

DOES THE USE OF HIGH FIDELITY HUMAN SIMULATION ENHANCE THE  
ACQUISITION OF PHYSICAL ASSESSMENT SKILLS IN FIRST YEAR  
ASSOCIATE DEGREE NURSING STUDENTS?

A thesis presented to the faculty of the Graduate School of  
Western Carolina University in partial fulfillment of the  
requirements for the degree of Master of Science in Nursing.

By

Michael Angelo-Amadeus Youngwood

Director: Dr. Mark A. Kossick  
Professor  
Graduate Anesthesia Simulation  
Education Coordinator

Committee Members: Dr. Linda Comer, Nursing  
Professor Anne-Marie Jones, Nursing  
Dr. Mason McDowell, Nursing

April 2013

## ACKNOWLEDGEMENTS

I would like to take the opportunity to thank the members of my thesis committee: Dr. Mason McDowell, Dr. Linda Comer, and Professor Anne-Marie Jones for their guidance, encouragement, and support during the development of my thesis. I would also like to extend my appreciation to Dr. Sue McPherson for her help with the statistical analysis of the data collected for this study and Dr. Jessica Shirley for her willingness to be a guiding light throughout this journey.

Most importantly, I would like to take this opportunity to humbly thank my thesis chair Dr. Mark Kossick. Throughout this journey, Dr. Kossick has been a leader, a mentor, a friend, and a teacher. Dr. Kossick believed when I could not find the courage to believe. He led by example when I did not have the vision to see the next step. Many nights he worked with me into the morning to meet seemingly impossible deadlines- never giving up. And meet them we did. Dr. Kossick is everything I believe a chair should be. Through his support and encouragement I feel I have become a better graduate student, a better educator, and ultimately, a better person. If I may aspire to be half the leader, mentor, friend and teacher that he is then I will consider myself a total success.

Additionally, I would like to take this opportunity to extend my warmest gratitude to my family, friends, colleagues, and students for their encouragement and support. Finally, I would like to extend my gratitude to the staff and faculty of Western Carolina University's School of Nursing for guiding me on this journey.

## TABLE OF CONTENTS

LIST OF TABLES .....	v
LIST OF FIGURES .....	vi
LIST OF ABBREVIATIONS/SYMBOLS.....	vi
ABSTRACT.....	vii
CHAPTER ONE: BACKGROUND AND RATIONALE FOR STUDY .....	8
Problem Statement.....	9
Justification of Study .....	9
Assumptions.....	10
Research Question .....	12
CHAPTER TWO: REVIEW OF LITERATURE.....	13
CHAPTER THREE: METHODOLOGY .....	29
Study Design, Setting, Population, and Sample .....	29
Data Analysis .....	31
Protection of Human Subjects.....	32
CHAPTER FOUR: RESULTS .....	33
Sample Characteristics .....	33
Results.....	34
CHAPTER FIVE: DISCUSSION.....	38
Summary of Major Findings.....	38
Limitations .....	39
Implications for Nursing Education .....	40
Implications for Future Research .....	41
Conclusion .....	41
REFERENCES .....	43
APPENDICES .....	47
Appendix A .....	47
WCU IRB Letter .....	47
Appendix B.....	48
Haywood Community College .....	48
IRB Letter .....	48
Appendix C.....	49
Participant Informed Consent.....	49

Appendix D ..... 51  
Demographic Questionnaire Student ..... 51  
Appendix E..... 52  
Demographic Questionnaire Faculty..... 52  
Appendix F ..... 53  
Faculty Data Collection Form..... 53  
Appendix G ..... 56  
Student Data Collection Form..... 56

LIST OF TABLES

Table 1: Frequency Counts For Nominal Variables ..... 35

## LIST OF FIGURES

Figure 1: The Lasater Interactive Model of Clinical Judgment .....	15
Figure 2: Timed Assessment of Dependent Variables.....	35
Figure 3: Timed Assessment of Dependent Variable .....	38

## LIST OF ABBREVIATIONS/SYMBOLS

ANOVA: Analysis of Covariance

CPAT (s): Clinical Performance Assessment Tool (student)

CPAT (f): Clinical Performance Assessment Tool (faculty)

CPR: Cardio pulmonary resuscitation

CAN: Certified Nursing Assistant

COPD: Chronic Obstructive Pulmonary Disease

CPAT: Clinical Performance Assessment Tool

HFHS: High Fidelity Human Simulation

HS: Heart Sounds

ID: Identification

*p* value: Level of significance

M: Mean

NCLEX-RN: National Certification licensure Exam for Registered Nurse

RN: Registered Nurse

SON: School of Nursing

SD: Standard deviation

SDS: Simulation Design Scale

SPSS: Statistical Package for the Social Sciences

## ABSTRACT

AN EVALUATION OF THE EFFECTIVENESS OF HIGH FIDELITY SIMULATION  
ON THE ACQUISITION OF PHYSICAL ASSESSMENT SKILLS IN FIRST YEAR  
ASSOCIATE DEGREE NURSING STUDENTS

Michael A. Youngwood, RN, BSN

Western Carolina University (April 2013)

Director: Dr. Mark A. Kossick, DNSc, CRNA, APN

The purpose of this prospective study will be to determine the effectiveness of high fidelity human simulation (HFHS) on first year associate degree nursing students' ability to perform basic physical assessment skills. Dependent variables will include the student's accuracy and efficiency with auscultation of heart sounds, lungs sounds, bowel sounds, and the palpation of peripheral pulses at the patient's bedside. Consequently, the research will be to examine if a relationship between student clinical performance and the use of HFHS exists.

