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Incorporating Simulation into Advanced Cardiac Life Support

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Incorporating Simulation into Advanced Cardiac Life Support

by

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Abstract

The knowledge and practical skills of the Basic Life Support (BLS) and the Advanced Cardiac Life Support (ACLS) are among the most important determining factors of the cardiopulmonary resuscitation (CPR) success rates. Every year there are millions of healthcare workers that dread coming to ACLS class for fear of failure of the written exam or the mega code. Many of these participants haven't participated in a code situation since they left class the previous two years. Participants sit in class for two days listening to lectures and going through practice mega codes to prepare them for the final mega code. Manikins used are low fidelity and are not life like. There has always been the question of how much of the information they receive is retained when they walk out the door and how confident are the participants of being able to initiate ACLS protocol in a real life situation. The purpose of this study was to examine if adding Human Patient Simulation (HPS) to ACLS class will increase the confidence level of participants, improve grades on course posttest and improve performance on the final mega code. The two instructional methods that were used were the traditional classroom style and an interactive approach using HPS. The study showed no significant difference in the pre and posttest score, the pre and post self-assessment scores, or the mega code performance on either instructional method. However, the HPS group had an increase in their self-assessment post scores.

Keywords: Advanced Cardiac Life Support, Human Patient Simulation, confidence, instructional methods

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CHAPTER I

Introduction

The theoretical knowledge and practical skills of the Basic Life Support (BLS) and the Advanced Cardiac Life Support (ACLS) are among the most important determining factors of the cardiopulmonary resuscitation (CPR) success rates. Each year one and a half million healthcare professionals around the world attend either an ACLS Provider course or an ACLS Renewal Course (Perkins et al., 2012). The mere thoughts of having to come to this class, take a test, and perform during a mega code successfully increases the participant's anxiety level significantly. Many of these participants may not get the chance to participate in a real life cardiac event and if they do, they are terrified. Currently participants sit in class for two days listening to lectures and going through practice stations to prepare them for the actual mega code. Manikins used are not realistic or life like. There has always been a question of how much of this ACLS class is actually retained once they walk out of the door.

Significance

Patient safety and outcomes is a major concern of all healthcare providers. Many providers have voiced how they feel unprepared for a real life resuscitation event in the clinical setting. The end result should always be improved patient outcomes. Advanced life support provider skills have been shown to deteriorate when assessed at three to six months and seven to 12 months (Advanced Cardiovascular Life Support Instructors Manual, 2010).

Simulation is defined by the National Council of State Boards of Nursing (NCSBN) as, "activities that mimic the reality of a clinical environment and are designed

to demonstrate procedures, decision-making and critical thinking through techniques such as role playing and the use of devices such as interactive mannequins" (NCSBN, 2012). Patient simulation is emerging as a valuable adjunct to traditional training methods and competence assessment. It has particular application in training responses to high-risk, low-frequency clinical events, of which a typical example is in-hospital cardiac arrest (Mayo, Hackney, Mueck, Ribaudo, & Schneider, 2004). There is limited data incorporating simulation into ACLS. This paper will attempt to show if there is a difference in outcome when simulation is included in ACLS training compared to when simulation is not included as in the traditional setting while applying Kolb and Kolb model of experiential learning.

Problem Statement

The research problem was; the average student that completed ACLS is not prepared for a real life resuscitation event. The retention of skills drastically goes down when the students leave class and goes down even further two weeks after class. Patient outcomes suffer when the student has to perform in the clinical setting, they don't know what to do. The traditional ACLS class is not fully preparing the student to perform at their highest level and feel confident about what they have learned. Practicing ACLS in a real life situation is neither in the best interest of the patient nor the student. Mistakes can be made that are critical to patient outcomes. There is room for improvement in enhancing retention of skills and increasing the confidence levels of students. Students are not able to associate a real life event when using a half body manikin that has no blood pressure, no pulse, and no life like symptoms.

Purpose

The purpose of this study was to examine if adding Human Patient Simulation (HPS) to Advanced Cardiac Life Support (ACLS) class would increase the confidence level of participants, improve grades on course posttest and improve performance on the final mega code. The goal of this study was also to achieve higher participant satisfaction and higher level of confidence in ability to perform in a real world situation. In addition, it would also provide positive reinforcement for participant to initiate ACLS in the clinical setting and enhance quality of care.

Theoretical Framework

The theoretical framework that was applied to my research was the experiential learning theory by Kolb and Kolb. Experiential learning theory draws on the work of prominent 20th century scholars who gave experience a central role in their theories of human learning and development, notably John Dewey, Kurt Lewin, Jean Piaget, William James, Carl Jung, Paulo Freire, Carl Rogers and others, to develop a holistic model of the experiential learning process and a multilinear model of adult development (Kolb & Kolb, 2005). Kolb's Experiential Learning Theory works on two levels, grasping and transforming experiences-establishing the framework for four distinct learning styles that are based on the four-mode learning cycle. In experiential theory, learning is considered to be a continuous process in which knowledge is created by transforming experience into existing cognitive frameworks, thus changing the way a person thinks and behaves (Sewchuk, 2005). The experiential learning cycle begins with a concrete experience that is incorporated through reflective observation. The learner then gains further insight into the experience through abstract conceptualization, which is

incorporated through active experimentation. By facilitating the movement of learners through this cycle, an educator can use a variety of teaching methods to successfully appeal to the four learning styles (Turesky & Gallagher, 2011).

The four different learning styles are accommodating, diverging, converging, and assimilating. Accommodating learners are those who learn through apprehension and active, hands-on experimentation. Diverging learners also learn by apprehension; however they internalize by reflection. Converging learners learn by comprehension, considering abstract ideas separate from the actual experience. Assimilating learners are those who learn by comprehension, but internalize the learning (Lisko & Odell, 2010).

Although most learners showed a preference for one learning style over others, they should be encouraged to learn using a variety of means to enrich the learning experience. The four learning styles are based on a four-stage learning cycle that includes concrete experience, reflection, abstract conceptualization, and active experimentation. Concrete experience provides the basis for learning. The learner actually has the experience either in real life or in a simulation manner. Reflective observation is when the learner reflects or contemplates on the actions done. The learner makes sense of the experience. Abstract conceptualization is developing reasoning as to why it happened and to understand the situation. Active experimentation is developing solutions from the concepts learned and applying them. Conceptual-Theoretical-Empirical (CTE) diagram illustrates the key components that make up Kolb and Kolb theoretical framework.

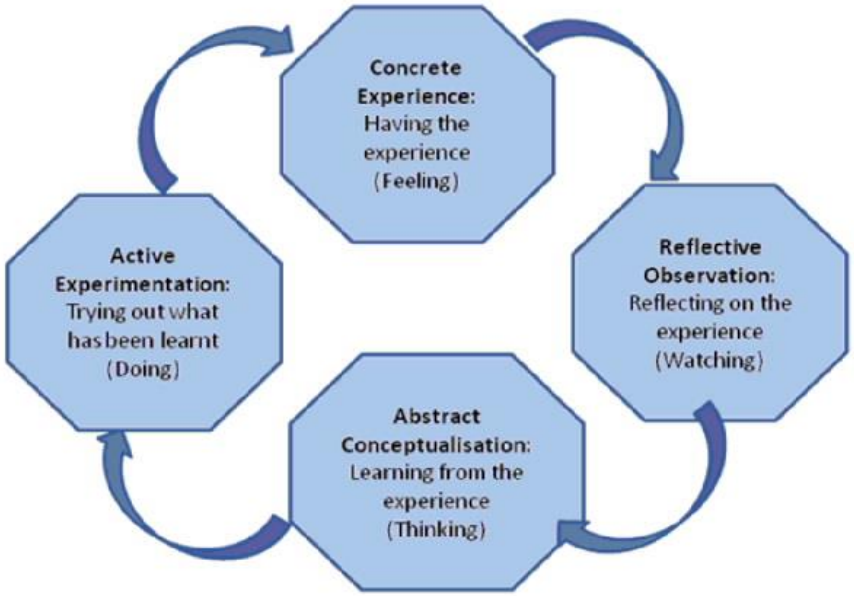

Figure 1. CTE Diagram of Experiential Learning Theory

Research Question

Which instructional method, Human Patient Simulator (HPS) or traditional classroom with utilization of low fidelity simulation, will increase self-confidence, improve course posttest grades, and improve performance of mega code testing in Advanced Cardiac Life Support (ACLS)?

Definition of terms

The aim of this study was to compare the outcome of participants who had simulation incorporated into their ACLS class versus those that had the traditional classroom ACLS.

