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The Effect of Human Patient Simulation on Medical-Surgical Nurses' Self-Efficacy in Cardiac Emergency Management

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The Effect of Human Patient Simulation on Medical-Surgical Nurses' Self-Efficacy in Cardiac Emergency Management

by

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Dissertation

Presented to the Faculty of the Graduate School of

The University of Texas Medical Branch

in Partial Fulfillment

of the Requirements

for the Degree of

Doctor of Philosophy

The University of Texas Medical Branch

August, 2014

Dedication

I would like to dedicate this dissertation to my husband, family, friends, and colleagues who supported me throughout this journey. Without your support, understanding, and the occasional gentle push, this work would never have been completed.

Acknowledgements

I would like to acknowledge all those individuals who helped and supported me over the last few years. To my husband Jeff, who never let me quite and put my education above all else: I can never say thank you enough. Your love and understanding saw me through the tough times and helped me enjoy the good times. To my parents, Diane and Bob: thank you for understanding why I had to miss family events and for encouraging me to keep going every day. To the rest of my family: I thank you for your never-ending support. To my great friend Heather: you made sure that I always kept my focus on the goal—graduation. To my coworkers and peers: without your help, support, and guidance, this process would have been all the more difficult. To the wonderful nurses who participated in this study: I have no words to express my gratitude.

Dr. Alice Hill has been my advisor since I entered the PhD program. She has also been my mentor and served as my dissertation chair. Dr. Hill: your patience, guidance, support, and understanding made this journey all the more possible. I have admired your demand for excellence and determination towards my success. You were there every step of the way and I am truly blessed to have had you help me through this process. To all my committee members who have supported me: I offer my sincerest thanks. Dr. Sheryl Bishop: for your commitment excitement towards the statistical analysis in this study, you made me understand the "why." Dr. M. Terese Verklan: for your feedback and guidance as I was first trying to develop my proposal, that work helped solidify the direction this dissertation would take. Dr. E. Tina Cuellar: for being there from the time I obtained my BSN and for always telling me I could do more and pushing me until the very end. Dr. Rosie Pine: you have supported me throughout this process and showed me firsthand that it could be done.

Lastly, I am thankful to the students I have had the honor of working with during my nursing courses and during the dissertation journey. Your support, guidance, and laughter have made the road much smoother. Thank you.

The Effect of Human Patient Simulation on Medical-Surgical Nurses' Self-Efficacy in Cardiac Emergency Management

Publication No._____________

Kimberly Kelly, PhD
The University of Texas Medical Branch, 2014

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Over 200,000 in-hospital cardiac arrests (IHCA) occur each year, making code management education and training a priority for first responders within the hospital. Medical-surgical nurses, who are frequently the first nurses to arrive at an IHCA, must begin immediate patient resuscitation. It is imperative for these first responders to remain confident in their own abilities. Therefore, the purpose of this study was to explore the effect of education intervention (simulation and traditional) on perceived self-efficacy of medical-surgical nurses in managing cardiac emergencies.

An experimental, repeated measures, two-group pre-test/post-test design was used with 132 subjects. Both groups received traditional training, and the experimental group receiving additional high-fidelity simulation training. The Modified Self-Efficacy (MSE) scale was used to measure perceived self-efficacy pre-test (T1), immediately post-test (T2), and four to six weeks post-test (T3). A Repeated Measures ANCOVA controlling

for self-efficacy pre-test scores (T1) revealed that self-assessed means of the nurses increased for the simulation and traditional groups: (T2, 56.59, 55.82) (T3, 58.21, 58.76), respectively. Stepwise forward and backward multiple regressions using education, age, years of nursing experience, and certification status as predictors indicated that years of nursing experience was the best predictor at T1 (P=.006) and T2 (p=.05) for both groups. At T3, which added the variable of participated in a code since education, the best predictors of self-efficacy were ACLS certification and subjects' education level (p=.02).

This study suggested that both simulation and traditional education increased the self-efficacy scores of medical-surgical nurses, yet there was no difference between groups in this increase across time. Further, it may be concluded that years of nursing experience, education level, and ACLS status were predictive of perceived self-efficacy of medical-surgical nurses in managing cardiac emergencies.

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List of Abbreviations

ACLS	Advanced Cardiac Life Support
AHA	American Heart Association
BLS	Basic Life Support
CPR	Cardiopulmonary response
ECG	Electrocardiogram
ER	Emergency Room
GSE	General Self-Efficacy Scale
IHCA	In-hospital cardiac arrests
IRB	Institutional Review Board
MSE	Modified Self-Efficacy
PALS	Pediatric Advanced Life Support
PCA	Patient care assistants
PI	Principal Investigator
PICC	Peripherally inserted central venous catheters
RM-ANCOVA	Repeated measure analysis of covariance
RRT	Rapid response teams
UTHealth	The University of Texas Health Science Center at Houston
UTMB	University of Texas Medical Branch

Chapter I: Introduction

Background

Over 200,000 in-hospital cardiac arrests (IHCA) occur every year (Merchant et al., 2011), making code management education and training a priority for first responders within hospitals. When IHCAs occur, medical-surgical nurses are frequently the first nurses to arrive in patients' rooms and must begin managing patient resuscitation. Medical-surgical nurses must recognize patients' rapidly deteriorating condition and immediately start resuscitation measures until arrival of the cardiac emergency team (Cohn et al., 2004; Peters & Boyde, 2007). The low (21%) survival rate for IHCA (Sinz et al., 2011) illustrates the need for early recognition and management of patients by first responders. Although regular updates are provided, many medical-surgical nurses may not feel confident in their resuscitation skills (Keys et al., 2009).

Cardiac management skills have been taught traditionally through a lecture format followed by demonstration and a return demonstration of cardiopulmonary response (CPR) skills. However, nurses' lack of confidence in their resuscitation skills may suggest, in part, an ineffective teaching method. Simulation training, a teaching technique, has been shown to be effective in teaching other types of skills by providing an immersive experience with guided instruction (Gaba, 2007) to help replicate a cardiac emergency on the medical-surgical unit. Bandura's (1977) self-efficacy theory stated that repeated exposure to an event lessens the stress and increases the confidence in the skills necessary to manage successfully the same event in the future.

Simulation training has been used in other high-risk industries, including aviation, nuclear power, and the military to provide a safe and effective means of training for low-frequency, high-risk situations (Gaba, 2007; Rochlin et al., 1987). Simulation training has been shown to improve the self-efficacy of nursing students in learning various skills while completing their nursing education (Blum et al., 2010; Gordon & Buckley, 2009). Previous studies have suggested that the use of simulation training improves the self-efficacy and skills of cardiac teams responding to cardiac emergences (Buckley & Gordon, 2011; Hoadley, 2009; Van Schaik et al., 2011).

Statement of the Problem

A majority of nurses working in acute care hospital settings are medical-surgical nurses. When a cardiac emergency arises on an inpatient unit, the first responder is expected to recognize deteriorating patient conditions and manage those conditions successfully until advanced practice teams arrive (Buckley & Gordon, 2011). Although medical-surgical nurses are usually the first responders on inpatient hospital units, many have never managed a cardiac emergency (Buckley & Gordon, 2011; Dorney, 2011). The lack of real-world clinical practice in managing cardiac emergencies reduces confidence of medical-surgical nurses to manage those emergencies (Keys et al., 2009). Studies have shown that CPR training helps to improve self-efficacy; however, the class is taken only once every two years, so it is unclear how to maintain such an increase in self-efficacy over that time period. Simulation has been shown to provide students with clinical experiences they will likely not encounter during their clinical rotations (Bantz et al., 2007; Nehring & Lashley, 2004). Simulation has also been shown to improve the self-efficacy of students and nurses in managing clinical situations, but research has not determined whether simulation helps to improve and sustain the medical-surgical nurses' self-efficacy during a high-risk, low-frequency skill such as code management in cardiac emergencies. Research subjects in previous studies have been medical residents in mixed discipline classes and medical-surgical nurses in advanced education settings where simulation education has been widely accepted. The current study was one of the first known studies to focus on medical-surgical nurses in inpatient hospital settings and quantify the impact simulation had on their self-efficacy in managing cardiac emergencies.

Statement of Purpose

The purpose of this study was to explore the effect of simulation training on the perceived self-efficacy of medical-surgical nurses in managing cardiac emergencies. Subjects were randomly assigned to two education sessions: (1) the traditional education session, which did not include human patient simulation, or (2) the human patient simulator education session. Subjects in both education sessions were administered a lecture on managing cardiac emergencies followed by independent practice during the traditional education sessions, or a simulation experience for subjects in the human patient simulation education session.

Specific Aims and Hypotheses

The following research aims and hypotheses framed the study analysis:

Aim 1: To assess the difference in the self-reported scores of medical-surgical nurses' self-efficacy (using the Modified Self-Efficacy [MSE] scale) from baseline prior to the education session (T1), immediately following a medium fidelity code simulation training or traditional education session for a simulated in-hospital cardiac arrest (IHCA) (T2), and four to six weeks after training (T3).

Hypothesis 1: The simulation training method will result in higher self-efficacy scores across time compared to the traditional education group.

Aim 2: To evaluate the contribution of demographic characteristics to self-efficacy in medical-surgical nurses using the MSE scale at T1, T2, and T3.

Hypothesis 2: Education level, years of experience, certification status (Advanced Cardiac Life Support [ACLS] certified and not ACLS certified), and age will be significant predictors of self-efficacy scores in medical-surgical nurses at T1, T2, and T3.

DEFINITION OF TERMS

Confidence is a feeling or belief that one has the ability to do something well or succeed at something (Merriam-Webster Online Dictionary, 2014).

Fidelity represents how authentically human the mannequin or equipment is designed and operated during a simulation training activity (Levett-Jones et al., 2011).

Human Patient Simulation is the use of a medium to high fidelity mannequin during a clinical simulation exercise that mimics the clinical setting and provides realistic recreation of a clinical experience.

Medical-surgical nurse is a nurse knowledgeable in all aspects of adult heath and who manages the care of patients with medical, surgical, or psychiatric diagnosis (Academy of Medical Surgical Nurses, 2014). For this study, a medical-surgical nurse was defined as a registered nurse working on one of five medical-surgical units in an acute care hospital setting and who was responsible for the care of all adult patients including assessments, administering medication, providing beside care, documentation, and managing a five to six patient load per shift.

Perceived self-efficacy is concerned with the judgments of how well one can execute courses of action required to deal with prospective situations, or people's beliefs about their capabilities (Bandura, 1977). For the purpose of this study, perceived self-efficacy was operationalized by using the MSE scale.

Simulation is a technique, not a technology, to replace or amplify real experience with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion (Gaba, 2007).

VARIABLES

The experimental and control groups compared in this study were a cardiac code management simulation training group, which was the experimental/treatment group, and a traditional cardiac code management lecture with demonstration, which was the control group. The experimental and control groups served as independent variables.

The dependent variable was self-efficacy and was measured at three points in time (prior to the education, pre-test [T1], immediately post-education, post-test [T2], and four to six weeks post-education [T3]). Self-efficacy was measured using the MSE scale.

SIGNIFICANCE OF THE STUDY TO HEALTHCARE PROFESSIONALS AND NURSING EDUCATION

Medical-surgical nurses are usually first responders (Buckley & Gordon, 2011; Dorney, 2011; Dwyer & Williams, 2002; Gombotz et al., 2006; Hamilton, 2005) on a medical-surgical floor when cardiac emergencies arise. Medical-surgical units account for a majority of the inpatient beds in most acute care hospitals. Many medical-surgical patients are in unmonitored beds and are acutely ill, increasing their risk for having an unwitnessed cardiac emergency (Gombotz et al., 2006; Williams & Chong, 2010). Medical-surgical nurses need to believe they can successfully manage a cardiac emergency and effectively begin the steps of cardiopulmonary resuscitation (CPR) if indicated by patient conditions. CPR has been shown to improve the survival rate for people who suffer cardiac arrests (Sinz et al., 2011) but is dependent on the skill and training of first responders (Montgomery et al., 2012). Speed and confidence of the first responders have been shown to be contributing factors in patient survival after cardiac emergencies (Dwyer & Williams, 2002). Without changes in the training of first responders on medical-surgical units, it is likely that the current 21% IHCA survivor rate will remain unchanged.

Hospital based nursing educators are primarily responsible for ensuring that the educational needs of the medical-surgical nurses are met. The research model assumed that once it was known whether medium fidelity simulation training improved medical-surgical nurses' self-efficacies during a cardiac emergency, then simulation training could be recommended for use in the education and training of medical-surgical nurses in the identification and management of IHCA events. Human patient simulation is expensive. The cost in both equipment and experienced clinicians trained to use simulation as a teaching technique can be substantial when utilizing medium to high fidelity human patient simulation. Therefore, these factors among others make it essential for researchers to study the benefits of using human patient simulation (Gaba, 2007). Such results are expected to have a positive impact on in-hospital nursing education by providing quantitative evidence to validate the use of simulation in hospital-based nursing education**.**

Assumptions

It was assumed that all subjects would understand and complete all questions contained on the MSE scale at all three assessment intervals. It was also assumed that subjects' perceived self-efficacy in managing a cardiac emergency could be measured using the MSE scale. It was assumed that all subjects would answer all questions honestly and accurately on the surveys. In addition, it was assumed that all subjects wanted to feel confident in managing cardiac emergencies on the nursing unit.

Delimitations

Study enrollment was limited to medical-surgical nurses working on one of five identified medical-surgical units at one hospital in southeast Texas, which affected generalizability of the study to other hospitals. The study took place during the winter education session, which limited the variability of study times and dates and may have affected enrollment.

Summary

Nurses working in a hospital setting have been required to have CPR certification obtained through the American Heart Association's (AHA) Basic Life Support (BLS) class. Many medical-surgical nurses have not utilized the skills taught during their BLS course on a regular basis in their nursing practice. Managing a cardiac emergency has been considered a low-frequency, high-risk skill for most medical-surgical nurses. As previously reported, over 200,000 IHCAs occur every year. Frequently, medical-surgical nurses are the first responders to patients' bedsides during cardiac emergencies. A cardiac emergency is a high stress event in which medical-surgical nurses are asked to use skills that they may never have used in practice, which increases the lack of self-efficacy many medical nurse surgical nurses experience while managing the emergency.

The infrequency of skill utilization has challenged nurse educators in attempts to increase their staff members' perceived self-efficacy in use of their cardiac management skills. Hospital nurse educators need to look for alternative strategies to help medical-surgical nurses practice cardiac emergency skills more frequently. Human patient simulation provides a realistic yet safe environment for nurses to practice all skills necessary in cardiac emergency management. Simulation has been shown to help improve students' and medical professionals' self-efficacy in managing skills used during simulation activities. The study rationale was that once it was known whether medium fidelity simulation training improved the self-efficacy of medical-surgical nurses during cardiac emergencies, then simulation training could be recommended for use in the education and training of medical-surgical nurses in the identification and management of IHCA events. This training, in turn, could lead to better patient outcomes.

Chapter II: Literature Review

LITERATURE REVIEW

The literature review has been divided into six major areas of study. The review begins with an introduction of medical-surgical nurses, their educational requirements related to managing cardiac emergencies, and why there has been a focus on the need for research related to medical-surgical nurses and their perceived self-efficacy in managing cardiac emergencies. The second section focuses on Bandura’s social cognitive theory and the concept of self-efficacy, which comprised the theoretical framework for this study. The third section of the review focuses on simulation and human patient simulation as a teaching pedagogy, including the history behind simulation, its use in other industries and nursing schools, the major accomplishments of simulation education, and the use of human patient simulation in the hospital setting. The fourth section of the literature review examines the research that has been completed on students utilizing human patient simulation and its effects on the perceived self-efficacy of the students in managing the clinical scenarios portrayed within the simulation. The fifth section of the review focuses on the literature surrounding the use of human patient simulation with practicing professionals including nurses, physicians, midwives, and other medical professionals and its effect on the perceived self-efficacy of the medical professionals in managing the clinical scenarios portrayed within the various simulations. The focus of the sixth section of the literature review is cardiac management involving medical-surgical nurses using human patient simulation and its effects on subjects’ perceived self-efficacy in managing the clinical skills utilized during the scenarios. The literature review concludes with a brief summary.

