you that the Academic Research and Scholarship Committee has approved your proposal. We ask that you keep the committee informed of your project status at completion or every six months (which ever comes first).

Congratulations on your work. If there are any questions, you should address them directly to me as chair of the committee. I look forward to reading your results. Upon completion, we hope that you will share a summary of your findings with our college.

Sincerely,

Patsy h. Fasnacht,

Patsy H. Fasnacht, PhD, RN, CNE
Faculty Coordinator and Chair, Academic Research and Scholarship Committee
Lancaster General College of Nursing and Health Sciences
Division of Nursing
410 N. Lime St.
Lancaster, PA 17602
Phone (717) 544-4912 ext. 76980
e-mail phfasnac@lancastergeneralcollege.edu

APPENDIX E

Cardiac Surgery Simulation Scenario

N202 Simulation: Part 1 – Cardiac Surgery

Discipline: Nursing Course: N202 Reviewed by: K. Zulkosky, C. Weber
Expected Simulation Run Time: 12 minutes Debriefing Time: 38 minutes
Location: N202 classroom Date Created: June 2009

Simulation Learning Objectives:
1. Uses patient history and assessment data in the early identification and management of patients requiring cardiac surgery (ANALYSIS).
2. Discuss the preoperative education plan for a patient and family for coronary artery bypass graft surgery. This should include preoperative education, instruction on the surgical procedure, postoperative course, and avoidance of complications (COMPREHENSION).
3. Examines current advances in cardiac surgery (ANALYSIS).
4. Anticipates management of post-operative complications (ANALYSIS).

<table>
<tr>
<td>Admission Date: Today
Brief Description of Patient
Name: Mr. Miller
Gender: M
Age: 68
Race: C
Weight: 70 kg
Allergies: None

Attending Physician/Team: THG
PMH: DM, smoking, HTN, high cholesterol, arthritis and BPH
History of Present illness: Pt developed substernal “crushing” chest pain today, which radiated to the left side of his neck and jaw while cleaning out his garage earlier this afternoon. His wife said his face turned a “horrible blue-gray color.”
Primary Diagnosis: Chest Pain R/O MI
Surgeries/Procedures: Cardiac cath and CABG

Psychomotor Skills Required prior to simulation:
• N/A
• Cognitive Skills Required prior to Simulation: i.e. independent reading (R), video review (V), computer simulations (CS), lecture(L)
• Independent reading</td>
<td>Setting/Environment
• ER
• ICU

Simulator Manikin/s Needed: High-fidelity

Equipment attached to manikin:
• Triple IV Pump
  o Heparin at 1000u/hour
  o Amiodarone @ 1 mg/min
  o Insulin @ 4 units/hr
  o Nitro @ 100 mcg/min
• 02 via NC
• Tele-monitor attached
• ID band
• Vent

Roles / Guidelines for Roles
• Primary Nurse
• Charge Nurse
• Nurse Clinician

Important information related to roles:
Played by faculty members</td>
</tr>
</table>

Report students will receive before simulation:
ED nurse calls report to ICU. Students should take notes as they listen to report

Mr. Miller is a 68-year-old retired gentleman with a PMH of DM, smoking, HTN, high cholesterol, arthritis and BPH who developed substernal "crushing" chest pain, which radiated to the left side of his neck and jaw while cleaning out his garage earlier this afternoon. His wife said his face turned a "horrible blue-gray color."

They called 9-1-1, the paramedics arrived and he was responsive and answering all of their questions. His initial vital signs were HR 66, BP 88/54, RR 22, and SpO2 97%. He stated his chest pain was 4/10. Paramedics gave him nitroglycerine 0.4mg SL x2 every 5 minutes without relief. Five minutes later after the third nitroglycerine SL was administered, the patient stated that his chest pain was now "almost gone" and paramedics had to convince him to come to the Emergency Department. They did an ECG in route, which showed 2mm ST-segment elevation in leads II, III, and aVf, indicating an acute inferior wall myocardial infarction (MI). The paramedics started oxygen at 2LPM by nasal cannula, administered 324 mg of chewable aspirin, and started a right forearm saline lock. He had no chest pain en route and upon arrival states he is pain free. He states he is "just fine now and don't know why I am here." Upon arrival to the ED a "Code R" was announced. He was sent to the cath lab from the ER based on his lab results and EKG. The cath lab will call you with report.