Gaba, 2007 defines simulation as a "technique, not a technology, to replace or amplify real experiences with guided experiences, often immersive in nature, that evoke or replicate substantial aspects of the real world in a fully interactive fashion" (Gaba, 2007, p. 127). He further describes a simulator as a "device" that mimics a real patient or a part of the human body, and that is capable of interaction with the learner (Gaba, 2007).

Traditional classroom lecture and human patient simulation were used to evaluate the outcomes of the ACLS class.

CHAPTER II

Research Based Evidence

Review of Literature

Research is emerging that supports the use of HPS as a teaching tool in nursing. Simulation is being used increasingly in nursing to help students develop confidence and competence in safe contexts. Healthcare centers are increasingly becoming dependent on using innovative ways to deliver instruction. The use of simulation for teaching clinical skills and decision making will complement practical clinical experiences. A review of the research was performed from 2005 to present using EBSCO Host, ProQuest, and CINAHL. The following concepts were used to gather scholarly articles: simulation, advanced life support training, education, competence, and confidence. The articles found on the use of simulation and ACLS were very limited.

The study done by Fisher et al. (2011) included 19 Maternal-Fetal Medicine (MFM) staff that participated in a maternal arrest simulation program which consisted of pre intervention, intervention, and post intervention maternal cardiac arrest simulations. The purpose of this study was to determine the impact of simulation-based maternal cardiac arrest training on performance, knowledge, and confidence among MFM staff. Before simulation, each provider was oriented to the simulation set up and equipment. The intervention was developed after initial pre intervention simulations identified deficiencies demonstrated by the participants. The multiple choice test, administered immediately after each simulation, consisted of nine questions focused on pregnancy-related modifications of cardiac arrest management. An attitudes and confidence survey was administered next, followed by individualized debriefing of trainee performance.

Response to the confidence question "I feel confident in my ability to manage maternal code" was assessed based on a Likert scale from 0 to 7 (strongly disagree being 0 and strongly agree being 7). Wilcoxon rank sum, Mann-Whitney U and Kruskal-Wallis tests were used for analysis. Nineteen MFM staff completed pre intervention simulations, followed by intervention and subsequent post intervention simulations. Six of the providers had 20-30 years of experience since graduating from residency, four had 10-19 years, and nine had less than 10 years. Eleven (58%) of MFM staff had participated in a maternal resuscitation in the past. Post intervention median scores demonstrated statistically significant improvement in maternal, critical care and total performance as well as knowledge and confidence scores when compared with pre intervention median scores (Fisher et al., 2011).

Gordon and Buckley (2009) examined the effect of simulation on medical-surgical graduate nurses' perceived ability and confidence in responding to patient clinical emergencies. This was a descriptive study and involved 50 medical surgical graduate nurses. Students attended live lectures, engaged in team building exercises, and participated in workshops based on technical skills related to emergency management. Only 16% of them had received advanced life support skills training, however, none had previously participated in high-fidelity immersive simulation. Students were asked before and after simulation to complete a questionnaire to rate their perceived ability and confidence. Students reported a high level of confidence in being able to respond to clinical emergencies and improved technical skills. Students also reported improved confidence in functioning as the team leader until more trained help arrived (Gordon & Buckley, 2009).

Smith and Roehrs (2009) used a descriptive correlational design to examine factors correlated with two outcomes of a high-fidelity simulation experience. The study consisted of 68 junior students in the traditional baccalaureate nursing program enrolled in their first medical/surgical course. During the first seven weeks, all students attended a 56 hour skills laboratory. Students completed the simulation experience during the ninth and tenth weeks of the course. The study revealed overall the students had a higher level of confidence but also there were a significant amount of variations (Smith & Roehrs, 2009).

Lucktar-Flude, Wilson-Keates, and Larocque (2012) evaluated high fidelity human simulators and standardized patients in an undergraduate nursing health assessment course. A convenience sample of 44 participants was recruited from 89 nursing students enrolled in a second-year undergraduate nursing health assessment course and randomly assigned to one of three learning modalities. Participants were assigned to community volunteers (CV), high-fidelity human simulator (HFS), and standardized patients (SP). Study participants were somewhat confident performing health assessment skills with each learning modality. There was a significant difference for the item related to feeling more prepared for clinical, with the HFS group reporting significantly less self-efficacy than participants in the CV and SP groups. Students reported greater self-efficacy with interviewing abilities than physical examination skills across the three modalities. Self-efficacy scores did not differ significantly among the three groups. Although HFS participants reported significantly less self-efficacy feeling prepared for clinical, they still rated this modality highly and agreed HFS helped them to feel better prepared. Higher performance scores with HFS may be due to reduced learner

anxiety, allowing students to focus on performing psychomotor techniques (Lucktar-Flude et al., 2012).

Ballangrud, Persenius, Hedelin, and Hall-Lord (2014) explored intensive care nurses' team performance in a simulation-based emergency situation: expert raters' assessments versus self-assessment. This was an explorative design based on laboratory high-fidelity simulation that involved 53 registered nurses who participated in a videotaped simulation based cardiac arrest setting. They were divided into two groups. One group was from a general intensive care unit and the other group was from a medical intensive care unit. The expert raters used the Ottawa Crisis Resource Management Global Rating Scale and the Mayo High Performance Teamwork Scale for the team's performance. The registered nurses used the first part of the Mayo High Performance Teamwork Scale for their self-assessments. Neither team was assessed as being superior. Both team's crisis management skills required some moderate improvement. There were significant differences found between the expert raters and the RN's self-assessment of their team's performance. The RN's rated themselves higher than the expert raters (Ballangrud et al., 2014).

Williams (2011) completed a literature review in relation to Advanced Life Support (ALS) training and certification for critical care nurses. The European resuscitation council 2010 guidelines stated that the aim of educational interventions in resuscitation should be to "ensure that learners acquire and retain the skills and knowledge that will enable them to act correctly in actual cardiac arrests and improve patient outcomes". The International Liaison Committee on Resuscitation (ILCOR) recommendations in regard to training health professionals in advanced skills included

that training should move away from large lecture based courses to small group scenario based interactive teaching targeted at specific learning populations and the experiences they might encounter in their practice. A more specific study comparing traditional and simulation based ACLS training for resident medical officers was performed in relation to leading the cardiac arrest team. The researcher found that the simulation group more closely adhered to the recognized ACLS protocols although there was no difference in patient survival between the two groups and as such it is unclear if the educational intervention was superior. The literature review revealed that while participants pre-course to post course ACLS knowledge increased, there was no significant difference in participant knowledge between low and high fidelity simulation. Much of the learning for both the low and high fidelity group occurred in the debriefing session that followed the simulation (Williams, 2011).

Boet et al. (2014) conducted a systematic review to gain a better understanding of the impact of simulation-based crisis resource management (CRM) teaching on transfer of learning to the workplace and subsequent changes in patient outcomes. Eight studies used a combination of didactic and simulation training approaches in teaching CRM principles, and one study used simulated mock codes. In terms of transfer of learning to the workplace, all included studies but one (with $P = 0.07$) found a significant effectiveness of simulation-enhanced CRM training, including when compared with didactic teaching alone. In terms of patient outcomes, all included studies found at least some improved patient outcomes after simulation CRM training, including when compared with didactic teaching alone. Only one study found that simulation CRM training had a clearly significant impact on mortality of in-hospital pediatric cardiac

arrest, where survival rates increased from 33% to 50 % within one year (Boet et al., 2014).

Roh, Lee, and Chung (2013) examined the effects of simulation-based resuscitation training on nurses' self-efficacy and satisfaction. In this study, the researchers evaluated self-efficacy and satisfaction by two different training modalities, computer-based simulation versus mannequin-based simulation. Thirty-eight participants were randomly assigned to the two different training modalities. The evaluation of self-efficacy and satisfaction was rated by a Likert scale. The results showed no significant difference between the two different modalities (Roh et al., 2013).