*Keywords:* high fidelity human simulation (HFHS), physical assessment, cardio pulmonary resuscitation (CPR), associate degree nurse (ADN).



## CHAPTER ONE: BACKGROUND AND RATIONALE FOR STUDY

Simulation is a process that emulates real-life clinical experiences and skillsets in a safe, non-threatening environment. Simulation addresses the cognitive, affective, and psychomotor components of effective learning while allowing the latitude to explore the question “why?” in a student-friendly setting. Learning through the use of simulation allows for students to work on complex, clinically relevant scenarios, make the necessary clinical assessments and judgments and then reflect upon those decisions (Gasper & Dillon, 2012).

Simulation, as it is utilized within the discipline of nursing, is delineated into categories based on the level of simulator fidelity. Low and medium fidelity simulators are viewed as partial task trainers (such as replication models), which are used to gain competence with simple techniques and procedures. High fidelity human simulation (HFHS) incorporates the use of a computerized life-sized manikin and can be programmed to contend with realistic physical conditions and responses relative to participant interactions. The use of HFHS often requires a realistic environment as well as the use of real medical instrumentation (Cant & Cooper, 2010). HFHS is not new to the profession of nursing, as nurses have used low fidelity static manikins for decades to learn as well as teach cardiopulmonary resuscitation (CPR) and other skill-related techniques. However, the inclusion of HFHS is relatively new to nursing education and integrates the use of high technology simulators and computers to replicate life-like scenarios (Sanford, 2010). Nurse educators appear relatively optimistic that the same success demonstrated with other disciplines using HFHS will be similarly echoed within the nursing profession (Garrett, Macphee, & Jackson, 2010).

### Problem Statement

Limited research has been conducted on the use of HFHS in undergraduate nursing curriculum with the use of objective dependent variables. Thus the focus of the proposed study was to evaluate the effectiveness of HFHS relative to the acquisition of physical assessment skills in first year associate degree nursing students. Effectiveness was determined by measuring students' accuracy and efficiency with basic, foundational physical assessment skills (heart sounds, lung sounds, bowel sounds, and peripheral pulses).

### Justification of Study

A quality clinical experience has traditionally been a key component to overall student success in most nursing curricula. However, in recent years clinical faculty has reported difficulty in effectively evaluating a student's clinical skills when they are responsible for the evaluation of multiple students in the same clinical facility. To further compound the issue of effective clinical evaluation, clinical sites are becoming increasingly restrictive in regards to what skills students are allowed to perform. As a result, nursing programs are required to develop innovative and creative methods to augment the student's clinical experience (Cato, Lasater, & Peeples, 2009). While much of the literature has typically addressed the benefits of HFHS within the affective domain of learning little has been written relative to the benefits of HFHS as it applies to the cognitive and psychomotor domains of learning. In 2010, a study was conducted to evaluate student knowledge acquisition (cognitive) and clinical skills performance (psychomotor) associated with a HFHS clinical experience as adjunct to a traditional clinical experience. Results of the study suggested that HFHS was indeed beneficial to

both knowledge acquisition and clinical performance of the participants (Schlairet & Pollock, 2010). The results of the study further support the increasing body of knowledge that indicates positive student outcomes related to HFHS.

The primary goal with simulation education is to create a learning environment that is ultimately conducive to better patient outcomes at the point of care. Furthermore, a primary purpose of any clinical component is to incorporate nursing theory at the bedside. However the challenge for clinical educators is to find clinical facilities that offer adequate clinical experiences for their students. Due to the limited availability of clinical sites, shorter hospital stays, and the ongoing nursing shortage, students are hindered in their ability to receive an optimal clinical experience (Norman, 2012). Research suggests that the implementation of simulation education may actually help to enhance the clinical component (Brewer, 2011). Simulation provides the clinical instructor with both objective and subjective ways to assess the student's decision-making processes prior to actual patient contact. Through the use of simulation, life-like scenarios can be created that help bridge the gap between nursing theory and clinical practice in a student-friendly learning environment (Pacsi, 2008). As a result, the proposed research will examine the effectiveness of HFHS on first year associate degree nursing student's clinical performance. Furthermore, the research will be to determine if a relationship exists between student clinical performance and HFHS.

