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Impact of Peer Observation on Learning Outcomes in Simulated Clinical Learning Experiences

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Impact of Peer Observation on Learning Outcomes in Simulated Clinical Learning Experiences

by

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Impact of Peer Observation on Learning Outcomes in Simulated Clinical Learning Experiences

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Comparison of traditional teaching methods with simulation in nursing education research fails to inform educators on how to best design, structure and implement simulation experiences to improve student learning outcomes. The prevalence of this technology in nursing education makes it essential to understand how to use simulation efficiently and effectively. The purpose of this study was to determine if a simulation instructional design that uses peer observation impacts student learning outcomes. Nursing students enrolled in an adult medical-surgical course were randomly assigned to either an experimental condition (peer observation) or a control condition (no peer observation). Raters evaluated small groups of approximately three students participating in a simulated clinical learning experience using the Creighton Simulation Evaluation Instrument™. The findings from this study indicate that peer observation had a positive impact on student learning outcomes in simulated clinical learning experiences. Specifically, overall learning outcomes measured by the Total Score for the C-SEI™ were statistically higher for the experimental condition than for the control condition following the initial instance of peer observation. When the findings for this study were

examined for the control condition against the combined experimental conditions, it was noted that the learning outcomes for the Total Score for the C-SEI™ as well as two of the categories of learning (i.e. Assessment and Technical Skills) were significantly higher for the peer observation experimental conditions than for the no peer observation control condition. Also, there was a sequential additive, or cumulative, effect on learning outcomes for successive groups for Technical Skills. There are indications, however, that the sequential additive, or cumulative, effect on learning outcomes may be more pervasive because the mean rank and median scores for the Total Score for the C-SEI™ increased for each successive peer observation experimental condition. Though the results were not statistically significant, each successive peer observation experimental condition scored better on the Total Score for the C-SEI™ resulting in a large effect size, which suggests that some measure of a sequential additive, or cumulative, effect may have occurred overall across all categories. Well-designed simulation experiences have the potential to impact nursing practice and patient outcomes.

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List of Abbreviations

AACN	American Association of Colleges of Nursing
C-SEI™	Creighton Simulation Evaluation Instrument™
GSBS	Graduate School of Biomedical Science
IOM	Institute of Medicine
NCSBN	National Council of State Boards of Nursing
NLN	National League for Nursing
QSEN	The Quality and Safety Education for Nursing
RN	Registered nurse
SON	School of Nursing
TDC	Thesis and Dissertation Coordinator
UTMB	University of Texas Medical Branch

Chapter 1: Introduction

INTRODUCTION

The Institute of Medicine (IOM) highlighted significant problems related to patient safety and quality of care in the American healthcare system (IOM, 1999; 2001). With the release of *Health Professions Education: A Bridge to Quality,* the IOM turned its attention to improving the quality and safety of healthcare delivered in the United States through health professions' educational reform (IOM, 2003). Reform is needed in health professions education to achieve national goals for quality and safety in healthcare. In response to the IOM report, The Robert Wood Johnson Foundation funded The Quality and Safety Education for Nursing (QSEN) initiative. The IOM competencies for nursing outlined in the report were adapted to develop the six QSEN competencies (patient-centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics) that encompass the knowledge, skills, and attitudes regarding the provision of safe and quality care that applies to all registered nurses (Cronenwett et al., 2007). Competency or outcome-based health professions education has been endorsed by regulatory and accreditation agencies and certification organizations (Joint Commission, 2005).

Traditional clinical education is increasingly seen as less than ideal for preparing students for professional nursing practice (Tanner, 2006). The American Association of Colleges of Nursing (2010) reports that there are insufficient quality clinical placements available for nursing education training opportunities. The clinical training opportunities that are available are often an inefficient use of students' time. Students are reported to

spend much of their time in traditional clinical rotations completing routine tasks and basic procedures which do little to foster higher order critical thinking and decision making skills needed to care for and manage today's high acuity, clinically complex patients (McNelis & Ironside, 2009; Tanner, 2006). There are inadequate opportunities for emergent care and crisis management available to nursing students because traditional clinical placements are unpredictable. Not every student is exposed to critical or emergent patient care situations, and when opportunities do arise nursing students are often relegated to observation roles because licensed primary caregivers typically react quickly out of concern for patient safety. This relegation results in graduate nurses who lack experience managing patients who rapidly deteriorate, leading to crisis situations and patient care emergencies. Students' ability to learn to recognize, respond, and manage complex clinical situations is being hindered by barriers in traditional clinical education. Further, traditional models of clinical education in nursing are not meeting the needs of today's workforce demands. Employers are dissatisfied with graduate nurses inability to recognize clinical data, articulate the primary problem, and safely intervene to manage patients' problems (Humphreys, 2013). Only 35% of new graduate nursing students are meeting entry-level expectations for clinical judgment and reasoning. The majority exhibits considerable difficulty transferring the knowledge and theory acquired in the academic setting into actual clinical practice (del Bueno, 2005). The expectation is that graduate nurses would emerge from nursing school adequately prepared to safely transition into the workforce. Substantive support for new nurses is reported to be needed, however, as students are anxious and feel ill-prepared for independent clinical practice (Santucci, 2004; Sharif & Masoumi, 2005).

Nursing education is increasingly utilizing sophisticated technology to respond to the need to transform undergraduate nursing education to better prepare graduate nurses for professional practice. High fidelity human patient simulation uses interactive, hands-on methods with computerized manikins that represent a life-sized human body with a high degree of realism wherein human physiology is reproduced. Today's high-tech manikins have breath sounds, lung sounds, bowel sounds, pulses, and exhibit neurological responses such as blinking. They are responsive to interventions and react in appropriate ways to the care delivered by students. Simulation addresses the issues of limited clinical placements and opportunities by utilizing technology to supplement with realistic patient care experiences. Students can benefit from exposure to a wide variety of health problems with patients across the lifespan and by being immersed in comprehensive clinical scenarios without the fear of harming living patients. Simulating infrequent but highly complex and demanding patient care scenarios provides essential training that may not otherwise be achieved prior to transitioning to professional clinical practice. There has been explosive growth in using simulated clinical learning experiences to support and enhance traditional clinical placements in nursing education because these simulated scenarios can be reproduced and standardized so that all students have the opportunity to practice, learn, and make errors in safe, controlled environments, which in turn ensures the safety of living patients by preventing exposure to risk and harm. Human patient simulation gives students an opportunity to actively engage in clinical decision-making, judgment, and reasoning within the context of real-life, complex, and demanding clinical practice scenarios. There is also the opportunity to reflect on actions and get feedback on performance with simulated clinical learning

experiences. Richardson and Claman (2014) strongly recommend that simulated experiences should be used to augment traditional clinical education but state that continued research is essential.

Nationwide studies indicate the value seen by state boards of nursing and schools of nursing regarding the use of simulated clinical learning experiences in nursing education. The state boards of nursing in all states, the District of Columbia, and Puerto Rico were surveyed to determine the use and regulation of high-fidelity human patient simulation in nursing education. Respondents to the survey included 44 states, the District of Columbia, and Puerto Rico. Changes in regulations allowing clinical hours to be accepted from simulated clinical learning experiences have been made in five states (Connecticut, Florida, Louisiana, North Carolina, and Texas) and Puerto Rico. State boards of nursing in 16 states (California, Colorado, Idaho, Kansas Maine, Maryland, Mississippi, Nebraska, New Hampshire, New Mexico, New York, Rhode Island, Vermont, Virginia, Washington, and Wisconsin) have given schools of nursing permission, on a case-by-case basis, to replace some of their clinical hours with human patient simulation experiences. California and Texas stated there would be future regulatory changes stipulating the use of simulation for clinical hours. Seventeen additional states (Alabama, Colorado, Delaware, Georgia, Iowa, Maine, Massachusetts, Missouri, Montana, Nebraska, Nevada, Oklahoma, Oregon, South Dakota, Vermont, Virginia, and Wisconsin) said the issue was or may be under consideration in the future (Nehring, 2008). The National Council of State Boards of Nursing (NCSBN) conducted their own survey in 2010 finding that of the 1,060 nursing schools responding to the survey 87% of pre-licensure programs use medium- or high-fidelity simulation

experiences with their students, with 69% reporting to substitute simulation experiences for clinical hours. A majority of schools of nursing (55%) reports simulation use in greater than five courses, indicating a trend toward integrating simulation throughout the nursing education curriculum. Eighty-one percent of schools of nursing said they should be using more simulation in the instruction of their students (Hayden, 2010). Baccalaureate programs accredited by the National League of Nursing (NLN) were surveyed and 78.9% of the respondents reported using patient simulation in their schools with 68.8% of the schools planning additional purchases of simulation materials and equipment for their programs. Actual clinical hours previously spent with live patients were replaced by using patient simulation in 40% of the responding schools (Katz et al., 2010).

The prevalence of this technology in nursing education makes it essential to understand how to use simulation most efficiently and effectively. The problem is that simulation research conducted to date is methodologically confounded and largely fails to inform faculty educators on how to best design, structure, and implement simulation experiences to improve learning outcomes and efficiently utilize capital and human resources. A major failure has been in the comparison of traditional teaching methods with simulation in nursing education. A direct comparison of simulation instructional design formats would provide evidence of the impact on learning outcomes. Comparisons between simulation formats can address which simulation designs lead to improved learning outcomes. An evidence base that assists nurse educators in the selection of efficient and effective teaching methods when using simulation with undergraduate nursing students would be a timely and significant contribution to the science of nursing

education. Well-designed simulation experiences have the potential to improve learning outcomes for student nurses, which can then impact nursing practice and patient outcomes.

SIGNIFICANCE

There has not been an interest, historically, in examining the effectiveness of clinical education in nursing because students have traditionally participated in clinical rotations, working alongside practicing nurses with living patients receiving care, and there were, for the most part, no alternatives. Now, with heightened concerns for patient safety and increased competition for limited clinical sites, technology is making it possible to simulate clinical learning experiences. It is incumbent upon nurse scientists and educators to ensure that an evidence base exists that informs educational practice on how to efficiently and effectively use simulated clinical learning experiences to support educational goals. As a result of this study, the investigator determined if a simulation instructional design that uses peer observation impacted student learning outcomes. The research in this study is significant because it adds to the evidence base informing nurse educators on how to best design, structure, and implement simulated clinical learning experiences to improve learning outcomes. Only one study found in the medical education literature measured the impact of peer observation on subsequent behavioral performance (McMullen et al., 2013). Three nursing studies were found wherein peer observation was measured but the measurement was in the form of self-reported Likert scales (Alinier et al., 2014; Harwood et al., 2009; Kiat et al., 2007). Methodologically rigorous research is needed to expand the evidence base regarding peer observation in simulated clinical learning experiences in nursing and health professions education.

PURPOSE STATEMENT

The purpose of this study was to determine if a simulation instructional design that uses peer observation impacts student learning outcomes.

SPECIFIC AIMS AND RESEARCH QUESTIONS

The specific aims and research questions of the study are outlined below.

Aim 1: Determine the impact of peer observation on student learning outcomes in simulated clinical learning experiences.

Research Question 1.1: Is there a difference in the learning outcomes between students who do not participate in peer observation (Condition 0) and students who participate in the initial instance of peer observation (Condition 1)?

Research Question 1.2: Is there a difference in the learning outcomes between students who do not participate in peer observation (Condition 0) and students who participate in any peer observation condition (combined Condition 1, Condition 2, Condition 3, and Condition 4)?

Aim 2: Determine if the impact of peer observation is additive, or cumulative, across sequential groups of students participating in peer observation.

Research Question 2.1: Is there a difference in the learning outcomes between the four peer observation conditions (Condition 1, Condition 2, Condition 3, and Condition 4)?

THEORETICAL FRAMEWORK

Social Cognitive Theory served as the theoretical framework to guide this study. First known as Social Learning Theory, the theory was renamed by Albert Bandura

(1986) in his book *Social Foundations of Thought and Action: A Social Cognitive Theory*. This work built on his previous theorization and research regarding the social aspects of the learning process and integrated a growing understanding of cognitive psychology. Bandura was an early pioneer of research on learning by observation, imitation, and modeling. Social Cognitive Theory posits that one's construction of knowledge is largely built on interactions with people and their environment. Bandura's theory is based on principles of learning within the human social context, of which, observational learning is a key concept. Individuals learn by observing others. Learning is more likely to occur, according to the theory, if the observer closely identifies with the model and if the observer has a high level of self-efficacy. An observer identifies with a model when they feel a sense of similarity with the model. Self-efficacy is an individual's belief about their competency and capability to accomplish a behavior. One of the determinants of self-efficacy is whether the learner has an identifiable model demonstrating a pattern of behavior. Thusly, self-efficacy can be developed and increased by social modeling using a model the observer can identify with. Individuals with high self-efficacy are more likely to learn the modeled behavior. Therefore, the observation of models, according to Social Cognitive Theory, plays a direct role in learning and as a determinant of self-efficacy. While self-efficacy is a part of Bandura's theory, this research focused on learning through observation.

DELIMITATIONS

The scope of the study is bound by time, setting and sample. The study was conducted at the simulation center at a School of Nursing (SON) in southeast Texas during the spring 2013 semester. Only undergraduate nursing students enrolled in a

required Adult Health Nursing course were included in this study. This study was conducted in an established educational setting involving normal educational practices. Data collection took place within the context and scope of standard course requirements for graduation from the nursing program in which the students were enrolled.