The Joint Commission identified communication breakdown as the root cause for most sentinel events. Banks and Trull (2012) gave an example of a possible sentinel event at their tertiary care hospital: A long delay in the use of automated external defibrillators (AEDs) during a cardiopulmonary arrest in which they referred to as a "code blue". It was identified that a need existed to improve the use of AEDs as a strategy to improve patient outcomes. To improve communication and decrease time to first defibrillation during a code blue, a process improvement strategy was implemented. Through informal interviews with direct care nurses revealed they had difficulty setting priorities during a code blue, teams had difficulty working together efficiently during a code, and many nursing staff observed that the first responders didn't use an AED soon enough or not at all. Nurses raised concern that this delay could be contributing to a poor survival rate for patients who arrest in the hospital. A review of the literature validated their concerns. One article published in The New England Journal of Medicine concluded that "delayed defibrillation is common and is associated with lower rates of

survival after in-hospital cardiac arrest" (Banks & Trull, 2012, p. 60). To be able to teach the entire nursing staff it was decided to educate self-selected "code blue champions". The goal was to efficiently and appropriately manage resuscitation efforts while awaiting the arrival of the official code team, rather than to teach the ACLS course. The class started with a power point presentation, demonstration of emergency equipment, a focus on providing high-quality (BLS), and followed by assisting with ACLS interventions. A delineation of responder roles was done and each student practiced first, second and third responder roles. A static manikin, AED, and bag-valve mask was used. The next part of the class took place in the simulation lab where realistic scenarios were presented. They had to arrive with the crash cart/AED and use the AED effectively. Nurses have been engaged in this program without mandates from management. Sixty-eight code blue champions have been educated, and 22 of the 40 hospital units are providing mock codes. During the eight month period of this initiative, 214 patients experienced cardiopulmonary arrest. Of these patients, 74% immediately survived with return of spontaneous circulation, compared with a national registry threshold survival rate of 44%. Of all the patients who arrested, 33% survived to hospital discharge, compared with a national benchmark survival rate of 17% (Banks & Trull, 2012).

Brannan, White, and Bezanson (2008) studied the effects of simulation on cognitive skills and confidence levels of student nurses with caring for patients who suffer acute myocardial infarctions (AMI). This study compared traditional lecture and HPS method, teaching strategies, and the effects on self-efficacy of nursing students. This study used a total of 107 baccalaureate nursing students in their junior year. The researchers developed a questionnaire to use to evaluate their cognitive skills before and

after the education on AMI. The results of this study suggested that using HPS method with teaching made a positive difference in the nursing students cognitive skills but found no significant difference in confidence levels by using HPS method (Brannon et al., 2008).

The British Heart Foundation funded a three year research study by Alinier, Hunt, and Gordon (2004) to investigate how beneficial it is for nursing students to be trained in a simulated specialist ward environment using an intermediate fidelity simulation platform and scenario-based training sessions. Students were invited to take part in this project on a voluntary basis. Informed consent was obtained from those that volunteered. Consecutive cohorts of students were assessed and reassessed after six months using an Objective Structured Clinical Examination (OSCE). Students were randomly divided into a control group and experimental group for the period intervening between the two examinations. The experimental group was exposed to simulation training while the other students followed their usual nursing courses. There were three sessions organized: the "First OSCE session", the "Simulation session", and the "Second OSCE". The first OSCE was used to determine the initial skills level of the students and included 15 stations they rotate through. After this station they were split into groups. During the Simulation session the students are adequately briefed and prepared for the simulation and are advised to act as "qualified nurses" to care for the patient simulator. At the start of the second OSCE the students were asked to fill out a questionnaire which included their demographic details. The second OSCE session was identical to the first except that in the second, students are given immediate feedback. By comparing the results obtained from the first OSCE with those of the second OSCE, it is possible to

determine whether or not students from the experimental group have improved their sills to a greater extent than those from the control group. A total of 101 students took part in the study but only 67 students (66.3%) actually attended all sessions required. This was 38 students from the control group and 29 students from the experimental group. Statistical analysis of the results showed that the two groups had respectively improved their score by 6.76% and 13.43% for the second OSCE. This supported the conclusion that simulation training has enabled students from the experimental group to improve their skills and knowledge to a greater extent than those from the control group. An independent sample *t*-test of the individual students' OSCE scores showed that the difference in improvement between the two groups was highly significant ($p<0.05$) (Alinier et al., 2004).

White, Brannan, Long, and Kruszka (2013) compared traditional classroom method versus the use of human patient simulators on cognitive skills and confidence levels of nursing students. The researchers also discussed how nurse educators were feeling the pressure of having to be responsible for the new graduates ability to perform task that required critical thinking skills. This was an experimental design study on senior nursing students which compared confidence and cognitive skills. The groups were randomly assigned to either the high-fidelity simulator method or traditional classroom lecture. The results showed that "neither cognitive skills nor confidence levels were significantly enhanced by the use of high-fidelity simulation" (White et al., 2013, pg. 417). The research revealed that a combination of both classroom lecture and high-fidelity simulator methods as teaching strategies is recommended (White et al., 2013).

Currey, Considine, and Allen (2014) examined learner perceptions and reflections after simulation-based advanced life support training. This was a qualitative, grounded theory research study that consisted of 17 physicians and nurses. The authors concluded that while the simulation based course resulted in a high degree of efficiency in applying the theoretical and practical components of ALS in the training setting, the content of the course was insufficient in developing the communication and teamwork skills necessary for transferring these skills and knowledge to the clinical setting. Participants in this study described a lack of confidence in their own practice and skills in emergency situations that may have related to their clinical background or exposure to resuscitation (Currey et al., 2014).

Mould, White, and Gallagher (2011) evaluated a critical care simulation series for undergraduate nursing students. The purpose of this study was to assess self-reported confidence and competence using scenario-based simulations. A pre-test post-test design was used to test the simulation with completing self-report surveys at the beginning and end of the semester during which the simulation series was conducted. This study demonstrated that a series of simulated scenarios was effective in improving undergraduate students' self-perceived confidence and competence in critical care (Mould et al., 2011).

Lewis and Ciak (2011) investigated the effectiveness of a simulation lab experience for nursing students in a quasi-experimental design. Sixty-three students enrolled in an obstetrical and pediatric course participated in a one day simulation lab. A pretest/posttest was used to measure changes in knowledge in the cognitive domain. Students were asked to complete a 20 question pretest to assess baseline knowledge and

following simulation based learning they were asked to complete the same test. A 13 item Student Satisfaction and Self Confidence in Learning tool was used to assess student satisfaction with simulation as an educational strategy and how confident students felt about applying skills learned in the lab to the clinical setting. A significant gain in knowledge was found between the pretest and posttest. However, no definitive conclusions were able to be drawn regarding critical thinking and experience in HFS training (Lewis & Ciak, 2011).

Garbee et al. (2013) reported the effectiveness of teamwork and communication education using an interprofessional high-fidelity human patient simulation critical care code. This was a quasi-experimental, pre/post-test design. The 35 participants in this study were drawn from a convenience sample of senior level medical, nursing, nurse anesthesia, and physical therapy students. Students completed two scenario sessions in the Fall and returned for two more sessions in the Spring. In each session the students had a chance to be the lead individual. Instruments used were the Teamwork Assessment Scales, a modified version of the Operating Room Teamwork Assessment Scales and the Communication and Teamwork Skills assessment tool. There were no significant increases in scores from simulation in the Fall to simulation in the Spring (Garbee et al., 2013).

Teamwork has been reported to impact patient outcomes in a variety of clinical situations. Teamwork and leadership training have been shown to improve subsequent resuscitation performance in simulation studies and actual clinical performance. Some manikins utilized in resuscitation training have realistic features such as the ability to replicate chest expansion and breath sounds, to provide exhaled carbon dioxide, to

generate a pulse and blood pressure, and to speak or make sounds. Two studies reported that training with such manikins improved clinical performance. Thirteen studies showed an improvement in end-of-course skills when realistic manikins were used, while six studies showed equal performance with lower technology manikins. Three studies indicated that learner satisfaction was greater with realistic manikins (Bhanji et al., 2010).

Studies have shown poor correlation between written tests used in resuscitation courses and clinical skills evaluations. Assessment used as an instructional tool at the end of resuscitation training has been shown to improve retention of skills at two weeks and showed a trend toward improvement at six months. Further research is needed to confirm if such technology improves resuscitation performance in the clinical setting and to determine if it can improve survival from cardiac arrest (Bhanji et al., 2010).

A study by Williams and Chong (2010) explored how the use of high fidelity simulation increased nurse's assessment skills in managing a deteriorating patient. This qualitative research pilot program was implemented using nine participants. Nurses were educated in methods of how to recognize deterioration and participated in a series of high fidelity scenarios. Evaluations from the sessions showed staff satisfaction in feeling better prepared to manage emergency situations and increased confidence in their abilities (Williams & Chong, 2010).