MEDICAL-SURGICAL NURSE AND CARDIAC EMERGENCIES

Although regular training updates have been provided, many medical-surgical nurses have reported not feeling prepared for managing cardiac emergencies due to their infrequent work on the unit (Keys et al., 2009). BLS training and certification have been requirements of nurses working in a hospital setting. The AHA has recommended recertification of BLS and ACLS training every two years. Studies have suggested that this two-year time period between recertification may be excessive and that retention of BLS and ACLS skills was lost quickly after the training (Dorney, 2011; Wayne et al., 2005). Typically, cardiac management skills have been taught via lecture format, followed by a demonstration of CPR by the instructor and a possible return demonstration of CPR skills by the participant. CPR has remained a high-risk, low-frequency event on most medical-surgical units. When patients have cardiac emergencies on medical-surgical units, nurses have indicated elevated anxiety and stress levels due to irregular exposure to such emergencies (Dwyer & Williams, 2002; Hill et al., 2010; Wehbe-Janek et al., 2012). Nurses with higher self-confidence levels demonstrated higher ventilation rates, compression rates, and compression depths associated with CPR skills compared with those lower-confidence level nurses (Verplancke et al., 2008). Although it has been shown that CPR skills improve with self-efficacy, it remains unclear how the self-efficacy of medical-surgical nurses in managing cardiac emergencies during IHCA can be sustained over time.

Theoretical Framework: Social Cognitive Theory and Self-Efficacy

Bandura's Social Cognitive Theory (Bandura, 1977), with an emphasis on the concept of self-efficacy, provided the theoretical framework for this study. The concept of self-efficacy was first developed by Albert Bandura in 1977, but was later incorporated into Albert Bandura's Social Cognitive Theory. The Social Cognitive Theory described how individuals acquire behavior patterns and included the impact of the environment, people's behavior capability, and their perceived self-efficacy (Chen et al., 2001; Cheraghi et al., 2009; Roslien & Alcock, 2009). Self-efficacy has been defined as the belief in one's ability to obtain desired goals (Leigh, 2008; Manojlovich, 2005; Plant et al., 2011). Bandura's (1977) concept of self-efficacy stated that repeated exposure to an event reduced stress and increased individuals' perceived self-efficacy in successfully managing the same event in the future. Bandura's (1977) theory suggested there were four sources of an individuals' self-efficacy: performance accomplishments at similar tasks, vicarious experiences (observing other nurses and modeling), verbal persuasion (education, advice or suggestions), and psychological states (self-evaluation of task performance, positive or negative) (Harvey & McMurray, 1994; Scholz et al., 2002). This study addressed the self-efficacy source of verbal persuasion. Medical-surgical nurses were exposed to verbal persuasion and psychological states through traditional education and high fidelity simulation.

Self-efficacy can affect the way in which individuals approach challenging or complex situations. Studies have shown that individuals who possessed greater self-efficacy when responding to a particular situation exerted increased effort and perseverance to master that situation (Bandura, 1977; Cheraghi et al., 2009; Manojlovich, 2005; Scholz et al., 2002; Sherer et al., 1982). Perceived self-efficacy may be dynamic and increase over time in response to experiences or education (Leigh, 2008). In essence, people's ability to learn new knowledge and to execute actions to achieve a desired goal may be affected by their self-efficacy (Leigh, 2008). Nurses need to feel they are capable of managing difficult situations for them to act on that situation. Personal mastery is an important aspect of self-efficacy. Bandura (1977) stated that if individuals were successful at managing complex situations, their self-efficacy increased; however, if they were not successful at managing such situations, their self-efficacy decreased. The premise of Bandura's theory guided this study in examining how an educational intervention using medium to high fidelity simulation affected the self-efficacy of medical-surgical nurses over time in cardiac emergency management.

SIMULATION

Simulation training has been used in other high-risk industries, including aviation, nuclear power industries, and the military, to provide a safe and effective means of training for low-frequency, high-risk situations (Beyea et al., 2007; Eaves & Flagg, 2001; Gaba, 2007; Issenberg & Scalese, 2008; Issenberg et al., 1999, 2005; Sahu & Lata, 2010). In particular, David Gaba extensively studied the use of simulation in healthcare. Gaba (2007) described simulation training as a teaching technique. Simulation training is meant to replace or amplify real experiences. Simulation allows learners to repeatedly practice skills in a controlled and safe environment, without fear of harm to patients, while allowing time for self-reflection and instructor feedback (Birkhoff & Donner, 2010; Cato & Murray, 2010; Eaves & Flagg, 2001; Issenberg & Scalese, 2008; Issenberg et al., 1999, 2005; Jeffries, 2005; Sahu & Lata, 2010; Smith & Roehrs, 2009; Wayne et al., 2005).

Simulation can be used to create a standardized teaching and learning experience that meets the needs of the individual learner (Issenberg et al., 1999). Simulation has been used for procedural skills such as surgery, obstetrics, and invasive cardiology (Gaba, 2007). Simulation training has also been used in specialties such as anesthesiology, critical care, and emergency medicine training (Beyea et al., 2007; Bremner et al., 2006; Hyland & Hawkins, 2009).

Typically, simulation training activities have been defined by the level of fidelity of the mannequin, which represents how authentically human the mannequin or equipment is designed and operated (Levett-Jones et al., 2011). Low fidelity simulation consists of a piece of equipment used to practice a specific skill. Static trainers without motion that represent specific parts of the body have been considered low fidelity simulators (Hyland & Hawkins, 2009; Rothgeb, 2008). This type of equipment has included arms to practice venipuncture, head intubation simulators, and upper body torso manikins used to practice CPR techniques. Medium fidelity manikins have encompassed computerized full body manikins with features such as heart rate, blood pressure, and pulse but without corresponding physiologic attributes such as chest rise and pupil dilation (Hyland & Hawkins, 2009; Levett-Jones et al., 2011; Rothgeb, 2008). High fidelity manikins have been termed human patient simulators (Nehring & Lashley, 2004). Human patient simulators are fully computerized, full body manikins that include both physiologic and pharmacological responses most similar to a human patient (Neil, 2009; Levett-Jones et al., 2011; Rothgeb, 2008). The first health care simulators were the Resusci Annie and the Harvey Cardiology Simulator, which were used during the 1960s and subsequently distributed by the Laerdal Medical Corporation (Wappingers Falls, NY) (Rothgeb, 2008; Schiavenato, 2008).

This study used a medium to high fidelity human patient simulator. The manikin was a nursing Kelly created by the Laerdal Medical Corporation. The manikin was fully computerized and provided blood pressure, pulse, heart rate, electrocardiogram (ECG) readings as well as basic one-word responses. The computer scenario was preprogrammed, but the instructor indicated which tasks were completed for the simulation to advance. In addition, the manikin could be defibrillated in a manner similar to that by which a medical-surgical nurse would use on the floor.

STUDENTS, SIMULATION, SKILLS, AND SELF-EFFICACY

Nursing schools have been facing many challenges in finding clinical placements for their students. The nursing shortage has created the need for more individuals to attend nursing school, leading to a nursing faculty shortage; due to higher hospital patient acuity and the shortage of practicing nurses, student clinical placements have become difficult to fill (Lasater, 2007; Miller, 2010). Nursing simulations have been used in nursing education since the 1950s (Bantz et al., 2007). High fidelity human patient simulators (HPS) have been used in medical schools since the 1980s and have experienced a steady increase in use in nursing education (Nehring & Lashley, 2004). Simulation training using HPSs has allowed nursing schools to administer clinical experiences in a safe and controlled environment, giving students repeated practice of their skills without the stress and anxiety of harming real patients (Leigh, 2008; Miller, 2010; Nehring & Lashley, 2004; Reese et al., 2010). HPS also has given nursing instructors the ability to standardize the clinical experiences their students must manage.

Human patient simulation has been used in nursing courses to bridge the gap between classroom knowledge and clinical practice. Bantz et al. (2007) surveyed nursing students following a one day simulation training session designed to help individuals integrate knowledge related to labor, delivery, and infant care. Ninety-nine percent of participants indicated that simulation in combination with lecture was better than lecture alone for providing understanding of how to apply knowledge in the clinical setting. Lasater (2007) found students reported that the realism of simulation helped them integrate their knowledge and apply critical thinking skills. The students also stated that the simulation was not as effective for neurologic assessments because mannequins had limited neurologic capabilities. Students in an undergraduate critical care course reported increased self-competence in managing critical care patients after attending multiple critical care simulation scenarios as part of their semester coursework (Mould et al., 2011).

As a teaching technique, simulation has been integrated successfully into graduate nursing education programs. Midwifery students who participated in simulation scenarios reached clinical decisions more rapidly, gathered more clinical data, and had increased self-confidence following their simulation activity (Cioffi et al., 2005). Graduate nurses enrolled in a nurse practitioner program participated in a mock code simulation using a human patient simulator and reported significant increases from pre-test to post-test scores for knowledge and confidence. This program, in turn, increased students' self-efficacy in managing a cardiac arrest but did not result in significant improvement on the competency checklist; although there were increases observed in the post-test scores (Bruce et al., 2009). In the same study, undergraduate nurses were administered a pre-test and a post-test for code management knowledge after the simulation; results indicated that for most participants the level of knowledge stayed the same or improved slightly, but not significantly (Bruce et al., 2009). Other studies have been conducted on the impact of high fidelity simulation on graduate medical-surgical nurses in recognizing and responding to clinical emergencies (Buckley & Gordon, 2011; Gordon & Buckley, 2009). Such studies found that technical skills (including breathing assessment and managing difficulties) and non-technical skills (including responding in a systematic way) increased after graduate students completed the simulation scenarios (Buckley & Gordon, 2011; Gordon & Buckley, 2009).

Simulation training has been shown to improve the self-efficacy of nursing students in learning various skills while completing their nursing education. Simulation has been used to improve perceived student self-efficacy in completing a physical assessment (Bremner et al., 2006), managing a deteriorating patient (Buckley & Gordon, 2011), and having difficult patient conversations (Rosenzweig et al., 2008). Junior level bachelor's students enrolled in a health assessment course were assigned to either a control group (using static trainers and student volunteers) or an experimental group (using a high fidelity simulator) for their laboratory experiences (Blum et al., 2010). The researchers found that perceived self-confidence and instructor perceived competency increased for both groups regardless of their laboratory enrollment.

In another study, nursing students enrolled in a BLS course were randomly assigned to either an online BLS course or an instructor-led course, and then randomly assigned within each course to either a monthly refresher course using simulation training to practice CPR skills or to a group that provided no monthly follow-up CPR sessions

(Montgomery et al., 2012). The students who attended the monthly follow-up sessions reported more self-efficacy in their CPR skills regardless of their initial teaching placement compared to the participants who did not have the monthly follow-up sessions (Montgomery et al., 2012).

Leflore et al. (2007) conducted a study using graduate nurses in a nurse practitioner program. The researchers found that simulation was insufficient to increase self-efficacy: traditional instructor modeling and debriefing caused higher increases in student perceived self-efficacy compared to students who participated in self-directed simulation activities. Thomas and Mackey (2012) found that self-efficacy of nursing students increased significantly in recognizing a change in patient conditions after a simulation training scenario when compared to students who did not participate in the simulation activity. Scherer et al.'s (2007) study of graduate nurses also documented an increase in self-efficacy post-test scores for students who participated in simulation training on managing a cardiac emergency; however, the control group that did not participate in the simulation training had a larger increase after their post-test scores. This result was attributed to the fact that only the experimental group was required to demonstrate their skills for the instructor during the simulation session, which the control group did not do prior to their post-test being administered (Scherer et al., 2007).

PRACTICING PROFESSIONALS, SIMULATION, SKILLS, AND SELF-EFFICACY

Simulation as a training technique has been used only recently within the hospital setting for nursing, although it has been used widely in schools of nursing since the 1950s (Bantz et al., 2007, Nehring & Lashley, 2004). Simulation has been used during the orientation process to validate competencies, teach new skills and equipment, reinforce previous learning, and practice rare patient events with nurses. Although simulation does not replace actual patient experiences, it can enhance nursing skill by providing an opportunity for nurses to practice their skills and gain confidence in a safe and controlled environment (Ackerman et al., 2007; Eaves & Flagg, 2001; Leigh, 2011).

Many new graduate nurses have begun to enter the profession in critical care areas once reserved for more experienced nurses. The nursing shortage has led to a need to place new graduate nurses in intensive care units and the emergency departments (Beyea et al., 2007). Simulation has been used in orientation programs for new graduates to improve their critical thinking skills, integrate nursing knowledge to practice, and improve their self-efficacy in dealing with higher acuity patients on their units (Ackerman et al., 2007; Beyea et al., 2007; Eaves & Flagg, 2001). Novice critical care nurses completing simulation scenarios as part of their unit education and orientation program reported more confidence and better preparation to manage the critical care patients encountered upon completion of simulation sessions (Stefanski & Rossler, 2009).

Simulation has been used as a teaching technique in high-risk, low-frequency skills to provide exposure to events not routinely seen on nursing units. Birkoff and Donner (2010) reported that Pediatric Advanced Life Support (PALS) course participants responded positively to the use of the human patient simulator, stating that the increased realism, patient deterioration, teamwork, and instant feedback of the simulator itself helped individuals with skill mastery. Simulation training has also been utilized in cardiopulmonary weaning for physicians—results indicated that those physicians who participated in the simulation training group had increased skill attainment post-test scores and retention scores (Bruppacher et al., 2010). Wayne et al. (2005) also used high fidelity simulation with internal medicine residents to explore the impact simulation training had on physicians' ACLS skills compared to real clinical practice. The results of study indicated that the repeated exposure to the ACLS skills through simulation caused higher skill attainment and adherence to the ACLS standards compared to clinical practice alone (Wayne et al., 2005).

Simulation training has been shown to improve the self-efficacy of nurses in managing low-risk daily nursing responsibilities as well as more complex high-risk situations. Simulation scenarios for mock codes improved nurses' perceived self-efficacy in managing pediatric emergencies and application of resuscitation skills (Van Schaik et al., 2011). New nurse graduates reported high confidence, competence, and readiness to practice after completing a nurse residency program that utilized a human patient simulator (Beyea et al., 2007). Eaves and Flagg's (2001) study examined new nurses and the impact of simulation on their readiness to work on a busy inpatient unit. The results of the study indicated that the nurses reported confidence in their ability to safely perform technical skills, to organize and prioritize patient care, and to work on busy inpatient units (Eaves & Flagg, 2001). Roselien and Alcock's (2009) study combined both didactic and skills demonstration simulation for nurses managing peripherally inserted central venous catheters (PICC). The study concluded that the combined education significantly increased self-efficacy, knowledge, and psychomotor skills in managing PICC lines. Although simulation has been shown to improve self-efficacy of nurses in various situations, it has not been determined whether simulation can improve and sustain across time medical-surgical nurses' self-efficacy for high-risk, low-frequency use skills such as code management and cardiac emergencies.

Medical-Surgical Nurses and Code Simulation

Medical-surgical nurses are the first responders for cardiac emergencies on the unit, and the need for training in code management and resuscitation techniques should remain a hospital priority. Simulation has been used to help nurses obtain, practice, and maintain their resuscitation skills. Cardiac emergencies can be very stressful for medical-surgical nurses due the infrequency of occurrence on the inpatient unit (Bruce et al., 2009). The repeated practice that occurs during a simulation can help reduce stress by providing nurses with practice of their skills in a safe environment. High fidelity patient simulators have been used to practice mock codes for inpatient nurses. Baker and Tyler's (2011) study used high fidelity simulation on the nursing unit to complete code blue education. The nurses reported increased comfort with resuscitation, location of items in the code cart, and documentation of the resuscitation after 12 months of unit mock codes (Baker & Tyler, 2011). Hoadley (2009) compared high fidelity versus low fidelity simulation in an ACLS class through measurement of knowledge and resuscitation skills. Study results showed no significant difference in the post-test scores of the two groups on the knowledge subscale or self-confidence subscale, but both groups improved their post-test scores on both scales. Medical residents who participated in a high fidelity simulation showed greater adherence to AHA's ACLS guidelines compared to non-participants (Wayne et al., 2008). ACLS trained personnel who managed an IHCA have been shown to improve short and long term patient survival outcomes (Moretti et al., 2007). Simulation training has also been used to prepare medical-surgical nurses to utilize rapid response teams (RRT) to help manage a deteriorating patient prior to a resuscitation event (Wehbe-Janek et al., 2012). Nurses participating in the RRT simulation training reported increased knowledge, skills, awareness of process, comfort, and confidence related to role responsibilities and preparedness for the event after the simulation training sessions (Wehbe-Janek et al., 2012). Simulation can help bridge the gap between knowledge and clinical practice for nurses in dealing with rare events such as cardiac resuscitation (Beyea et al., 2007; Birkhoff & Donner, 2010), for which many medical-surgical nurses may have limited exposure to during their everyday practice. Although some studies on simulation have been conducted, a dearth of research literature exists on medical-surgical nurses working on hospital units. Previous studies have focused on skill acquisition, comparisons of self-efficacy during mock unit codes, and use of ACLS education sessions but none has explored the self-efficacy of medical-surgical nurses in managing cardiac emergencies. Research subjects in previous studies have been residents in mixed discipline classes and medical-surgical nurses in advanced education settings where simulation is widely accepted. The current study was one of the first to focus on medical-surgical nurses in an inpatient hospital setting and the impact simulation had on nurses' self-efficacy in managing cardiac emergencies.