DEFINITION OF TERMS

Learning outcomes: performance behaviors demonstrating that students have learned what was expected of them (Gronlund & Brookhart, 2009; McDonald, 2007). Learning outcomes were measured for this study using the Creighton Simulation Evaluation Instrument™ (C-SEI™).

Peer: someone who is of equal standing in terms of educational practice and professional experience (Hodges, 2011). Peer is operationalized as student-to-student relationship.

Media comparative research: studies that makes comparisons between different media formats. An example would be to compare outcomes of lecture and simulation (Cook, 2005; Cook, 2009a; 2009b).

Methodological confounding: occurs when multiple variables simultaneously influence the dependent variable. The outcomes, in turn, may have more than one explanation which can lead to incorrect interpretations and conclusions (Clark, 1985; Cook, 2009a; 2009b).

Simulated clinical learning experience: a technique that recreates patient care situations allowing students to practice and learn so they will be better prepared to manage the occurrence when it happens in actual practice (National League for Nursing, n.d.). The experience was operationalized in this study through the use of a high-fidelity

human patient manikin programmed to exhibit a deteriorating condition in a center that reflected an acute care hospital with a high degree of realism.

Simulation instructional design: the process used to improve instruction by assessing learning needs and developing tools, methods and circumstances that best bring about desired outcomes (Culatta, 2013).

CONTENTS OF THE DISSERTATION

The dissertation is organized into five chapters followed by appendices and references. Chapter one presented the introduction, significance, purpose statement, specific aims and research questions, theoretical framework, delimitations, and definition of terms. Chapter two presents an overview of human patient simulation in nursing education, an overview of peer observation in human patient simulation, and a critique of current relevant simulation literature. Chapter three presents the research design, setting, sample, instruments, procedures, data analyses, and human subjects review. Chapter four presents the results of the data analysis. Chapter five presents the findings related to the literature, limitations and strengths of the study, conclusions drawn from the data presented in the previous chapter, and concludes with recommendations for future research.

Chapter 2: Review of the Literature

INTRODUCTION

Chapter two presents the purpose of this study, an overview of human patient simulation in nursing education, an overview of peer observation in human patient simulation, and a critique of current relevant simulation literature. The purpose of this study was to determine if a simulation instructional design that uses peer observation impacts student learning outcomes.

HUMAN PATIENT SIMULATION IN NURSING EDUCATION

Human patient simulation laboratories are low-risk, safe environments capable of providing rich, integrated learning experiences for nursing students as they learn the art and science of caregiving. These laboratories, which simulate clinical learning experiences, have become increasingly relevant in the training of healthcare professionals due to public safety concerns in the delivery of healthcare. In fact, the publication of *To Err Is Human* (Institute of Medicine, 1999) has made the practice of using patients as educational subjects untenable. The need for patient safety is paramount: practicing nurses and students in training alike fear harming patients.

This vigilance on patient safety has led to a paradoxically difficult circumstance regarding the use of traditional clinical teaching methods. For example, when nursing students are assigned to work alongside a registered nurse (RN), they have limited hands-on experiences and their opportunities to engage in clinical decision making are restricted. Students often defer to RNs who care for patients, which in turn leads to disengagement from the thinking, reasoning, and judgment involved in effective clinical

decision making. That is, having a student status necessarily restricts their scope of practice. This restriction leads to fewer opportunities because primary nurses are ultimately responsible for decision making and providing competent care. Further, employers have begun to demand that nursing school graduates possess the ability to care for patients immediately upon entry into the workforce. In other words, new graduates are expected to deliver safe and competent care for patients even as restrictions to patient care training opportunities have risen.

Simulated clinical learning is a realistic enactment of clinical scenarios wherein nursing students assume the role of primary RN caregivers. In this function, nursing trainees practice interventions, make independent clinical decisions, and experience the consequences of their actions in real-time, which provides students with immediate feedback. Nursing students who experience simulated clinical learning acquire new information and problem solve reality-based clinical situations in a safe and structured environment without possibility for adverse outcomes to actual patients. These laboratory environments provide advantages over traditional clinical rotations, which vary in consistency among students. Simulation labs standardize learning opportunities for nursing students, in turn allowing for increased consistency in the curriculum.

The National League for Nursing's *Annual Survey of Schools of Nursing* (2012) continues to identify the lack of clinical placements and lack of faculty as the main obstacles to expanding capacity in prelicensure RN programs. A decreasing number of clinical sites have been available for nursing students, especially in critical care and specialty areas, which has been coupled with increased student enrollment and faculty shortages. Thus, human patient simulation will be in use for the foreseeable future. As of

2008, 16 state Boards of Nursing had given approval for substituting simulation for clinical time and an additional 17 states were considering changes in regulations concerning simulation (Nehring, 2008). Newer academic journals have focused specifically on simulation topics, simulation centered conferences have become more prevalent, and schools of nursing have made substantial capital investments in simulation resources.

PEER OBSERVATION IN HUMAN PATIENT SIMULATION

Numerous studies have used peer observation during simulated clinical learning scenarios. Faculty member and student views have been reported in the literature, but those often conflict with little evidence provided on the impact of peer observation on learning outcomes. Only one study, found in the medical education literature, directly measured the impact of peer observation on learning outcomes using pass rates for a high-stakes examination following participation in simulated clinical learning scenarios as well as observation of a peer completing identical scenarios (McMullen et al., 2013).

Of the studies reviewed, 35% (11 of 31) only reported use of an observer role and peer observation during simulated clinical learning experiences. Peer observation was not measured nor were any faculty or student comments reported. While the purpose of the these studies was not to measure or research peer observation, the authors did report use of an observer role and peer observation but only in the methods sections (Alfes, 2011; Beddingfield et al., 2011; Christiansen & Jensen, 2008; Hoffman et al., 2007; Hughes et al., 2014; Kardong-Edgren et al., 2008; Mould et al., 2011; Smith & Roehrs, 2009; Swenty & Eggleston, 2011; Thompson & Bonnel, 2008; Traynor et al., 2010). Swenty and Eggleston's (2011) study recommended that future research correlate questionnaire

responses to specific simulation roles assigned (e.g., nurse, family member, observer) to determine whether students' levels of satisfaction were influenced by the role assigned for the simulation.

Other studies have reported on the use of an observer role and peer observation during simulated clinical learning experiences. Peer observation was not measured because it was not the focus of the studies; however, faculty member and student comments regarding peer observation during simulated clinical learning experiences were reported. The studies provided qualitative evaluations on the value of peer observation without measured outcomes or using supportive evidence (Alinier et al., 2004; Alinier et al., 2006; Boellaard et al., 2014; DeBourgh & Prion, 2011; Fabro et al., 2014; Jeffries & Rizzolo, 2006; Jenkins et al., 2011; Lasater, 2007; Nestel & Tierney, 2007; Nevin et al., 2014; Partin et al., 2011; Prescott & Garside, 2009; Schoening et al., 2006; Slager et al., 2011; Smith-Stoner, 2009). For example, peer observation has been described as being important, valued, and appreciated due to the assumed benefits and advantages it imparted to observers (Alinier et al., 2004; Alinier et al., 2006; Partin et al., 2011; Slager et al., 2011). Yet these assertions prompt many questions: How is observation of one's peers important? What are the benefits and advantages of observing one's peers complete a simulation scenario? How are outcomes defined and measured? What do students gain from peer observation? And does peer observation impact subsequent performance in either simulations or clinical settings?

Further, faculty members reported high levels of cognitive engagement for observers in areas such as analysis, critical observation, and critique (Alinier et al., 2006; Nevin et al., 2014; Prescott & Garside, 2009; Slager et al., 2011). Yet follow-up

questions remain: How did the researchers know what the students were doing while in the observation room? Were faculty members present to ensure that students were attending to the simulations? And would high levels of cognitive engagement impact their own practice or performance in subsequent simulations or clinical settings?

Lasater (2007) described the quality of learning for observers as being poorer than that of students actively participating in simulations. Assumptions about the role of observers are important because some students admitted that "watching the simulation scenarios from another room was often boring and not always that useful" (Lasater, 2007, p. 274) and recommended structured observation tasks for students in observer roles. A student in Harder et al.'s study (2013) stated that while he was initially comfortable with the role of observer, the act of observing others actively participate in simulated scenarios became "boring" (p. 332) over time. Lasater (2007) described how observer roles were made to be more actively engaging for students through the use of textbooks as resources. But learning mechanisms have remained unclear because students cannot observe their peers and retrieve information from textbooks simultaneously. Jenkins et al. (2011) reported that students became so involved in discussions about what they were observing that they were unable to stay focused on structured observation tasks. Thus the types of structured observation activities that led to improved leaning outcomes for students participating in simulated clinical learning scenarios has remained unknown.

There were two additional facets of peer observation that were raised in student comments. Some students made negative comments about being observed while actively participating in simulation scenarios, stating that emotions such as embarrassment and anxiety impeded learning (Nestel & Tierney, 2007; Prescott & Garside, 2009). Secondly,

another student commented that the time at which peer observation occurs during one's degree program could influence learning outcomes in simulated clinical learning scenarios (Schoening et al., 2006).

Two qualitative research studies were located wherein role assignment and, specifically, the role of observer was the focus of the research. Peer observation was not measured because the primary methods used to obtain data regarding the role of observer were naturalistic inquiry interviews and a focused ethnographic approach. Hober (2012) conducted a study utilizing a descriptive, exploratory approach that was based primarily on naturalistic inquiry interviews. Findings revealed that participants' did perceive the role of observer to foster learning. The role was deemed "important" (p. 99) in that there were opportunities to notice, interpret, respond, and reflect particularly with enhancement of the observer role through a guided observer role activity. The investigator supported use of the observer role with a guided learning activity. In contrast, however, are the findings of an ethnographic study regarding student perspectives of role assignment in high-fidelity simulation (primary nurse, secondary nurse, other nurse, documentation nurse, communication nurse, observer, family member, and physician). Students commented both positively and negatively regarding the role of observer but the investigator concluded that, overall, students perceived that their learning experience was impaired when they were assigned to the observer role and recommended that faculty limit the number of students assigned to the observer role (Harder et al., 2013).

Only four studies were found of those reviewed that measured peer observation. One study in the medical education literature measured the impact of peer observation on subsequent behavioral performance (McMullen et al., 2013). Two studies reported in the

nursing education literature measured peer observation but the measurement was in the form of self-reported Likert scales (Alinier et al., 2014; Kiat et al., 2007). One conference abstract was located regarding presentation of a nursing study wherein peer observation was the focus of the study. The measurement of peer observation for that study was also in the form of a self-reported Likert scale questionnaire (Harwood et al., 2009).

McMullen et al. (2013) conducted two simulated Clinical Assessment of Skills and Competencies (CASC) events. The CASC is the final membership examination for the Royal College of Psychiatrists in the United Kingdom (UK), and is characterized by a low pass rate (33%). These two events were an attempt to support candidates preparing for the high-stakes examination and to improve their chances for success. The events were designed so that candidates were paired with peers and made two circuits of the stations. For each circuit, one candidate completed the simulated scenarios and the other candidate observed their peers who completed the scenarios. On completion of the first circuit, candidates reversed roles and completed the circuit again.

At the end of the event, participants were asked to complete an anonymous evaluation questionnaire. Using a mix of Likert-scale questions and free-text comments, 67% of participants indicated that peer observation as an educational method was helpful. Other trainees reported that peer observation made no difference (11%) or was a hindrance (22%). Of note, these results only included those individuals who observed first. No data were provided for trainees who completed the stations first then observed a peer during the second circuit.

Following training events, participant pass rates for the first event were 33%. The pass rate for the candidates participating in the second event was 54%. The pass rate after

the first event was identical to the pass rate prior to the training event (33%). The second event, while yielding a significantly higher pass rate, had its duration increase from a half day to a full day and six additional stations were added to more accurately represent the real examination. It is unknown whether the improved pass rate resulted from six additional opportunities to complete training stations and get feedback from the examiners, from having additional opportunities to observe a peer complete the stations, or from both variables. Nonetheless, this study was significant because it linked peer observation with subsequent behavioral performance when trainees completed the formal CASC examination.

Kiat et al. (2007) measured peer observation through a survey of 260 nursing students in Singapore six months after introduction of high fidelity patient simulators into the curriculum. The study goal was to assess the effectiveness of the new training approach and to evaluate the learning experience so that the design and conduct of the simulated clinical learning experiences could be enhanced. Students were asked 10 questions regarding the perceived benefits of simulation-based training as a learning approach and 10 questions regarding the perceived benefits of simulation-based training provided in the past six months. Each section had one question regarding peer observation. Students were asked to rate the perceived benefits of observing and critiquing their peers of during simulation-based training as a learning approach, and the perceived benefits of observing and critiquing their peers during actual simulation-based training provided in the last six months. A four-point Likert scale self-report measure was used. The results showed that 96% and 97% of students, respectively, agreed or strongly agreed that there was a perceived benefit to observing and critiquing one's peers during

simulation-based training. The study was limited by collection of a self-report measure as the sole outcome. Further, the authors made assertions regarding benefits to the observers including mental engagement while observing one's peers; development of higher order cognitive skills; and acquisition and refinement of technical, clinical, and social skills accrued from observing their peers during simulated clinical learning experiences. None of these outcomes, however, was clearly defined or measured.