Report diagnostics:

WBC 8.2
Hgb 11.3
K 4.5
Cr 0.9
CK 602
CKMB 15
Troponin 3.7

CXR – NAD

EKG: 2mm ST-segment elevation in leads II, III, and aVf, indicating an acute inferior wall myocardial infarction (MI)

FADE TO NEW SCENE

Report from Cath Lab

Primary ICU RN receives phone call from the cath lab.

Cath lab results: RCA 95%, LAD 80%, D1 70% and Circumflex 75%. EF 40%.

The RCA was stented with bare metal stent for acute coronary syndrome. Cardiac surgery was consulted and the surgeon was already here. Mr. Miller is stable with current vital signs of HR 90, BP 110/80, resp 16, NSR on the monitor. Heparin is running at 1000 units/hour.

Arrival to ICU

Primary RN performs assessment. Relays findings to charge RN who documents findings.

Assessment Findings:

VS *(by charge RN)*
BP 114/76, HR 86, RR 18, pulse Ox 98% on 2 LPM O2 via NC
Assessment *(primary RN)*
Neuro – WNL
Resp – WNL
CV – NSR, Denies chest pain
GI – normoactive BS
GU – Foley draining 30 ml/hr
BLE pink, warm, cap refill < 3 sec, pedal pulses +2
R groin – syvek patch in place. No swelling, bruising, or bruit
IV – heparin @ 1000units/hr

PAUSE for QUESTIONS: *Large group discussion (no handout)*

1. Where do we go from here? (Obj # 1) *Uses patient history and assessment data in the early identification and management of patients requiring cardiac surgery (ANALYSIS).*
    a. CABG (1 vessel was stented but others have high occlusion %)
2. What are this patient's indications for a CABG? (Obj # 1) *Uses patient history and assessment data in the early identification and management of patients requiring cardiac surgery (ANALYSIS).*
    a. Triple vessel disease
    b. Acute MI
3. What are other indications for a CABG? (Obj # 1) *Uses patient history and assessment data in the early identification and management of patients requiring cardiac surgery (ANALYSIS).*
    a. Do not respond to medical treatment or dz progression
    b. Angina w/ >50% occlusion L main
    c. Unstable angina w. severe 2 or moderate 3 vessel dz
    d. Ischemia w/HF

e. S/S ischemia or impending MI after angiography of PTCA (stents)
f. Cardiogenic shock (class 4 HF > 40% necrosis LV)
g. Vessels unsuitable for PTCA
h. Vessels > 70% occlusion with good distal runoff
i. EF > 40 – 50%

FADE TO NEW SCENE

In ICU

Pre-operative CABG teaching by nurse clinician.

Nurse Clinician: Hello Mr. Miller, my name is Mary and I am a nurse who works with the heart surgeons. I am here to tell you a little bit about what to expect with open heart surgery.
Patient: Oh good, I was hoping someone would come by soon. The nurses in the cath lab told me to expect you. I am very nervous about all of this
Nurse Clinician: That is understandable. For most patients, this preoperative education is so very important in helping patients cope with this surgery and helping them to feel prepared. Tell me what you understood from how the surgeon explained the surgery to you.
Patient: Well, I know they will cut through my breastbone to get to my heart. Then they will use veins from my leg and also something about a "left mammary artery" in my chest will also be used to make bypasses around the blocked arteries in my heart. Is that right, a mammary artery? What is that?
Nurse Clinician: Good question. The mammary arteries are inside your chest and feed blood to your chest wall. We often use one of them as one of the bypasses because research has shown that using arteries increases the patency rate for the bypasses. The younger a patient is, the more arteries we try to use to help the bypass last as long as possible. We can sometimes use both the left and the right mammary artery, but not in the case of a patient with diabetes or a smoking history, like yourself. We don't want to divert too much blood away from the chest wall because the incision will need a good blood supply to heal well too. Sometimes we also use an artery from the arm, called the radial artery. What other questions do you have?
Patient: How can they cut into my heart if it is such a vital organ? The surgeon mentioned a pump, but I didn't understand him. How will the rest of my body get enough blood flow and oxygen?
Nurse Clinician: The surgeon was referring to the cardiopulmonary bypass (CPB) pump. In surgery we drain the blood from the right side of your heart into this machine that gives is oxygen and then we return the blood to your aorta right outside your heart so it can go to the rest of your body. Using the bypass pump keeps the blood out of your heart so your surgeon can better visualize the structures he is working with and it also ensures the blood still gets oxygenated, since it misses traveling through the lungs. We also do other things to protect your organs from ischemia, or lack of oxygen. We cool your body down to slow its metabolism and oxygen demand. Your heart is further protected by a technique called "cold cardioplegia" where a cooled solution high in potassium is infused into the arteries to the heart to further reduce metabolism by stopping the heart from having electrical activity. We call this asystole. Again, the cold temperature also reduced metabolism. Throughout your surgery, we try to save as much blood that you lose as possible, filter it, and return it to your heart at the end of the procedure. This is called autotransfusion and it helps to keep your blood volume up, further helping your organs get enough blood and oxygen. Does all of this make sense?
Patient: Yes, I think so. Thanks so much. So what will happen to me afterwards?