Mariani, Cantrell, Meakim and Jenkinson (2015) used a nonexperimental pretest-posttest design to determine whether senior-level undergraduate nursing students' perceptions and comfort level regarding safety principles and practices increased after participating in a safety-focused simulation-based experience. The sample was composed of 175 senior-level undergraduate students enrolled in a nursing leadership and

management course. Prior to the simulation and didactic sessions, participants completed a three part survey where they were asked to rate the level of agreement about statements related to errors and safety in healthcare, comfort level in reporting errors, and how well they felt their facility addressed patient safety. The same survey was completed at the end of the simulation and didactic sessions. Berndt (2014) reported that when simulation was used as an educational strategy to teach patient safety competencies in prelicensure nursing, simulation was reported to be as effective as other interactive educational interactive interventions and more effective than traditional lecture alone. The findings of this study demonstrated an increase in students' comfort level relating to reporting patient safety and supported the use of simulations as a strategy for teaching quality and safety (Mariani et al., 2015).

Strengths and Limitations of Literature

The studies that were completed described some of the various ways simulation was used to enhance learning. The population included nurses, nursing students and residents. The results may have been different if they had an even number of males versus females, the age range was the same, or if it had been done specifically for ACLS. Several of the articles incorporated the use of Kolb and Kolb's (2005) experiential learning theory. All of the studies discussed in the literature review on the use of human patient simulators and comparing with traditional lecture were able to quantitatively report an increase in confidence, growth in communication skills, and a positive learning experience by their participants. There was only one study involving ACLS. There were many studies noted that involved simulation and critical thinking and simulation and self-

confidence. This study compared the outcomes of traditional lecture versus HPS when ACLS was incorporated.

This study contributed to the information that simulation prepares a person for the real life clinical setting more than the traditional classroom setting. Using a human patient simulation manikin will increase confidence level, improve critical thinking, and increase retention of life saving skills learned in an ACLS course.

CHAPTER III

Methodology

Maximizing survival from cardiac arrest requires improvement in resuscitation education and the implementation of systems that support the delivery of high-quality resuscitation and post arrest, including mechanisms to systematically evaluate resuscitation performance. The intention of ACLS certification has been to improve the chances of survival for patients suffering in and out of hospital cardiac arrest. ACLS certification has become a requirement for most critical care nurses. Nurses come to ACLS class feeling very unconfident about passing this course. Despite they have taken it several times, their confidence level of being successful is absent. There is substantial evidence that Basic and Advanced Life Support (ALS) skills decay rapidly after initial training. The purpose of this study was to explore which instructional method, HPS or traditional classroom lecture would increase self-confidence, improve course posttest grades, and improve performance of mega code testing in ACLS. Confidence level was measured using a pre/post participant self-assessment evaluation that was administered to every participating student for the HPS group and the traditional classroom lecture group. A pre/posttest was taken by every student to measure change in test score for HPS versus traditional classroom. Each student was also evaluated on the mega code using the mega code performance checklist.

Design

The study design was a quantitative pretest-posttest; with a pre/post course self - assessment design. The study examined the effects of the instructional methods, traditional classroom, or human patient simulator, on how nurses and physicians perceive

their level of self-confidence in performing a mega code scenario and knowledge base. The study also compared pretest scores versus posttest scores for both the HPS and the traditional lecture group. Before any surveys were distributed, the primary investigator informed the subjects of the purpose, method, and confidentiality of the study. Prior to each group undergoing the designated instructional method of learning, the participants completed a demographic sheet and turned in their pretest scores. Demographic data was collected on all the subjects. The demographic data included: age in years, race, gender, highest level of nursing degree, unit of employment, length of time as a nurse, and previous code involvement. A copy of the demographic sheet can be found in Appendix A. Participant self-assessment post-course evaluation included the same data questions as the participant self-assessment pre-course evaluation with one additional question on which instructional method was used for their ACLS class. The participant self-assessment pre-course sheet can be found in Appendix B. The participant self-assessment post-course sheet can be found in Appendix C. Participants were encouraged to answer all questions and not include any names or other identifying information on the demographic sheet or the pre or post self-assessment.

Setting

The study took place at a 540 bed acute care hospital. The hospital system is a designated Magnet facility, Chest Pain Accredited, and Stroke Certified center. The traditional classroom group and the human patient simulation (HPS) group started out together in one auditorium for introduction of the course and instructions. The traditional classroom group using the lecture style was held in a classroom in the hospital. The lecture class utilized an educational PowerPoint and video for training purposes. Group

two, HPS class, was held in the Simulation Center's scenario rooms located also within the hospital. The study was conducted over four days using two different ACLS classes. All participants were required to be able to speak and comprehend the English language. Participants of any ethnicity, gender, race, or socioeconomic status was allowed to participate in this study. Recruitment for this study was done on a voluntary basis with the survey given out upon registration of the ACLS course. If the participant chose not to take part in the survey or fail to return the survey tools, they were excluded from the study.

Sample

The study consisted of a convenience sampling of 36 first time participants taking the ACLS course. The inclusion criteria was only first time participants taking ACLS that do not work in a critical care area but are healthcare providers that work in other areas. Any person registered taking ACLS for the first time and meeting the above criteria was eligible to participate in the study. The subjects were invited to participate in the study by the primary investigator at the beginning of each ACLS course as they were signing in. During this time, the primary investigator asked the participant to remove their name from the pretest with scissors and distributed the study information sheet which included a description of the study, purpose, method of research, and confidentiality information on the study. The subjects who volunteered to participate were then given the demographic sheet and participant pre-course self-assessment evaluation. They were also given a numbered envelope and a three by five index card with their study number on it. The subjects were asked to put their demographic sheet and participant pre-course self-assessment evaluation in the numbered envelope and give to

the instructor at the registration table. They were asked to keep the card with their number on it as this is how they would be identified for the next two days. At the end of class on day two, the primary investigator asked the participants to complete a participant post-course self-assessment evaluation along with their written exam. The subjects received contact information for the primary investigator in case any concerns or questions arose during the study. All subjects were informed that they were free to decline to participate in the study at any point.

Data Collection

All data collection was completed by the primary investigator. The data and information collected identified if simulation made a difference in the outcomes of ACLS written test score, knowledge of intervention in a cardiac arrest situation, confidence in initiating ACLS in a real life emergency situation and successful mega code completion. The percentage of participation was reported along with the results. The mega code performance score sheet was completed by the ACLS Instructor during the final mega code. Upon completion of all other requirements of the ACLS course, the student was given the ACLS written exam. Once the written exam was complete, they received the self-assessment post course evaluation and were asked to fill it out and drop it off in a sealed envelope upon leaving the class. Data was collected over the course of four days in July of 2015. Results of study data was completed by July 10, 2015 and reported. The benefit of this study far outweighed the cost to participants. There was no cost incurred by participants, only time taken to fill out the surveys.

Right to privacy was upheld and all information obtained in relevance to the study remained confidential to the extent permitted by law. Along with the primary

investigator, others who reviewed the data information were as follows: statistician, members of the participating facility Nursing Research sub-committee, and members of the Institutional Review Board. The primary investigator held one class in which traditional classroom lecture and instructor led discussions was used as the educational method and one class in which the HPS was used as the educational method. Participants completed a self-assessment pre-course evaluation indicating their confidence level prior to designated educational method ACLS class as well as a demographic sheet and an ACLS pretest. Upon completion of day two, the participants completed the post course self-assessment survey indicating which instructional method they participated in, and a posttest written exam. The data was comprised of both the pre and post written exam and the pre and post self-assessment evaluation for each participant who volunteered to participate in the study. All demographic sheets and surveys remained anonymous by containing no personal information on either.

Methods of Measurement including Instrument

One of the measurement instruments that was used for this study was a scale type of measurement related to knowledge, post intervention performance, and confidence level. The subjects were given a 10 item self-assessment questionnaire with a given Likert scale pre course and post course. The scale was based on one to seven with one being not competent and seven being highly competent. The instrument was adapted from the Dissertation completed by Dr. David L. Rodgers on "The Effect of High Fidelity Manikin-Based Human Patient Simulation on Educational outcomes in ACLS courses". Permission for use of this self-assessment scale was granted by Dr. David L. Rodgers and is found in Appendix D. Using this type of measurement gave a more direct

measurement of subjective variables. The mega code scoring sheet with checklist was also used as an instrument and can be found in Appendix E. The other measurement instruments were a 60 item pretest and a 50 item posttest. Due to confidentiality of the American Heart Association (AHA) ACLS tests, they will not be available in the appendix. Permission from AHA to use these test can be found in Appendix F. The survey was interpreted and reported using the JMP Statistical Analysis program. The final results of the study determined if changes were made to the traditional ACLS class. Completed demographic sheet and participant self-assessment pre-course evaluation by the participants will serve as the implied consent.