Alinier et al. (2014) surveyed 237 interprofessional students over a three year period participating in a series of multiprofessional simulation scenarios. Nursing students in adult health, pediatrics, and psychiatric and mental health courses participated alongside students in the emergency medical responder, radiography, physical therapy, and pharmacy programs. Prior to participating in the simulation scenarios students were asked, among other questionnaire items, if they expected to learn from watching others complete simulation scenarios. After their own participation in the simulated scenarios the students were surveyed again and asked whether they learned from watching others complete simulation scenarios. The authors reported a significant difference between what the students expected to learn from watching others complete simulation scenarios and what the students believed they did learn. Students reported that they learned even more than they expected to from observing peers complete simulated scenarios. Further, students in the experimental groups scored higher on discipline-specific knowledge tests, indicating that there was knowledge gain. It is unclear, however, if the knowledge gain was a result of participating in the immersive, interprofessional simulated clinical scenarios or from observing their peers complete the scenarios, or both. The authors stated that further research was needed to understand the impact of simulation based

experiential learning activities with subsequent behavioral performance in the clinical setting.

Harwood et al. (2009) reported that there was an emerging use of peer observation during simulated clinical learning scenarios in nursing education. The results of a Likert-scale based questionnaire showed that 84% of the students reported learning from watching peers complete a simulation scenario. The authors cautioned, however, that it was unclear if this knowledge transferred to practice or if students also learned negative aspects through observation.

Increases in student capacity and decreases in faculty resources have required most simulations to be conducted with small groups of students. In most schools of nursing, it is simply impractical for teaching, learning, and evaluation using human patient simulation to be conducted with individual students. Although peer observation may impact learning outcomes in human patient simulation, no evidence in the nursing education literature was found to support this claim. Further, if peer observation does impact student learning in simulation, no evidence was found on the best way to structure and implement observation roles and activities for optimal learning. No studies were found that focused on the impact of peer observation on learning outcomes in the simulation literature for nursing education. In essence, educators have utilized peer observation in simulation labs without sufficient evidence of its outcomes. An evidence base is necessary to advance the science of simulation in nursing education. Moreover, an evidence base is the only quantitative method to determine the efficiency and effectiveness of capital and human resources.

Compounding the lack of clarity in peer observation was the considerable variation in the implementation of observer roles. Some authors have reported only that students observe their peers (Partin et al., 2011; Thompson & Bonnel, 2008). Other authors have reported that observers participated in debriefings with students who completed the simulation scenarios (Alfes, 2011; Alinier et al., 2004; Alinier et al., 2006; Beddingfield et al., 2011; DeBourgh & Prion, 2011; Kiat et al., 2007; Lasater, 2007). A few authors have included vague activity descriptions of observers during scenarios such as to critique positively, record observations, take notes, and critically observe (Prescott & Garside, 2009; Slager et al., 2011; Smith & Roehrs, 2009; Swenty & Eggleston, 2011).

Schoening et al. (2006) documented specific observer activities by requiring nursing student observers to develop a written care plan for simulated patients. It was, however, unclear whether student observers prepared the written care plan for simulated patients while observing their peers or if they wrote the care plan after the simulation scenario was complete.

Jenkins et al. (2011) asked observers to rate the frequency of safe practice behaviors such as handwashing, checking orders, patient identification, and medication calculations. Data were collected on the extent to which students were able to complete a task based on observing their peers during a simulation scenario. There was a disconnect, however, between observing students' ability to recognize a peer violating patient safety standards and awareness of students' own violations during participation in simulated clinical learning experiences. When observing their peers during simulation, students readily recognized patient safety standard violations but they were not readily aware of their own violations when participating in the simulation themselves. The authors

clarified that this research only documented the extent to which students were able to identify safe practice behaviors while observing a peer group complete a simulation scenario. There was no evidence presented that these observations impacted subsequent behavior or performance in simulated clinical learning experiences or in actual clinical settings. The study authors recommended that further research be conducted to determine the impact of peer observation on subsequent performance both in other simulated learning experiences and in clinical settings.

In summary, no studies were found in the nursing education literature that addressed the impact of peer observation on learning outcomes in simulated clinical learning experiences. However, McMullen et al.'s study (2013) in the medical education literature has shown that peer observation may be a promising instructional design strategy. There is a gap in the nursing and health professions education literature on use of peer observation in human patient simulation. The information educators have to date regarding the use of peer observation in human patient simulation consists largely of anecdotal faculty and student comments regarding peer observation and the role of observer. Qualitative studies (Harder et al., 2013; Hober, 2012) and research utilizing self-reported Likert scale measures (Alinier et al., 2014; Harwood et al., 2009; Kiat et al., 2007) have revealed the perceptions of students participating in peer observation. Only one study measured the impact of peer observation on subsequent behavioral performance (McMullen et al., 2013). Peer observation as an instructional design strategy in human patient simulation in nursing education has not been rigorously studied. It is unclear whether knowledge gained by peer observation transfers to performance improvements when observers engage in their own simulated clinical learning

experiences or work in clinical settings. The research study conducted herein addressed the impact of peer observation on students' subsequent performance during simulated clinical learning experiences.

CRITIQUE OF CURRENT RELEVANT SIMULATION LITERATURE

Based on the literature review, there were two primary concerns regarding human patient simulation research. The first concern was that human patient simulation research is largely methodologically confounded. The second concern was that nursing studies involving human patient simulation have primarily used self-report surveys to measure research outcomes.

Methodological Confounding of Simulation Research

Simulation research conducted in nursing education has been largely methodologically confounded, failing to inform faculty educators on how to best design, structure, and implement simulation experiences to improve learning outcomes and efficiently utilize capital and human resources. Methodological confounding occurs when multiple variables simultaneously influence the dependent variable. The outcomes, in turn, may have more than one explanation, which can lead to incorrect interpretations and conclusions (Clark, 1985; Cook, 2009a; 2009b). In the nursing literature, a major failure has been in the comparison of traditional teaching methods with simulation. A valid comparison group does not exist when traditional teaching methods are compared with simulation in nursing education research because confounding variables make it difficult to attribute an outcome to a specific variable. A direct comparison of simulation instructional design formats would provide evidence of the impact on learning outcomes.

Comparisons between different simulation formats can address which simulation designs lead to improved learning outcomes. Well-designed simulation experiences have the potential to improve learning outcomes for student nurses, which in turn can impact nursing practice and patient outcomes.

The first research summit for The Society for Simulation in Healthcare was convened in January 2011. The research group responsible for reviewing the literature was unable to provide recommendations for best practices in instructional design or pedagogical principles for simulation due to a lack of well-designed studies from which to draw a consensus (Schaefer et al., 2011). Later that year Cook et al. (2011) conducted a systematic review and meta-analysis of simulation in health professions education from 609 research studies. The researchers concluded that, in comparison with no-intervention (i.e., single-group pretest-posttest studies and comparisons with no-intervention controls), simulation experiences were consistently associated with large effects for outcomes measuring knowledge, skills, and behaviors. The authors noted large heterogeneity in the analysis, indicating a wide variability of results from one study to another. This result suggests that some simulation designs are more effective than others. The authors strongly advocate a direct comparison of simulation designs in studies to determine how to most effectively use simulation experiences to train health care professionals.

New educational interventions are commonly compared to traditional methods to establish superiority, or at least equivalence. Questions asked at this level of inquiry focus on demonstrating efficacy: “Does the new method work?”; “Is it effective?”; “Is the new method at least equivalent to established methods?”; and “Is the new method

superior to traditional methods?" The underlying research question is: "Should we use the new method?"

Clarification research, in contrast, compares one simulation method to another and asks: "How does it work?" and "Why does it work?" Clarification research can provide an evidence base to improve educational interventions using human patient simulation. Educators need evidence-based guidance on how to design, structure, and implement simulation experiences. While evidence has supported the effectiveness of simulation, the literature does not clearly identify design principles to guide future implementations (Cook et al., 2011). Thus, the question is no longer whether we *should* use simulation in health professions education, but rather *how* to efficiently and effectively use simulated clinical learning experiences to support educational goals.

Most quantitative simulation research studies in nursing have been media-comparative—that is, the researchers compare simulation based instructional formats to non-simulation based instructional formats. Simulation has been compared to traditional nursing courses, lecture, written interactive case studies, usual teaching, enrichment sessions, regular nursing curriculum, classroom sessions, case scenarios, didactic instruction, usual nursing training, managing actual patients in clinical experiences, case study seminars, self-directed learning packages with and without scenario-based virtual workshops, and case study clinical conferences (Adamson, 2010; Alinier et al., 2004; Alinier et al., 2006; Birch et al., 2007; Brannan et al., 2008; Brown & Chronister, 2009; Hoffman et al., 2007; Jeffries & Rizzolo, 2006; Radhakrishnan et al., 2007; Ravert, 2008; Scherer et al., 2007; Shepherd et al., 2010; Sinclair & Ferguson, 2009).

The instructional methods in these studies (e.g., lecture, Socratic questioning, clinical cases and scenarios, interactive models, analogies, group discussion and activities, concept maps, self-assessment, feedback) vary along with the medium (e.g., face-to-face, computer based learning, textbooks, other paper-based instruction), resulting in methodologically confounded findings. There could be multiple explanations for the observed effect. It is not possible to know if the instructional method, the medium, or both variables contributed to the findings, in turn making generalizability difficult because the cause could not be attributed to a specific variable (Cook, 2005). To this effect, Cook (2009a) indicated that, "It is virtually impossible to make statements regarding the global superiority of one method over another when variability reigns" (p. 102).

The lack of direct simulation-simulation comparative research studies has created a gap in the literature and has hindered advancement of educational interventions using human patient simulation at a time when radical change is being called for in nursing education (Benner et al., 2010; Institute of Medicine, 2010). Facilitation of evidence-based improvements in educational practice regarding simulation has the potential to advance the science of nursing education. The advances could properly address issues of how simulation experiences should be best designed, structured, and implemented to maximize efficiency and effectiveness in order to improve learning outcomes.

The Need for Higher Levels of Measurement

Suzie Kardong-Edgren (2010), a lead researcher and seminal author in simulation, stated that there was no longer a need to focus on students' self-report measures as the sole measured outcome: "The low-hanging fruit has been plucked" (p. 203). Yet myriad

simulation research has been measured with self-report data. Previous research has established that students and faculty members like simulation (Howard et al., 2011; Bray et al., 2009), that students are satisfied with simulation (Alfes, 2011; Smith, 2009), and that simulation increases students' self-confidence and self-efficacy (Bambini et al., 2009; Brown & Chronister, 2009; Sinclair & Ferguson, 2009).

Student self-ratings are inadequate for making decisions about instructional strategies that improve learning outcomes in simulated clinical experiences. The literature has suggested that self-report data are not particularly useful—self-reported perceptions, attitudes, and opinions have little correlation with actual performance and behaviors when caring for patients, nor do they impact patient care outcomes (Davis et al., 2006). In fact, students have reported feeling confident even after repeatedly harming patients during simulation experiences (Lambton et al., 2008). Further, simulated clinical learning scenarios can be conducted in a variety of ways, making it impossible to assess the relative effectiveness of variations by students' self-ratings (Tanner, 2011). A higher-level evidence base is needed to provide quality simulation learning experiences in nursing education.

Prion and Adamson (2012) stated that it was imperative for scientists to conduct research that informs educators of which characteristics of simulation learning experiences impact improved learning outcomes and that learning should be measured directly. This study utilized a randomized, experimental methodology and objective measurement of the dependent variable to assess the impact of peer observation on learning outcomes in human patient simulation. The outcomes of learning were measured directly by rating actual student performance during a simulation scenario, thus indicating

whether an instructional design using peer observation impacted learning outcomes. Yucha et al. (2011) reported that very few nursing education research studies (5.3%) reported behavioral outcomes. The methodological quality of nursing education research can be improved by collecting objective data (Schneider et al., 2013; Yucha et al., 2011). To achieve the Institute of Medicine's goals specified in *The Future of Nursing* report (Institute of Medicine, 2010), nursing education researchers must improve the methodological rigor of their studies conducted to begin to improve education of the nursing workforce.

SUMMARY

This chapter presented the purpose of this study, an overview of human patient simulation in nursing education, an overview of peer observation in human patient simulation, and a critique of current relevant simulation literature. Chapter three presents the research design, setting, sample, instruments, procedures, data analyses, and human subjects review.

Chapter 3: Research Design and Methods

INTRODUCTION

Chapter three presents an overview of the problem, the research design, setting, sample, instruments, procedures, data analyses, and human subjects review.

Overview of the Problem

Most of the quantitative simulation research studies conducted to date compare simulation instructional formats to non-simulation instructional formats. The instructional methods in these studies vary along with the medium, resulting in methodologically confounded findings. An evidence base is needed that informs nurse educators on how to efficiently and effectively use simulation experiences to improve student learning outcomes. Research with a direct comparison of one simulation instructional strategy to another simulation instructional strategy would clarify how to best design, structure, and implement simulated clinical learning experiences to support educational goals when training healthcare professionals. The purpose of this study was to determine if a simulation instructional design that uses peer observation impacts student learning outcomes.