Nurse Clinician: You will leave the operating room and go directly to the ICU. You will still be asleep and on a ventilator. You will have chest tubes placed around your heart and possibly also your lungs to help drain any additional bleeding so it does not accumulate around your heart. You will have a large IV in a vein near your neck to receive fluids, medicine and possibly blood products if needed. They will also insert a monitoring line in that IV called a Swan-Ganz catheter. This will give the nurses instant readings on the various pressures in your heart to help them adjust your medicines and fluids appropriately. If all of your vital signs, heart pressures, chest X-ray and blood work look OK, the nurses can let your anesthesia wear off and you will gradually wake up. You will also have temporary pacemaker wires attached to your heart to use in case there are any temporary electrical disturbances to your heart rhythm. Until you are allowed out of bed they will leave your urinary catheter in place.
Patient: Wow, all of that sounds awful. Will I really be able to get back to normal again?
Nurse Clinician: Yes, it is a lot at first. Fortunately, our goal is to have the breathing tube removed within 6 hours, and most of the other monitoring lines and chest tubes come out the next day. We just need to watch everything VERY closely for the first 24 hours or so. Believe it or not, we will aim to have you out of bed and walking around by the next afternoon after surgery. You will be in the hospital for 3 to 5 days after surgery and then will need 6-8 weeks minimum to gradually get your strength back at home. In the hospital, we ask you to focus on 3 main things: eating, breathing & walking. You won’t have a great appetite, but need to eat healthy meals to gain strength and fight infection. Trying 6 small meals a day instead of 3 large ones often helps. We will show you coughing & deep breathing exercises to help protect your lungs from pneumonia and atelectasis (or lung collapse). You will need to do these at least every hour whenever you are awake. We encourage you to take walks several times a day, slowly increasing the number and length. We will help you as you gradually increase your stamina and improve your balance to be able to walk independently again before you leave.
Patient: I will try my best. Thank you for explaining all of this beforehand. I think it will really help me now that I know what to expect. But I have another question. I’m kind of embarrassed to ask.
Nurse Clinician: It’s OK- please feel free to ask anything.
Patient: Will I have a lot of restrictions when I go home? I mean, when is it OK to have sex again?
Nurse Clinician: That is a great question and a common concern. The only restrictions you have is that you can’t drive for about a month and can’t lift anything over 10 pounds for 6-8 weeks. Otherwise, we tell you to listen to your body and gradually increase your activity as you feel able. With regards to sexual activity, a good guideline to consider is that if you can walk up 2 flights of steps without getting out of breath, you probably have enough stamina to be able to have sex. Obviously, listen to your body and find positions that are most comfortable for you.
Patient: Well it sounds like I don’t have a lot of choice- I need this surgery to prevent any future heart attacks and have the best chance at prolonging my life. But my daughter did a whole bunch of internet research on cardiac surgery and told me to ask about other things that are out there. She mentioned “OPCAB”, “MIDCAB”, “TMR” and Robotic surgery. What do you know about them? Are any of them options for me?