#### Assumptions

Studies appear to support the use of simulation in nursing education to further prepare students for real life clinical experiences (Bambini, Washburn, & Perkins, 2009; Cant & Cooper, 2010; Rourke, Schmidt, & Garga, 2010; Weaver, 2011). Researchers

have addressed the concepts of self-efficacy, critical thinking, and competence as skillsets required by student nurses to be effective in their practice. However, in the effort to provide students with these skillsets, nurse educators must be creative in their teaching methods and strategies (Yuan, Williams, & Fang, 2012). Research suggests that the inclusion of simulation is a valuable tool in the overall knowledgebase acquisition of nursing students. While not meant to supplant traditional teaching modalities, some studies suggest that simulation education is as equally effective as traditional clinical experiences in equipping students with the skills necessary for the role of bedside nurse (Schlairet & Pollock, 2010). However, much of the validation for the use of simulation is typically a result of student's self-reports using questionnaires that draw upon subjective data to support conclusions (Wotton, Davis, Button, & Kelton, 2010). Moreover, these studies are usually limited by small sample sizes and the lack of established psychometric evaluation tools (Blum, Borglund, & Parcells, 2010; Leigh, 2008; Smith & Roehrs, 2009).

Simulation education is not intended to replace the experience of actual patient care. However, simulation does provide students with the opportunity to draw upon their knowledge and understanding of patient care (Lasater, 2007). Simulation allows the student to fail at a task and then learn from the mistakes that were made. Furthermore, simulation can offer the learner an avenue for the integration of both theory and practice (Berragan, 2011).

For the current study, the assumptions included clinical faculty had accurately and consistently evaluated the participants involved. Furthermore, the faculty possessed the necessary skills to serve as the benchmark regarding the dependent variables; and both

clinical faculty and students were able to accurately complete the study clinical performance assessment tool (CPAT).

#### Research Question

The completed research attempted to answer one primary question. Is HFHS applied in the preclinical setting an educational tool that promotes improved efficiency and accuracy of first year associate degree nursing students' performance with basic physical assessment skills at the bedside?

## CHAPTER TWO: REVIEW OF LITERATURE

HFHS is a teaching modality currently being used by many nurse educators as an adjunct to a traditional didactic approach to nursing education (Brewer, 2011). The focus of this chapter will be to review literature relative to the use of HFHS as it pertains to clinical skills competence, self-confidence, and self-efficacy; with self-efficacy in the context of how well someone is prepared to succeed at an assigned task which can influence a person's goals and aspirations. Nursing students need challenges and scenarios that closely mimic the real world, which can be accomplished in a simulated environment. Through the use of simulation, students can be exposed to the potential complexities of patient care. Furthermore, as these complexities change students are required to act in accordance with those changing conditions (Leigh, 2008).

The education of nurses relies on the synthesis of both clinical and didactic components. Satisfactory clinical experiences remain a key component to the growth and knowledge base acquisition of nursing students. Beginning with their first year of nursing school, associate degree nursing students are placed in clinical settings and are required to demonstrate the concepts and skillsets learned while in the didactic setting. However, the assurance that students will have the necessary, quality clinical experiences presents challenges beyond the control of both the student and the professor. Factors that contribute to this challenge include: hospital staff and faculty shortages, length of inpatient hospital stays, increasing patient acuity, and overall patient safety concerns (Gasper & Dillon, 2012). Furthermore, clinical sites are becoming more restrictive in regards to the skills students are allowed to practice. The nursing shortage exists on all levels. Many nursing programs are faced with a much lower inpatient census at clinical

sites, fewer clinical staff to serve as preceptors, and increasing competition among nursing schools for clinical sites. Factors such as these may limit the time a student has to interact with patients and may contribute to an inconsistent clinical experience. Higher patient acuity and advances in health care technology have also led to a demand for advanced student preparation prior to their entry into the workforce (Maas & Flood, 2011).

In the absence of quality comprehensive clinical experiences, HFHS may provide the contemporary nursing student with an opportunity to develop essential clinical skillsets while becoming clinically competent in a safe and non-threatening learning environment (Luctkar-Flude, Wilson-Keates, & Larocque, 2012). HFHS provides reality-based skills training in a safe setting and allows for reflective learning in areas of positive as well as negative performance. One key component of simulation training is the ability to repeat scenarios in an effort to ensure that safe, clinical skill competence is being met (Cant & Cooper, 2010). Simulation in nursing education has typically been used to facilitate psychomotor skills. However, there has been little research in the area of simulation and the acquisition of cognitive and affective skills.

Currently there is an insufficient number of qualified nursing faculty to address the demands of the ongoing nursing shortage. This insufficiency requires nurse educators to explore new teaching and learning modalities to better prepare students to assume more complex roles with higher levels of critical thinking and clinical judgment (Lasater, 2007).