RESEARCH DESIGN

A randomized experimental approach with a posttest-only control group design was used to examine the research questions. Two criteria must be met for a study to be categorized as using a randomized experimental approach. The key criterion is that the participants must be randomly assigned to groups or conditions. Random assignment of

participants to conditions allows one to assume that the conditions were essentially equivalent prior to the intervention. If the conditions were essentially equivalent prior to the intervention then differences in the dependent variable can be assumed to be due to the intervention not from differences in participant characteristics. This strengthens the internal validity of the study. A pretest is used in a pretest-posttest design to establish the initial equivalence of the groups prior to the intervention. The advantage of a post-test only design is that no practice or carry-over effects can occur because there are no repeated measures. This strengthens the external validity of the study. Less confidence can be placed in random assignment providing equivalent conditions with small samples or very heterogeneous participants.

The second criterion is that there must be an active independent variable. An active independent variable allows the researcher to control exactly what the intervention will be and when and to whom it will be implemented during the study. Research approaches that have an active independent variable allow a researcher to infer that the intervention caused the change or behavior that is measured as the dependent variable.

This study had one active independent variable with two levels: peer observation (experimental conditions) and no peer observation (control condition). The dependent variable was the Creighton Simulation Evaluation Instrument™ (C-SEI™) score. Comparisons were made between independent groups because each student was a member of only one group.

SETTING

The simulation center at a School of Nursing (SON) in southeast Texas served as the data collection setting for this study. The primary areas in the simulation center used

to conduct this study were the simulation rooms and a separate room set up for peer observation. The simulation rooms reflected an acute care hospital environment with a high degree of realism. Unobtrusive cameras and microphones are mounted in the ceiling in each simulation room. Students in the observation room used a computer station equipped with a monitor and headphones to observe and listen to a peer group complete the simulation scenario.

SAMPLE

The convenience sample for this study consisted of 40 small groups that were made of nursing students in the second semester of their first year of studies in an undergraduate program at a SON located in southeast Texas. The nursing students were required to enroll in Adult Health Nursing, the second medical-surgical course offered during the Spring 2013 semester. Once admitted to the program, nursing students at the SON progress through the curriculum as a cohort. Students, therefore, had similar levels of nursing simulation exposure upon reaching the second semester of nursing school.

A total of 119 students were enrolled in the course. Three students received an excused absence from the required course activity and made arrangements with the course coordinator to complete a make-up assignment. A total of 97.5% (n=116) of students enrolled in the course participated in the study on their designated simulation laboratory day. Students race/ethnicity was self-reported as 28% (n=32) Asian or Native Hawaiian or other Pacific Islander or American Indian or Alaskan Native; 5% (n=6) Black or African American; 50% (n=58) Caucasian; 15% (n=17) Hispanic or Latino; and 3% (n=3) bi-racial/bi-ethnic. The students ranged in age from 19 to 49 years. Of all students, 86% (n=100) were female and 14% (n=16) were male.

Sample Size

The sample size for this research study was determined by the number of students enrolled in the required course during the spring 2013 semester. Effect sizes will be calculated based on this sample for use in future research.

Inclusion and Exclusion Criteria

Students enrolled in the required Adult Health Nursing course in the spring 2013 semester at the SON were included in the study. Students not enrolled in this course were not included in the study.

INSTRUMENTS

Two instruments were used to measure non-study and study variables in this study. A demographic form and the Creighton University Simulation Evaluation Instrument (C-SEI™) were used to obtain post measurements.

Demographic Form

The demographic form was developed by the principal investigator. Descriptive data including age, gender and race/ethnicity was requested from and provided by all student participants. These data were used to describe the characteristics of each study condition and the overall sample of the study.

Simulation Instrument

Permission was obtained from Creighton University to use the Creighton Simulation Evaluation Instrument™ (C-SEI™) for the current simulation research study. The National Council of State Boards of Nursing (NCSBN) selected the C-SEI™ for use in its current multi-site, multi-year national simulation study making it the gold standard for group evaluation of simulation performance. There are few options for objective measurement of student performance during simulation, especially instruments that measure group performance. The C-SEI™ tool was specifically designed to provide a group simulation grade. Increasing student capacity and decreasing faculty resources have made it necessary that simulation teaching, learning, and evaluation be designed for both individual students and groups of students.

Todd et al. (2008) created the C-SEI™ and established content validity through use of an expert panel. Inter-rater and intra-rater (test-retest) reliability for the instrument was reported using Intraclass Correlation Coefficient (ICC) by Adamson et al. (2011). For the C-SEI™, it was determined that the inter-rater reliability using ICC (2,1) (95% CI) was .952 (.697, .993), the intra-rater (test-retest) reliability using ICC (3,1) (95% CI) was .883 (-.001, .992), and the internal consistency using Cronbach's Alpha was $\alpha = .979$.

The C-SEI™ is based on the four categories of the American Association of Colleges of Nursing's (AACN) *Essentials of Baccalaureate Education for Professional Nursing Practice* (1998): 1) assessment, 2) communication, 3) critical thinking, and 4) technical skills. These core competencies demonstrate the cognitive, psychomotor, and affective learning domains. The C-SEI™ is composed of 22 dichotomous items, and the raters decide which of the 22 items are relevant to the learning objectives of the

simulation scenario. Specific observable behaviors that indicate demonstration of competency are identified for each of the items deemed relevant to the learning objectives of the simulation scenario.

As an example, one of the 22 instrument items is "Uses patient identifiers." If the raters were in agreement on this item's relevance, it became necessary for the specific observable behavior demonstrating this item's competency to be identified. Several behavioral possibilities existed: 1) Students ask the patient's name and compare the name given to the name on the chart; 2) Students view the name on the patient's wristband and compare the name on the wristband to the name on the chart; 3) Students asks the patient's name and compare the name given to the name on the patient's wristband; and 4) Any of the options above.

In this study, the raters evaluated each of the 22 items for their relevance to the learning objectives of the simulation scenario. Specific observable behaviors to determine competency were identified for each of the relevant items. Ultimately, 18 observable behaviors were scored in the conduct of this study: five observable behaviors were scored in the assessment category, five observable behaviors were scored in the communication category, five observable behaviors were scored in the critical thinking category, and three observable behaviors were scored in the technical skills category. Each observable behavior was scored as either 0 (does not demonstrate competency) or 1 (demonstrates competency). Thus, the total score any group could receive on the C-SEI™ in this study ranged from 0 – 18, with 0 being lowest and 18 being highest.

PROCEDURES

Recruitment

The purpose of the study was explained to the faculty member teaching the Adult Health Nursing course, the BSN Track Administrator and to the Baccalaureate Program Director. A simulation activity was a requirement of the course and the faculty member teaching the course permitted access to the students to conduct the research study. The students were told that data would be collected as they participated in their required simulation activity but that none of the data would be shared with their course instructor until after the semester was over and that the data collected would in no way impact their grade in the course. It was explained that the data were being collected to improve simulation experiences for nursing students in future semesters.

Establishment of Inter-rater Reliability Among Raters

There were two raters in this study, Rater 1 and Rater 2. One of the raters was also the principal investigator for this research study. Inter-rater reliability was determined after the raters decided which of the 22 dichotomous items on the C-SEI™ were relevant to the learning objectives of the simulation scenario and then identified the specific observable behaviors demonstrating competency for each of the relevant items. Each rater used the C-SEI™ to independently score three validated, video-archived simulations depicting nursing students of various proficiency levels. These leveled simulation scenarios were available via the National League of Nursing Simulation Innovation Resource Center's website.

Portney and Watkins (2008) reported that reliability coefficient values above .75 indicate good reliability; this study deemed an inter-rater reliability of .80 as acceptable for each of the three independently rated videotaped simulations.

Training of Simulation Operators

There were two simulation operators in this study, Operator 1 and Operator 2. Both operators had experience in the role prior to the conduct of this study. Both operators specifically had previous experience with the model of the simulated patient manikin used in this study. Operator 1 was the director of the simulation center in which the study was conducted and is a Certified Healthcare Simulation Educator.

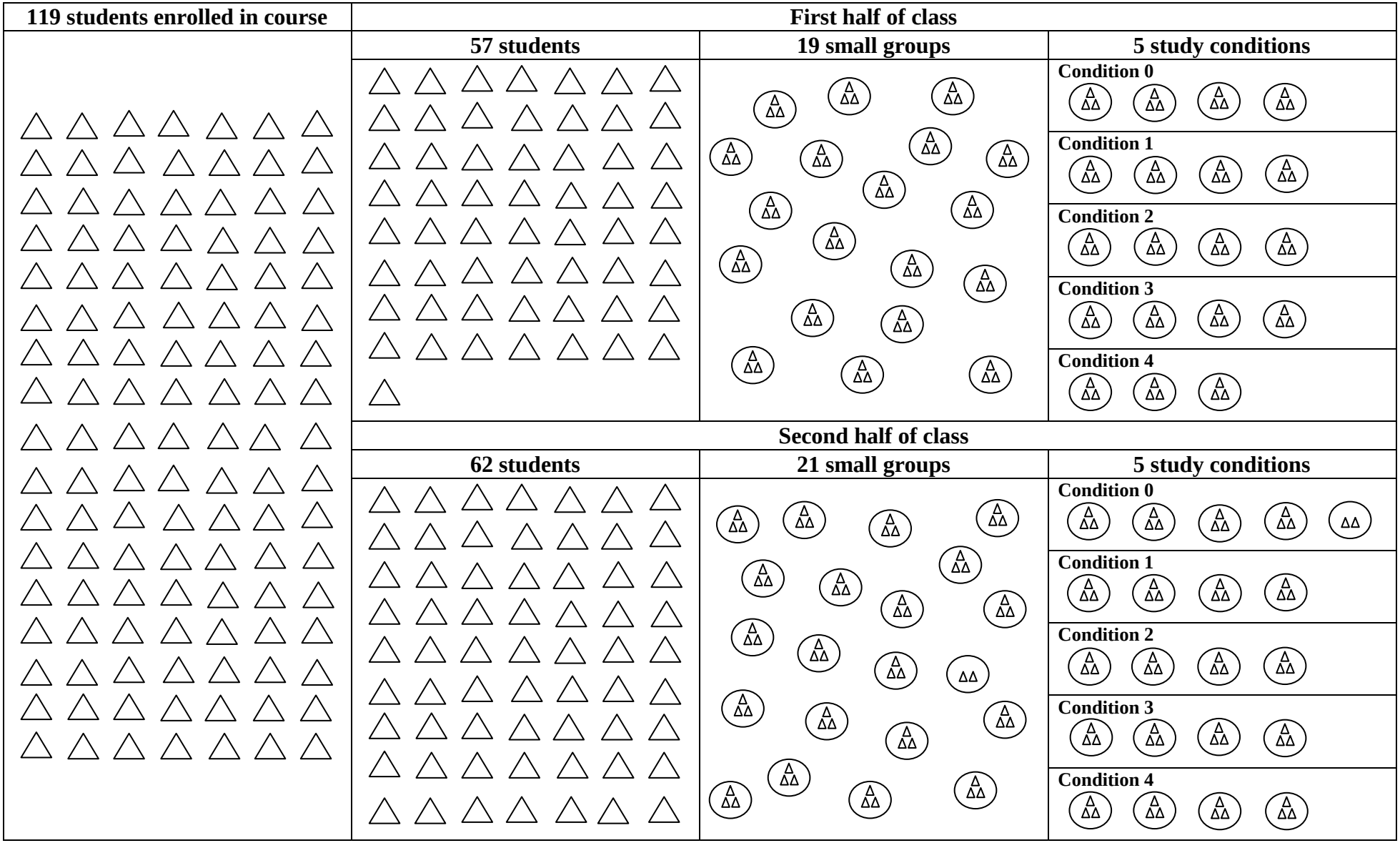
Simulation operators completed training prior to the designated simulation laboratory day to ensure standardization of the simulation experience for each of the small groups rated. Operators standardized the following aspects of the simulation experience: responses to questions asked of the simulated patient by the student nurses; the questions the simulated patient asks the student nurses; the signs and symptoms exhibited by the patient to indicate transfusion-associated circulatory overload; the timing of the onset of the signs and symptoms of transfusion-associated circulatory overload; the impact of nursing interventions; the role of the operator during debrief; the questions the operators ask the student nurses during debrief; and the responses to questions asked of the operator by the student nurses during debrief.

Random Assignment of Students to Small Groups and Study Conditions

A total of 119 students were enrolled in the course. Approximately half of the class (57 students) completed their medical-surgical clinical rotation while the other half

of the class (62 students) completed their psych-mental health rotation. The two groups switched rotations at mid-term. Students enrolled in the course were randomly assigned to either a control condition or an experimental condition. A two-step randomization process was used: Step 1) individual students in each half of the class were randomly assigned to small groups (approximately three students each); Step 2) These small groups were randomly assigned to one of five study conditions: Condition 0 (the control condition), or Condition 1, 2, 3 or 4 (the experimental conditions). The 57 students in the first half of the class were randomly assigned to 19 small groups. These 19 small groups were then randomly assigned to one of five study conditions (Condition 0, Condition 1, Condition 2, Condition 3 or Condition 4) to participate in the simulated learning experience on their designated simulation day. Seven weeks later, the 62 students in the second half of the class were randomly assigned to 21 small groups. These 21 small groups were then randomly assigned to one of five study conditions (Condition 0, Condition 1, Condition 2, Condition 3, or Condition 4) to participate in the simulated learning experience on their designated simulation day. Students participated in the simulated clinical learning experience together in their small groups. Figure 1 illustrates the two-step randomization process.