SUMMARY

A dearth of research exists on self-efficacy of medical-surgical nurses in an inpatient setting, especially as it pertains to the use of high fidelity simulation in the management of cardiac emergencies. Over 200,000 IHCAs occur annually, with a 21% survival rate for these incidents. Medical-surgical nurses tend to be the first responders to a majority of these cardiac emergencies. Hospital-based nurses have been required to be certified in BLS, but this certification has been only required for renewal every two years, which may diminish nurses' belief in their own ability (i.e., self-efficacy) to manage cardiac emergencies. Bandura’s (1977) social cognitive theory and the concept of self-efficacy provided a framework to address this issue. Historically, simulation has been used to provide education experiences in many fields including aviation, military and medicine.

Nursing schools have embraced simulation and the use of human patient simulators since the 1950s. In schools of nursing, simulation has been used to bridge the gap between classroom knowledge and clinical practice and to improve the perceived self-efficacy of students.

Hospitals have begun only recently to utilize simulation as a training technique for their nurses. To date, simulation has been used as a teaching technique in educating medical professionals in managing high-risk, low-frequency skills. Although some work has been accomplished, medical-surgical nurses have not been the primary focus of research in managing cardiac emergencies. The current study focused on the self-efficacy of medical-surgical nurses in an inpatient hospital setting following an education intervention using a high fidelity simulation.

Chapter III: Methods

This chapter reviews the research objectives, specific aims and underlying questions posed to accomplish these aims. This section provides a description of the research methods undertaken for this study including the sample, description of the instruments, data collection, and statistical procedures used to analyze the data. An experimental repeated measures design was used to address the aims of the study and to explore the effect of human patient simulation on the self-efficacy of medical-surgical nurses in managing cardiac emergencies.

OBJECTIVES

The overall objective of this quantitative study was to compare the effect of two teaching methods (simulation versus traditional) on the self-assessed perceived self-efficacy of medical-surgical nurses in managing cardiac emergencies at three time points (i.e., prior to the education, immediately post-education, delayed time post-education).

METHODS

Research Design

An experimental, repeated measures, two-group pre-test/post-test design was used to explore the self-efficacy of medical-surgical nurses following a cardiac emergency educational intervention. The experimental and control groups being compared in this study were a cardiac code management simulation training group, which was the experimental or treatment group, and a traditional cardiac code management lecture with demonstration group, which was the control group. A repeated measures design allowed the researcher to examine change across time following treatment. In this study, the self-reported self-efficacy of the medical-surgical nurse was measured before, immediately after, and four to six weeks after the education was conducted. The strengths of a two-group pre-test/post-test design included being able to assess a) equality of the two groups prior to administration of the treatment, and b) attributes that may contribute to mortality or subject loss across time. Utilizing a control group and an experimental group also strengthened the study by isolating the impact of the intervention (simulation education) on study outcomes. In this type of design the experimental and control groups were randomly assigned and the dependent variable was measured across time. The use of random assignment was also a strength of the methodology. Random assignment attempted to eliminate systemic bias and help make the groups similar at the start of the experiment, which promoted internal validity.

The weaknesses of using a pre-test/post-test design included the length of time required to complete the study, difficulties in administration, subjects' sensitization to instruments, and demand characteristics that altered ways in which subjects acted. This study had a pre-test, immediate post-test, and delayed post-test, which increased the length of time and repetitiveness of the study. Subjects may have become sensitized to the instruments; however, four to six weeks were placed in between the immediate post-test and delayed post-test to prevent memorization of the questions on the self-efficacy questionnaire. Some subjects may have been bored or felt drained from repeated completion of the surveys, in turn affecting outcomes. Time between administrations helped to mitigate the practice effect and fatigue effect by providing a rest period between the education and evaluation—this was aimed at giving subjects time to reflect and digest the education for better accuracy in self-reporting their feelings of self-efficacy.

Subjects not only had the opportunity to practice the skills during the study, but a possibility existed that subjects may have experienced a true cardiac emergency between the immediate post-test and delayed post-test. This occurrence would have put their practiced skills into real world use, in turn affecting their self-efficacy when reassessed. A unique, potential problem for study subjects was that they were asked about their belief in their ability to perform a required nursing skill, i.e., managing a cardiac emergency involving resuscitation, at their hospital of employment. Nurses may have felt compelled to rate their self-efficacy higher than their true perceived levels for fear of appearing incompetent in their nursing practice. To help reassure nurses, aspects of confidentiality and anonymity were discussed and practiced during the study process.

In this study, the experimental and control groups served as the independent variables. The dependent variable was self-efficacy and was measured at three time points: pre-test, immediate post-test, and delayed post-test. Self-efficacy was measured using the MSE scale. The objective was to understand the influence that simulation training had on the self-efficacy of medical-surgical nurses in managing cardiac emergencies.

Setting

Institutional Review Board (IRB) approval to conduct the study was requested and obtained from the University of Texas Medical Branch (UTMB) in Galveston and from The University of Texas Health Science Center at Houston (UTHealth) which was the IRB utilized by Memorial Hermann Southeast Hospital (MHSE). As a 250 bed acute care community hospital located in Houston, Texas, MHSE had an average of 160 medical-surgical nurses working on its five medical-surgical units. Subjects in the study were practicing medical-surgical nurses. Each year all nurses at this facility have been required to receive education and training on managing cardiac emergencies and code management techniques.

Sample Size Determination

A power analysis was conducted to determine the sample size *a priori* for the study. Because a stepwise forward and backward multiple regression and a one-way repeated measure analysis of covariance (RM-ANCOVA) were used for data analysis in this study, these statistical tests were taken into consideration when conducting the power analysis. Cohen (1977, 1988) established the effect sizes index (f2) for multiple regression as small: 0.02, medium: 0.15, and large: 0.35. Using a Cohen’s f2 medium effect size k of 0.15, a power level of 0.8, the number of predictors set at 5, and a probability level of 0.05, a sample size of 91 subjects was calculated. This sample size was the largest number of subjects required for all statistical tests being conducted. In anticipation of a 20% attrition rate, 110 subjects were recruited.

Inclusion/Exclusion Criteria

The inclusion criteria for the study included nurses who were a) RNs currently working on one of the five designated medical-surgical units within the specified hospital, b) able to speak, read, and write in English (survey instruments were written in English and the simulation was conducted in English), and c) employed at the hospital of study.

Nurses were excluded if a) they were contract nurses not employed by the hospital of study, b) their primary unit of work was not one of the five designated medical-surgical units in the hospital of study, and c) they were unable to speak, read, and write in English.

There were no subject exclusionary criteria for the study based on gender, race, or ethnicity. Women were not considered a vulnerable population in this research study.

Sample

Convenience sampling was used to identify nurses that met the specific inclusion and exclusion criteria for the study. Of the 168 nurses who attended staff meetings where the study was explained, 110 nurses were recruited for the study from the staff meetings but there were 132 nurses who actually consented to participate in the study.

INSTRUMENTS

Three instruments were used to collect data for the study: a demographic data sheet (Appendix A), MSE instrument (Appendix B), and the Participation in Code Events Post-Training data sheet (Appendix C).

Demographic Data Sheet

The demographic data sheet was developed by the PI and was used to collect data prior to the start of the education session. Data recorded on the demographic data sheet included subjects' age, sex, amount of time practicing as a nurse, last time they participated in a code, ACLS certification, and highest level of nursing education achieved. Data were collected on this form at Time 1, pre-test (T1). A modified version of the demographic data sheet called the Participation in Code Events Post-Training form was used at Time 3 (T3), four to six weeks after the education session, to determine whether nurses had participated in a code on their unit since the education session. These data were important because it was possible the experience may have affected subjects' responses on the MSE scale.

MSE Scale

The German version of the General Self-Efficacy (GSE) scale (Appendix D) was developed by Schwarzer and Jerusalem and consisted of 20 Likert scale items. The GSE scale was adapted to its current Likert scale version containing 10 items (Schwarzer & Jerusalem, 1995). The GSE scale was designed to be used with adult and adolescent populations, has been translated in 26 languages, and has been used in many published studies since the 1990s (Rimm & Jerusalem, 1999; Schwarzer & Jerusalem, 1995;

Schwarzer & Scholz, 2000). The scale was developed to examine the perceived self-efficacy of individuals in dealing with the general problems of everyday life and also stressful events that may occur less frequently. Internal consistency of the GSE scale was established in many research projects using Cronbach's alpha, which ranged between .75 and .91, and with most studies scoring in the high .80s (Scholz et al., 2002). The GSE scale consisted of 10 questions using a four point Likert scale. Subjects circled the number statement that most reflected their perceived self-efficacy for each statement. The instrument was scored by adding up the numbers for each question and calculating an answer range: 10 to 20 indicated low self-efficacy, 21 to 30 indicated a moderate self-efficacy score, and 31 to 40 indicated a high self-efficacy score. Permission to use and modify the GSE scale for this study was obtained via email from instrument co-author Ralph Schwarzer (Appendix E). Schwarzer and Scholz's (2000) study established criterion-related validity using 3,514 high school students and 302 teachers. The study detailed general self-efficacy correlations with optimism; perception of challenge in managing stressful situations in students; and coping, self-regulation, and procrastination in teachers.

The GSE scale was a general scale to be modified for use in specific situations. In most situations this can be accomplished by adding items to the original scale (Schwarzer & Fuchs, 1996). Ralph Schwarzer stated that adding items to the GSE scale to measure self-efficacy as it pertained to specific skills and objectives could be accomplished by adding "I can" statements to the instrument (Scholz et al., 2002). This type of modification has been done in three previous dissertation studies and has resulted in instruments with high internal reliability statistics (Dykes, 2011; Michael, 2006;

Rockstraw, 2006). The GSE scale was modified for this study to include 18 statements relating to managing a cardiac emergency based on the American Heart Association's Basic Life Support Curriculum; the result was the MSE scale using a four point Likert scale. Subjects circled the number statement that most reflected their perceived self-efficacy for each statement. The instrument was scored by adding up the numbers for each question and grouping answer ranges: 18 to 36 indicated a low self-efficacy score, 37 to 54 indicated a moderate self-efficacy score, and 55 to 72 indicated a high self-efficacy score (Appendix D). The MSE scale was used to measure the medical-surgical nurses' self-efficacy before the education session (T1), immediately after the education session (T2), and four to six weeks after the education session (T3).

PROCEDURES

Recruitment Strategies

This study was developed to coincide with the code management and cardiac emergency education training implemented at the study hospital during winter 2013. All medical-surgical nurses were required by hospital policy to attend this training session. Although participation in the study was voluntary, all medical-surgical nurses from the five units of the study hospital were asked to participate in the study.

Recruitment was conducted using several strategies. Prior to beginning nurse recruitment, the PI obtained permission from three hospital sources. First, the PI obtained permission from the hospital education department to conduct the study during the annual education session for nurses on identified units. Second, the PI received permission from the administrative leadership team to communicate via e-mail with potential research subjects prior to and throughout the study. Third, the PI obtained permission from the managers to meet with the nurses. Once all prior approval permissions were obtained, fliers (Appendix F) were placed on the five identified medical-surgical units inviting the nurses to participate in the study. In addition, the PI provided further details about the study to nurses at their staff meetings during the month preceding the study start date. Fliers were sent via e-mail to medical-surgical nurses. During the winter education session the PI disseminated additional information about the research study prior to subject consent and answered subjects' questions about the research study.

One hundred ten nurses were required for the study, but the final sample size was 132 nurses. Nurses who were interested in the study were asked to sign-up to participate. A sign-up sheet was provided when the PI described the study to the nurses during the staff meeting. In addition, a sign-up sheet was placed at unit clerks' desks on each medical-surgical unit and left for one-week following the staff meeting for nurses who wanted more time to consider their participation in the study.

Random Assignment

A day and time sign-up sheet was developed for all medical-surgical nurses from the five units. The sign-up sheet indicated which sessions were participant sessions and which sessions were for non-participants. For the participants, days and time slots were set-up for all participants who signed-up for the study. Twenty time slots were randomly assigned for the experimental and the control groups on Monday through Wednesday during the two-week study period. One hundred and ten nurses originally signed up to participate in the research study, but the final subject enrollment was 132 nurses (explained below). The sessions were randomly assigned to days of the week and times of day so that each group had equal access to all time slots and more non-participant time slots were available. Although the group sessions were predetermined, study subjects were blinded to the group method prior to session selection. Fifty-three subjects self-registered for the experimental sessions and 54 subjects self-registered for the control sessions. Days and times were also made available for non-participants. Non-participant sessions were conducted on all days of the week but were held separately from subjects in the experimental and control groups. The non-participants were asked to sign up for these time slots only.

The hospital required education sessions, which were being held at the same time as the research study, mandated that nurses pre-register for a session prior to attendance. Nurses who did not pre-register for the hospital required nursing education yet came to one of the required sessions for which they were unregistered were allowed to stay and complete the required education session. During multiple sessions in which the required education and the voluntary research study were occurring at the same time, qualified subjects requested to be allowed to participate in the study. At that time the study subjects were consented and added to the randomly assigned groups already established for the study. At the conclusion of the study, 132 subjects were consented and participated in the study: 64 subjects were in the experimental group and 68 subjects in the control group. IRB approval was requested and obtained for the divergence from the protocol, and all additional subjects were allowed to participate in the research study.

Five to six subjects signed up for most sessions, resulting in approximately 10 sessions needed for the control group and approximately 10 sessions needed for the experimental group. Twenty groups of five to six subjects each were established to increase the probability of even distribution between the control and experimental groups.

With the additional subjects who were consented to participate in the research study, the experimental group had 10 total sessions including two sessions with five subjects, five sessions with six subjects, and three sessions containing eight subjects. The control group also had 10 sessions including one session with five subjects, three sessions with six subjects, three sessions with seven subjects, and three sessions containing eight subjects.

Data Collection Procedure

One hundred and thirty-two subjects consented to participate in the study. Upon subjects' consent to participate in the study (Appendix G) at T1, they were asked to create their own custom ID using a specific structure for use on the instruments. The structure consisted of subjects' mothers' maiden names and year of high school graduation. They used this ID on their T1, T2, and T3 questionnaires. Subjects were then asked to complete the demographic data sheet and the MSE scale. The demographic data sheet and initial survey were completed immediately prior to the start of the education session after consent was obtained. The instruments were returned to the PI before the education session began.

Following completion of the education or simulation sessions (T2) with the control and the experimental groups, the MSE scale was re-administered to subjects. The MSE scale was returned to the PI at the completion of the education session. The subjects in both the control and experimental groups were reminded prior to leaving the education session that they would need to complete the MSE scale survey and the Participation in Codes Events Post-Training data sheet in four to six weeks. The time range of four to six weeks was chosen to accommodate variability in the nurses' schedules.

At T3 (four to six week following the education/simulation sessions) the PI followed up with subjects to re-administer the MSE scale and the Participation in Code Events Post-Training data sheet. To decrease the attrition rate, a group session with coffee and cookies was held at T3. These sessions were held for two hours in the morning and two hours in the afternoon for five days, Monday through Friday. At that time subjects were asked to complete the questionnaires and to place them in a drop box that was placed in the staff lounge. Subjects were asked to use the self-selected identification number they used at T1 and T2. One hundred and nineteen subjects attend the T3 session. Thirteen subjects were unable to attend the T3 session and the PI or unit charge nurse hand-delivered the MSE scale and Participation in Code Events Post-Training instruments in a sealed envelope to the subjects. The envelope contained the surveys instruments along with contact information for the PI, directions for completing the surveys, and the location of the survey return drop box on the unit to maintain confidentiality. One subject preferred to complete the survey away from the hospital and mailed the survey back to the PI. This subject was provided with a self-addressed stamped envelope from their charge nurse. Self-addressed stamped envelopes were left on each unit with the charge nurse to help ensure that the survey would be returned and that it remained anonymous.

Standard Education

At each of the 10 sessions conducted for the control group, the PI presented the standard education. The standard education consisted of a 15-minute lecture (Appendix H) on cardiac emergencies, including code management skills, and a 7-minute video clip on performing two rescuer CPR authored by the AHA. A 10-minute discussion was held in which subjects were allowed to ask questions. The discussion was instructor-driven and focused on a patient whose condition was deteriorating and then turned into a cardiac emergency. Following the discussion session, cardiac management skills were practiced for 15 minutes on a static manikin. The skills included correct hand placement, correct ratio of compressions to ventilations, and manually ventilation of the patient with an ambu bag. Upon completion of the practice session, subjects were given approximately 15 minutes to independently explore the code management equipment (e.g., defibrillator, code cart, intubation equipment). Once all questions were answered the control group immediately completed the MSE scale (immediate post-test). The total session took approximately 80 minutes to complete, which included the time needed to complete the surveys.