In 2007, a study was conducted to explore the development of clinical judgment among four-year nursing students at Oregon Health and Science University using HFHS

as adjunct to the clinical learning experience. The design for this study was a qualitative method of researcher observations that addressed four primary dependent variables: self reported confidence in clinical judgment; aptitude for critical thinking; qualitative objective observation of clinical judgment applied during high-fidelity simulation; and the experience of the student when followed through a focus group (Lasater, 2007).

Figure 1 represents the variables that were measured.

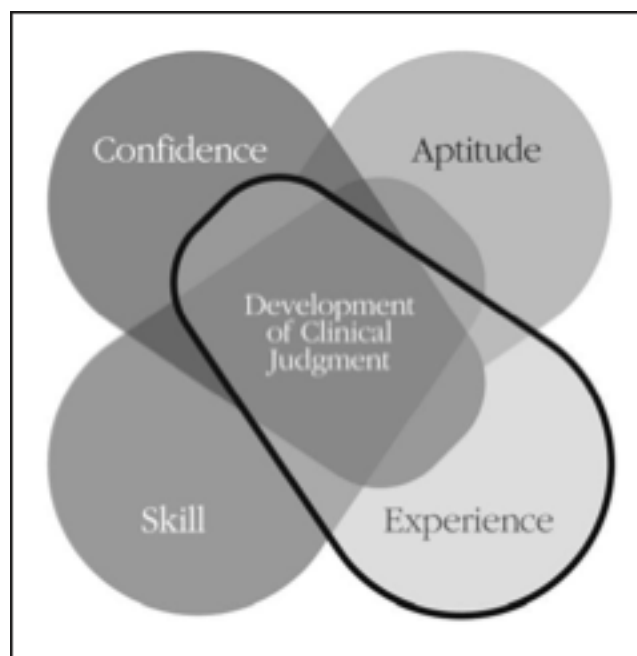


Figure 1: The Lasater Interactive Model of Clinical Judgment taken from Lasater, 2007b.

The sample for this study was forty-eight junior-level baccalaureate degree students (47 female, 1 male) who were enrolled in a Nursing Care of the Acutely Ill Adult course. The initial introduction of HFHS as a regular component of the nursing curriculum occurred during the first semester. Each of the participants had weekly exposure to HFHS as part of their regular coursework. Simulation sessions began with



the nursing faculty facilitator providing pre-simulation teaching, linked to a theory topic (e.g., caring for patients with respiratory illnesses). Within each group of twelve, four patient care teams of three students each participated in a simulation scenario during each session. While one team participated in the scenario, the other teams were able to observe simultaneously from the debriefing room. Within each team, roles were assigned with one student serving as primary nurse. The student primary nurse had ultimate responsibility for the patient care interventions, including delegation of responsibilities to other team members. Each team engaged in weekly scenarios and every third week a different student became the primary nurse. Each HFHS experience included two phases with three opportunities for learning. In the first phase (the actual simulation) students were involved in a simulation scenario from a contextual based patient scenario, in which they interacted directly. At the same time, the other students could observe the scenario. In the second phase (debriefing) observers and students who had engaged in the scenario learned through reflecting and discussing the experience with the help of the simulation facilitator (Lasater, 2007).

Of the forty-eight students enrolled in the study, thirty-nine became candidates for a post simulation focus group. The purpose of the focus group was to identify common themes within the study. The focus sessions were videotaped and later analyzed for accuracy of the data. The analysis identified the following primary themes:

- Simulation was stressful, although relatively low risk.
- Role-playing was sometimes difficult.
- Some scenarios were more real than others.
- Debriefing was the most important phase for determining clinical judgment as students reported that the acuity level of the simulation scenarios helped to increase their awareness in their clinical practice.

- The scenarios required students to think critically for themselves and intervene accordingly.
- The physiological responses from the HFHS were important feedback.
- The HFHS had some limitations.
- More feedback from the facilitator was needed.
- Assessment and reassessment was key to successful clinical judgment.
- Working and connecting with other students was helpful.
- Learning from the simulation laboratory frequently transferred to the clinical settings.
- Some changes in the HFHS process may prove helpful for increasing the quality of the learning.

Results of the study demonstrated when HFHS is utilized as a component of experiential learning, it is a comprehensive and valuable learning tool. Additionally, the results of this study were useful in gaining an insight to student perceptions regarding the use of simulation. Further suggestions were to incorporate multiple student focus groups that consider independent variables such as age, racial/ethnic considerations and previous health care experience in the effort to provide greater insight into the effects of simulation (Lasater, 2007). Ultimately, the desired outcome of HFHS is the transfer skills and knowledge learned in the simulation laboratory to the clinical setting.