Figure 1. Randomization of Students Enrolled in Course to Small Groups and Study Conditions



The control condition (Condition 0) received no intervention (no peer observation prior to completing the simulation scenario). The experimental conditions (Condition 1, Condition 2, Condition 3 and Condition 4) received the intervention (peer observation prior to completing the simulation scenario).

Simulation Scenario

As part of the course requirements, all students were scheduled to participate in a simulated clinical learning experience on a designated simulation laboratory day. Simulation scenarios and data collection occurred on these designated simulation laboratory days during the Spring 2013 semester.

The simulated patient manikin SimMan® by Laerdal was used to conduct this study. The National League for Nursing has simulation scenarios that are peer-reviewed, evidence-based, and commercially available. "Surgical Scenario 5 – Lloyd Bennett: Complex Case: Postoperative Hip Arthroplasty – Blood Transfusion Reaction" served as the basis for the simulation scenario used in this study. The case was modified to present transfusion-associated circulatory overload as an alternative adverse reaction to a blood transfusion for a postoperative hip arthroplasty patient who receives two units of packed red blood cells due to blood loss from surgery. Simulation sessions were a total of 25 minutes in length. The first 17 minutes were for the simulation scenario and the last 8 minutes were for debriefing of the simulation just experienced. During the simulation students were expected to demonstrate basic care (perform hand hygiene, introduce themselves, state their role, use patient identifiers, perform a focused assessment and monitor vital signs); answer patient questions (regarding the need for a blood transfusion and risks of receiving a blood transfusion); recognize signs and symptoms of transfusion-

associated circulatory overload (dyspnea, orthopnea, cough, sudden anxiety, tachycardia, hypertension, crackles in the base of the lungs, and decreased oxygen saturation); demonstrate appropriate independent nursing interventions (sit the patient up, obtain vital signs, and notify the physician); and verbalize anticipated physician orders (slow or stop the infusion, administer oxygen, and administer diuretics).

Two raters (Rater 1 and Rater 2) used the C-SEI™ to score group performance during the simulation scenarios. Rater 1 and Rater 2 simultaneously scored separate student groups in separate simulation rooms. Each rater scored the performance of the 18 specific observable behaviors by the students during the simulated clinical learning experience. All the items scored 1 (demonstrates competence) were added together to determine a total score for the performance during the simulation. All students in each small group received the same score.

Simulations were halted at the 17-minute mark and the simulation operators went into the rooms to debrief the small groups at the bedside. The debrief conducted at the bedside by the simulation operators was standardized in length and in content. Each debrief was eight minutes with the operators, now in the role of conducting the debrief, led the small group through a discussion consisting of the following questions: 1) What did the group do well?; 2) If you were able to do this scenario again, how might you handle the situation differently?; 3) What was the patient's primary problem?; 4) What were the key signs and symptoms of transfusion-associated circulatory overload?; and 5) What were the key interventions? The operators sole objective during the eight-minute bedside debrief was to ask the questions of the students and engage them in a student-led discussion. The students were not corrected nor were the correct answers to the questions

given during the eight-minute bedside debrief. The goal was for the students to consider the issues themselves and use what information they had to verbally work through the questions together in the immediate post-scenario debrief. The operators did not provide feedback to the students during the bedside debrief. They only posed questions for the students to consider and discuss amongst themselves.

Simulation sessions were a total of 25 minutes in length (17 minutes simulation time with an eight-minute debrief). A five-minute transition period was allotted in between each session. The principal investigator served as the time-keeper and utilized the overhead intercom system to notify everyone participating in the study (raters, operators and students) when a transition was to occur.

Each rater scored approximately five small groups as they completed the simulation scenario in the morning and, following a lunch break, scored approximately five small groups as they completed the simulation scenario in the afternoon. Overall, two raters scored approximately 10 small groups per day on two designated simulation laboratory days, rating a total of 40 small groups: Condition 0 (n=9 small groups); Condition 1 (n=8 small groups); Condition 2 (n=8 small groups); Condition 3 (n=8 small groups); and Condition 4 (n=7 small groups). Figure 2 shows a graphic of the overall research design.

Figure 2. Graphic of the Research Design

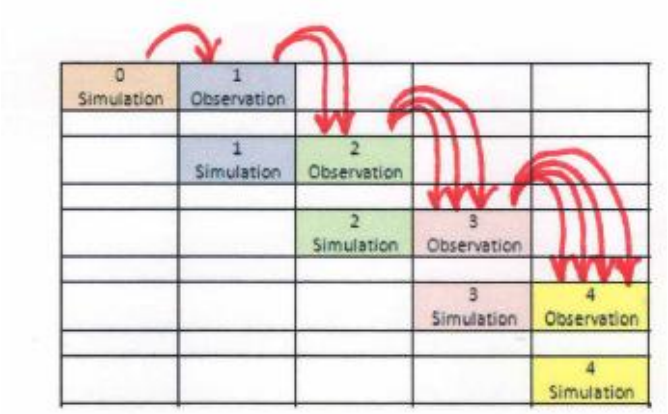
Experimental Conditions

Small groups randomized to the experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4) were exposed to the intervention (peer observation prior to completing the simulation scenario). Small groups randomized to the control condition (Condition 0) were not exposed to the intervention (no peer observation prior to completing the simulation scenario). At a designated time, small groups in the experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4) entered a room set up for observation. These students used a computer station equipped with a monitor and headphones to observe and listen to a peer group complete the simulation scenario.

Sequencing of the experimental conditions was an important research design aspect as one of the research questions sought to determine if the impact of the intervention was additive or cumulative across the sequential groups of students participating in peer observation. Evidence was sought as to whether each small group that observed a peer group complete the simulation scenario learned something during the observation, incorporated what they learned, built on it and then passed that learning on to subsequent small groups thus creating a cascade of learning through observation of one's peers. Each small group randomized to an experimental condition observed only one peer group complete the simulation scenario before completing the simulation scenario themselves. The small groups randomized to each of the experimental conditions were inherently different from each other, however, in the underlying number of observations that had occurred prior to their own observation. For example, a small group randomized to Condition 1 observed a peer group randomized to Condition 0 complete

the simulation scenario before they completed the scenario themselves. The small groups randomized to Condition 1 that observed the small groups randomized to Condition 0 complete the simulation scenario was the initial instance of observation since the small groups randomized to Condition 0 (control condition) did not observe a peer group complete the simulation scenario before they completed the simulation scenario themselves. This can be contrasted with the small groups randomized to Condition 4, for example, that observed the small groups randomized to Condition 3 that observed the small groups randomized to Condition 2 that observed the small groups randomized to Condition 1 that observed the small groups randomized to Condition 0. It is possible that each small group learned something by observing their peers, incorporated what they learned, built on that learning and passed that learning on to subsequent small groups. Evidence of learning by sequential groups of students observing their peers complete a simulation scenario was sought by examining the differences in the scores between the four experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4). Figure 3 illustrates the possible impact of sequencing in the experimental conditions.

Figure 3. Possible Impact of Sequencing in the Experimental Conditions



Control Condition

Small groups randomized to the control condition (Condition 0) had the same simulated clinical learning experience as the small groups randomized to the experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4). The small groups randomized to the control condition completed the same clinical simulation scenario in the same simulation rooms using the same equipment with the same simulation operators. The only difference was that the small groups randomized to the control condition did not go into a room set up for peer observation to observe and listen to a peer group complete the simulation scenario prior to completing the simulation scenario themselves. In other words, the only difference between the small groups randomized to the control condition (Condition 0) and the small groups randomized to the experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4) was exposure to the intervention. The small groups randomized to the control condition (Condition 0) received no intervention (no peer observation prior to completing the simulation scenario) and the small groups randomized to the experimental conditions

(Condition 1, Condition 2, Condition 3, and Condition 4) received the intervention (peer observation prior to completing the simulation scenario).

Group Debrief

At the end of the day when all of the small groups had completed the simulation scenario, everyone participating in the study (raters, operators, and students) proceeded to a large common area for an end-of-day group debrief. The same questions posed to the students at the bedside debrief were discussed. In the group debrief at the end of the day, however, the faculty for the course answered questions and ensured that all students understood the rationale for the answers to the questions. The faculty member also asked what they liked and didn't like about the day, on the whole, and what they learned that could be applied to their medical-surgical clinical rotations on which students would be starting the next week.

Second Half of the Class

Seven weeks later, the second half of the class participated in simulation activities required for the course on their designated simulation laboratory day. The same two-step randomization process was used to assign students to small groups and to a study condition. 62 students were in the second half of the class. These 62 students were randomly assigned to 21 small groups. These 21 small groups were randomly assigned to one of the five study conditions (Condition 0, Condition 1, Condition 2, Condition 3, or Condition 4). The same standardization procedures were followed regarding rater training and determination of inter-rater reliability in preparation for simulation activities and data collection. Simulation operators also convened for retraining.

DATA ANALYSES

IBM SPSS Statistics (Version 21) software was used for all data analyses. Nonparametric statistical analyses were used because the assumptions for the use of parametric statistics are markedly violated due to the small sample size for each of the conditions: Condition 0 (n=9 small groups); Condition 1 (n=8 small groups); Condition 2 (n=8 small groups); Condition 3 (n=8 small groups); and Condition 4 (n=7 small groups). Significance was calculated at $p \leq .05$ level.

Two small groups had large amounts of missing data (approximately 70% missing data) and were excluded from data analyses. Upon investigation it was determined that two small groups on the first designated simulation day encountered technical difficulties such that data collection was not possible. The technical difficulties were subsequently corrected and all remaining small groups were scored and included in data analyses. The sample sizes for each of the conditions after excluding the two small groups with large amounts of missing from data analysis was as follows: Condition 0 (n=8 small groups); Condition 1 (n=7 small groups); Condition 2 (n=8 small groups); Condition 3 (n=8 small groups); and Condition 4 (n=7 small groups).

Preliminary Analyses

Before any data analyses were performed, all data on each C-SEI™ were compared with the data entered into SPSS on the computer to ensure that the data were entered completely and correctly. Entries were checked and errors corrected prior to data analyses. Basic descriptive statistics were computed to check for errors, outliers, and missing data by comparing the frequency and minimum/maximum scores for each variable on the output data with the values in the codebook.

Demographic Data

Descriptive statistics were used to calculate the mean age of the control condition (Condition 0) and each of the experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4). Age range was reported for each condition. Gender and race/ethnicity data for each condition was presented in absolute numbers and as a percentage. Age, gender, and race/ethnicity data were reported to demonstrate comparability of groups.

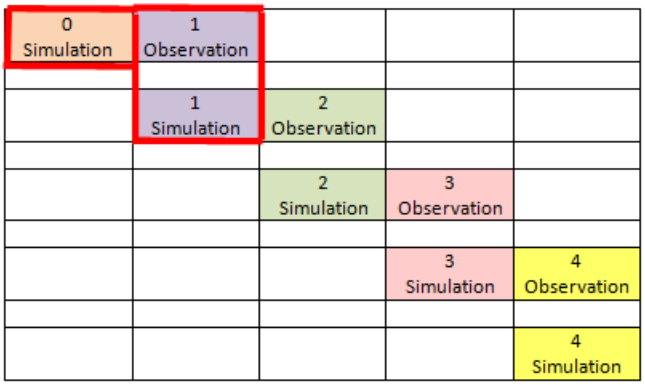
Specific Aim 1

The first aim sought to determine the impact of peer observation on student learning outcomes in simulated clinical learning experiences.

Research Question 1.1

Was there a difference in the learning outcomes between students who did not participate in peer observation (Condition 0) and students who participated in the initial instance of peer observation (Condition 1)? To examine this question, the Mann-Whitney U test was performed to make comparison between two independent groups. For Research Question 1.1, the two independent groups were students who did not participate in peer observation (Condition 0) and students who participated in the initial instance of peer observation (Condition 1). Figure 4 shows the two independent groups being compared for Research Question 1.1. Table 1 illustrates the schematic for data analysis used for Research Question 1.1. The Mann-Whitney U test is the nonparametric analog of the independent samples t-test. This test is used when comparison is made between two (and only two) independent groups. Effect size was also calculated.

Figure 4. Independent Groups Being Compared for Research Question 1.1



Condition 0 n=8 small groups (control condition)

Condition 1 n=7 small groups (experimental condition)

Table 1. Schematic of Statistical Analysis for Research Question 1.1

	Condition 1: Assessment	Condition 1: Communication	Condition 1: Critical Thinking	Condition 1: Technical Skills	Condition 1: Total Score on C-SEI™
Condition 0: Assessment	Mann-Whitney U				
Condition 0: Communication		Mann-Whitney U			
Condition 0: Critical Thinking			Mann-Whitney U		
Condition 0: Technical Skills				Mann-Whitney U	
Condition 0: Total Score on C-SEI™					Mann-Whitney U

Research Question 1.2

Was there a difference in the learning outcomes between students who did not participate in peer observation (Condition 0) and students who participated in any peer observation condition (combined Condition 1, Condition 2, Condition 3, and Condition 4)? To examine this question, the Mann-Whitney U test was performed to make

comparison between two independent groups. For Research Question 1.2, the two independent groups were students who did not participate in peer observation (Condition 0) and students who participated in any peer observation condition (combined Condition 1, Condition 2, Condition 3, and Condition 4). Figure 5 shows the two independent groups being compared for Research Question 1.2. Table 2 illustrates the schematic for data analysis used for Research Question 1.2. The Mann-Whitney U test is the nonparametric analog of the independent samples t-test. This test is used when comparison is made between two (and only two) independent groups. Effect size was also calculated.