Methods of Analysis

The primary investigator collected all data for the study at the end once all envelopes were sealed. The course director received data at the beginning of the class in order to keep data anonymous. Data was analyzed based on the survey results of both pre-course and post course self-assessment evaluations and the pre and post written test in comparison with the designated instructional method. Once all data results of the survey were reported, the researcher performed a statistical analysis on the Likert scale results using the JMP analysis. The statistical tests completed were descriptive statistics to determine mean, median, and standard deviation of pre and post survey, overall scores and the difference in the pre and post survey results. Data analysis included the comparison of the pre and post self-assessment survey results which produced the effects of each instructional method on the ACLS participant's confidence level of performing ACLS in a real emergency situation. The change of the self-assessment score from pre

course to post course was evaluated. The research analysis was done at the beginning of July and completed by July 10, 2015.

Protection of Human Subjects

Prior to any data collection, the primary investigator obtained approval from the Institutional Review Board (IRB) of the healthcare system where the study was conducted and the approval from the University IRB. The primary investigator also completed the required Collaborative IRB Training Initiative (CITI) course. Participants were not exposed to any risks or benefits during the conduction of the research. Letters of informed consent detailing the purpose, risks, benefits, and voluntary completion of the questionnaire were given. Subjects were protected throughout the implementation and dissemination of results by the concealment of identifying demographic and personal information. Data was collected in a secure and safe learning environment. The primary investigator remained prepared to address any adverse events that may have occurred during the study, although the study posed very minimal risk to the participants.

Summary

Our role as educators is to give students what they need to succeed. This includes helping them achieve the confidence to be successful. Learning is a process by which all the correct steps should be followed and all the senses should be involved. Learning is a holistic process of adaptation to the world around us. Just like technology changes in the workplace, learning strategies change also and as educators we must keep up with the change in learning styles and techniques. Educators play a valuable role indirectly to patient outcomes by way of preparing the people that take care of those patients. All healthcare providers should strive to make patient outcomes be a journey to excellence.

Final results of this study will be published so that simulation can be used throughout hospital systems for all education, increase the confidence level of nurses having to initiate emergency care and improve patient outcomes.

CHAPTER IV

Results

Sample Characteristics

The final sample size for this study was 36 participants. It consisted of 18 nurses, 16 residents, one physician assistant, and one physician. There were 16 students in the traditional classroom group and 20 students in the HPS group. All students present consented to being in the research study. None of the participants withdrew from the study during the two day timeframe between the participant self-assessment pre-course and the self-assessment post-course. Upon analyzing the data, it was noted all responses were filled in on the self-assessment and the demographic sheet. Descriptive statistics of the sample were categorized by the demographic information to include age in years, years of healthcare experience, gender, specific profession, specific unit of employment, and previous code involvement. As shown by Table 1, the majority of students were female (24) and 12 male. Various age groups were represented. Only three of the students were between the ages of 21-25 with the largest group, 16, being in the 26-30 age groups and nine in the 31-35 age range. The 36-40 age group had only one, the 41-45 had three, and the 46-50, 51-55, 61-65, and71-75 all had one student each. Nineteen of the students had less than four years of healthcare experience while 17 of them had greater than four years of experience. The demographic information obtained also included unit of employment which varied from medical-surgical, oncology, labor and delivery, bariatric, and interventional radiology with a mixture of Family Medicine, Transitional, and Surgery residents. In regards to the previous code involvement, 27 students reported yes and only nine had no code involvement.

Table 1

Sample Demographics

Sample Demographics		Number of Participants
	Age 21 - 25	3
	Age 26 – 30	16
	Age 31 – 35	9
	Age 36 – 40	1
	Age 41 – 45	3
	Age 46 – 50	1
	Age 51 – 55	1
	Age 61 – 65	1
	Age 71 – 75	1
	Female	24
	Male	36
	Residents	16
	Physician	1
	Physician Assistant	1
	Registered Nurse	18
Years of Experience:	0 – 1	6
	2 – 4	13
	>4	17
Previous Code Involvement:		
	Yes	27
	No	9

Major Findings

The hypothesis being tested was those participants incorporating HPS in their ACLS class as compared to the traditional classroom ACLS would have an increased confidence level, an improvement of post course written exam grades and improved performance on the mega code. After each ACLS class was completed using either HPS or traditional classroom lecture and all survey tools returned, data analysis begun. First the change in participant pre and post self-assessment scores were determined as noted in Figure 2. This illustrates how many points the self-assessment score changed from pre course to post course for the HPS group and the traditional classroom group. The p value of $p<0.05$ was used to determine if the data was statistically significant. The p value = 0.5955. This revealed the data was not statistically significant. A Chi-square ordinal data points test was used to obtain this value.

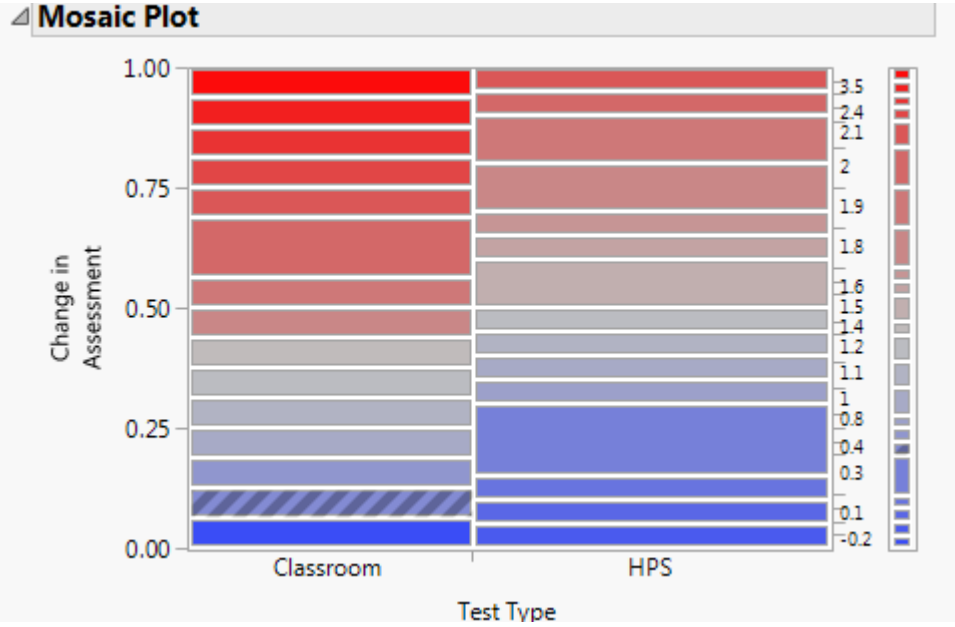

Figure 2. Changes in Pre to Post Self-Assessment Scores per Test Type

However, the HPS group faired slightly better on their post course self-assessment with a mean of 6.76 compared to a mean of 6.71 for the classroom group. A score of one means not competent/no confidence and a score of seven means highly competent/high confidence. Figure 3 identifies the descriptive statistics for the post self-assessment for both groups.

Post Self Assessment Classroom	
Mean	6.7125
Standard Error	0.07
Median	6.75
Standard Deviation	0.27
Minimum	6.3
Maximum	7
Count	16

Post Self Assessment HPS	
Mean	6.76
Standard Error	0.08
Median	7
Standard Deviation	0.34
Minimum	6
Maximum	7
Count	20

Figure 3. Descriptive Statistics for Post Course Self-Assessment Score per Test Type

Next an analysis for pre and post test scores for classroom and HPS was determined. A Wilcoxon/Kruskall-Wallis test was used to determine the p value of the classroom versus HPS for the pre and post test scores. The p value of $p<0.05$ was used to determine if the results were significant. The p value was 0.7739 which means the data was not statistically significant.

The post test score by HPS versus classroom was also compared. Although there was no statistical significance with the pre and post test scores, the classroom group according to the mean score of 93.25 did slighlty better than the HPS group with a mean score of 92.4. Expected score was 100. Figure 4 identifies the descriptive statistics for the post test for the HPS group and the classroom group.

Post Test Score Classroom	
Mean	93.25
Standard Error	1.22
Median	94
Standard Deviation	4.9
Minimum	84
Maximum	100
Count	16

Post Test Score HPS	
Mean	92.4
Standard Error	1.16
Median	94
Mode	94
Standard Deviation	5.17
Minimum	84
Maximum	100
Count	20

Figure 4. Descriptive Statistics for Post Test by Test Type – Classroom vs. HPS

Table 2 gives a detailed overview each participant's method of class, pre and post test score, change in test score from pre course to post course, pre and post self-assessment with one being not competent/confident and 7 being highly competent/highly confident, and change in the pre course self-assessment score to the post course self-assessment score.