In 2009, a descriptive, correlational study was conducted that addressed potential factors that impacted the use of HFHS in nursing education via a previously described nursing education simulation framework (Jeffries, 2005). The study participants consisted of sixty-eight baccalaureate degree nursing students enrolled in an introductory medical-surgical course. The purpose of the study was to evaluate several key components of the Jeffries Model: perceived student self-confidence and learner satisfaction as well as

student demographics and characteristics of the simulation design. For the study, a series of five questions were asked. The first question addressed overall student satisfaction with the HFHS experience. The second question addressed the self-reported impact of HFHS on student's self-confidence. The third question explored how students evaluate a HFHS experience as it related to the five simulation design components of Jeffries' model. The fourth question investigated the possibility of a correlation between the perceived design characteristics and reports of satisfaction and self-confidence of students who participated in the HFHS scenario. The fifth question examined correlations between reports of self-confidence, demographic characteristics of the students and reported satisfaction after a HFHS experience. Analysis of data for question five indicated that no significant correlations existed between any of the demographic data (age, education, gender, health care experience and simulation experience) and reports of student satisfaction and self confidence (Smith & Roehrs, 2009).

The nursing education simulation framework used by the investigators was established earlier by research done in 2005 (Jeffries, 2005). Specifically, Jeffries' framework consists of five major components: teacher, student, educational practices, design characteristics of the simulation, and outcomes. Outcomes presented in this framework are ultimately influenced by the degree to which best practices in nursing education are incorporated in the design and implementation of the simulations. The effectiveness of teaching and learning while using HFHS is dependent on the interactions of the teacher and student as well as the expectations, and roles of each during these experiences. Thus, two compelling components of the framework are teacher factors and student factors (P. R. Jeffries, 2005). For the first seven weeks of the course the faculty

provided 56 hours of didactic skills lab. During weeks nine and ten, students were assigned to participate in the simulation lab. For the purpose of the simulation exercise students were broken into groups of four. Students were asked to complete a basic physical assessment as well as administer medication to a patient diagnosed with chronic obstructive pulmonary disease (COPD). The remaining two students who were not assigned to one of the two groups of four were delegated to record observations. The scenario lasted for 20 minutes or until an intervention occurred that resulted in help for the patient, whichever came first. At the conclusion of the scenario and subsequent debriefing, the students were asked to complete a researcher-designed demographic instrument. Additionally, two survey instruments developed for the National League for Nursing were also used in the study (P.R. Jeffries, 2007). These included the 1) Simulation Design Scale (SDS) and 2) Student Satisfaction (SS) and Self-Confidence in Learning Scale (SCLS). Both instruments incorporated a 5-point, self-report, Likert scale. The SS and SCLS consisted of 13 items and reported a Cronbach's alpha of 0.94 for SS and 0.87 for SCLS, which suggests high internal consistency. Additionally, the SDS consisted of five components relative to simulation design (Objectives, Support, Problem-Solving, Feedback, and Fidelity) and reported a Cronbach's alpha of 0.92 (Smith & Roehrs, 2009).

The SCLS analysis was based on a student's experience with caring for a simulated patient with COPD. Scores for the SCLS and SS suggested that students were satisfied with the teaching method. Additionally, scores for the SCLS (research question two) indicated that students reported an increase of self confidence in their ability to care for a patient with COPD following the HFHS scenario. The SDS score (research

question three) further indicated that students generally felt positive about the five design characteristics of Jeffries' framework with the highest rated design characteristic being Objectives. The fifth research question suggested that no significant correlations appeared to exist between any of the five listed demographic characteristics: age, gender, previous degree, health care experience and simulation experience and the student's self report of overall satisfaction and self confidence (Smith & Roehrs, 2009).

The results of the study suggested nurse educators must carefully consider the design of HFHS prior to implementation. The study demonstrated that a template might be useful to help ensure that each of the five design characteristics from the SDS is present and addressed during the scenario. Results also suggested that heavy faculty workloads may impede the time required to design and implement quality learning scenarios. Having clear objectives and appropriate case scenarios requires consideration by the nurse educator in the design and implementation of scenarios as overall student satisfaction and reported self-confidence are correlated with characteristics of the simulation design (Smith & Roehrs, 2009).

In 2009, an integrated, quasi-experimental study was conducted to determine overall reported self-efficacy of students relative to the use of simulation in a four-year baccalaureate degree program. Participants in the study were assigned to a three-hour simulation lab scenario, which consisted of eight stations with various types of simulation scenarios. Students were required to complete assigned readings as well as video demonstrations in advance of the simulation experience. Two faculty members and the simulation lab coordinator were responsible for conducting this research. For this study, three research questions were identified 1) does the use of HFHS increase a student's

level of self-efficacy? 2) What are the perceptions of the students relative to the use of HFHS and 3) does a student's previous experiences with patient care have an effect on the perceived level of confidence?