Condition 0	n=8 small groups	(control condition)
Combined	n=30 small groups	(combined experimental conditions)
Condition 1		
Condition 2		
Condition 3		
Condition 4		

Figure 5. Independent Groups Being Compared for Research Question 1.2

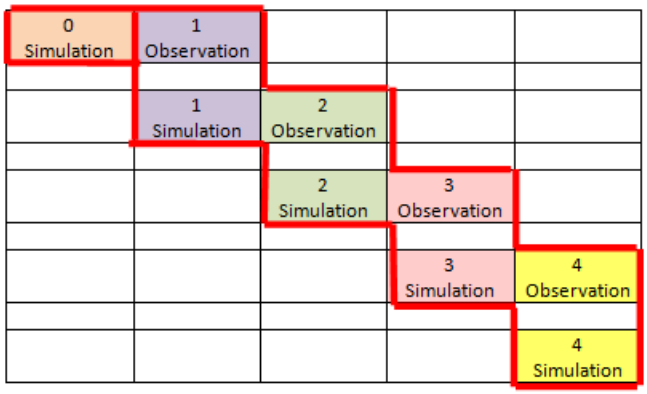


Table 2. Schematic of Statistical Analysis for Research Question 1.2

	Combined Conditions 1, 2, 3, 4: Assessment	Combined Conditions 1, 2, 3, 4: Communication	Combined Conditions 1, 2, 3, 4: Critical Thinking	Combined Conditions 1, 2, 3, 4: Technical Skills	Combined Conditions 1, 2, 3, 4: Total Score on C-SEI™
Condition 0: Assessment	Mann-Whitney U				
Condition 0: Communication		Mann-Whitney U			
Condition 0: Critical Thinking			Mann-Whitney U		
Condition 0: Technical Skills				Mann-Whitney U	
Condition 0: Total Score on C-SEI™					Mann-Whitney U

Specific Aim 2

The second aim sought to determine if the impact of peer observation was additive, or cumulative, across sequential groups of students participating in peer observation.

Research Question 2.1

Were there differences in the learning outcomes between the four peer observation conditions (Condition 1, Condition 2, Condition 3, and Condition 4)? To examine this question, the Kruskal-Wallis test was performed to make comparisons between four independent groups. For Research Question 2.1, the four independent groups were students who participated in the four sequential peer observation conditions (Condition 1, Condition 2, Condition 3, and Condition 4). Figure 5 shows the four independent groups being compared for Research Question 2.1. Table 3 illustrates the schematic for data analysis used for Research Question 2.1. The Kruskal-Wallis test is the nonparametric analog of the one-way ANOVA. This test is used when comparison is made between three or more independent groups. A Mann-Whitney U post-hoc test was then performed to compare between the highest mean rank condition and lowest mean rank condition in each category (Assessment, Communication, Critical Thinking, and Technical Skills) and for the Total Score on the C-SEI™ to determine if differences were significant. Effect size was also calculated.

Condition 1	n=7 small groups	(experimental condition)
Condition 2	n=8 small groups	(experimental condition)
Condition 3	n=8 small groups	(experimental condition)
Condition 4	n=7 small groups	(experimental condition)

Figure 6. Independent Groups Being Compared for Research Question 2.1

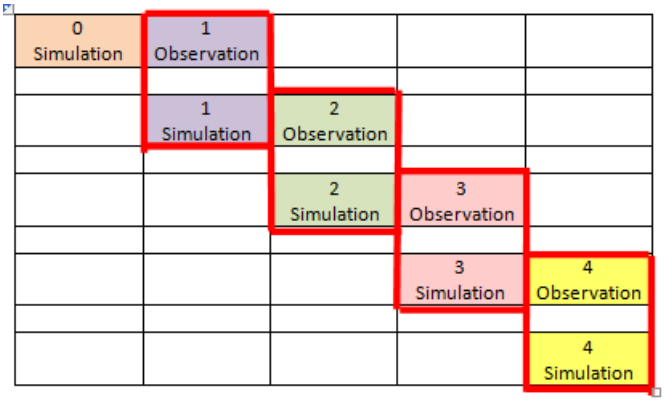


Table 3. Schematic of Statistical Analysis for Research Question 2.1

	Assessment	Communication	Critical Thinking	Technical Skills	Total Score on C-SEI™
Condition 1 Condition 2 Condition 3 Condition 4	Kruskal-Wallis	Kruskal-Wallis	Kruskal-Wallis	Kruskal-Wallis	Kruskal-Wallis

HUMAN SUBJECTS REVIEW

Prior to initiation of the study, the investigator applied for approval from the UTMB Institutional Review Board (IRB) and received a letter of exemption (UTMB IRB #12-258). The study met the criteria for exemption from review by the IRB under 45 CFR 46.101 (b) (1) because 1) it was conducted in an established educational setting involving normal educational practices, and 2) data collection took place within the context and scope of standard course requirements for graduation from the nursing program in which students were enrolled. A copy of this letter is included in the Appendix.

SUMMARY

This chapter presented an overview of the problem, the research design, setting, sample, instruments, procedures, data analyses, and human subjects review. Chapter four presents the results of the data analysis.

Chapter 4: Results

Introduction

Chapter four presents the results of the data analysis. The study's specific aims were 1) to determine the impact of peer observation on student learning outcomes in simulated clinical learning experiences, and 2) to determine if the impact of peer observation was additive, or cumulative, across sequential groups of students participating in peer observation. This chapter is organized into a description of study sample characteristics followed by results of the reliability analysis and then the results for each of the research questions for Specific Aims 1 and 2.

Sample Characteristics

The study sample was composed of 40 small groups of approximately three students each. The small groups were randomly assigned to one of five study conditions: Condition 0 (the control condition), or Condition 1, 2, 3, or 4 (the experimental conditions). Two groups were excluded from data analysis due to large amounts of missing data on the C-SEI™. For the purposes of data analysis the control condition (Condition 0) was composed of 8 small groups (n=8 small groups). Condition 1 (n=7 small groups), Condition 2 (n=8 small groups), Condition 3 (n=8 small groups), and Condition 4 (n=7 small groups) comprised the experimental conditions. Table 4 presents descriptive characteristics of the sample included in the analysis: mean age, age range, and absolute numbers and percentages of gender and race/ethnicity of the participants. As indicated by the table, the overall individual sample included in the analysis was predominantly female (88%) with a mean age of 24.2 years and over 50% minority.

Table 4. Sample Characteristics

			Gender		Race/Ethnicity				
Condition	Mean Age	Age Range	Female	Male	Asian; or Native Hawaiian or Other Pacific Islander or American Indian or Alaska Native	Black or African American	Caucasian	Hispanic or Latino	Bi-racial or Bi-ethnic
Condition 0	23.9	20-47	20 (87%)	3 (13%)	10 (43%)	0 (0%)	11 (48%)	1 (4%)	1 (4%)
Condition 1	24	20-34	19 (95%)	1 (5%)	7 (35%)	1 (5%)	7 (35%)	4 (20%)	1 (5%)
Condition 2	25.2	19-35	19 (79%)	5 (21%)	5 (21%)	4 (17%)	12 (50%)	2 (8%)	1 (4%)
Condition 3	24.5	19-40	20 (91%)	2 (9%)	4 (18%)	1 (5%)	13 (59%)	4 (18%)	0 (0%)
Condition 4	23.4	20-49	19 (90%)	2 (10%)	5 (24%)	0 (0%)	10 (48%)	6 (29%)	0 (0%)
All	24.2	19-49	97 (88%)	13 (12%)	31 (28%)	6 (6%)	53 (48%)	17 (16%)	3 (3%)

RESULTS

Reliability Analysis

The Cronbach's alpha scores for the Assessment, Communication, Critical Thinking and Technical Skills categories and for the Total Score for the C-SEI™ are as follows: Assessment $\alpha = .48$, Communication $\alpha = .25$, Critical Thinking $\alpha = .07$, Technical Skills $\alpha = .54$, and Total Score $\alpha = .37$. Standards put forth by scholars to interpret these reliability estimates would universally agree that these scores represent poor to extremely low values of reliability. These reliability estimates should be interpreted with caution. There are too few scored items across too few rated groups to get a stable reliability estimate. Cronbach's alpha is a function of test length. When there are too few scored items, the value of alpha is underestimated.

Briggs and Cheek (1986) suggest that when there are fewer than 10 items, as is the case for each of the categories that make up the C-SEI™ (Assessment, Communication, Critical Thinking, and Technical Skills), that it may be better to calculate and report the mean inter-item correlation for the items with optimal values ranging from .2 to .4. Utilizing this method of analysis the Assessment and Technical Skills categories each had a mean inter-item correlation of .3. The Communication and Critical Thinking categories each had a mean inter-item correlation of .05.

Research Question 1.1

Research Question 1.1 sought to determine if there were differences in the learning outcomes between students who did not participate in peer observation (Condition 0) and students who participated in the initial instance of peer observation (Condition 1). Small samples and convenience samples cannot automatically be

considered representative of a larger population with a normal distribution so normality cannot be assumed to be satisfied. Because the sample sizes were small (Condition 0, n=8 small groups; Condition 1, n=7 small groups) and a convenience sample was used the nonparametric Mann-Whitney U test for analysis was warranted. Significance was calculated at $p \leq .05$ (two-tailed), and effect sizes were reported as small (r =.10 to .29), medium (r =.30 to .49), and large (r = .50 to 1.0) (Cohen, 1988). The Mann-Whitney U test revealed a significant difference in the Total Score for the C-SEI™ between Condition 0 (Md=11.50, n=8) and Condition 1 (Md=13.00, n=7), U=9.000, Z= -2.231, p=.026, r=.6, suggesting that the small groups that participated in peer observation scored better overall on the C-SEI™ than the small groups that did not participate in peer observation. Despite not having achieved statistical significance, the mean rank scores for small groups that participated in peer observation (Condition 1) were higher in every category scored on the C-SEI™ (Assessment, Communication, Critical Thinking and Technical Skills) than those that did not participate in peer observation (Condition 0). A large effect size noted in the Assessment category and a medium effect size was noted in the Communication and Critical Thinking categories (see Table 5).

Table 5. Mann-Whitney U Test Comparing Students Who Did Not Participate in Peer Observation (Condition 0) and Students Who Participated in the Initial Instance of Peer Observation (Condition 1).

	Mean Rank		Median		n					
Condition	0	1	0	1	0	1	U	Z	p	r
Assessment	6.13	10.14	4	5	8	7	13.0	-1.897	.058	.5
Communication	6.94	9.21	3	3	8	7	19.5	-1.031	.303	.3
Critical Thinking	6.69	9.50	4	5	8	7	17.5	-1.369	.171	.4
Technical Skills	7.63	8.43	0	0	8	7	25.0	-.395	.693	.1
Total Score	5.63	10.71	11.5	13.0	8	7	9.0	-2.231	.026	.6

Research Question 1.2

Research Question 1.2 sought to determine if there were differences in the learning outcomes between students who did not participate in peer observation (Condition 0) and students who participated in any peer observation condition (combined Condition 1, Condition 2, Condition 3, and Condition 4). Because the sample sizes were small (Condition 0, n=8 small groups; combined Condition 1, Condition 2, Condition 3, and Condition 4, n=30 small groups) and a convenience sample was used the nonparametric Mann-Whitney U test for analysis was warranted. Significance was calculated at $p \leq .05$ (two-tailed), and effect sizes were reported as small (r =.10 to .29), medium (r =.30 to .49), and large (r = .50 to 1.0) (Cohen, 1988). The Mann-Whitney U test revealed a significant difference in the Total Score for the C-SEI™ between the control condition (Condition 0) (Md=11.50, n=8) and the experimental condition (combined Condition 1, Condition 2, Condition 3, and Condition 4) (Md=14.50, n=30),

U=30.000, Z=-3.299, p=.001, r=.5, suggesting that the small groups that participated in peer observation scored better overall on the C-SEI™ than the small groups that did not participate in peer observation. Significant differences were also observed in the Assessment and Technical Skills categories. The Mann-Whitney U test revealed a significant difference in the Assessment category between the control condition (Condition 0) (Md=4.00, n=8) and the experimental condition (combined Condition 1, Condition 2, Condition 3, and Condition 4) (Md=5.00, n=30), U=56.500, Z= -2.672, p=.008, r=.4. The Mann-Whitney U test revealed a significant difference in the Technical Skills category between the control condition (Condition 0) (Md=0.00, n=8) and the experimental condition (combined Condition 1, Condition 2, Condition 3, and Condition 4) (Md=1.00, n=30), U=64.000, Z= -2.093, p=.036, r=.3. Despite not having achieved statistical significance, mean rank scores were higher for the experimental condition (combined Condition 1, Condition 2, Condition 3, and Condition 4) than for the control condition (Condition 0) in the Communication and Critical Thinking categories. Both categories exhibited medium effect sizes (see Table 6).

Table 6. Mann-Whitney U Test Comparing Students Who Did Not Participate in Peer Observation (Condition 0) and Students Who Participated in Any Peer Observation Condition (Combined Condition 1, Condition 2, Condition 3 and Condition 4).