Nurse Clinician: OPCAB means off-pump coronary artery bypass surgery. It is a technique that uses a stabilization device in order to operate on the heart while it is still beating. Therefore, the patient doesn’t require CPB. Some studies suggest the patient will then have much less of an inflammatory response from the surgery, so less risks, less deaths, and possibly shorter length of stay. But it is very difficult to do if multiple arteries need to be bypassed, as in your situation. It is best for bypasses to only 1 or 2 arteries on the front of the heart only.
MIDCAB is minimally invasive direct coronary artery bypass. It is done through a 2inch left thoracotomy incision instead of going through the breastbone. Again, no CPB is needed but it is best for surgeries limited to 1 or 2 anterior bypasses. There is actually usually more incisional pain involved related to the muscles and nerves between the ribs and it is even more important to do aggressive breathing exercises to protect the lungs after surgery.
TMR is transmyocardial revascularization. This is done if patients continue to have chest pain and are no longer candidates for further bypass procedures. A laser is used to create 20-24 long narrow channels within the heart muscle of the left ventricle. It is theorized that oxygenated blood from the left ventricle can flow into the channels during the rest period between contractions (called diastole) and give oxygen to the heart muscle in that manner. The goal of the surgery is to relieve chest pain and is often a late or end-stage procedure.
Lastly, robotics are being used in some hospitals to do heart surgery. Some people believe doing so overcomes any human error related to hand tremors and allows a better reach into difficult areas to bypass. The down side is that it requires a great deal of specialized skill and often means patients are asleep in surgery much longer than with traditional open heart surgery. Being asleep that long with anesthesia has increased risks related to it as well.
Patient: Wow, sounds like I am better served with the operation you have already proposed to me. Thanks again for your time and for answering all of my questions. I am still a little nervous, but if I need this surgery I feel very good about being here to have it done. I hope everyone continues to be as helpful as you have been!

PAUSE for QUESTIONS: (small group with handout)

1. Evaluate the pre-op teaching provided to the patient for thoroughness, professionalism, use of jargon, anticipatory teaching. (Obj # 2) *Discuss the preoperative education plan for a patient and family for coronary artery bypass graft surgery. This should include preoperative education, instruction on the surgical procedure, postoperative course, and avoidance of complications (COMPREHENSION).*
    a. answer
2. Discuss current advances in cardiac surgery (Obj # 3) *Examines current advances in cardiac surgery (ANALYSIS).*
    a. MIDCAB
        i. Minimally invasive direct coronary bypass. 2in L thoracotomy incision, 4^{th} rib removed, L iMA attached below LAD lesion. No CPB needed. More incisional pain. DC in 2-3 days. Resp – T, C, DB, inc spiro x 6 weeks
    b. Transmyocardial Laser Revascularization
        i. Single lung intubation. L ant thoracotomy. Laser creates 20 – 24 long narrow channels in LV muscle. Allow O2 blood to flow during diastole from LV to muscle.
    c. OPCAB
        i. decreased mortality
    d. Robotics
        i. advantages – eliminates hand tremors, reach more sites, telesurgery. Disadvantages – computer failure, greater skill needed, longer time in surgery.
3. D/C teaching (Obj # 1) *Discuss the preoperative education plan for a patient and family for coronary artery bypass graft surgery. This should include preoperative education, instruction on the surgical procedure, postoperative course, and avoidance of complications (COMPREHENSION).*
    a. Risk factor modification
        i. Smoking
        ii. Diet
        iii. Physical activity
        iv. BP control
        v. BS control
        vi. Sexual activity
    b. Meds
        i. ASA
        ii. BBlocker
        iii. Ca Channel blocker- not routinely used unless pt had a radial artery harvest- then it's used for arterial spasm prophylaxis. Not an issue with the IMA, just the radials
        iv. Statin
        v. MI – add ACE inhibitor
    c. When to call doc

   i. Irregular heart rate (Afib is such a common complication).
   ii. HR < 50
   iii. Wheezing/SOB
   iv. Wt gain > 3 lb/week or 1 – 2lbs overnight
   v. CP
   vi. SOB, dizziness or fainting with activity

d. When to call 911
   i. CP

FADE TO NEW SCENE

****Pt goes to CABG***

Return to ICU ****on vent****

Returns with mediastinal and left pleural chest tubes, swan and A-line, temporary pacing wires.

Primary RN performs assessment. Relays findings to charge RN. Post-op labs drawn from line by charge RN.