Data collection for the study took place over the course of four semesters and included a sample of 112 students in a post-partum and newborn setting. The mean age of participants was 24.85 years ( $SD=6.7$ ). Fifty seven percent of the subjects had prior experience in the health care field while twenty six percent of the sample had previously completed a degree prior to entering the nursing curriculum. For this study three surveys were developed: a pretest, a posttest and a follow-up survey. Each survey consisted of six questions using a ten-point scale from one (not at all confident) to ten (very confident). The posttest and follow up survey also contained three open-ended questions. Each of the surveys were numbered and subsequently placed in blank envelopes so that results for all three surveys completed could be reviewed together (Bambini et al., 2009).

Data analysis for the study suggested that internal consistency was acceptable (Cronbach's  $\alpha$ : pretest, 0.817; posttest, 0.858). A  $t$ -test analysis was used to compare the means of the pretest and posttest scores. Results suggested that students did experience an overall significant increase in reported self-efficacy ( $p < 0.01$ ) while results of a pairwise comparison, demonstrated a significant increase in reported student confidence in performing an exam after the simulation experience ( $p < 0.01$ ). Results also indicated that students experienced an overall increase in self-confidence while assessing vital signs ( $p < 0.01$ ), breasts ( $p < 0.01$ ), fundus ( $p < 0.001$ ), and lochia ( $p < 0.001$ ). Qualitative data showed that students felt the use simulation was a valuable learning experience and their reported self-confidence increased by knowing what to expect.

Results of the study suggested that real-life clinical simulation experiences are effective in increasing student's self-efficacy in performing clinical skills. Furthermore, results suggested that simulation may provide the bridge between theory and clinical practice by providing a safe learning environment for students (Bambini et al., 2009).

In 2010 a longitudinal study was conducted to evaluate the role of HFHS as it related to the overall preparation of third year undergraduate nursing students for clinical practice. The study addressed how simulation helped students make the transition from student nurse to staff nurse. This study was comprised of 153 nursing students that had been previously exposed to simulation and were currently in the transition from student to staff nurse. A thirty-two item questionnaire that incorporated twenty-seven Likert scales with a five-point scale that ranged from "strongly agree" to "strongly disagree" was used to gather data. A free response section was also provided on the questionnaire that allowed participants to expand upon their answers. Additionally, a five item demographic questionnaire was distributed to the sample to help in the construction of a population profiles. (McCaughey & Traynor, 2010).

The surveys were analyzed using five key areas: 1) the impact of simulation relative to students' perception of their clinical effectiveness, 2) the second key area addressed the effect simulation has on the students' perception of their professional development, 3) the perceived impact that simulation has on helping the student link theory to practice, 4) the effect that simulation has on perceived preparation for key stage management assessment (an evaluation of student progression) in third year undergraduate nursing students, and 5) the perceived effect that simulation has on student preparation for their transition to the roles as registered nurses.

Conclusions from the study included participants felt as though simulation helped prepare them for the transition from nursing student to staff nurse. The results were even more remarkable in relation to whether or not simulation promoted confidence to deal with similar situations as a new staff nurse as they had encountered in the simulation case scenarios as a nursing student. Participants reported that they felt as though simulation helped to prepare them for real-life scenarios. When asked if participation in the simulation experience had made them feel more anxious regarding the change from the role of nursing student to the role of a staff nurse, a dichotomous pattern emerged. More than half the respondents (49.5%) disagreed while 34.4% (n = 32) agreed and 16.1% (n = 15) were indifferent on this issue. Rather than being regarded as an ineffectual outcome of simulation, this result could be interpreted in the context that an emotional disturbance could occur during the simulation process. One of the most striking findings of the study was the potential benefit of increased clinical competence and safe practice following exposure to HFHS. Results of this study suggested that skills acquired during HFHS will be transferred to the clinical setting to the advantage of patient care. Students were also found to view simulation as a preferred method of preparation for the transition to clinical practice. Furthermore, students felt that simulation enhanced their ability to provide holistic care to their patients and prepare them for the transition from the role of student nurse to the role of staff nurse. Although there were some questions regarding the realism of simulation and the case scenarios, in this study the simulated learning experience was considered by the participants to be realistic. Limitations of the study included the use of a convenience sample from a single institution. Additionally, this was a descriptive study that measured only subjective data. Finally the questionnaire used in



the study would benefit from testing of its psychometric properties. Psychometric testing measures how well the data collected with the instrument relates to the construction of the instrument.

While much of the current literature appears to focus on student perceptions of HFHS, more recent studies have suggested that HFHS has a positive correlation on the acquisition of critical thinking skills. In (2010) a study was conducted to examine the relationship between the metrics of critical thinking skills and simulated clinical performance. The study involved a convenience sample of thirty six diploma, associate and baccalaureate nursing students and employed a quasi-experimental, cross over design. Results of this study indicated that performance in HFHS appeared to approximate scores on standardized critical thinking tests. Additionally, the study revealed that more research is needed to determine if a correlation exists between HFHS and critical thinking in a clinical setting (Fero et al., 2010).