Intervention

The intervention group completed the same activities as the standard education (control) subjects plus the medium to high fidelity simulation training. After the experimental group had explored the crash cart, they were divided into teams of four to six nurses, a representation of the number of individuals usually available during an emergency situation. There were six teams of four nurses, two teams with five nurses, and five teams with six nurses. The four-nurse teams consisted of a primary nurse who was responsible for the patient, a secondary nurse who was new to the unit being precepted by the primary nurse, a charge nurse, and one patient care assistant. Patient care assistants (PCA) were unlicensed nursing assistants who worked on the units as part of the team and were required to be AHA BLS certified and regularly participate in unit codes. If the group consisted of more than four subjects, the fifth subject was assigned the role of PCA and a sixth subject was assigned the role of unit nurse. This study used a medium to high fidelity human patient simulator. The manikin was a Nursing Kelly manufactured by Laerdal Corporation (Wappingers Falls, NY). The manikin was fully computerized, providing blood pressure, pulse, heart rate, ECG readings, and basic one-word responses. The computer scenario was preprogrammed and the instructor indicated which tasks had been completed for the simulation to advance. The manikin could be defibrillated in the same way in which medical-surgical nurses would perform the act on the floor. The team was given a scenario for the simulation that was adapted from the AHA ACLS course. The stem used for the purpose of this study was a 53-year old male admitted to the medical-surgical unit the previous day from the emergency room (ER) where he had complained of chest pain. The patient's ECG, labs, and vital signs were all within normal ranges. The patient's chest pain was relieved by morphine in the ER. The patient called the nurse into the room complaining of chest pain. Once the nurse came in to assess the patient, his condition deteriorated until the patient's tachycardic rhythm progressed to pulseless ventricular tachycardia or ventricular fibrillation, and the patient needed to be defibrillated back into a livable rhythm. Because medical-surgical nurses were not required to be ACLS trained in this facility, the administration of medication was not required in the scenario. The subjects followed their code management procedure and the scenario ended when the team had moved through the CPR algorithm: providing a ratio of 30 compressions: 2 ventilations along with defibrillation, no further action was taken, or the 10-minute scenario time limit had been reached. The team then debriefed the scenario for no longer than 10 minutes. The same interventions, vital signs, rhythm changes, and transitions were used for each session to make sure each group received the same scenario session. The stem was modified for the different groups in terms of patient sex, reason for admission, and time on the unit to prevent the subjects in later sessions from becoming familiar with the scenario and planning their care—actions which may have affected nurses' feelings of self-efficacy. All simulation sessions were facilitated by the PI. Once the simulation concluded, the experimental group immediately completed the MSE scale (immediate post-test). The total session including transition time, standard education session, and simulation scenario took approximately two hours to complete, which included time needed to complete the surveys.

DATA ANALYSIS

Data were analyzed using SPSS Version 22. All data were inputted by the PI and examined for normality and homogeneity. For this study, significance was set at $\alpha = .05$ for all research questions and hypotheses. The alpha level (α) or level of significance referred to the risk of committing a type I error or finding significance when significance did not exist. Descriptive statistics were used to describe the demographic characteristics of the sample. There were no missing data on the survey instruments. Analysis for each hypothesis has been described below.

Analysis for Each Aim and Hypothesis

Specific Aim 1: To assess the difference in the self-reported scores of medical-surgical nurses' self-efficacy (using the MSE scale) from baseline prior to the education session (T1), immediately following a medium fidelity code simulation training or traditional education session for a simulated IHCA (T2), and four to six weeks after training (T3).

Hypothesis 1: The simulation training method would result in higher self-efficacy scores across time compared to the traditional education group.

Analysis: A one-way RM-ANCOVA of the teaching methods was conducted on the MSE scale scores across the three identified points in time for the two groups. The one-way RM-ANCOVA explored the pattern of change over time of the self-efficacy scores. The use of the one-way RM-ANCOVA for data analysis reduced error variance. Used with a pre-test design, ANCOVA analysis aims to equalize the pre-test results if there are differences. The correlation that can occur between the subject variability and the dependent variable was controlled for using an ANCOVA. The covariate that was controlled for was subjects' self-efficacy pre-test scores taken at T1.

Specific Aim 2: To evaluate the contribution of demographic characteristics to self-efficacy in medical-surgical nurses using the MSE scale at T1, T2, and T3.

Hypothesis 2: Education level, years of experience, certification status (ACLS certified and not ACLS certified), and age would all be significant predictors of self-efficacy scores in medical-surgical nurses at T1, T2, and T3.

Analysis: Stepwise forward and backward multiple regressions were conducted on the self-efficacy scores of medical-surgical nurses at T1, T2, and T3 using education, age, years of experience, and certification status as predictors. At T3, code participation was used since the education session was included as a predictor. Education level was collected as an interval level of measurement composed of weighted values (e.g., associate's degree=2, bachelor's degree=4). Age and level of experience were also collected as interval data. Certification status and code participation data were collected as nominal levels of measure and entered as dummy variables in the regression equation.

The multiple regression analysis was run independently at T1, T2, and T3 for the MSE scale. The pattern of predictors was examined and discussed.

Human Subjects

The potential risk of participation in this study was loss of confidentiality. The study posed minimal risk to the subjects. A unique or potential problem for study subjects was that they were asked about their confidence in performing a required nursing skill—managing a cardiac emergency involving resuscitation—at their hospital of employment. Nurses may have felt compelled to rate their self-efficacy higher than they truly felt for fear of looking incompetent in their nursing practice. To help reassure nurses, aspects of confidentiality and anonymity were discussed and displayed during the study process. The primary mode of data collection was through surveys. Privacy and confidentiality were maintained by coding subject data to remove all names and any demographic identifiers that could connect the subject with their surveys and demographic data sheet. To ensure anonymity of the responses, subjects were asked to create their own custom ID using a specific structure on the questionnaires. The structure subjects were asked to use was their mothers' maiden name and the year of high school graduation. Subjects used this ID on their T1, T2, and T3 questionnaires. Subjects' names were not listed on the forms. Subjects filled out the surveys at T1 and T2 while attending the education session. The process eliminated the need for the PI to create a master list. Upon readiness to complete the final survey, the PI held a group session at the four- and six-week time point. At this time subjects were asked to complete the questionnaires and to place them in a drop box that was made available in the staff lounge. Subjects were asked to use the self-selected identification number that was used at T1 and T2. All forms were locked in a filing cabinet in the PI's home and were only accessed by the PI. All completed forms were destroyed when data analysis was completed.

SUMMARY

The main objective of this study was to understand the influence of human patient simulation education on medical-surgical nurses' self-efficacy in managing a cardiac emergency. This experimental research study used both within-group and between-group designs to compare medical-surgical nurses' perceived self-efficacy at three points in time: pre-test, post-test and four to six weeks after completion of the testing. Medical-surgical nurses' self-assessed perceived self-efficacy towards managing a cardiac emergency was evaluated using the MSE scale. Permission to adapt the GSE scale was obtained from the author. The Principal Investigator (PI) developed a demographic data sheet and a post-education code participation data sheet was also utilized to obtain population demographics.

Subjects were selected from a local hospital from which they worked on one of five medical-surgical units. Qualified medical-surgical nurses who consented to participate in the research study were randomly assigned to one of two groups: one group utilized human patient simulation for their education session while the other group participated in a traditional education session that included a lecture and independent time for self-practice.

The demographic data sheet was administered prior to the education session upon subject consent. The MSE scale was administered prior to the education session, immediately after the education session, and four to six weeks after the education session was complete. During the last administration of the MSE scale, subjects were also asked to complete the Participation in Code Events Post-Training data sheet. A subject created unique identifier was used to complete all surveys to protect subject anonymity and help ensure confidentiality.

Data analysis of the MSE scale and demographic data sheet were completed using three statistical tests: descriptive statistics, an RM-ANCOVA, and stepwise forward and backward multiple regressions. The results were expected to have a positive impact on in-hospital nursing education by providing quantitative evidence to validate the use of simulation in hospital-based nursing education.

Chapter IV: Results

INTRODUCTION

This study examined the effect of two teaching methods, simulation training versus a traditional non-simulation education session, on the perceived self-efficacy of medical-surgical nurses in managing cardiac emergencies. The Statistical Social Sciences (SPSS version 22) was used to analyze the data. This chapter presents the results of the data analysis. The findings are presented in three sections. Section one provides a description of the demographic characteristics of the sample, section two provides the psychometric properties of the MSE Scale, and section three reports findings for each research question.

DESCRIPTION OF THE SAMPLE

One hundred thirty-two subjects completed the study. All subjects completed evaluations pre-test, immediately post-test, and 4-6 weeks after the intervention. The age range was 22-62 years, with a mean of 37; the average years of experience was 9 with a range of 1-37 years (Table 4.1). Ninety-four percent of the subjects were female and 6% of subjects were males (Table 4.1). This percentage precluded any analyses exploring the contribution of gender to the study questions. Nationally, females comprise 90.9% of the nursing workforce and males make up 9.1% of the group (U.S. Health Resources and Services Administration, 2013). Thus, the gender breakdown of the study sample was equivalent to national data. Ethnically, 39% of the nurses were Caucasian, with the highest percentage holding an Associate Degree in Nursing (ADN). Nearly half of the subjects were not ACLS certified, 29% had never participated in a code prior to the education session, and 83% of subjects had not participated in a code within the four to six weeks after the education session (Table 4.2).

Demographic characteristics of the experimental and control groups indicated 64 subjects in the experimental group and 68 subjects in the control group. The age range of the experimental group (simulation) was slightly older at both ends of the range than that of the control group. The mean number of years of experience for the experimental group was greater than that of the control group. A majority of the nurses in the experimental and control groups were female and Caucasian. There was a slightly higher percentage of baccalaureate prepared nurses in the experimental group than in the control group. A greater percentage of the nurses in the control group were ACLS certified than non-certified, and a greater percentage of study nurses had never participated in a code prior to and after the education session.

Parametric and non-parametric tests of difference were conducted on the demographic variables to determine which ones were required for inclusion in subsequent analysis. An independent t-test and a Mann-Whitney U were conducted for age and years of nursing experience. A Chi Square analysis was conducted on ethnicity, gender, education, ACLS certification, code participation prior to the education session, and code participation after the education session.

Table 4.1. Age and Years of Experience for Total Group (n = 132)

Variable	M	SD	Range
Age	37.39	10.14	22-62
Years of Experience	8.97	8.14	1-37

Table 4.2. Percentage for All Subjects by Race/ethnicity, Gender, Education, ACLS Certification, and Code Participation

Variable	N	%
Race/Ethnicity		
Caucasian	51	38.6
African American	27	20.5
Hispanic	16	12.0
Asian	38	28.9
Gender		
Male	8	6.1
Female	124	93.9
Education		
Associate’s Degree	68	51.5
Baccalaureate Degree	64	48.5
ACLS Certification		
Certified	68	515
Not Certified	64	48.5
Code Participation		
Never	38	28.8
Last 6 Months	57	43.4
Within the Last Year	22	16.8
More than One Year	15	11
Code Participation Since Edu.		
No	109	82.6
Yes	23	17.4

A t-test analysis revealed that age was not normally distributed as assessed by a Shapiro-Wilk test ($p>.05$), indicating the need to run a non-parametric test. There was homogeneity of variances as assessed by Levene's test for equality of variances ($p=.820$). The simulation groups mean age was 2.086 years higher than the mean age of the traditional subjects. A Mann-Whitney U test was run to determine if there were differences in the age distributions between the simulation and traditional education groups. Age distributions for the simulation and traditional groups were similar when assessed by visual inspection. Median age for the simulation group (36) and the traditional education group (34) was not statistically significant ($p=.182$) (Table 4.3).

The t-test analysis for years of nursing experience also indicated that the variable was not normally distributed as assessed by the Shapiro-Wilk's test ($p>.05$), requiring a non-parametric test. There was homogeneity of variances, as assessed by Levene's test for equality of variances ($p=.420$). The simulation group's subjects' mean years of nursing experience was 2.31 years higher than the mean years for traditional education session subjects. The t-test indicated that there was not a statistically significant difference in mean years subjects had been nurses for the simulation and traditional education groups ($p=.103$). This finding was not upheld when the non-parametric test of difference was conducted. A Mann-Whitney U test was run to determine if there were differences in subjects' years of nursing experience in the simulation and traditional education groups because the variable did not meet the assumption of being normally distributed. Distributions for the years of nursing experience in the simulation and traditional groups were similar as assessed by visual inspection. Median years of nursing experience for the simulation group (eight) and the traditional education group (five) were statistically significant (p=.047) (Table 4.3). The findings indicated that further analyses include this variable as a covariate.

A chi-square test for association was conducted between the two education session groups (simulation and traditional) and the remaining variables: ethnicity (p=.330), gender (p=.483), education level (p=.492), ACLS certification status (p=.167), subject code participation prior to the education session (p=.134), and subject code participation within the four to six weeks since the education session (p=.396). Expected cell frequencies were greater than five for all variables except gender. The Fisher's exact statistic was reported for gender. The analyses indicated that there was not a statistically significant association for any of the remaining variables (Table 4.4).

PSYCHOMETRIC PROPERTIES

Data on self-efficacy were collected using the MSE scale, a modification of the GSE scale. Cronbach's alpha was computed on the MSE scale for each assessment period (T1, T2, and T3). Reliability was determined as follows: T1: pre-education session = 0.96, T2: immediately following the education session = 0.97, and T3: four to six weeks following the education sessions = 0.96. All alphas exceeded the recommended 0.70 for a new instrument, as well as the criteria of 0.80 for an established instrument. While the reliability measure aligned with the reliability ranges noted for the GSE, the very high alphas strongly suggested a notable degree of redundancy in the instrument with an opportunity for improved efficiency by reduction. The MSE was reviewed and edited by four American Heart Association ACLS instructors to establish content validity.

Table 4.3. Mean Age and Years of Experience for Experimental and Control Groups

	Experimental n = 64			Control n = 68			
Variable	M	SD	Range	M	SD	Range	p
Age	38.47	10.120	24-62	36.38	10.125	22-59	.182
Years of experience	10.16	8.373	1-33	7.85	7.810	1-37	.047

Table 4.4. Percentage of Subjects by Race/ethnicity, Gender, Education, ACLS Certification, and Code Participation for Experimental and Control Groups

	Experimental n = 64		Control n = 68		
Variable	n	%	n	%	p
Race/Ethnicity					.330
Caucasian	25	39.1	26	38.2	
African American	12	18.8	15	22.1	
Hispanic	5	7.8	11	16.2	
Asian	22	34.2	16	23.5	
Gender					.483*
Male	5	7.8	3	4.4	
Female	59	92.2	65	95.6	
Education					.492
Associate’s Degree	31	48.4	37	54.4	
Baccalaureate Degree	33	51.6	31	45.6	
ACLS Certification					.167
Certified	29	45.3	39	57.4	
Not certified	35	54.7	29	42.6	
Code Part. Prior to Education					.134
Never	16	25	22	32.4	
Last 6 months	28	43.8	29	42.6	
Within the last year	15	23.4	7	10.3	
More than 1 year	5	7.8	10	14.7	
Code Part. Since Education					.396
No	51	79.7	59	86.8	
Yes	13	20.3	9	13.2	

*Fisher’s Exact was used due to small sample size, which also precluded further use in subsequent analyses.

ANALYSIS OF DATA

The two specific aims and hypotheses of the study were examined. Analyses were conducted for each aim.

Specific Aim 1: To assess the difference in the self-reported scores of medical-surgical nurses' self-efficacy (using the MSE scale) from baseline prior to the education session (T1), immediately following a medium fidelity code simulation training or traditional education session for a simulated IHCA (T2), and four to six weeks after training (T3).

Hypothesis 1: The simulation training method will result in higher self-efficacy scores across time compared to the traditional education group.

Hypothesis 1 was analyzed using RM-ANCOVA while controlling for self-efficacy pre-test scores**.** Independent variables were the traditional and simulation education groups and dependent variables were the two post-test periods—immediate and four to six weeks after the education session.