Table 2

Pre Survey to Post Survey Change by Participant

	Test Type	Pre Test Score	Post Test Score	Change of Test Score	Pre Self-Assessment	Post Self-Assessment	Change in Assessment
Participant 1	Classroom	90	98	8	4.9	6.8	1.9
Participant 6	Classroom	95	100	5	4.9	7	2.1
Participant 7	Classroom	90	98	8	5	7	2
Participant 8	Classroom	90	92	2	5.2	7	1.8
Participant 9	Classroom	95	100	5	3.1	6.7	3.6
Participant 13	Classroom	92	96	4	4	6.4	2.4
Participant 17	Classroom	93	94	1	5.6	6.8	1.2
Participant 18	Classroom	85	90	5	6.6	7	0.4
Participant 20	Classroom	97	94	-3	3.5	6.3	2.8
Participant 21	Classroom	93	86	-7	6.5	6.3	-0.2
Participant 23	Classroom	95	92	-3	5.7	6.7	1
Participant 26	Classroom	92	92	0	5.6	6.7	1.1
Participant 27	Classroom	88	94	6	3.1	6.6	3.5
Participant 34	Classroom	92	86	-6	4.8	6.8	2
Participant 35	Classroom	88	96	8	4.9	6.3	1.4
Participant 36	Classroom	85	84	-1	6.3	7	0.7
Participant 2	HPS	97	94	-3	5.2	7	1.8
Participant 3	HPS	87	94	7	4.8	6.7	1.9
Participant 4	HPS	100	98	-2	5.4	7	1.6
Participant 5	HPS	90	100	10	4.9	6.6	1.7
Participant 10	HPS	85	84	-1	4.8	6.3	1.5
Participant 11	HPS	87	96	9	5.9	6.9	1
Participant 12	HPS	88	98	10	4.5	6	1.5
Participant 14	HPS	97	94	-3	4.9	6.1	1.2
Participant 15	HPS	87	92	5	5.2	7	1.8
Participant 16	HPS	92	98	6	4.4	6.5	2.1
Participant 19	HPS	93	88	-5	5.9	7	1.1
Participant 22	HPS	98	84	-14	6.7	7	0.3
Participant 24	HPS	88	94	6	4.9	6.8	1.9
Participant 25	HPS	82	92	10	6.7	7	0.3
Participant 28	HPS	87	96	9	5	7	2
Participant 29	HPS	90	84	-6	7	7	0
Participant 30	HPS	90	96	6	6.8	7	0.2
Participant 31	HPS	97	92	-5	6.9	7	0.1
Participant 32	HPS	97	84	-13	6	6.3	0.3
Participant 33	HPS	87	90	3	6.2	7	0.8

The mega code scoring sheet was used to compare class types. As illustrated in Figure 5, there was a significant difference in the performance of the HPS group versus that of the classroom group. The classroom group scored better on their Mega code performance score sheet with a median score of 6.86 compared to the HPS groups median score of 6.47 .

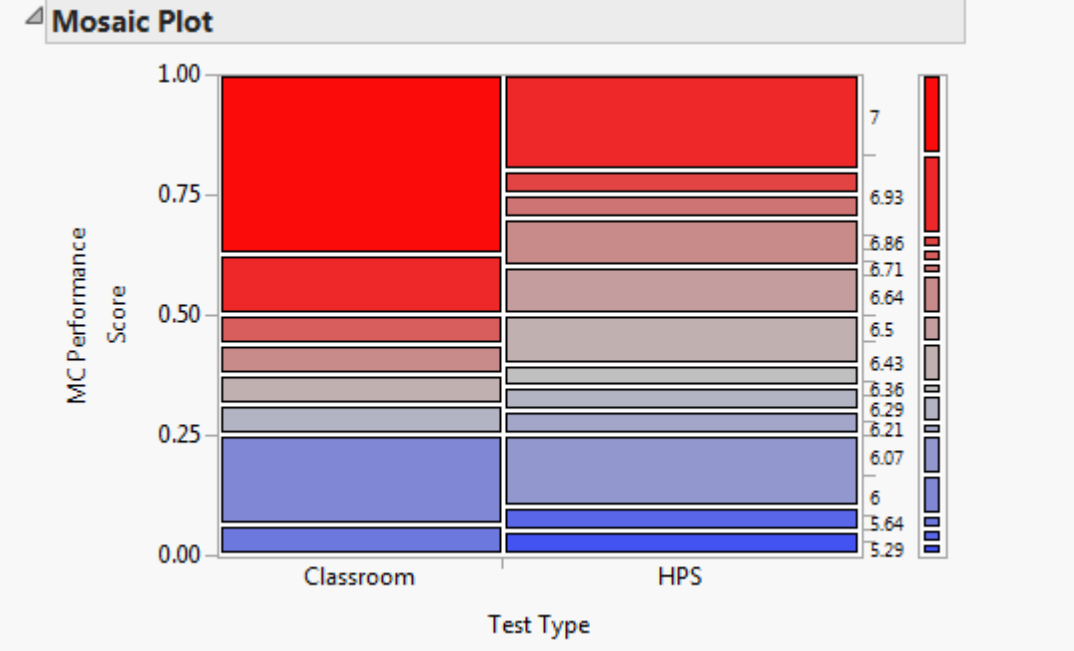

Figure 5. Mega Code Performance Score Sheet by Test Type – Classroom vs. HPS

The p value of $p<0.05$ was used to determine if the results were significant. The data was close to being statistically significant at p Value=.0805. There was a significant difference of the scores of the two groups but not enough to be statistically significant. Figure 6 details the descriptive statistics for the mega code performance scoring sheet and illustrates the comparison.

MegaCode Scoring for Classroom	
Mean	6.6
Standard Error	0.12
Median	6.9
Standard Deviation	0.47
Minimum	5.64
Maximum	7
Count	16

MC HPS	
Mean	6.4
Standard Error	0.1
Median	6.47
Standard Deviation	0.5
Minimum	5.29
Maximum	6.93
Count	20

Figure 6. Descriptive Statistics for Mega Code Performance Score Sheet

The level of significance was set at $p<0.05$ for this study. All p values were above this number. This study showed their was no statistical difference between incorporating simulation into ACLS compared to ACLS in the traditional classroom setting.

Summary

Although data collected from the "Incorporating Simulation into ACLS" study did not show statistical significance, it will be used to improve the style in which current classes are conducted. However there was a slight improvement in participant self-assessment post course scores of those who participated in the HPS group. This showed that simulation had some positive effects on the confidence levels of students taking an ACLS course. The classroom group did better on the post test.

CHAPTER V

Discussion

Implication of Findings

Based on the findings of this research study, there was no significant difference between post test scores or post self-assessment scores based on the instructional method. The students did not have a mega code prior to the final mega code so there wasn't any data to compare it to. However, the students in the HPS group had slightly higher scores on their post self-assessment. High fidelity manikin based patient simulation is an expensive resource. Finding the most appropriate areas to utilize this technology is important for Directors of education and instructors. Healthcare workers need the confidence to initiate the protocols of ACLS in the real world. Using HPS may not improve their test scores in ACLS but it can improve their teamwork, improve critical thinking skills, and provide a realistic, safe environment to learn in. As the results showed whether students are participating in the traditional classroom ACLS or the HPS ACLS, it will give them the tools they need to be a successful deliverer of emergency care.

Although the overall study results showed there was no statistical difference between the pre and post test scores or the pre and post self-assessment scores, the fact that the post self-assessment scores improve with the HPS group means they felt more confident after taking the ACLS course. That is a positive for the hospital and the healthcare profession. In order to improve quality of care to our patients, they must be armed with the necessary knowledge, tools and self-confidence to be prepared to handle an Advanced Life Support emergency whenever it arises.

ACLS Instructors can use the results from this study to improve the way they conduct their courses and make each learning experience as realistic as possible. ACLS Instructors can now include more simulation into their planning in hopes of increasing the self-confidence of its students. Traditional classroom lecture can still be used effectively also. Traditional classroom lecture can provide ACLS participants with the knowledge they need to provide emergency care and HPS can provide application of that knowledge. It is a win-win situation. Application of the knowledge is just as important as the knowledge itself. HPS can enhance the learning experience by providing students with realistic patient scenarios in a safe learning environment.