In another recent simulation study, researchers attempted to evaluate traditional and simulated clinical experiences of undergraduate baccalaureate degree nursing students. The investigators attempted to examine a student's knowledge base acquisition relative to the implementation of HFHS. This intervention study used a 2×2 crossover design that contained two key interventions (simulated and traditional clinical experiences) and two intervention related time periods (2-week exposure to each of the interventions). The dependent variable was the student's knowledge posttest scores. Independent variables were identified as clinical experience and time of testing (pretest and posttest). The sample size for this study was 74-baccalaureate degree students enrolled in a nursing fundamentals course (Schlairet & Pollock, 2010).

Random assignment to the intervention groups was used. Participants in the study were designated as either simulated-traditional (participants engage in simulation training first then traditional clinical training) or traditional-simulated (participants engage in traditional clinical training first then simulation training). The simulated-traditional clinical intervention experience used HFHS in a skills laboratory setting. Conversely, the traditional-simulated clinical intervention experience occurred in a long-term care facility and consisted of the traditional assignment of students to individual patients for the provision of holistic nursing care. Equivalency testing was used in the study in an attempt to establish a correlation between the two interventions and to determine if the two methods used (simulation training and traditional training) were equal to each other. In an attempt to generate quantitative data a 100-point knowledge test was created which consisted of 25 multiple-choice questions taken from the National Certification Licensure Exam for Registered Nurse (NCLEX-RN). Questions were chosen based on the level of difficulty likely to be represented within the interventions. Test analysis revealed that the internal consistency reliability coefficients were within the acceptable ranges. Students were initially oriented to the study and completed a knowledge pretest. During weeks one and two students were randomly assigned and either participated in traditional clinical experiences or simulated clinical experiences. Students participating in the simulation intervention group received faculty guided debriefing sessions. Conversely, students that participated in the traditional clinical intervention group received traditional post-conferencing sessions. All participants in the study completed a knowledge posttest. Participants were then asked to cross over into the opposite intervention group (participants that were in the simulation group first went to the traditional group and

participants that were in the traditional group first went to the simulation group) and complete a second posttest. In an attempt to promote consistency within both intervention groups, clinical experiences focused on course objectives and fundamental skillsets.

Results of the  $t$  tests indicated no significant difference on pretest scores, midterm grade or final grades. However, the  $t$  test did reveal a difference in scores from pretest to posttest 1 and from posttest 1 to posttest 2. The  $t$  test also indicated a difference from the pretest to posttest 2. Statistical analysis for demographic variables indicated that there were no significant differences among student participants. The equivalency test scores for both intervention groups were considered to be statistically equivalent which suggests that undergraduate nursing students can benefit from both traditional and simulated clinical experiences. Furthermore, this study suggests that simulated clinical experiences using HFHS have positive outcomes. While the simulated traditional intervention group had lower pretest scores, the knowledgebase acquisition scores after the simulated traditional clinical experience reflect a positive growth when compared with the traditional simulated clinical intervention group.

Results of the study indicate that a positive correlation between the use of HFHS as a method of experiential learning and the acquisition of cognitive, affective and psychomotor skills of undergraduate nursing students exists (Ricketts, 2011; Wotton et al., 2010). One possible reason for the interest in simulation is that students are embracing the efficacy of simulation as a form of experiential learning (Rourke et al., 2010). Another convincing explanation may be that due to the current trend of restrictive clinical placement there is less opportunity to consolidate practical clinical skills (Yuan et

al., 2012).

To this end, a key argument for the inclusion of HFHS in nursing education is the perceived gap that exists between theory and practice. It can be inferred that the goal of nursing is to apply the theoretical foundations of nursing education to the clinical setting. Simulation can play an important role in making the transition from theory to practice by allowing students to, first, practice required skills in a student friendly environment prior to attending clinical rotations (Wotton et al., 2010). International research also supports this contention; in a survey conducted at McMaster University in Canada to explore students preferred method of learning psychomotor skills, students repeatedly requested more simulation teaching as they reported that simulation served to reinforce lecture material (McCallum, 2007).

Simulation potentially makes for the ideal learning environment for novice nursing students as it emulates the clinical setting as well as patient responses in a controlled, student friendly setting and without the risk of patient harm (P. R. Jeffries, 2005). Additionally, HFHS allows for the repetitious teaching of skills and concepts through the use of trial and error while allowing the latitude to fail at a task. Furthermore, simulation can also provide the student with unique learning opportunities they may rarely encounter in an actual clinical setting (Berragan, 2011). HFHS can be a useful educational tool that can be implemented across the nursing curriculum (Blum et al., 2010; P. R. Jeffries, 2005; McCallum, 2007; McCaughey & Traynor, 2010). For example, simulation can be used to teach basic fundamental assessment skills by demonstrating abnormal physical findings (Bambini et al., 2009). In medical-surgical nursing courses, simulation can be used to teach students the importance of drug and IV

fluid administration techniques (Weaver, 2011).