Assumptions for Repeated Measures Analysis of Covariance

Prior to or during analysis, the six assumptions required to be conducted to complete an RM-ANCOVA were tested and met. These assumptions included linearity, homogeneity, normality, homoscedasticity, Levene's test of homogeneity between groups, and checking for outliers. Visual inspection of a scatterplot was used to determine linearity between the covariate, pre-test self-efficacy scores, and the dependent variable, post-test self-efficacy scores. Assessment of the scatterplot (Appendix I) indicated a linear relationship between pre-test self-efficacy scores and post-test self-efficacy scores. The next assumption tested was homogeneity of regression slopes between the covariate, pre-test scores, and the independent variable groups, simulation or traditional. The test of between-subject effects showed homogeneity of the regression slopes because the interaction term was not statistically significant ($p=.226$). Normality was the next assumption for which the data were tested. Using the Shapiro-Wilk’s test, the standardized residuals were assessed and found to be normally distributed ($p>.05$). The assumption of homoscedasticity was validated using a scatterplot (Appendix J) for the residuals, which was visually assessed to be randomly distributed. The homogeneity of variance assumption was tested using Levene’s test of homogeneity of variance. Using the Levene’s test of equality of error variances table, the p values for the subjects’ self-efficacy score immediately after the education session was $p=.061$ and the p value for the subjects self-efficacy score four to six weeks later was $p=.092$, which indicated that the assumption of homogeneity of variance was met. Outliers in the data were assessed by inspecting the data for standardized residuals greater than ±3 standard deviations. There were no outliers identified in the data.

To determine if covariance was equal across all levels of the between subjects effects, Box’s test of equality of covariance was conducted. The p value of .332 indicated that the assumption was met. The next step was to determine whether to use the multivariate or univariate approach to report within subject effects using Mauchly’s test of sphericity. The test did not yield significance, indicating that the assumption of compound symmetry was met and the univariate results should be reported.

Repeated Measures Analysis of Covariance

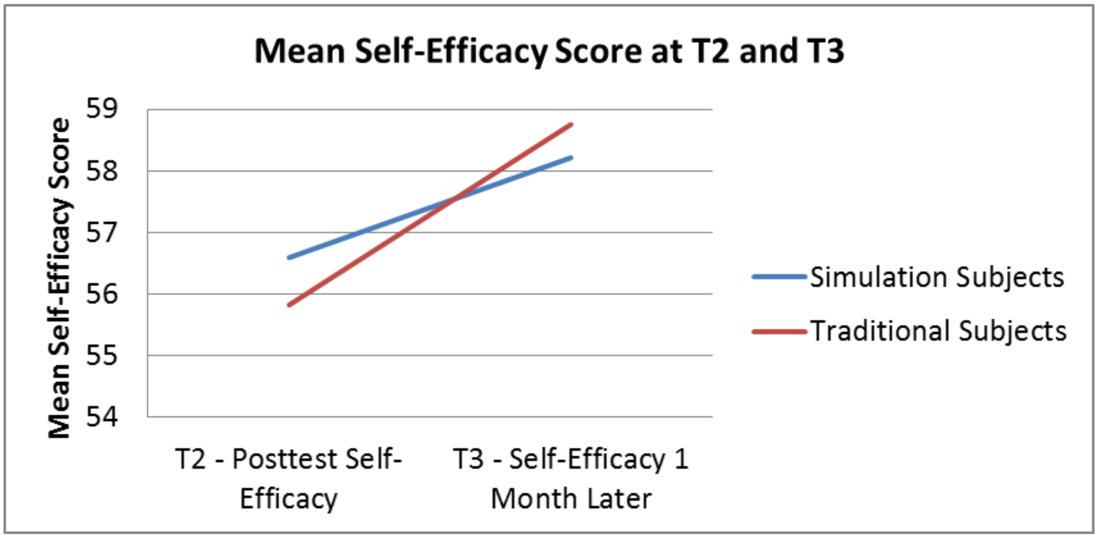
The results of the RM-ANCOVA indicated that after adjusting for self-efficacy pre-test scores, the main effect for the groups (traditional versus simulation) was not significantly different ($F=1.477(1,129)$, $p=.226$). Using univariate analysis, indications were that the main effect for time, i.e., the combined within-subjects self-efficacy scores across the two time periods, were significantly different ($F=12.298(1,129)$, $p=.001$). This in turn indicated increasingly higher self-efficacy scores immediately following and four to six weeks later for the total group (T2 $M = 56.20$ versus T3 $M = 58.49$). Interaction analyses between groups across time (group x time) indicated a trend of increasing self-efficacy scores across both time points for both groups. The mean for the simulation group immediately following the education session was 56.593 (indicating high self-efficacy) and four to six weeks later it was 58.210 (indicating high self-efficacy). Although the growth was not significant, results indicated that the simulation groups' self-efficacy continued to increase four to six weeks after the education session.

Similarly, the mean for the traditional group also increased from 55.824 (indicating high self-efficacy) immediately following the traditional education session to 58.758 (indicating high self-efficacy) four to six weeks after the education session. Although the growth was not significant, results indicated that the traditional group's self-efficacy continued to increase after the education session and at a faster rate compared to the simulation group.

Figure 4.1 displayed the relationship between the two groups and change across time. Results clearly showed that the simulation group's self-efficacy was higher immediately following the education intervention but that the traditional group's perceived self-efficacy at managing cardiac emergencies was greater than the simulation group's perceived self-efficacy four to six weeks after the education session. Although the difference between groups at either immediate or four to six weeks post-test was not statistically significant, the pattern of results suggested that simulation training may benefit individuals mostly in the short term; traditionally taught individuals appeared to have caught up to and possibly surpassed simulation trainees by the four to six week mark.

The statistical analysis completed on the descriptive variables indicated that years of nursing experience had a significant association and needed to be added to the analysis. The non-normal distribution of the variable required the use of a nonparametric test of difference—the Mann-Whitney U. There was no equivalent nonparametric test for a RM-ANCOVA. ANCOVA procedures have been known to be robust against non-normality violations. The robustness of the ANCOVA procedure towards normality violations paired with the unavailability of a nonparametric statistical approach necessitated the addition of years of nursing experience to the original RM-ANCOVA. The RM-ANCOVA was run again including both pre-test self-efficacy scores and years of nursing experience as covariates. The results of the new RM-ANCOVA with both years of nursing experience and pre-test scores as covariates were the same as the original analysis when pre-test scores were included as the only covariate.

Figure 4.1. Self-Efficacy Scores of Subjects over Time (Adjusted for Pre-Test Self-Efficacy Scores)



Summary Aim 1: RM-ANCOVA

There was a significant difference across time for all group participants on their perceived self-efficacy scores after controlling for the pre-test scores. Scores on the MSE scale increased for the total group from T2 (immediately following the education session) to T3 (four to six weeks following the education session). The results indicated that the type of education session the subjects attended (i.e., simulation, traditional) did not make a significant difference in the subjects' self-reported perceived self-efficacy in managing cardiac emergencies.

Specific Aim 2: To evaluate the contribution of demographic characteristics to self-efficacy in medical-surgical nurses using the MSE scale at T1, T2, and T3.

Hypothesis 2: Education level, years of experience, certification status (ACLS certified and not ACLS certified), and age would be significant predictors of self-efficacy scores in medical-surgical nurses at T1, T2, and T3.

Stepwise forward and backward multiple regressions were conducted on the self-efficacy scores of medical-surgical nurses at T1 and T2 using education, age, years of experience, and certification status as predictors. The same predictors were used at T3 with the inclusion of another predictor: code participation since the education session. The multiple regression analysis was run independently at T1, T2, and T3 using the MSE scale data.

Assumptions for Multiple Regression

Either prior to or during the multiple regression analysis, the nine required assumptions were tested and met. These assumptions included appropriate level of measurement for predictors, low correlation between predictors, high correlation between predictors and criterion, multcollinearity, independence of error, linearity, homoscedasticity of residuals, normal distribution of residuals, and ensuring no significant outliers or influential points.

The level of measurement for the independent variables (predictors) in a multiple regression must be continuous or dichotomous. Education level was collected as an interval level of measurement composed of weighted values (e.g., associate's degree=2, bachelor's degree=4) where two years of nursing education equated to an associate's degree and four years of nursing education to a bachelor's degree. Age and level of experience were also collected as interval data. Certification status and code participation data were collected as a dichotomous nominal level of measurement and entered as 'dummy' variables in the regression equation. Certification status asked subjects if they were currently certified in ACLS. If subjects were not ACLS certified they were coded as '0' and if subjects were ACLS certified they were coded as '1'. Code participation data collected at T3 asked subjects if they had participated in a code during the four to six weeks after the education session. Subjects who had not participated in a code during the four to six weeks following the education session were coded as ‘0’ and subjects who had participated in a code were coded as ‘1’. Multiple regression analysis was run independently at T1, T2, and T3 for the MSE scale. The pattern of predictors was examined and discussed.

Pearson’s correlation was conducted at T1, T2, and T3 with the interval level data to determine the correlation between the predictors and the correlation between the criteria and the predictors. Correlations were conducted between age, years of nursing experience, education level (years of nursing education), and self-efficacy. All correlations between criteria and predictors were positive. There magnitude of the correlation was low at T1 between self-efficacy on the pre-test and years of nursing experience (r=.238). There was a strong correlation between years of nursing experience and subject age (r=.686) (Table 4.5). Because the variables years of nursing experience and age were strongly correlated to each other, concerns of multicollinearity due to inclusion of both variables in the stepwise forward and backward multiple regression were addressed by examination of tolerance statistics. Tolerance for age (.515) and years of nursing experience (.505) indicated no multicollinearity issue with including both variables.

Table 4.5. Pearson's r Correlations between Predictor Variables and between Predictor Variables and Criterion Variables at T1

	Self-Efficacy Pre-Edu.	Age	Years Nursing Exp.
Age	.094 (p=.142)		
Years Nursing Exp.	.238 (p=.003)	.686 (p=.000)	
Education Level	.035 (p=.346)	-.069 (p=.215)	-.012 (p=.447)

Pearson's correlation between each of the three interval level variables and post-test self-efficacy was conducted at T2. All correlations between criteria and predictors were positive. There was a small correlation between post-test self-efficacy and two variables at T2: age (r=.112) and years of nursing experience (.170). There was a strong correlation between the years of nursing experience and age (r=.686) (Table 4.6). These results were similar to the results at T1. Because the variables years of nursing experience and age were strongly correlated, concerns with including both variables in the stepwise forward and backward multiple regression due to multicollinearity were addressed by examination of tolerance statistics. Results indicated that no issues with multicollinearity existed, as tolerance statistics were the same as T1 for both variables.

Table 4.6 Pearson's r Correlations between Predictor Variables and between Predictor Variables and Criterion Variables at T2

	Self-Efficacy Post-Test.	Age	Years Nursing Exp.
Age	.112 (p=.101)		
Years Nursing Exp.	.170 (p=.026)	.686 (p=.000)	
Education Level	.069 (p=.215)	-.069 (p=.215)	-.012 (p=.447)

Pearson's correlation was again conducted at T3 between each of the three interval level variables and self-efficacy scores four to six weeks after the education session. All correlations between the criteria and predictors were positive. There was a small correlation between subjects' self-efficacy scores four to six weeks after the education session and two variables: years of nursing experience (.145) and the level of nursing education (r=.148). There was a strong correlation between the years of nursing experience and age (r=.686) (Table 4.7). Because the variables years of nursing experience and age were strongly correlated, concerns with including both variables in the stepwise forward and backward multiple regression were addressed by examination of tolerance statistics. Results indicated that no issue with multicollinearity existed because the tolerance statistics were similar to T1.

Table 4.7 Pearson's r Correlations between Predictor Variables and between Predictor Variables and Criterion Variables at T3

	Self-Efficacy 4-6 Weeks after Education Session	Age	Years Nursing Exp.
Age	.044 (p=.308)		
Years Nursing Exp.	.145 (p=.049)	.686 (p=.000)	
Education Level	.148 (p=.045)	-.069 (p=.215)	-.012 (p=.447)

While the correlations between the predictors and criterions were small at all three time intervals, the regression analyses were still performed with an understanding of this limitation. There was no issue with multicollinearity for the independent variables because years of nursing experience and age were the only variables to have correlations greater than 0.6 in the correlations table created post-multiple regression analysis. Tolerance statistics were used to verify that there was no issue with multicollineraity for both variables.

Independence of residuals was assessed using the Durbin-Watson statistic, which was reported as 2.170 for the pre-test session (T1), 2.227 immediately following a medium fidelity code simulation training or traditional education session for a simulated IHCA (T2), and 2.215 four to six weeks after training (T3). These results indicated that the assumption was met.

The assumption of linear relationship was assessed through visualization of the scatterplot, which for T1, T2, and T3 (Appendix K, Appendix L, and Appendix M) was accomplished by plotting the studentized residuals against the predicted values. The residuals formed a horizontal band, which provided confirmation that the relationship between the dependent variable and independent variables was linear. The assumption of homoscedasticity was also assessed by visualization of the scatterplot (Appendix K,

Appendix L, and Appendix M) between the studentized residuals and the predicted values. Results showed that residuals were spread equally, indicating that the assumption was met.

Collinearity statistics demonstrated tolerance values all greater than 0.1, which mitigated any concerns of collinearity. No outliers were detected in either the stepwise forward or backward regression, and no casewise diagnostics were created for any results ±3 standard deviations for the data collected at T1, T2, and T3. The data were checked for influential points by examining Cooks Distance values for each case in each regression. No values over one were noted, so no influential points were found to exist. The assumption of normality was checked using histogram and P-Plot. The histogram and P-Plot for all regressions indicated normality upon visualization (Appendix N, Appendix O, and Appendix P).

Data Analysis T1 Regression

Stepwise forward and backward regressions was performed at T1 using education, age, years of nursing experience, and certification status as predictors of the criterion self-efficacy. The model summaries for the stepwise forward and backward regressions at T1 indicated that both models were poor fits, with years of nursing experience being the only variable left in the forward and backward regression which accounted for only 5.7% of the variance in each of these models. Although the ANOVA overall analysis was significant ($p<.05$), indicating that all four predictors were significant predictors of the self-efficacy scores on the pre-test, years of nursing experience was the only predictor that remained in the stepwise forward and backward regression models ($p=.006$) (Table 4.8 and Table 4.9).

Table 4.8 Stepwise Forward Regression for T1

Variable Included	Standardized β	R^2	F Value (df)	p
Years Nursing Exp.	.238	.057	7.792 (1,130)	.006

Note: df = degrees of freedom

Table 4.9. Backward Regression for T1

Variable Included	Standardized β	R^2	F Value (df)	p
Years Nursing Exp.	.238	.057	7.792 (1,130)	.006

Note: df = degrees of freedom

Data Analysis T2 Regression

The model summaries from the stepwise forward and backward regressions at T2 indicated that the stepwise forward regression did not enter any variables into the equation. Backward regression was a poor fit, with years of nursing experience being the only variable left in the model accounting for 2.9% of the variance. The ANOVA overall indicated that three of the four predictors—certified in ACLS, age, and highest level of nursing education—were not significant predictors of self-efficacy on the post-test. The best and only significant predictor for backward regression was years of nursing experience (p=.05) (Table 4.10).

Table 4.10. Backward Regression for T2

Variable Included	Standardized β	R^2	F Value (df)	p
Years as a Nurse	.170	.029	3.850 (1,130)	.052

Note: df = degrees of freedom

Data Analysis T3 Regression

The model summaries from the stepwise forward and backward regressions at T3 indicated that both models were poor fits, with certified in ACLS accounting for 19% of the variance and education levels accounting for 17% of the variance in both models. The ANOVA overall analysis for both forward and backward regressions was significant and indicated that four of the five predictors—code participation since the education session, certified in ACLS, highest level of nursing education, and years of nursing experience—were all significant predictors of self-efficacy scores four to six weeks after the education session ($p<.05$); however, the best predictors that remained in the stepwise forward and backward regressions were ACLS certification and highest level of nursing education ($p=.021$) (Table 4.11 and 4.12). Subjects' participation in a unit code during the four to six weeks following the education session was not a significant predictor of self-efficacy.

Time 4.11. Stepwise Forward Regression for T3

Variable	Standardized β	R^2	F Value (df)	p
ACLS Certification	.193			.027
Education Level	.171			.049
ACLS Certification and Education Level		.058	4.005 (2,129)	.021

Note: df = degrees of freedom

Table 4.12. Backward Regression for T3

Variable	Standardized β	R^2	F Value (df)	p
ACLS Certification	.193	.027		
Education Level	.171	.049		
ACLS Certification and Education Level		.058	4.005 (2,129)	.021

Note: df = degrees of freedom

Summary of Aim 2: Multiple Regression at T1, T2, and T3

Stepwise forward and backward multiple regression at T1 indicated that years of nursing experience (β=.238, p=.006) was the best predictor of pre-test self-efficacy score of medical-surgical nurses in managing cardiac emergencies. This predictor explained 6% of the variance (R^2=.057, F=7.792 (1,130), p=.006). At T2 no predictors were included in the stepwise forward regression, and the backward regression indicated that the only predictor of medical-surgical nurses self-efficacy at managing cardiac emergencies on the post-test was years of nursing experience (β=.170, p=.052). Years of nursing experience was a significant predictor of post-test self-efficacy and explained 2.9% of the variance (R^2=.029, F=3.850 (1,130), p=.052). Four to six weeks following the education session at T3, the forward and backward regressions indicated that 5.8 % variance was explained by two significant predictors (R^2=.058, F=4.005 (2,129), p=.021).