Application of Theoretical/Conceptual Framework

The theoretical framework on which this study is based on is that of Kolb and Kolb's Theory of Experiential Learning. Kolb's Theory on Experiential Learning is based on four learning cycles that begin with a concrete experience. The learner has an experience either in the real world or a simulated one. The next phase is to reflect upon that experience through reflective observation. The learner contemplates the actions done with the concepts presented in class in a safe environment. This is followed by abstract conceptualization where the learner develops reasoning and uses logic for why the experience happened. The last phase is active experimentation where the learner applies the concepts learned. According to Kolb, all stages of the cycle must be experienced for learning to be effective. Kolb's Theory of Experiential Learning was applied to this study with the goal of comparing which instructional method would increase self-confidence, increase posttest grades, and improve mega code performance. This study found no significance with either instructional method. However, the HPS group had an

increase in their self-assessment post course scores compared to the traditional group but just not enough to make it significant. Having the students practice on the HPS increased their confidence level, improved their teamwork skills and improved their assessment skills.

Limitations

Exploring the advantages of incorporating simulation into ACLS was the purpose of this study. Hoping to also answer the question of which instructional method, traditional classroom or HPS will increase the confidence level of participants, improve grades on course posttest, and improve performance on the final mega code. Although this study resulted in no statistical difference found between course posttest grades, mega code performance and the instructional method, there was a slight increase in the confidence level although no statistical significance was noted. This gain in confidence level was definitely a noted positive outcome. There were several limitations in this study to discuss.

One of the requirements to attend the ACLS class by the facility was that you have a minimum score of 84% on the ACLS pre-course self-assessment. It can be taken as many times as needed to achieve that score of 84. This was a limitation and could have skewed the results. The small sample size of 36 who participated (20 in the traditional classroom and 16 in the HPS group) was also a limitation. In addition to the ACLS pre-course score and small sample size, lack of variability in gender could also have been a potential limitation. There were 12 males and 24 females. Another limitation may have been the ACLS instructors in the HPS group weren't as familiar with conducting ACLS in the simulation lab as they are in the traditional classroom. The fact

that only six of the participants had less than a year of experience could have been a limitation. There were 13 that had two to four years' experience and 17 had greater than four years' experience. The participants were not graded on a mega code prior to taking the final mega code. If this was done, there may have been more data to answer the research question.

Implications to Nursing

Kolb's Theory of Experiential Learning is very important to nursing because it places the learner in direct contact with the realities being studied. In this theory, one of the learning cycles is concrete experience. Concrete experience is important because: it contains much of the information we need for understanding, because it produces images for our brains to analyze, rearrange, manipulate, and turn into action (Congdon, Gantt, & Campbell, 2009). An individual's concrete experience, reflecting on that experience, conceptualizing that experience, and applying active experimentation supports Kolb's theory on continuous learning.

As shown a little in this study, human patient simulation offered an important alternative to traditional learning and a means to facilitate development of critical thinking abilities. Simulation is used widely in undergraduate education and other areas of healthcare education. Giving learners the didactic information and then allowing them to apply that information through active experimentation in a risk-free environment will increase their confidence level, improve their critical thinking skills, and will allow them to retain more information as they walk out of the classroom into the real world.

Recommendations

Due to the noted limitations of gender variability, small sample size, minimum score requirement on pretest, and instructor inexperience with simulation, there were noted recommendations needed. A suggestion would be to even out the sample with a more even number of males and a more diverse sample including more new nurses. Another suggestion would be for the sample size to be larger. This would give more reliable results and strengthen the results if a larger population was surveyed. The recommendation can be made to conduct the research over a longer period of time to be able to increase sample size. Changing the requirement of having a minimum score of 84% on the ACLS pretest is in order also. Having the participants bring the results of their first test without taking it multiple times to achieve the minimum score would definitely reveal more valid results. Either allow students a block of time prior to class for them to take the ACLS pretest or have them bring a copy of the results of their initial test. Choose the more experienced ACLS Instructors and those that are familiar with using simulation. This will allow for the participants to feel more confident because the instructors will portray a sense of comfort with the instructional method. A mega code at the beginning of class would also be recommended and then compare it to the final mega code. Simulation in healthcare is very important. It is equally important for it to be incorporated into ACLS. Incorporating simulation into the learning experience will help the learner to have that concrete experience and apply critical thinking skills in a safe environment. However there is a need for further research to be conducted on involving simulation into ACLS. More data is needed to validate how using simulation in ACLS

courses will increase self-confidence, improve posttest scores, and improve mega code testing. This will also improve quality of care for patients.

Conclusion

While there was no significance found with the research question of which instructional method would increase self-confidence, increase course posttest grades, and improve mega code testing, there are some relevant conclusions that can be gained from the data. Those that participated in the HPS group scored better on their self-assessment post course. This revealed there are some improvements in self-confidence that can be gained through simulation. The classroom group did better on their posttest. This showed there are still some positive outcomes noted from using the traditional lecture style of teaching. Although the traditional classroom lecture style is the norm, educators are faced with finding alternative ways to prepare learners to face the real world with better critical thinking skills and more self-confidence. The traditional classroom style of teaching does not allow students to learn how to apply the knowledge they have gained. Simulation not only incorporates critical thinking but also enhances teamwork of healthcare providers with diverse backgrounds. HPS is most beneficial when used to apply the knowledge learned in the traditional classroom. Traditional lecture formats create a teacher-centered learning environment that encourages passive learning. The experiential learning cycle place less emphasis on teacher centered learning and focuses more on the learner, the process of learning, and the use of experience in the process (Sewchuk, 2005). Utilizing a mixture of education methods, like traditional classroom lecture and HPS can increase student's confidence in themselves and will greatly affect their performance in a positive way. Although this study resulted in no significant

difference in post test scores, post self-assessment, or improved mega code testing, the confidence levels increased for those who were in the HPS group. This is a positive for those participants, their hospital and the healthcare profession. They will have more confidence in their ability to initiate ACLS protocol which will improve quality of care.

References

Advanced Cardiovascular Life Support Instructors Manual. (2010). Dallas, TX. American Heart Association.

Alinier, G., Hunt, W. B., & Gordon, R. (2004). Determining the value of simulation in nurse education: study design and initial results. *Nurse Education in Practice, 4,* 200-207. http://dx.doi.org/10.1016/s1471-5953 (03)00066-0

Banks, D., & Trull, K. (2012, March). Optimizing patient resuscitation outcomes with simulation. *Nursing, 42*(3), 60-61. http://dx.doi.org/10.1097/01.NURSE.0000411419.36903.65

Ballangrud, R., Persenius, M., Hedelin, B., & Hall-Lord, M. L. (2014). Exploring intensive care nurses' team performance in a simulation-based emergency situation, - expert raters' assessments versus self-assessments: an explorative study. *BMC Nursing,* 13(1), 1-22. doi:10.1186/s12912-014-0047-5

Bhanji, F., Mancini, M. E., Sinz, E., Rodgers, D. L., McNeil, M. A., Hoadley, T. A., & Hazinski, M. F. (2010, November 2). 2010 American Heart Association Guidelines for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care [Supplemental material]. *Circulation, 122*(18), S920-S923.

Boet, S., Bould, D., Fung, L., Qosa, H., Perrier, L., Tavares, W., &… Tricco, A. C. (2014). Transfer of learning and patient outcome in simulated crisis resource management: a systematic review. *Canadian Journal of Anaesthesia= Journal Canadien D'anesthésie,* 61(6), 571-582. doi: 10.1007/s12630-014-0143-8

Brannon, J. D., White, A., & Bezanson, J. L. (2008, November). Simulation effects on cognitive skills and confidence levels. *Journal of Nursing Education, 47*(11), 495-500.

Congdon, T., Gantt, L., & Campbell, R. (2009). Teaching workflow analysis and lean thinking via simulation: a formative evaluation. Perspective Health Information Management.