	Mean Rank		Median		n					
Category	Control	Experimental	Control	Experimental	Control	Experimental	U	Z	p	r
Assessment	11.56	21.62	5	4	8	30	56.5	-2.672	.008	.4
Communication	14.13	20.93	3	4	8	30	77.0	-1.617	.106	.3
Critical Thinking	14.50	20.83	4	5	8	30	80.0	-1.678	.093	.3
Technical Skills	12.50	21.37	0	1	8	30	64.0	-2.093	.036	.3
Total Score	8.25	22.50	11.5	14.5	8	30	30.0	-3.299	.001	.5

Research Question 2.1

Research Question 2.1 sought to determine if there were differences in the learning outcomes between the four peer observation conditions (Condition 1, Condition 2, Condition 3, and Condition 4). Because the sample sizes were small (Condition 1, n=7 small groups; Condition 2, n=8 small groups; Condition 3, n=8 small groups; Condition 4, n=7 small groups) and a convenience sample was used the nonparametric Kruskal-Wallis test for analysis was warranted. Significance was calculated at $p \leq .05$ (two-tailed). The Kruskal-Wallis test did not reveal any statistically significant results. It was noted that the mean rank and median scores increased in the Technical Skills category and for the Total Score for the C-SEI™ with each successive group of students participating in peer observation. This suggests that the impact of peer observation was additive, or cumulative, for Technical Skills and for the Total Score on the C-SEI™ across sequential groups of students participating in peer observation (see Table 7). A post-hoc Mann-Whitney U test was performed to compare between each category's highest mean rank condition and lowest mean rank condition to determine if differences were significant. Significance was calculated at $p \leq .05$ (two-tailed), and effect sizes were reported as small (r =.10 to .29), medium (r =.30 to .49), and large (r = .50 to 1.0) (Cohen, 1988). The Mann-Whitney U test revealed a significant difference in the Technical Skills category between Condition 1 (Md=.00, n=7) and Condition 4 (Md=2.00, n=7), U=9.500, Z=-1.985, p=.047, r=.5, suggesting that the impact of peer observation was additive, or cumulative, for Technical Skills across sequential groups of students participating in peer observation. A large effect size was noted for Technical Skills. Although statistical significance was not achieved, a large effect size was observed

for the Total Score for the C-SEI™ and a medium effect size was observed in the Assessment category (see Table 8).

SUMMARY OF RESULTS

Results described in this chapter addressed the aims of the study: 1) to determine the impact of peer observation on student learning outcomes in simulated clinical learning experiences, and 2) to determine if the impact was additive, or cumulative, across sequential groups of students participating in peer observation. Descriptive statistical analysis allowed for examination of the sample characteristics of each of the study conditions and the overall sample of the study.

Mann-Whitney U tests determined differences in the scores on the C-SEI™ between students who did not participate in peer observation (Condition 0) and students who did participate in peer observation (Condition 1, Condition 2, Condition 3, and Condition 4). Results indicated higher mean rank scores for the peer observation experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4) than for the no peer observation control condition (Condition 0) in every category (Assessment, Communication, Critical Thinking, and Technical Skills) and for the Total Score on the C-SEI™. Statistically significant results and large effect sizes were noted for the Total Score on the C-SEI™ for both Research Question 1.1 and Research Question 1.2 suggesting that the small groups that participated in peer observation scored better overall on the C-SEI™ than the small groups that did not participate in peer observation.

Table 7. Kruskal-Wallis Test Comparing Students Who Participated in the Four Sequential Peer Observation Conditions (Condition 1, Condition 2, Condition 3 and Condition 4)

	Mean Rank				Median				n					
Category	Cond 1	Cond 2	Cond 3	Cond 4	Cond 1	Cond 2	Cond 3	Cond 4	Cond 1	Cond 2	Cond 3	Cond 4	χ^2	p
Assessment	15.36	17.69	13.56	15.36	5.0	5.0	5.0	5.0	7	8	8	7	1.491	.684
Communication	14.93	13.88	15.75	17.64	3.0	4.0	4.0	4.0	7	8	8	7	.826	.843
Critical Thinking	16.21	14.88	14.88	16.21	5.0	5.0	5.0	5.0	7	8	8	7	.259	.968
Technical Skills	10.43	13.75	17.88	19.86	0.0	1.0	1.5	2.0	7	8	8	7	5.356	.148
Total Score	11.64	13.44	16.00	21.14	13.0	14.0	14.5	15.0	7	8	8	7	5.038	.169

Table 8. Mann-Whitney U Post-hoc Analysis of the Highest and Lowest Mean Rank Condition in Each Category and for the Total Score on the C-SEI™

Category	Mean Rank		Median		n		U	Z	p	r
Assessment	Condition 2	Condition 3	Condition 2	Condition 3	Condition 2	Condition 3				
	17.69	13.56	5	5	8	8	23.500	-1.179	.239	.3
Communication	Condition 2	Condition 4	Condition 2	Condition 4	Condition 2	Condition 4				
	13.88	17.64	4	4	8	7	21.000	-.919	.358	.2
Critical Thinking	Condition 1	Condition 2	Condition 1	Condition 2	Condition 1	Condition 2				
	16.21	14.88	5	5	7	8	25.500	-.354	.724	.1
Technical Skills	Condition 1	Condition 4	Condition 1	Condition 4	Condition 1	Condition 4				
	10.43	19.86	0	2	7	7	9.500	-1.985	.047	.5
Total Score	Condition 1	Condition 4	Condition 1	Condition 4	Condition 1	Condition 4				
	11.64	21.14	13	15	7	7	11.000	-1.787	.074	.5

A Kruskal-Wallis test revealed that the mean rank and median scores increased in the Technical Skills category and for the Total Score for the C-SEI™ with each successive group of students participating in peer observation. A post-hoc Mann-Whitney U test determined that there was a significant difference between Condition 1 and Condition 4 in the Technical Skills category. Results indicated a large effect of peer observation on sequential groups of students in the Technical Skills category and for the Total Score for the C-SEI™; however, results of the other individual instrument categories (Assessment, Communication, and Critical Thinking) did not support a cumulative effect.

This chapter presented the results of the data analysis. Chapter five presents the findings related to the literature, limitations and strengths of the study, conclusions drawn from the data presented in the previous chapter, and concludes with recommendations for future research.

Chapter 5: Summary, Conclusions and Recommendations

INTRODUCTION

Chapter five presents the findings related to the literature, limitations and strengths of the study, conclusions drawn from the data presented in the previous chapter, and concludes with recommendations for future research.

OVERVIEW

Most quantitative simulation research studies conducted to date are methodologically confounded. When simulation instructional formats are compared with non-simulation instructional formats, instructional methods vary along with the medium. Direct comparison of one simulation instructional strategy with another simulation instructional strategy clarifies how to design, structure, and implement simulated clinical learning experiences so that learning is optimized. Further, research is limited regarding the role of peer observation in simulated clinical learning experiences. Exploration is needed to discern the impact of peer observation on student learning outcomes in simulation in nursing education.

Purpose Statement and Research Questions

The purpose of this study was to determine if a simulation instructional design that uses peer observation impacts student learning outcomes. The specific aims and research questions of the study are outlined below.

Aim 1: Determine the impact of peer observation on student learning outcomes in simulated clinical learning experiences.

Research Question 1.1: Is there a difference in the learning outcomes between students who do not participate in peer observation (Condition 0) and students who participate in the initial instance of peer observation (Condition 1)?

Research Question 1.2: Is there a difference in the learning outcomes between students who do not participate in peer observation (Condition 0) and students who participate in any peer observation condition (combined Condition 1, Condition 2, Condition 3, and Condition 4)?

Aim 2: Determine if the impact of peer observation is additive, or cumulative, across sequential groups of students participating in peer observation.

Research Question 2.1: Is there a difference in the learning outcomes between the four peer observation conditions (Condition 1, Condition 2, Condition 3, and Condition 4)?

Review of the Methodology

A randomized experimental approach with a posttest-only control group design was used to examine the research questions of this study. The convenience sample for this study consisted of 40 small groups that were composed of nursing students who were in the second semester of an undergraduate nursing program.

The intervention consisted of students observing their peers complete a simulated clinical learning scenario prior to completing the same simulation scenario themselves. Small groups randomized to the experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4) were exposed to the intervention (peer observation prior to completing the simulation scenario). Small groups randomized to the control condition

(Condition 0) were not exposed to the intervention (no peer observation prior to completing the simulation scenario).

Two instruments were used to measure non-study and study variables in this study. A demographic form and the Creighton University Simulation Evaluation Instrument (C-SEI™) were used to obtain post measurements. The demographic form was used to describe the characteristics of each study condition and the overall sample of the study. Two raters (Rater 1 and Rater 2) used the C-SEI™ to score group performance during the simulated clinical learning scenario in each of the four categories of the instrument (Assessment, Communication, Critical Thinking, Technical Skills). The category scores were added to give a Total Score for the C-SEI™ for each small group. IBM SPSS Statistics (Version 21) was used to analyze the data.

FINDINGS RELATED TO THE LITERATURE

The findings from this study indicate that peer observation had a positive impact on student learning outcomes in simulated clinical learning experiences. Specifically, overall learning outcomes measured by the Total Score for the C-SEI™ were statistically higher for the peer observation experimental condition (Condition 1) than for the no peer observation control condition (Condition 0) following the initial instance of peer observation. These findings support those of Alinier et al. (2014) wherein students reported that they benefitted even more than they expected from observing their peers complete an interprofessional simulation experience.

When the findings for this study were examined for the no peer observation control condition (Condition 0) against the combined peer observation experimental conditions (combined Condition 1, Condition 2, Condition 3, and Condition 4) it was

noted that the learning outcomes for the Total Score for the C-SEI™ as well as two of the categories of learning, (i.e. Assessment, Technical Skills) were significantly higher for the peer observation experimental conditions (combined Condition 1, Condition 2, Condition 3, and Condition 4) than for the no peer observation control condition (Condition 0). As noted above, students exposed to peer observation scored higher overall on the C-SEI™ than those not exposed. This effect of peer observation seemed to continue when students from the four different experimental conditions were combined and examined as one group. As reported in the qualitative literature, students shared that "… [they] were glad that we learned as a group and assessed each other on our performances. It was helpful to see how my fellow peers would react under such circumstances…" (DeBourgh & Prion, 2011, p. 52) and "at this point in school I appreciate my time observing other people…" (Schoening et al., 2006, p. 256). One observer in Harder et al.'s (2013) study explained it this way:

> You're watching your peers do something so you're thinking about how you would maybe do something differently. And you can get the bigger picture sometimes…If you're given the med nurse role, you're just really focused on the meds, I find.

These findings and those of the current study support the results of Kiat et al. (2007), who found that students agreed there was a perceived benefit to observing and critiquing one's peers during simulation-based training. In contrast, however, are the findings of an ethnographic study regarding student perspectives of role assignment in high-fidelity simulation (primary nurse, secondary nurse, other nurse, documentation nurse, communication nurse, observer, family member, and physician). Students

commented both positively and negatively regarding the role of observer but the investigator concluded that, overall, students perceived that their learning experience was impaired when they were assigned to the observer role and recommended that faculty limit the number of students assigned to the observer role (Harder et al., 2013). Further research is needed given that findings are conflicting not just between studies but also within studies.

It is important to note that while every category (i.e., Assessment, Communication, Critical Thinking, Technical Skills) was not statistically significant, the scores for each of the categories was higher for the peer observation experimental conditions (Condition 1, Condition 2, Condition 3, and Condition 4) than for the no peer observation control condition (Condition 0). This finding bears further study to determine whether this phenomenon continues to hold.

The findings for Aim 2 showed that the impact of peer observation was additive, or cumulative, across sequential groups for Technical Skills for students participating in peer observation. These findings indicate that each successive peer observation experimental condition scored better in the Technical Skills category suggesting better learning outcomes for Technical Skills for the peer observation experimental conditions. The findings of higher mean rank and median scores for the Technical Skills category for each successive peer observation experimental group indicate a sequential additive, or cumulative, effect on learning outcomes for successive groups in this category (Condition 1 < Condition 2 < Condition 3 < Condition 4). These findings support the results of McMullen et al.'s study (2013) that yielded significantly higher pass rates for the CASC examination following an extended simulated training event. It is not clear, however,

whether the improved pass rate resulted from additional opportunities to complete training stations and get feedback from the examiners, from having additional opportunities to observe a peer complete the stations, or from both variables. Nonetheless, there was an additive, or cumulative, effect for participants in McMullen et al.'s study (2013) because a higher pass rate was achieved on the CASC examination following the training event with additional simulated scenarios. Further, it is important to note that although not statistically significant, the Total Score for the C-SEI™ increased for each successive peer observation experimental condition and a large effect size was noted. This finding should be examined in future research with a larger sample to determine whether or not the outcome reaches significance.