Subjects' ACLS status accounted for the largest percentage of the explained variance (19%) of medical-surgical nurses' perceived self-efficacy in managing cardiac emergencies four to six weeks after the education session (β=.193, p=.027). Subjects' education level accounted for 17% of explained variance (β=.171, p=.049).

SUMMARY

Study results indicated that the self-assessed self-efficacy means of medical-surgical nurses increased for both the medium to high fidelity simulation (experimental) group and the traditional education (control) group after receiving education on cardiac emergency management. The traditional education group's self-efficacy increased at a faster rate compared to the simulation group from immediately after the education session to four to six weeks after education session. The best significant predictor of self-efficacy for the medical-surgical nurses on the pre-test and immediate post-test was years of nursing experience. The best significant predictor of self-efficacy for the medical-surgical nurses four to six weeks after the education session was ACLS certification status and education level. These findings are further discussed in Chapter V.

Chapter V: Discussion and Summary

This chapter provides the purpose of the study and a discussion of the results as they relate to the two research questions and extant literature. Additionally, this chapter provides the limitations of the study, implications for nursing education, and recommendations for future studies in nursing simulation.

PURPOSE OF THE STUDY

The purpose of this study was to explore the effect simulation training had on the perceived self-efficacy of medical-surgical nurses in managing cardiac emergencies. Subjects were randomly assigned to two education sessions: (1) the traditional education session, which did not include human patient simulation, or (2) the human patient simulator education session. Subjects in both education sessions were provided with a lecture on managing cardiac emergencies followed by independent practice during the traditional education sessions or a simulation experience for subjects in the human patient simulation education session.

DISCUSSION OF RESEARCH FINDINGS

Specific Aim One

To assess the difference in self-reported scores of medical-surgical nurses' self-efficacy (using the MSE scale) from baseline prior to the education session (T1), immediately following a medium fidelity code simulation training or traditional education session for a simulated IHCA (T2), and four to six weeks after training (T3).

Hypothesis 1: The simulation training method would result in higher self-efficacy scores across time compared to the traditional education group.

The RM-ANCOVA showed no significant difference in self-efficacy scores between traditional versus simulation groups. There was, however, a significant difference across time for all subjects on self-efficacy scores. There was an increase in self-efficacy for the simulation group immediately post-test and four to six weeks post-test, but the change was not significant. Similarly, self-efficacy scores for the traditional group increased at subsequent time points, but not significantly. Of note was that the self-efficacy scores of the traditional group increased to greater levels than scores of the simulation groups. Thus, Hypothesis 1 was not supported.

The self-reported perceived self-efficacy of both the experimental and control group was high for the immediate posttest and again on the delayed posttest four to six weeks after the education session. The ceiling effect is one explanation for the lack of significance between the subject's self-efficacy at T2 and T3. Since the subjects rated themselves as having high self-efficacy at T2 there was less opportunity to see a large growth in the perceived self-efficacy scores of the subjects at T3.

The increase in self-efficacy scores of both the traditional and simulation group were consistent with results of other studies completed on students and graduate medical-surgical nurses (Bruce et al., 2009, Buckley & Gordon, 2011; Gordon & Buckley, 2009). The results of this research study were consistent with Bandura's (1977) concept of self-efficacy, which stated that repeated exposures to an event lessened stress and increased an individuals' perceived self-efficacy in successfully managing the same event in the future (e.g., managing a cardiac emergency). Bandura (1977) also stated that self-efficacy would increase with successful management of complex situations, but it would also decrease if individual were not successful at managing such instances. Although unstudied, this concept could help to explain the greater increase in the self-efficacy scores of traditional subjects compared to subjects who participated in the simulation experience. During the simulated education session subjects had to successfully manage the cardiac emergency and begin the steps of CPR. During some sessions subjects were not as successful at managing a cardiac emergency, which could explain why their perceived self-efficacy grew less quickly than those in the traditional group who did not have to demonstrate successful management of a cardiac emergency and their CPR skills. Another explanation for the difference in the rate of growth for both groups was that the control group had 57% of their nurses certified in ACLS whereas the experimental group had only 45% of their nurses certified in ACLS. Subjects who were ACLS certified should have greater exposure to cardiac emergency skills and may perceive themselves as better able to manage a cardiac emergency regardless of the type of education provided.

Specific Aim Two

To evaluate the contribution of demographic characteristics to self-efficacy in medical-surgical nurses using the MSE scale at T1, T2, and T3.

Hypothesis 2: Education level, years of experience, certification status (ACLS certified and not ACLS certified), and age would be significant predictors of self-efficacy scores in medical-surgical nurses at T1, T2, and T3.

Stepwise forward and backward multiple regressions were conducted on the self-efficacy scores of medical-surgical nurses at T1, T2, and T3 using education, age, years of experience, and certification status as predictors. At T3 another predictor was added to the regressions: subject participation in a code since the education session. The multiple regression analysis was run independently at T1, T2, and T3 using MSE scale pre-test, post-test, and four to six week post-test data. The only significant predictor of higher self-efficacy scores on the pre-test and immediate post-test was years of nursing experience. At T3, code participation since the education session, ACLS certification, level of nursing education, and years of nursing experience were are all significant predictors of self-efficacy scores four to six weeks after the education session. The best predictors that remained in the regressions were ACLS certification and subjects' highest level of nursing education. Thus, results provided partial weak support for Hypothesis 2.

Increased years of nursing experience should provide nurses with more opportunities to be exposed to a cardiac emergency, which could positively or negatively affect their perceived self-efficacy in managing cardiac emergencies (Bandura, 1977). Nurses also tend to work in various specialties throughout their nursing careers, which could also explain why more experienced nurses had a higher perceived self-efficacy on the pre-test.

Studies have shown that nurses' education level can play a role in predicting their perceived self-efficacy. In a study comparing undergraduate and graduate nursing students' self-efficacy in managing a cardiac arrest after a high fidelity simulation, graduate nursing students showed a significant increase in their self-efficacy compared to undergraduate nursing students (Bruce et al., 2009). The role of education level in that study indicated that graduate students benefited more from the high fidelity simulation than did undergraduate nursing students. A study completed using graduate nurses in a nurse practitioner program found that simulation was not enough to increase self-efficacy on its own but that a traditional education session caused higher increases in students' perceived self-efficacy (LeFlore et al., 2007). In the current study, level of education did not play a significant role in predicting pre-test or post-test self-efficacy scores but was a significant predictor on the post-test completed four to six weeks after the education session. This finding suggested that education level was not a predictor of self-efficacy when studying practicing nurses but did contribute to skills retention.

Study nurses were required to have CPR certification and encouraged to have ACLS certification. Studies have shown that medical professionals who participated in an ACLS class using high fidelity simulation had higher skill attainment and adherence to ACLS standards compared to the medical professionals who had managed a cardiac emergency during clinical practice alone (Wayne et al., 2005). Nursing students enrolled in a CPR course that offered monthly refresher opportunities using simulation had greater perceived self-efficacy in their CPR skills compared to students who did not have monthly follow-up sessions (Montgomery et al., 2012). The current study data supported those research findings at T3 (four to six weeks after the education session). However this study did not show a correlation between being ACLS certified and having a higher perceived self-efficacy at managing a cardiac emergency at T1 or T2. One reason for this result may have been that even though over half of the research subjects were ACLS certified, 23% (n=16) of those certified had never participated in a code and 66% had not participated in a code in the last year. Although medical-surgical nurses will be the first responders at a code, the findings from this study suggested that being certified in ACLS may not be a predictor of increased self-efficacy in their management of cardiac emergencies.

LIMITATIONS OF THE STUDY

The first limitation of the study was its generalizability. Because the study was conducted at one community hospital in Houston, Texas, results could be better understood if the study were repeated on a larger scale and included various geographic regions.

The second limitation of the study was that the research study took place during the winter education session at the hospital, thus limiting the amount of time available for recruitment and completion of the study. Subjects had to decide quickly if they wanted to participate in the research study. A separation of the education session from the research study in future studies may allow more flexibility for subjects in enrollment.

IMPLICATIONS FOR NURSING EDUCATION

Hospital nursing educators are responsible for providing education that meets the needs of the nurses they serve. Medical-surgical nurses need to feel they are capable of managing cardiac emergencies successfully. Studies have shown that simulation has helped students and other medical professionals increase their self-efficacy in managing high-risk, low-frequency situations, including cardiac emergencies. Purchasing simulation equipment and providing the necessary education for clinicians to manage a simulation scenario can be expensive. The cost of the human patient simulator increases as the fidelity of the equipment becomes more advanced. Study findings revealed that the self-efficacy of medical-surgical nurses increased regardless of the teaching modality that they were exposed to—simulation or traditional education. The study results showed that all subjects' perceived self-efficacy increased after the education session and continued to increase when reassessed four to six weeks later. The results indicated that education on managing cardiac emergencies is needed to increase nurses' perceived self-efficacy, but the best teaching pedagogy remains unknown. Knowledge of this fact is important for hospital administrators who must budget their limited resources in the most effective manner.

Study findings indicated the need for continued education and reeducation around managing cardiac emergencies. Acuity of the medical-surgical patient can change quickly, and many medical-surgical units have patients in unmonitored or remotely monitored beds. These scenarios require medical-surgical nurses to recognize deteriorating patient conditions and to manage such conditions until help arrives. Cardiac emergencies can occur suddenly and without warning. This lack of symptomology requires medical-surgical nurses to act quickly and effectively in managing patients' cardiac emergencies, including being able to effectively complete the skills of CPR. Providing education on deteriorating patients and management of cardiac emergencies resulted in increased self-efficacy scores, which continued to rise four to six weeks after education sessions were presented.

Simulation training is another way in which hospital educators can immerse adult learners in safe and realistic clinical environments to practice infrequently used cardiac management skills. And based on study results, this training can also be accomplished just as effectively through lower fidelity, cheaper modalities.

Recommendations for Future Studies

The current research study did not determine whether traditional education session subjects showed a faster increase in self-efficacy because the sessions were better fits for practicing nurses or because nurses did not have to demonstrate skill competency. The inclusion of a skills competency checklist in future studies could bridge the gap between self-efficacy and competence in order for educators to make informed decisions on which teaching style would benefit all aspects of the medical-surgical nurses' management of cardiac emergencies.

Based on the results of the study, identification of other potential predictors of medical-surgical nurses' self-efficacy in managing cardiac emergencies is recommended. Medical surgical nurses are able to become nationally certified medical surgical nurses. This is one variable that might be considered for inclusion in future studies.

The study should be replicated at another institution using a similar sample and also replicated in a different geographic location to allow generalization of results; however, additional potential predictors should be included in future studies. The replication of the study using similar tools and questionnaires would also help increase the generalizability of the study.

In addition to study replication, increasing the time between the education session and the final follow-up could help educators to understand retention rates of skills obtained during education sessions. Adding a fourth measurement, time, would help educators understand the impact of the education session longitudinally and clarify whether one education type was better than another at managing skill retention.

Future studies should also include qualitative aspects of the subjects. Collecting and analyzing the qualitative data related to the simulation or traditional education session experience will provide educators with a better understanding of sessions' impact on perceived self-efficacy. Qualitative data points should include open-ended questions on how education sessions impacted students’ nursing practices related to managing a cardiac emergency and how educational aspects helped or hurt subjects’ self-efficacy in managing a cardiac emergency. This information could provide information to explain results obtained on the self-efficacy survey at T2 and T3.

SUMMARY AND CONCLUSION

Simulation training is increasingly being utilized in hospitals with medical professionals. There is extensive literature regarding simulation and its effect on managing high-risk, low-frequency skills in aviation, nuclear industries, and the military. There is also extensive research available on the use of simulation and its effect on self-efficacy of nursing students and other medical professionals in managing various clinical skills. Yet little research exists on medical-surgical nurses and the effect simulation has on their self-efficacy at managing clinical skills. Although hospital educators are being asked to find new ways to educate medical-surgical nurses, little research has been conducted with this subject population.

This study concluded that both simulation and traditional education increased the self-efficacy scores of medical-surgical nurses; however, there was no difference in this increase across time. Further, it may be concluded that years of nursing experience, education level (years of nursing education), and ACLS status were predictors of perceived self-efficacy of medical-surgical nurses in managing cardiac emergencies.

Appendix A: Demographic Data Sheet

1. **What is your age in years? ____**

2. **How many years have you been a nurse? ___________________**

3. **What is your gender? Please Circle One.**

   Male Female

4. **What is your race/ethnicity? Please Circle One.**

   White (Caucasian) Hispanic (Non-White) Black (African-American)

   Asian/Pacific Islander American Indian/Alaskan Native

   Other (Please write in) ____

5. **What is your highest level of nursing education? Please Circle One**

   Associate Degreed Nurse (ADN) Bachelors of Nursing (BSN)

   Master of Nursing (MSN) Other (Please Specify)
   ____

6. **How many hours a week do you work? Please Circle One.**

   Full-Time (32-40 hours/wk) Part-Time (20-24 hours/ wk)

   PRN/ Supplemental

7. **Are you Basic Life Support (CPR) certified? Please Circle One**

   Yes No

8. **Are you Advanced Cardiac Life Support (ACLS) certified? Please Circle One**

   Yes No Was ACLS certified but let it lapse and am no longer ACLS certified

9. List the amount of experience you have had as a nurse (RN) in the following specialty areas. Please list time in years and months (ex. 1 year 6 months).

Medical Surgical ______________________________

Critical Care (ICU, IMU, NICU) ______________________________

Emergency Room ______________________________

Procedural Areas (Cath Lab, Endo) ______________________________

Women's Service (L/D, Pedi) ______________________________

Other ______________________________

10. When was the last time you participated in a code (code blue involving resuscitation attempts) on your unit? (Please list in days, weeks, months, and/or years format. For example 3 weeks ago, 6 months ago, or 2 years ago. If you have never participated in a code please enter zero in the space provided).

____

Appendix B: Modified Self-Efficacy Instrument

Directions: This is a questionnaire designed to determine how confident you are that you can perform each of the following behaviors. This is a questionnaire designed to determine how confident you feel that you are in performing each of the following behaviors. Read each behavior and then circle the number to the right of the behavior to indicate how confident you are that you can perform the behavior. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems to describe how you generally feel. Your answers are confidential.

Not at All Confident 1	Slightly Confident 2	Moderately Confident 3	Highly Confident 4

1. I can recognize a patient having a cardiac emergency.	1	2	3	4
2. It is easy for me to complete a focused assessment on a patient during a cardiac emergency.	1	2	3	4
3. I can check for patient responsiveness during a code involving a cardiac emergency.	1	2	3	4
4. I can obtain a valid pulse measurement during a code involving a cardiac emergency.	1	2	3	4
5. I can correctly place the quick combo pads (defibrillation pads) on the patient during a code involving a cardiac emergency	1	2	3	4
6. I can always connect the defibrillation pads to the AED correctly.	1	2	3	4
7. I can effectively operate the AED during a code involving a cardiac emergency	1	2	3	4
8. I can focus on the patient and effectively clear the staff away from the patient immediately prior to delivering an electrical charge (shock) during a code involving a cardiac emergency.	1	2	3	4
9. I can deliver chest compressions that are at least 2 inches deep at a rate of 100 compressions per minute (30:2 cycle) for two minutes during a code involving a cardiac emergency.	1	2	3	4
10. I can deliver two ventilations using the ambu bag	1	2	3	4

resulting in bilateral chest rise after every 30 compressions until an advanced airway is put in place during a code involving a cardiac emergency.				
11. I can manage the patient code involving the cardiac emergency until Code Team arrives.	1	2	3	4
12. I am confident that I could deal effectively with unexpected events while managing a code involving a cardiac emergency.	1	2	3	4
13. Thanks to my resourcefulness, I know how to handle unforeseen situations while managing a code involving a cardiac emergency	1	2	3	4
14. I can solve most problems related to managing a code involving a cardiac emergency.	1	2	3	4
15. I can remain calm when facing difficulties managing a code involving a cardiac emergency because I can rely on my coping abilities.	1	2	3	4
16. When I am confronted with a problem while managing a code involving a cardiac emergency, I can usually think of several solutions.	1	2	3	4
17. If I am in trouble, when managing a code involving a cardiac emergency, I can solve the problem.	1	2	3	4
18. I can usually handle whatever happens when I am managing a code involving a cardiac emergency.	1	2	3	4

Appendix C: Participation in Code Events Post-Training

Post-Education Session Demographic Follow Up

Since the end of the education session four to six weeks ago have you participated in a code on your unit?
(Please circle to correct response below)

Yes No

Appendix D: General Self-Efficacy Instrument

Directions: This is a questionnaire designed to determine how confident you are that you can perform each of the following behaviors. Read each behavior and then circle the number to the right of the behavior to indicate how confident you are that you can perform the behavior. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer which seems it describe how you generally feel. Your answers are confidential.