Currey, J., Considine, J., & Allen, J. (2014). Learner perceptions and reflections after simulation-based advanced life support training. *Australian Critical Care,* 27(2), 103-105

Fisher, N., Eisen, L. A., Bayya, J. V., Dulu, A., Bernstein, P. S., Merkatz, I. R., & Goffman, D. (2011, September). Improved performance of maternal-fetal medicine staff after maternal cardiac arrest simulation-based training. *American Journal of Obstetrics & Gynecology*, 239.e1-5. http://dx.doi.org/10.1016/j.ajog.2011.06.012

Gaba, D. (2007, Summer). The future vision of simulation in healthcare. *Simulation Healthcare*, 2(2), 126-135. Doi: 10.1097/01.SIH.0000258411.38212.32

Garbee, D. D., Paige, J. T., Bonanno, L. S., Rusnak, V. V., Barrierr, K. M., Kozmenko, L. S., … & Nelson, T. K. (2013). Effectiveness of teamwork and communication education using an interprofessional high-fidelity human patient simulation critical care code. Journal of *Nursing Education and Practice,* 3(3), 1. Retrieved from http//ezproxy.gardner-webb.edu/login?url=http://search.proquest.com/docview/1355944216?accountid=11041

Gordon, C., & Buckley, T. (2009). The effect of high-fidelity simulation training on medical-surgical graduate nurses' perceived ability to respond to patient clinical

emergencies. *Journal of Continuing Education in Nursing,* 40(11), 491-500. Doi: 10.3928/0020124-20091023-06

Kolb, A. Y., & Kolb, D. A. (2005). Learning styles and learning spaces: enhancing experiential learning in higher education. *Academy of Management Learning & Education*, *4*(2), 193-212. http://dx.doi.org/10.5465/AMLE.2005.17268566

Lewis, D. Y., & Ciak, A. D. (2011). The impact of a simulation lab experience for nursing students. *Nursing Education Perspectives,* 32(4), 256-258

Lisko, S. & O'Dell, V. (2010). Integration of theory and practice: experiential learning theory and nursing education. *Nursing Education Perspectives,* 31(2), 106-108

Lucktar-Flude, M., Wilson-Keates, B., & Larocque, M. (2012). Evaluating high fidelity human simulators and standardized patients in an undergraduate nursing health assessment course. *Nurse Education Today,* 32(4), 448-452

Mariani, B., Cantrell, M.A., Meakim, C., & Jenkinson, A. (2015). Improving students' safety practice behaviors through a simulation-based learning experience. *The Journal of Nursing Education,* 54(3Suppl.) S35-S38. doi: 10.3928/01484834-20150218-05

Mayo, P. H., Hackney, J. E., Mueck, J. T., Ribaudo, V., & Schneider, R. F. (2004). Achieving house staff competence in emergency airway management: results of a teaching program using a computerized patient simulator. *Critical Care Medicine*, *32*, 2422-2427. http://dx.doi.org/10.1097/01.CCM.0000147768.42813.A2

Mould, J., White, H., & Gallagher, R. (2011). Evaluation of a critical care simulation series for undergraduate nursing students. *Contemporary Nurse: A Journal for the Australian Nursing Profession,* 38(1/2), 180-190. Doi: 10.5172/conu.2011.38.1-2.180

National Council of State Boards of Nursing (NCSBN). (2012). *NCSBN Clinical Instruction in Prelicensure Nursing Programs.* Retrieved from National Council of State Boards of Nursing: https://www.ncsbn.org/index.htm

Perkins, G., Kimani, P., Bullock, I., Clutton-Brock, T., Davies, R., Gale, M., & … Stallard, N. (2012). Improving the efficiency of advanced life support training: a randomized, controlled trial. *Annals of Internal Medicine,* 157(1), 19-28.

Roh, Y. S., Lee, W. S., & Chung, H. S. (2013, February). The effects of simulation-based training on nurses' self-efficacy and satisfaction. *Nurse Education Today, 33*(2), pp. 123-128.

Sewchuk, D. H. (2005). Experiential learning-A theoretical framework for perioperative education. AORN Journal, 81(6), 1311-1318.

Smith, S., & Roehrs, C. (2009). High fidelity simulation: Factors correlated with nursing student satisfaction and self-confidence. *Nursing Education Perspectives*, 30(2), 74-78.

Turesky, E. F., & Gallagher, D. (2011). Know thyself: Coaching for leadership using Kolb's experiential learning theory. *The Coaching Psychologist,* 7(1), 5-14.

White, A., Brannan, J., Long, J., & Kruszka, K. (2013). Comparison of instructional methods: cognitive skills and confidence levels. *Clinical Simulation in Nursing*, pp. 417-423.

Williams, G. & Chong, N. (2010). Managing deterioration through high fidelity simulation. *Australian Nursing Journal,* 18(5), 31-33.

Williams, N. M. (2011). Advanced life support training and assessment: A literature review. *Australasian Emergency Nursing Journal,* 14(4), 240-245. Doi:10.1016/j.aenj.2011.07.001

Appendix A

Demographics Information Tool

Demographic Information

Age: _____ years

Years of healthcare experience:
_____ 0 – 1 years
_____ 2 – 4 years
_____ > 4 years

Race:
_____ Black or African American
_____ White or Caucasian
_____ Hispanic or Latino
_____ Other

Gender:
_____ Male
_____ Female

What is your profession? RN RRT Resident
Other_____

Specific unit of employment_____

Previous code involvement: Yes No

Study #_____

Appendix B

Participant Self-Assessment Pre-course

Instructions: Answer the following questions and circle the number that corresponds to your self-assessment of how you view yourself in regard to these skills.

Scale: **1** – Not competent; 7 – Highly competent

1. I know how to do high-quality CPR	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. I know what roles each person plays in a cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. I know how to attach ECG leads in a cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. I know how to manage an airway.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. I can recognize a lethal rhythm on the cardiac monitor.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. I know how to perform a defibrillation.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. I know what first line medications are used in cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. I know how to follow the ACLS Pulseless Arrest Algorithm.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. I know what to do when the cardiac arrest patient gets a pulse back.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. I am confident in my ability to manage a cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Study #_____

Appendix C

Participant Self-Assessment Post-course

Instructions: Answer the following questions and circle the number that corresponds to your self-assessment of how you view yourself in regard to these skills.

Scale: **1** – Not competent; 7 – Highly competent

1. I know how to do high-quality CPR	**1**	**2**	**3**	**4**	**5**	**6**	**7**
2. I know what roles each person plays in a cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
3. I know how to attach ECG leads in a cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
4. I know how to manage an airway.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
5. I can recognize a lethal rhythm on the cardiac monitor.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
6. I know how to perform a defibrillation.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
7. I know what first line medications are used in cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
8. I know how to follow the ACLS Pulseless Arrest Algorithm.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
9. I know what to do when the cardiac arrest patient gets a pulse back.	**1**	**2**	**3**	**4**	**5**	**6**	**7**
10. I am confident in my ability to manage a cardiac arrest.	**1**	**2**	**3**	**4**	**5**	**6**	**7**

Please indicate which instructional method you attended:

Human Patient Simulator **Classroom**

Study #_____

Appendix D

Permission for Use of and Modifications for Participant Self-Assessment

From: Rodgers, David [mailto:drodgers1@hmc.psu.edu]
Sent: Monday, March 16, 2015 11:27 AM
To: Calwile, Lorraine
Subject: Permission

Please accept this e-mail as indicating my permission you for you to use original surveys included my 2007 dissertation titled "The Effect of High-Fidelity Manikin-Based Human Patient Simulation on Education Outcomes in Advanced Cardiovascular Life Support Courses."

If you have any questions, please feel free to contact me.

David Rodgers
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Appendix E

ACLS Mega Code Performance Score Sheet

Instructions: Complete the following information in regards to the Team Leader along with the Mega Code Testing Checklist.

Circle the number that corresponds to your rating of this individual's performance.
Scale: 1 – Not competent, 7 – Highly competent

1. Team Leader assured that high-quality CPR was in progress	1	2	3	4	5	6	7
2. The Team Leader assigned team member roles	1	2	3	4	5	6	7
3. The Team Leader assured that Quic Combo pads were applied correctly	1	2	3	4	5	6	7
4. The Team Leader assured the airway was being managed appropriately	1	2	3	4	5	6	7
5. The Team Leader recognized the initial ECG rhythm	1	2	3	4	5	6	7
6. The Team Leader properly utilized defibrillation	1	2	3	4	5	6	7
7. The Team Leader ordered the correct medication treatment for the initial rhythm	1	2	3	4	5	6	7
8. The Team Leader followed the appropriate ACLS algorithm	1	2	3	4	5	6	7
9. The Team Leader recognized the ECG rhythm changes	1	2	3	4	5	6	7
10. The Team Leader provided appropriate post arrest care	1	2	3	4	5	6	7
11. The Team Leader demonstrated confidence	1	2	3	4	5	6	7
12. The Team Leader appeared knowledgeable	1	2	3	4	5	6	7
13. What is your overall feeling about this Team Leader	1	2	3	4	5	6	7
14. What is your overall feeling about this Team	1	2	3	4	5	6	7

Study #_____

Appendix F

Permission for Use of ACLS Pre-course Self-Assessment and ACLS Written Exam Version C

Thank you for the quick response.

I have reviewed you proposal and the request you have made is approved. My impression is that you are running standard AHA ACLS courses as designed, with varying equipment and tools (putting it simply).
Please let me know if you need anything else. I would be very interested in receiving a copy of your results, and would encourage you to consider submitting you study and results for publishing once all is completed. Questions like the one you are studying have been part of ILCOR questions that contribute to Guidelines in the past. The more educational research that is done and appears in peer reviewed journals, the more data is contributed to resuscitation education science.

Good luck with your study.

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