Assessment Findings:

VS *(by charge RN)*
BP 95/56, HR 84 A-Paced, Vent settings: rate 18; Pulse Ox 98%
Assessment *(primary RN)*
Neuro – sedated on vent
Resp – Clear, on vent
CV – A-paced, S1, S2, no murmurs/S3/S4
GI – hypoactive BS
GU – Foley draining 20 ml/hr
Chest tubes: sanguinous fluid @ 50 ml/hr

Meds:
Insulin drip running @ 4 units/hr
Nitro drip running @ 100 mcg/min
Amiodarone drip @ 1 mg/min

PAUSE for QUESTIONS: *small group with handout*

1. Discuss potential post-op complications following OHS. (Obj # 4) *Anticipates management of post-operative complications (ANALYSIS).*
    a. Fluid/electrolyte imbalances
    b. Hypo/HTN
    c. Hypothermia
    d. Bleeding – CT drainage > 150 ml/hr
    e. Cardiac Tamponade
    f. Altered cerebral tissue perfusion

2. How are these potential complications managed? (Obj # 4) *Anticipates management of post-operative complications (ANALYSIS).*
    a. Fluid/electrolyte imbalances
        i. Fluid
            1. Edema is common but fluid admin is based on assessment findings/protocols & orders
        ii. Electrolytes
            1. K and Mg depletion are common r/t hemodilution or diuretic therapy
            2. K can fluctuate dramatically
                a. Check levels frequently (i.e. q 4 hours x 3 @ LGH)

    b. Replacement – max 40meq/hr. central catheter preferred, MUST use pump & be on monitor

b. Hypo/HTN
    i. Hypo: Risk collapse of vein graft; may be r/t hypovolemia or vasodilation; Tx low PAWP, dec. sys. Vasc. Resis and vasodil. w/ volume replacement followed by vasopressor therapy (causes vasoconstriction). If r/t from LVF (increased PAWP) tx w/ IV inotropes (increase myocardial contractility).
    ii. HTN may be r/t hypothermia, CPB, meds, SNS activity; ↑ pressure → leakage @ suture lines, may cause bleeding

c. Hypothermia
    i. Management = pt rewarmed by CPB but may need warm blankets, rewarming lights or thermal blankets. **DANGER – rewarming too quickly → shivering = metabolic acidosis, ↑ myocardial O2 consumption, and hypoxia.

d. Bleeding
    i. Monitor drainage hourly; may use autotransfusion

e. Cardiac Tamponade
    i. Auscultate heart sounds, telemonitor

f. Altered cerebral tissue perfusion
    i. Transient (up to 75% PTS) r/t anesthesia, CPB, air emboli, hypothermia. s/s slowness to arouse, memory loss, confusion.
    ii. Permanent r/t intraoperative CVA s/s abnormal pupil response, failure to awaken from anesthesia, seizures, absence of sensory or motor function.
    iii. NEUROCHECKS – q 30 – 60 mins till awake then q 2 – 4 hours or per policy.

APPENDIX F

Debriefing Guide

N202 Simulation: Part 1 – Cardiac Surgery
Student Handout

Simulation Learning Objectives:

1. Uses patient history and assessment data in the early identification and management of patients requiring cardiac surgery (ANALYSIS).

2. Discuss the preoperative education plan for a patient and family for coronary artery bypass graft surgery. This should include preoperative education, instruction on the surgical procedure, postoperative course, and avoidance of complications (COMPREHENSION).

3. Examines current advances in cardiac surgery (ANALYSIS).

4. Anticipates management of post-operative complications (ANALYSIS).

Patient Report from ER

Notes:

Diagnostics:

WBC: _____

Hgb: _____

K: _____

Cr: _____

CK: _____

CKMB: _____

Troponin: _____

CXR:

EKG:

Patient Report from Cath Lab

Notes:

Cath lab results:

RCA _____

LAD _____

D1 _____

Circumflex _____

EF _____

Arrival to ICU

Assessment Findings:

Large group discussion:

1. Where do we go from here?

2. What are this patient's indications for a CABG?

3. What are other indications for a CABG?

In ICU: Pre-operative CABG teaching by nurse clinician.

Notes:

Small group discussion:

4. Evaluate the pre-op teaching provided to the patient for thoroughness, professionalism, use of jargon, anticipatory teaching.