Not at All Confident 1	Slightly Confident 2	Moderately Confident 3	Highly Confident 4

1. I can always manage to solve difficult problems if I try hard enough.	1	2	3	4
2. If someone opposes me, I can find the means and ways to get what I want.	1	2	3	4
3. It is easy for me to stick to my aims and accomplish my goals.	1	2	3	4
4. I am confident that I could deal efficiently with unexpected events.	1	2	3	4
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	1	2	3	4
6. I can solve most problems if I invest the necessary effort.	1	2	3	4
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	1	2	3	4
8. When I am confronted with a problem, I can usually find several solutions.	1	2	3	4
9. If I am in trouble, I can usually think of a solution.	1	2	3	4
10. I can usually handle whatever comes my way.	1	2	3	4

Appendix E: Permission to Use and Modify GSE

From: Ralf Schwarzer [health@zedat.fu-berlin.de]
Sent: Tuesday, December 04, 2012 1:26 AM
To: Kelly, Kimberly M.; health@zedat.fu-berlin.de
Subject: Re: General Self-Efficacy Scale

you are welcome, see attachment (below)

You do not need our explicit permission to utilize the scale in your research studies. We hereby grant you permission to use and reproduce the General Self-Efficacy Scale for your study, given that appropriate recognition of the source of the scale is made in the write-up of your study.

The main source is: Schwarzer, R., & Jerusalem, M. **(1995)**. Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, *Measures in health psychology: A user's portfolio. Causal and control beliefs* (pp. 35-37). Windsor, England: NFER-NELSON.

At 09:22 04.12.2012, Kelly, Kimberly M. wrote:
Dr. Schwarzer,

I am writing to ask your permission to use and adapt your General Self-Efficacy Scale in my proposed dissertation research study. I am in the early phases of developing my study on the impact simulation has on the self-efficacy of experienced medical-surgical nurses in managing cardiac emergencies on the hospital unit. I am currently enrolled in a PhD nursing program at The University of Texas Medical Branch in Galveston, Texas. Credit will be given to you and as well as Dr. Jerusalem.

If you have any questions, please do not hesitate to let me know.

Thank you for your time and consideration.

Sincerely,
Kimberly Kelly, MSEd, BSN, RN-BC
Clinical Nurse Educator
Memorial Hermann Southeast Hospital
281-507-1515
kmkelly@utmb.edu< mailto:kmkelly@utmb.edu >< mailto:kmkelly@utmb.edu>
kimberly.kelly@memorialhermann.org< mailto:kimberly.kelly@memorialhermann.org >< mailto:kimberly.kelly@memorialhermann.org>
****
Prof. Dr. Ralf Schwarzer, Freie Universität Berlin, Psychologie,
Habelschwerdter Allee 45, 14195 Berlin, Germany, FAX +49(30)838-55634
Office JK 25/114 E-mail: ralf.schwarzer@fu-berlin.de
Personal Web: http://www.RalfSchwarzer.de/
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Appendix F: Research Flier

Research Study

Simulation's Effect on Education and Confidence

Needed

Medical-Surgical Nurses

You are invited to participate in a research study exploring the effect simulation has on the self-efficacy (self-confidence) of medical-surgical nurses in managing cardiac emergencies. This study is being conducted by Kimberly M. Kelly MSEd, BSN, RN-BC; PhD student at the University of Texas Medical Branch (UTMB). The study involves a 90 minute cardiac management education session/simulation conducted during your current education session and completing survey documents related to the cardiac education session and its impact on your confidence in managing a cardiac emergency.

If you are a medical-surgical nurse working on 1A, 1B, 2 A, 2BC, or 3B and you would like more information about participating please contact:

Kim Kelly at 281-507-1515

or

Kim_Kelly1975@yahoo.com

Appendix G: Research Consent Form

RESEARCH CONSENT FORM

You are being asked to participate as a subject in the research project entitled, Simulation and its impact on the self-efficacy of the medical/surgical nurse in managing code situations, under the direction of Kimberly Kelly MSEd, BSN, RN-BC, Nursing PhD student at the University of Texas Medical Branch (UTMB).

PURPOSE OF THE STUDY

The purpose of this study is to explore the impact that simulation has on medical-surgical nurses' self-efficacy in managing a cardiac emergency. The study includes exploring the effect a cardiac code management simulation has on the self-efficacy of medical-surgical nurses in responding to a cardiac code management emergency compared to medical-surgical nurses who do not participate in the cardiac code management simulation.
You are being asked to participate in this study because you are a practicing medical/surgical nurse working on a defined medical/surgical unit within the hospital of study.

PROCEDURES RELATED ONLY TO THE RESEARCH

The procedure for data collection for this research study will consist of data collection at three time points and will include administering a demographic data sheet, the Modified Self-Efficacy (MSE) scale, and the Participation in Code Events Post Training data sheet. The MSE scale and demographic data sheet will be administered at T1 prior to the start of the education on code management. The MSE scale will be completed at T2 immediately following the education on cardiac code management. The MSE scale and Participation in Code Events Post Training data sheet will be administered to subjects at T3 approximately four to six weeks after the education has been completed. Subjects will register for the education session that fits their work schedule and they will then be randomly assigned to either the control or experimental/treatment education sessions.

RISKS OF PARTICIPATION

The potential risks of participation in the study are loss of anonymity and confidentiality. Survey is the primary mode of data collection for the study. Personal identifiers and other identifying information will be removed to help ensure confidentiality as well as reporting data in aggregate form.

NUMBER OF SUBJECTS PARTICIPATING AND THE DURATION OF YOUR PARTICIPATION

The anticipated number of subjects involved in the study will be approximately 110 practicing medical-surgical nurses. The total length of time for your participation is approximately two and a half hours over four to six weeks depending on the time it takes to complete the required surveys. The initial surveys completed at T1; the Demographic Data Sheet and the MSE scale, will take approximately 30 minutes to complete prior to the start of the education session. The code management education will last approximately one hour and twenty minutes. The surveys completed at T2, the MSE scale, and T3, the MSE scale and Participation in Code Events Post Training data sheet, will take approximately twenty minutes to complete immediately after the education session and four to six weeks after the education session respectively.

BENEFITS TO THE SUBJECT

You will not benefit from your participation in the research project.

BENEFITS TO SOCIETY

The contribution of the proposed research is expected to be a beginning understanding of the impact simulation has on the self-efficacy of experienced medical/surgical nurses in managing a cardiac code management situation. Such results are expected to have a positive impact on in-hospital nursing education by providing research to validate the use of simulation in hospital-based nursing education.

WITHDRAWAL FROM THE STUDY

Participation is voluntary; refusal to participate will involve no penalty or loss of benefits to which you are otherwise entitled. You may discontinue participation at any time without penalty or loss of benefits to which you are otherwise entitled.

REIMBURSEMENT FOR EXPENSES

There will be no reimbursement for participation in this study.

COMPENSATION FOR RESEARCH RELATED INJURY

Compensation for an injury resulting from your participation in this research is not available from the University of Texas Medical Branch at Galveston. You, or your insurance company or health care plan, will be billed and you will be responsible for any charges.

You will be responsible for paying any costs related to illnesses and medical events not associated with being in this study. There are no plans to provide other forms of compensation. However, you are not waiving any of your legal rights by participating in this study. Questions about compensation may be directed to the study investigator.

USE AND DISCLOSURE OF YOUR HEALTH INFORMATION

Information from the survey instruments used in this study; Modified Self-Efficacy (MSE) scale and the demographic survey is being collected because you are in the study. Due to the anonymous nature of the study no information from questionnaires will be included in any medical records. The study data may be reviewed in order to meet federal or state regulations. Authorization continues for review of the data until the end of the research. The results, in the form of group statistics, may be published in scientific journals.

ADDITIONAL INFORMATION

1. If you have any questions, concerns or complaints before, during or after the research study you should immediately contact Kimberly Kelly at 281-507-1515.
2. Your participation in this study is completely voluntary and you have been told that you may refuse to participate or stop your participation in this project at any time without penalty or loss of benefits and without jeopardizing your medical care at UTMB. If you decide to stop your participation in this project and revoke your authorization for the use and disclosure of your health information, UTMB may continue to use and disclose your health information in some instances. This would include any health information that was used or disclosed prior to your decision to stop participation and needed in order to maintain the integrity of the research study. If there are significant new findings or we get any information that might change your mind about participating, we will give you the information and allow you to reconsider whether or not to continue.
3. If you have any complaints, concerns, input or questions regarding your rights as a subject participating in this research study or you would like more information, you may contact the Institutional Review Board Office, at (409) 266-9475.

The purpose of this research study, procedures to be followed, risks and benefits have been explained to you. You have been allowed to ask questions and your questions have been answered to your satisfaction. You have been told who to contact if you have additional questions. You have read this consent form and voluntarily agree to participate as a subject in this study. You are free to withdraw your consent, including your authorization for the use and disclosure of your health information, at any time. You may withdraw your consent by notifying Kimberly Kelly at 281-507-1515. You will be given a copy of the consent form you have signed.

Informed consent is required of all persons in this project. Whether or not you provide a signed informed consent for this research study will have no effect on your current or future relationship with UTMB.

Signature of Subject	Date
Date	Signature of Person Obtaining Consent

Appendix H: Education Session Lecture Outline (15 Minutes)

I. Introduction
    a. Background on the number of in-hospital cardiac arrests (IHCA) per year
    b. First responders
    c. Medical-Surgical nurses confidence at managing cardiac emergencies and codes
    d. Barriers to confidence

II. Signs and Symptoms
    a. What does a cardiac emergency look like?
    b. Assessment
    c. Do they have pain?
        i. Onset
        ii. Where
        iii. Duration
        iv. Intensity
        v. Alleviate
        vi. History
    d. What do the vital signs tell us?
        i. Heart rate (high or low)
        ii. Oxygen level
            1. Do they need oxygen?
        iii. Respiratory Rate
    e. Labs?
        i. Enzymes
        ii. Electrolyte
    f. EKG
        i. What am I looking for?
    g. Help?
        i. When is it time to call the MD/RRT/Code

III. It is a code, now what?
    a. How do you get help?
    b. What do you need?
        i. Help
        ii. Responsiveness? Pulse?
        iii. Crash cart
        iv. Backboard
        v. Pads
        vi. Patient Position
    c. Who brings what?
        i. PCA
        ii. Nurse

iii. Charge Nurse

d. Who does what?

i. Compressions

ii. Ventilations

iii. Documentation

iv. AED / Life Pack

v. Managing the crash cart

vi. Intubation supplies

vii. Medications

IV. Code Team Arrives

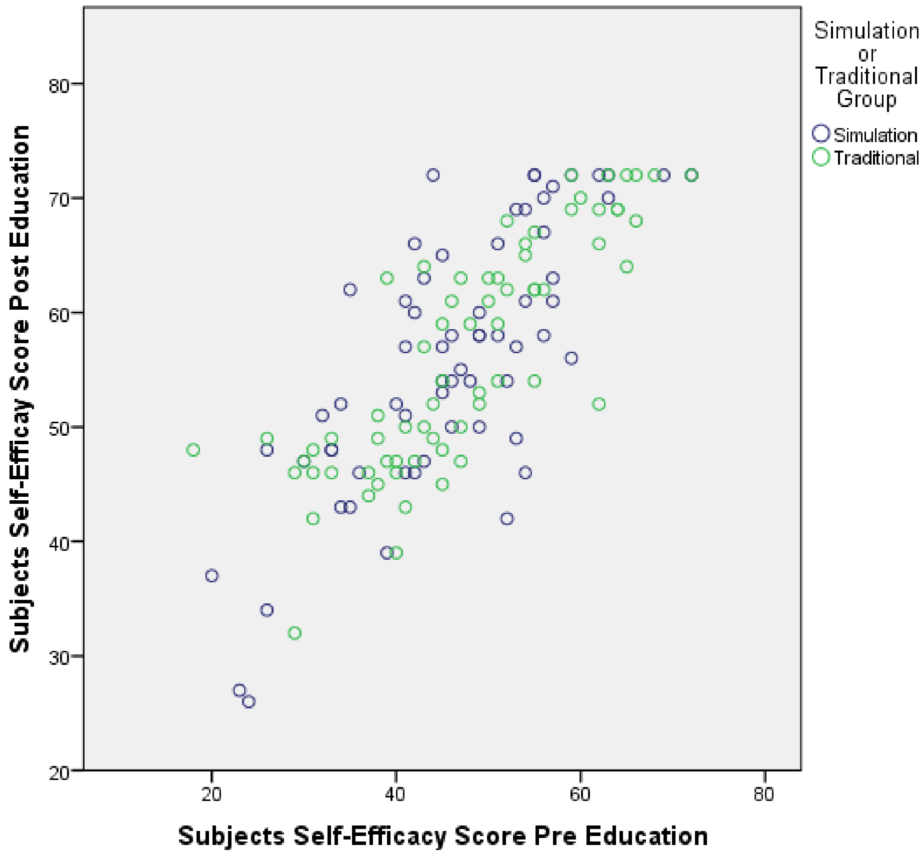
a. Your role?

b. Their role?

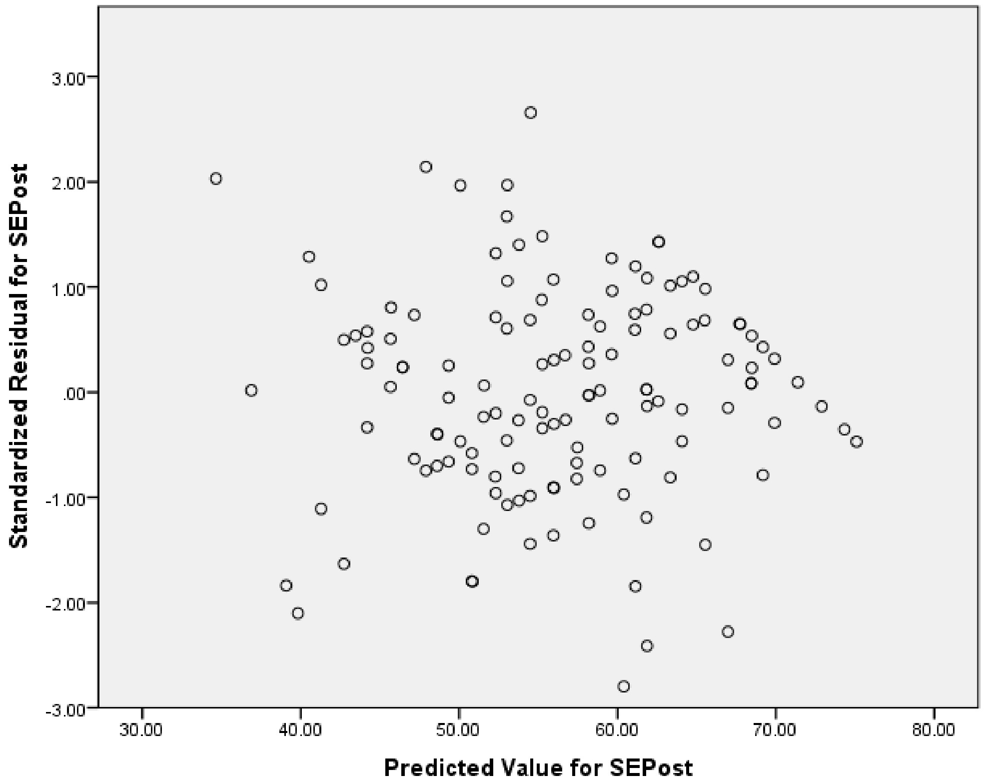
V. Debriefing

VI. How do we learn to feel more confident?

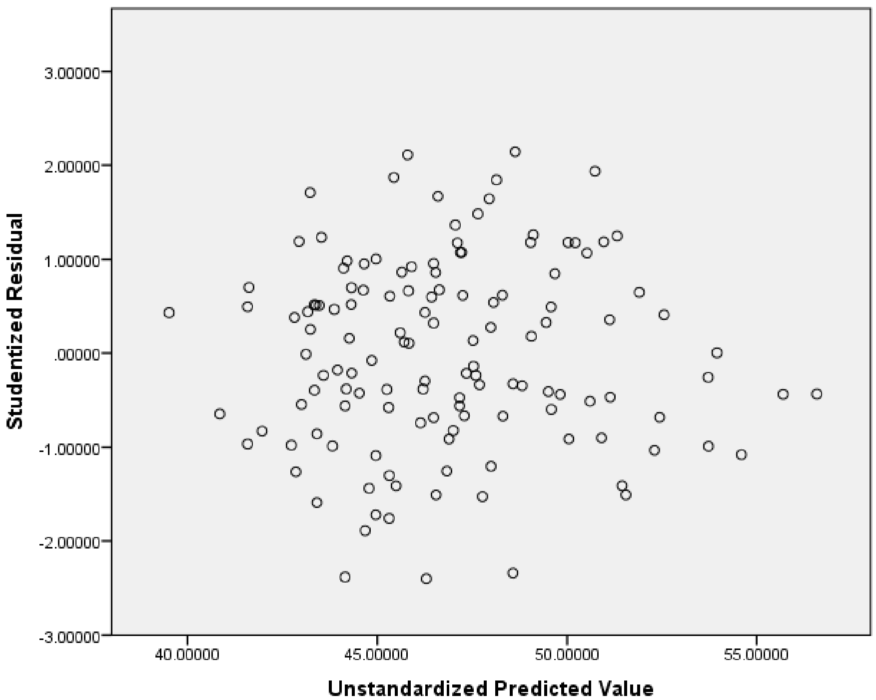
Appendix I: Scatterplot Assumption of Linearity