When the impact of peer observation on student learning outcomes is explored within the context of Bandura's Social Cognitive Theory, it becomes clear that peer observation in simulated clinical learning experiences, is supported by this theory. That is, Bandura's theory is based on principles of learning within the human social context for which observational learning is a key concept, i.e., individuals learn by observing others. Given this premise, peer observation in simulated clinical learning experiences is likely to have a positive impact on student learning outcomes as it did, in part, for this study. Students participating in peer observation learned from the group they observed complete a simulated clinical learning experience then served as identifiable models of behavior for the students in the small groups that observed them complete the same scenario. Learning was passed from group to group through social modeling. Further, because the models were identifiable to the students self-efficacy, although not tested in this study, may have been increased making learning more likely to occur. In light of the

concept of a sense of salience written about in *Educating Nurses: A Call for Radical Transformation* (Benner et al., 2010) it is understandable that Technical Skills was the only category that indicated statistical significance. These were novice nursing students who had not yet developed a perceptual grasp of what is more and less important in complex clinical situations and had little experience differentiating priorities relative to assessments and interventions. The work in the simulation lab during these students' first semester of nursing school consisted of learning to correctly and competently complete basic task-oriented and procedural skills. As novices, the students likely focused on deliberate problem solving and explicit tasks, i.e., Technical Skills, during this simulation scenario.

LIMITATIONS

Limitations of this study include small sample size and use of a convenience sample limited to nursing students in one class, at one university, during one semester. These limitations prevent generalization of the findings beyond the study sample. Also, the reliability estimates of this instrument for this sample were lower than expected. Support for reliability would be bolstered by additional use of the instrument with larger and more diverse samples.

STRENGTHS OF THE STUDY

This study is methodologically rigorous in several ways compared to other simulation research. First, a randomized experimental approach is utilized, which allows inference that the differences in the dependent variable are due to the intervention, not from differences in participant characteristics. Second, methodological confounding was

reduced by direct comparison of one simulation instructional design (peer observation) with another simulation instructional design (no peer observation). Lastly, the outcomes of learning were measured directly by rating actual student performance during a simulated clinical learning experience and collecting objective data, thereby utilizing a higher level of measurement than is reported for most simulation studies in nursing education.

CONCLUSIONS

The small groups that participated in peer observation had better overall learning outcomes than the small groups that did not participate in peer observation. Also, there was a sequential additive, or cumulative, effect on learning outcomes for successive groups for Technical Skills. There are indications, however, that the sequential additive effect on learning outcomes may be more pervasive as the mean rank and median scores for the Total Score for the C-SEI™ increased for each successive peer observation experimental condition (Condition 1 < Condition 2 < Condition 3 < Condition 4). Though the results were not statistically significant, each successive peer observation experimental condition scored better on the Total Score for the C-SEI™ (Condition 1 < Condition 2 < Condition 3 < Condition 4) resulting in a large effect size, which suggests that some measure of a sequential additive effect may have occurred overall across all categories.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future research would benefit from having larger sample sizes, multiple data collection sites, additional simulation scenarios for content from different nursing courses

for students at different levels in nursing education programs, and measurement of the impact of the intervention on learning outcomes over longer periods of time. Study of the type and structure of peer observation would add to the robustness of future research. Peer observation in its simplest form, as used in this study, with students observing and listening to their peers complete a simulation scenario, should be compared with structured observation activities. Lastly, the impact on learning outcomes of peer observation compared with repetition (repeating the same or different simulated clinical learning experiences multiple times) needs to be studied.

SUMMARY

This chapter presented the findings related to the literature, limitations and strengths of the study, conclusions drawn from the data presented in the previous chapter, and concluded with recommendations for future research.

Appendix 1: Letter of Permission to Use the Creighton Simulation Evaluation Instrument™ (C-SEI™)

RE: permission to use the CSEI
Hawkins, Kim S. [khawkins@creighton.edu]
Sent: Thursday, May 10, 2012 10:57 AM
To: Poe, Michelle

Michelle,

We would be happy to have you use our tool for your study. I have contacted our administrative assistant, Jan Schnack, who will be contacting you with the information, including training materials which will help you in using the tool as well. If you have any questions just let me know.

Thank you,

Kim Hawkins, MS, APRN-NP
Assistant Professor
Creighton University
khawkins@creighton.edu

From: Poe, Michelle [mipoe@UTMB.EDU]
Sent: Thursday, May 10, 2012 10:46 AM
To: Hawkins, Kim S.
Subject: permission to use the CSEI

Hello Ms. Hawkins,

My name is Michelle Poe. I'm a fourth year BSN-PhD student at The University of Texas Medical Branch at Galveston, Texas (UTMB). I'm in the process of writing my dissertation proposal and am in need of permission to use the Creighton Simulation Evaluation Instrument (CSEI) in my dissertation study. I am unsure of the process required to obtain permission to utilize the instrument. Can you be of assistance or direct me to the correct person to obtain permission?

Thank you, Michelle Poe

Appendix 2: Creighton Simulation Evaluation Instrument™ (C-SEI™)

Creighton UNIVERSITY

Creighton Simulation Evaluation Instrument™ (C-SEI)

Scenario:

0 = Does not demonstrate competency
1 = Demonstrates competency

Date: M M D D Y Y Y Y

	(Circle Appropriate Score for all Applicable Criteria)	
ASSESSMENT		
Obtains Pertinent Subjective Data	0	1
Obtains Pertinent Objective Data	0	1
Performs Follow-Up Assessments as Needed	0	1
Assesses in a Systematic & Orderly Manner Using the Correct Technique	0	1
COMMUNICATION		
Communicates Effectively w/Providers (delegation, medical terms, SBAR, WRBO)	0	1
Communicaties Effectively with Patient and S. O. (verbal, nonverbal, teaching)	0	1
Writes Documentation Clearly, Concisely, & Accurately	0	1
Responds to Abnormal Findings Appropriately	0	1
Promotes Realism/Professionalism	0	1
CRITICAL THINKING		
Interprets Vital Signs (T, P, R, BP, Pain)	0	1
Interprets Lab Results	0	1
Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0	1
Formulates Measurable Priority Outcomes	0	1
Performs Outcome-Driven Interventions	0	1
Provides Specific Rationale for Interventions	0	1
Evaluates Interventions and Outcomes	0	1
Reflects on Simulation Experience	0	1
TECHNICAL SKILLS		
Uses Patient Identifiers	0	1
Utilizes Standard Precautions Including Hand Washing	0	1
Administers Medications Safely	0	1
Manages Equipment, Tubes, & Drains Therapeutically	0	1
Performs Procedures Correctly	0	1

GROUP COMMENTS*

Total Score → ☐

Passing Score → ☐

If not applicable, no score is given.

Passing score = 0.75 × number of items used.

*Individual comments on clinical evaluation form

Revised 10/09

Note to Rater: Do NOT write student names ANYWHERE on this form.

Appendix 3: Expected Minimum Behaviors for the C-SEI™

Expected Minimum Behaviors for the C-SEI™

Assessment
Obtains Pertinent Subjective Data • Asks pertinent questions about general patient status • Notices subjective changes in patient status indicative of transfusion reaction
Obtains Pertinent Objective Data • Vital signs • Focused assessment (lung sounds, pulse on operative extremity, surgical site)
Performs Follow-Up Assessments as Needed • Continues to monitor vital signs after noticing transfusion reaction
~~Assesses in a Systematic & Orderly Manner Using the Correct Technique~~ Not Applicable
Communication
~~Communicates Effectively w/Providers (delegation, medical terms, SBAR, WRBO)~~ Not Applicable
Communicates Effectively with Patient and S. O. (verbal, nonverbal, teaching) • Acknowledges patient including introducing their name and role • Able to respond to patient's question related to risks when receiving blood (overload and reaction)
~~Writes Documentation Clearly, Concisely, & Accurately~~ Not Applicable
Responds to Abnormal Findings Appropriately • Notifies (or delegates notification of) provider in response to abnormal vital signs
Promotes Realism/Professionalism • Professional dress • Professional behavior
Critical Thinking
Interprets Vital Signs (T, P, R, BP, Pain) • Recognizes abnormal vital signs
~~Interprets Lab Results~~ Not Applicable
Interprets Subjective/Objective Data (recognizes relevant from irrelevant data) • Identifies abnormal assessment findings and changes in patient status (crackles in lung sounds)
~~Formulates Measurable Priority Outcomes~~ Not Applicable
Performs Outcome-Driven Interventions • Sits patient up as requested
Provides Specific Rationale for Interventions • Able to respond to patient's question related to why blood needed
Evaluates Interventions and Outcomes • Able to anticipate physician orders
~~Reflects on Simulation Experience~~ Not Applicable
Technical Skills
Uses Patient Identifiers • Identifies patient using 2 identifiers
Utilizes Standard Precautions Including Hand Washing • Performs hand hygiene • Glove use
~~Administers Medications Safely~~ Not Applicable
~~Manages Equipment, Tubes, & Drains Therapeutically~~ Not Applicable
~~Performs Procedures Correctly~~ Not Applicable

Appendix 4: Data Collection Sheet

Data Collection Sheet-Group 1		
Criterion	1 Yes	0 No
Asks about general patient status • Asks "How are you" or How are you feeling?" (at any time)	1	0
Notices subjective changes in patient status indicative of transfusion reaction • Acknowledges or responds to dyspnea, anxiety	1	0
Vital signs • Prior to reaction to satisfy transfusion protocol	1	0
Focused assessment • lung sounds • pulse on operative extremity (any 2 of 3) • surgical site	1	0
Continues to monitor vital signs after noticing transfusion reaction	1	0
Introduces self and states role	1	0
Able to respond to patient's question related to risks when receiving blood • overload and reaction (need both)	1	0
Notifies (or delegates notification of) provider in response to abnormal vital signs	1	0
Professional dress • Scrubs and badge (all students need both)	1	0
Professional behavior • No eye rolling, no inappropriate laughing or giggling, stays focused on simulation (all students)	1	0
Recognizes abnormal vital signs • Tachycardia • Hypertension (any 2 of 3) • Decreased O2 sat	1	0
Identifies abnormal assessment findings and changes in patient status • crackles in lungs (any 1) • cough	1	0
Sits patient up (as requested by patient)	1	0
Able to respond to patient's question related to why blood needed • Lost blood during surgery, aren't enough RBC to carry oxygen, that's why feeling fatigued and dizzy and look pale (any part)	1	0
Able to anticipate physician orders (any to get 1) • Slow or stop infusion • Administer oxygen • Administer diuretics	1	0
Identifies patient using 2 identifiers (need both parts, name and DOB)	1	0
Performs hand hygiene • At any time, by anyone	1	0
Glove use • At any time, by anyone	1	0
Total score		

Appendix 5: Institutional Review Board Letter of Approval

UTMB
The University of Texas Medical Branch

OFFICE OF RESEARCH SUBJECT PROTECTIONS
Institutional Review Board

13-Dec-2012

MEMORANDUM

TO: Alice Hill, PhD, RN/Michelle Poe, RN, PhD(c)
SON Nursing PhD Program

Andrea McKay

FROM: Aristides Koutrouvelis, MD
Chairman, IRB #1
Institutional Review Board 0158

SUBJECT: IRB #12-258 - Final Approval of Exempt Protocol.
Impact of Peer Observation on Learning Outcomes in Simulated Clinical Learning Experiences

Having met the requirements set forth by the Institutional Review Board by an expedited review process on **November 8, 2012,** your research protocol is now approved, effective **December 13, 2012.** I am therefore, pleased to inform you that you may proceed with this project immediately.

This request met the criteria for exemption from review by the IRB under 45 CFR 46.101(b)(1), "Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods". You may proceed with your analyses.

AK/ak

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Vita

Michelle Poe began her nursing career in Galveston at The University of Texas Medical Branch working in the Emergency/Trauma Department. Later, at other hospitals and academic medical institutions, she also worked in pediatrics, burn care, and outpatient head and neck surgical cancer care.

Education

B.S., August 1988, Texas A&M University, College Station, Texas
B.S.N., May 1996, The University of Texas Medical Branch, Galveston, Texas

Summary of Dissertation

Comparison of traditional teaching methods with simulation in nursing education research fails to inform educators on how to best design, structure and implement simulation experiences to improve student learning outcomes. The prevalence of this technology in nursing education makes it essential to understand how to use simulation efficiently and effectively. The purpose of this study was to determine if a simulation instructional design that uses peer observation impacts student learning outcomes. Nursing students enrolled in an adult medical-surgical course were randomly assigned to either an experimental condition (peer observation) or a control condition (no peer observation). Raters evaluated small groups of approximately three students participating in a simulated clinical learning experience using the Creighton Simulation Evaluation Instrument™. The findings from this study indicate that peer observation had a positive impact on student learning outcomes in simulated clinical learning experiences. Specifically, overall learning outcomes measured by the Total Score for the C-SEI™ were statistically higher for the experimental condition than for the control condition following the initial instance of peer observation. When the findings for this study were examined for the control condition against the combined experimental conditions, it was noted that the learning outcomes for the Total Score for the C-SEI™ as well as two of the categories of learning (i.e. Assessment and Technical Skills) were significantly higher for the peer observation experimental conditions than for the no peer observation control condition. Also, there was a sequential additive, or cumulative, effect on learning outcomes for successive groups for Technical Skills. There are indications, however, that the sequential additive, or cumulative, effect on learning outcomes may be more pervasive because the mean rank and median scores for the Total Score for the C-SEI™ increased for each successive peer observation experimental condition. Though the results were not statistically significant, each successive peer observation experimental condition scored better on the Total Score for the C-SEI™ resulting in a large effect size, which suggests that some measure of a sequential additive, or cumulative, effect may have occurred overall across all categories. Well-designed simulation experiences have the potential to impact nursing practice and patient outcomes.