5. Discuss current advances in cardiac surgery

6. What discharge teaching would be appropriate for this patient?
    a. Risk factor modification

    b. Meds

    c. When to call doc

    d. When to call 911

* Patient undergoes CABG Surgery *

Return to ICU

Assessment Findings:

Meds:

Small group discussion:

Discuss potential post-op complications following OHS.	How are these potential complications managed?

APPENDIX G

Demographic Tool

Demographic Tool
Research Identification Packet Number ____________

Please place a checkmark on the appropriate responses

Gender
_______ Male
_______ Female

Age
_______ 18-22
_______ 23-27
_______ 28-32
_______ 33-37
_______ 38-42
_______ 43-47
_______ 48-52
_______ 53-57
_______ 58-62
_______ 63 or older

Ethnicity
_______ African-American
_______ American Indian/ Alaskan Native
_______ Asian/Pacific Islander
_______ Caucasian (Non-Hispanic
_______ Hispanic
_______ Other

Is this a 2nd degree for you?
_______ No
_______ Yes (If "yes" please answer the following question)

What is the highest degree you have earned?
_______ Associate
_______ Bachelor
_______ Master's
_______ Doctorate
_______ Other
In what area was your 1st degree?
____

Healthcare Experience
_____ No
_____ Yes (If "yes" please answer the following questions)

What type of experience have you had?
______ CNA
______ LPN
______ EMT
______ Other ____________

How long have you worked in this capacity?
______ 1 year or less
______ Greater than 1 year

Human Patient Simulator Experience
______ No
______ Yes (If "yes" please answer the following question)

What type of simulation experience have you had?
______ Classroom experience
______ Clinical experience

For Office Use Only

Overall GPA _______
Cardiac Test Score _______
Hypoperfusion Test Score _______
NLN Satisfaction Score _______
NLN Self-Confidence Score _______

The contents of this document will remain confidential

APPENDIX H

Satisfaction and Self-Confidence in Learning Scale

Student Satisfaction and Self-Confidence in Learning

Instructions: This questionnaire is a series of statements about your personal attitudes about the instruction you receive during your simulation activity. Each item represents a statement about your attitude toward your satisfaction with learning and self-confidence in obtaining the instruction you need. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the numbers that best describe your attitude or beliefs. Please be truthful and describe your attitude as it really is, not what you would like for it to be. This is anonymous with the results being compiled as a group, not individually.

Mark:
1 = STRONGLY DISAGREE with the statement
2 = DISAGREE with the statement
3 = UNDECIDED - you neither agree or disagree with the statement
4 = AGREE with the statement
5 = STRONGLY AGREE with the statement

Satisfaction with Current Learning	**SD**	**D**	**UN**	**A**	**SA**
1. The teaching methods used in this simulation were helpful and effective.	○ 1	○ 2	○ 3	○ 4	○ 5
2. The simulation provided me with a variety of learning materials and activities to promote my learning the medical surgical curriculum.	○ 1	○ 2	○ 3	○ 4	○ 5
3. I enjoyed how my instructor taught the simulation.	○ 1	○ 2	○ 3	○ 4	○ 5
4. The teaching materials used in this simulation were motivating and helped me to learn.	○ 1	○ 2	○ 3	○ 4	○ 5
5. The way my instructor(s) taught the simulation was suitable to the way I learn.	○ 1	○ 2	○ 3	○ 4	○ 5
Self-confidence in Learning	**SD**	**D**	**UN**	**A**	**SA**
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	○ 1	○ 2	○ 3	○ 4	○ 5
7. I am confident that this simulation covered critical content necessary for the mastery of medical surgical curriculum.	○ 1	○ 2	○ 3	○ 4	○ 5
8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical	○ 1	○ 2	○ 3	○ 4	○ 5
9. My instructors used helpful resources to teach the simulation.	○ 1	○ 2	○ 3	○ 4	○ 5
10. It is my responsibility as the student to learn what I need to know from this simulation activity.	○ 1	○ 2	○ 3	○ 4	○ 5
11. I know how to get help when I do not understand the concepts covered in the simulation.	○ 1	○ 2	○ 3	○ 4	○ 5
12. I know how to use simulation activities to learn critical aspects of these skills.	○ 1	○ 2	○ 3	○ 4	○ 5
13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time..	○ 1	○ 2	○ 3	○ 4	○ 5

 Revised December 22, 2004