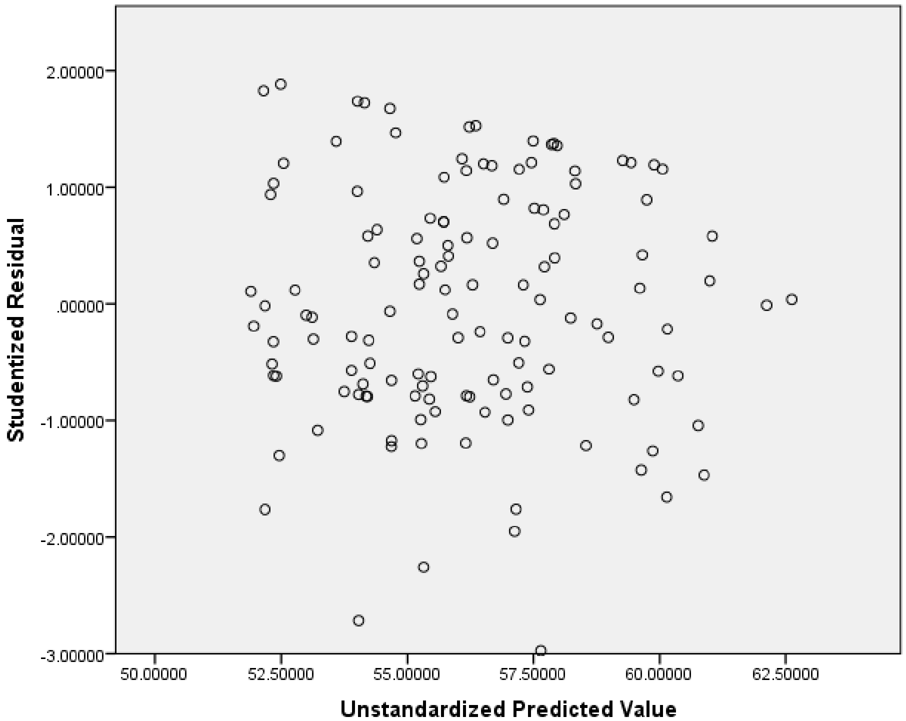
Appendix J: Scatterplot Assumption of Homoscedasticity



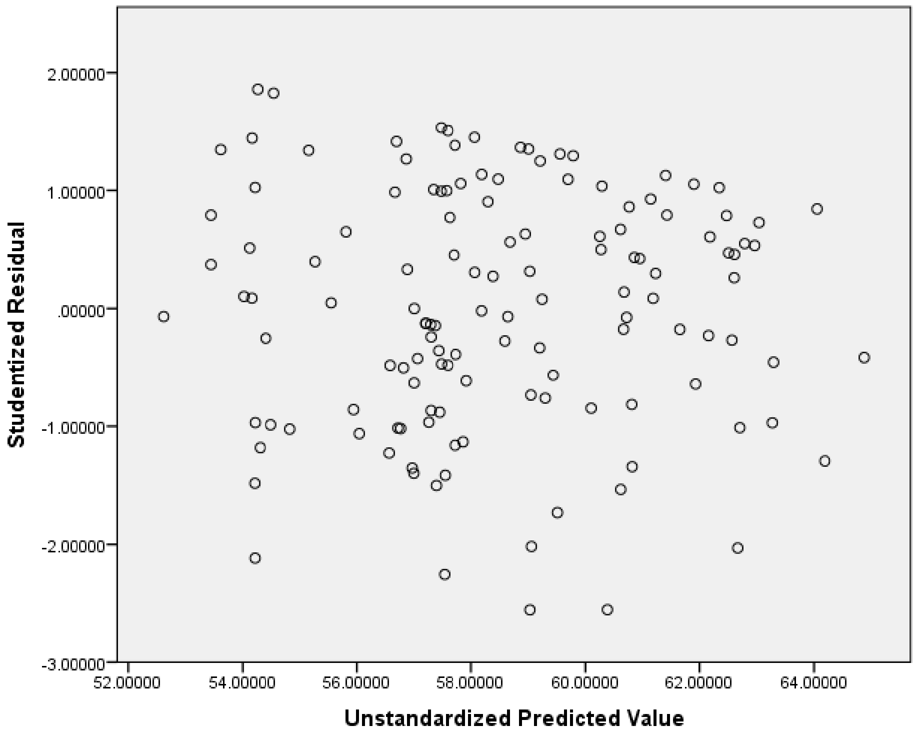
Appendix K: Scatterplot at T1 for Linear Relationship



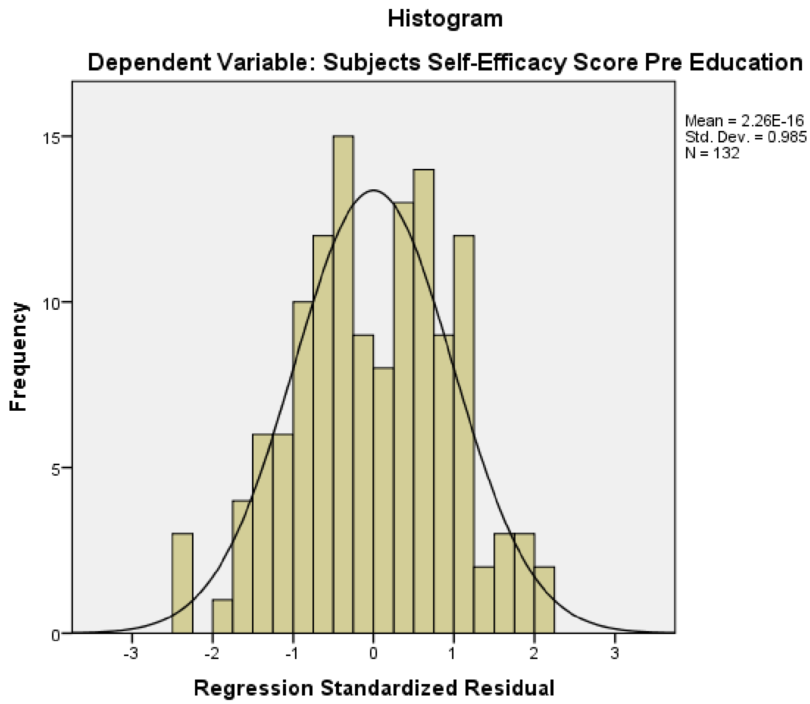
Appendix L: Scatterplot at T2 for Linear Relationship

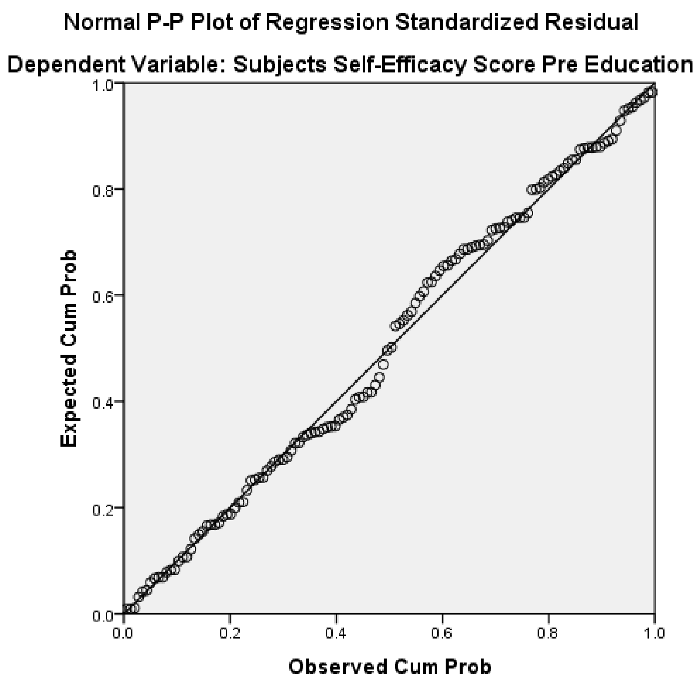


Appendix M: Scatterplot at T3 for Linear Relationship

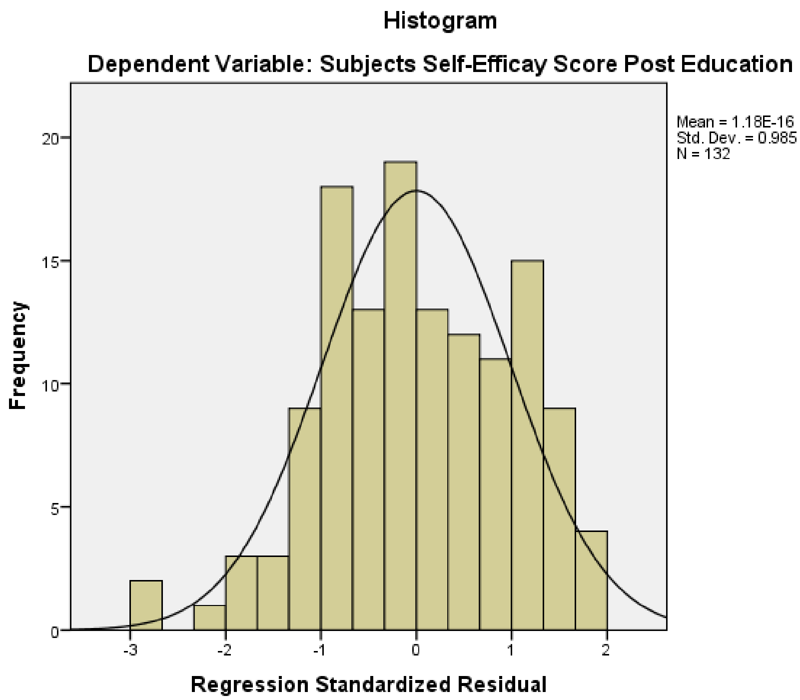


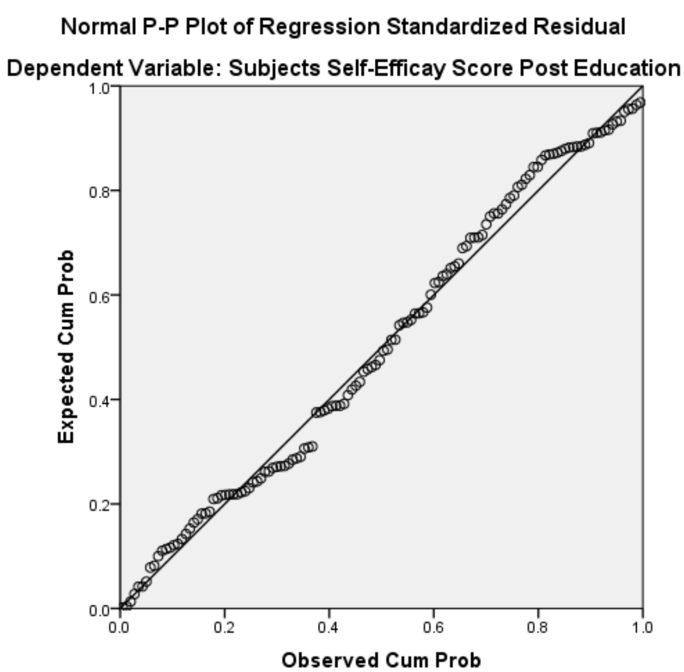
Appendix N: Histogram and P-Plot for T1



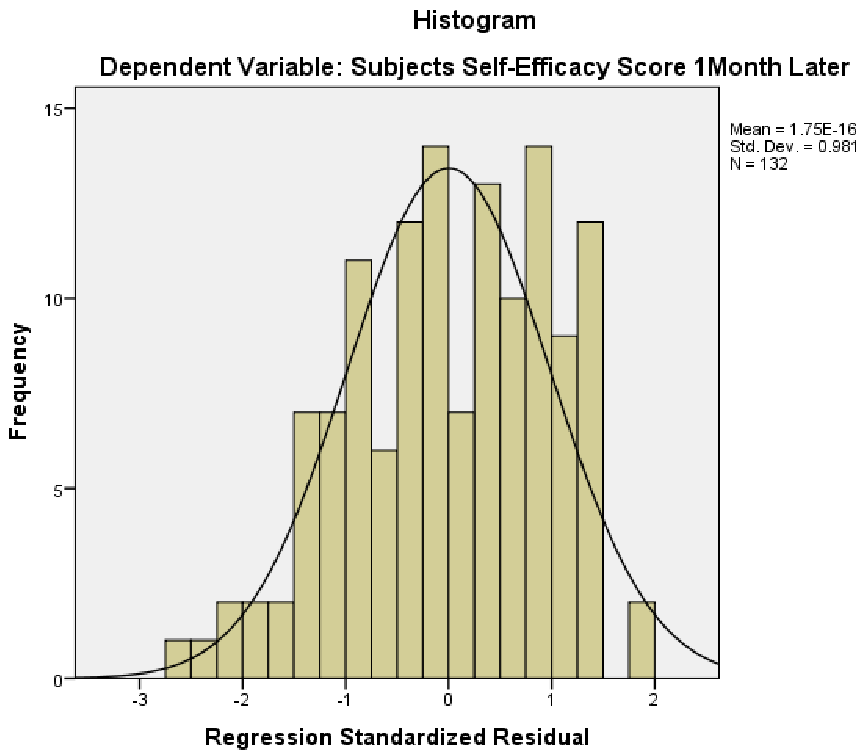


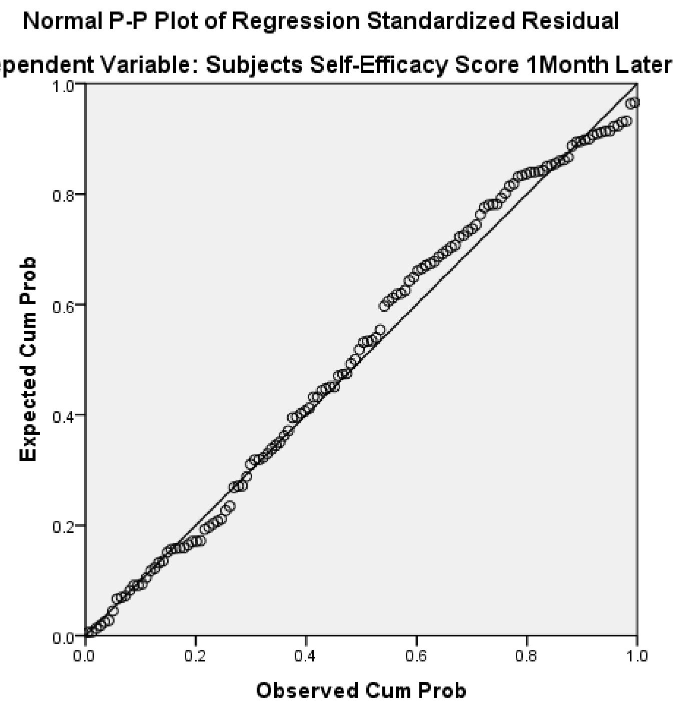
Appendix O: Histogram and P-Plot for T2





Appendix P: Histogram and P-Plot for T3





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