Based on the literature presented and critiqued in this review, it appears HFHS may at times be an effective teaching method in the preparation of nursing students for the clinical setting. It is possible with continued research in HFHS that best practice educational paradigms may further incorporate simulation as a means to assist in the development of undergraduate nursing students (Garrett et al., 2010; Pacsi, 2008; Sanford, 2010). In addition, existing evidence further suggests that the acquisition of knowledge associated with simulation only serves to enhance traditional methods of nursing education (Norman, 2012). Lastly, national trends demonstrate a continued increase in the number of simulation centers which supports this contention.

## CHAPTER THREE: METHODOLOGY

Nursing competency is vital to assure overall patient safety. Incidences of sentinel events occur most frequently in care settings where new graduate nurses begin their professional careers (Fero et al., 2010). To address the issue of improving student clinical competence, HFHS is now considered an essential component in nursing education (Hauber, Cormier, & Whyte Iv, 2010). Currently HFHS is used as an adjunct to active teaching modalities in an effort to expose student nurses to a variety of patient conditions in a student friendly setting.

### Study Design, Setting, Population, and Sample

The study incorporated a quasi-experimental quantitative research design with five of six clinical groups of students randomly invited to participate in the study. These six clinical groups represented 37 students enrolled at a local community college. Of the six clinical groups, 32 participants were chosen from five of the groups to form a study. The initial composition of participants within each of the six clinical groups could not be randomly determined in that the college agreed to assign students to cohorts based on their logistical and personal needs relative to available clinical sites.

All of the 37 students received identical, simultaneous didactic instruction by the same faculty members. Didactic instruction followed curriculum objectives relative to techniques of basic physical assessment. The didactic component was comprised of lecture, video vignettes, and lab practicum experience. The use of simulation was not a component of the didactic instruction. Prior to participating in clinical rotations, sixteen students from five of the original six clinical groups were randomly assigned to an intervention group. The remaining sixteen students were assigned to a control group.

The sixth clinical group (comprised of 5 students) was excluded from entry into the study due to the principal investigator being responsible for coordinating and evaluating their clinical performance. To strengthen internal validity of the study, clinical evaluators were required to demonstrate accuracy, efficiency, and proficiency in the use of the CPAT prior to conducting the study in a clinical setting. Through the use of the Laerdal 3G essential human simulator, clinical evaluators were instructed by the principal investigator on the correct methods for rating categories of the CPAT. The principal investigator then timed each evaluator for accuracy, efficiency, and proficiency. Each evaluator was then required to rate each other using the CPAT and compare those findings with the findings of the principal investigator. All of the clinical evaluators complied with the rules for scoring the CPAT.

All students enrolled in the curriculum were required to attend assigned clinical sites on either Tuesdays or Wednesdays. The clinical rotations were conducted at three separate long-term care facilities. Tuesday's clinical rotations were comprised of four clinical groups attending three facilities. Wednesday's clinical rotations were comprised of the two remaining clinical groups attending two separate facilities; additionally, all students participating in the study, were assigned a separate patient for a total of 32 patients.

The start of clinical training occurred simultaneously for all students and only after the intervention group had received HFHS via the Laerdal 3G essential human simulator. The simulation intervention occurred approximately over a four-hour period, one day before students began their first day of clinical training. All students participating in the intervention group were in attendance during this session, which was

conducted by the principal investigator. The simulation experience was designed to address specific components of basic physical assessment that represented dependent variables in this study (heart sounds, lung sounds, bowel sounds and peripheral pulses). Clinical evaluators were blinded in regards to which students received preclinical HFHS and the clinical evaluator's physical assessment findings on respective patients served as the measurement standard. The recording of dependent variables at clinical sites ended when all students had been evaluated via the study's data collection form. In addition, a questionnaire was used to collect demographic data on the students and clinical faculty participating in the study.

The control group of 16 students received the same HFHS training but only *after* the dependent variables of the study had been recorded. The dependent variables were measured to assess the impact of HFHS on the accuracy and efficiency of students' performance of basic physical assessment skills. The CPAT (see Appendices F, G) used by full-time and adjunct clinical faculty allowed the researcher to measure each student's ability to accurately and efficiently assess heart sounds, lung sounds, bowel sounds, and peripheral pulses at their assigned clinical sites. During the informed consent process, all students were instructed not to share with clinical faculty if they have received HFHS prior to beginning their respective clinical rotations.

#### Data Analysis

Data collected from the study was used to determine if differences existed between, as well as among students randomized to the intervention group and students serving as the control group. Specifically, data collected addressed overall student performance of cardinal physical assessment skills, as well as any significant



demographic differences (age, gender, ethnicity, education, previous experience in healthcare and marital status). Further analysis of the data also attempted to determine if demographic differences existed between clinical faculty. Demographic analysis of the faculty included age, gender, ethnicity, highest degree obtained, number of years employed as a registered nurse (RN) providing bedside care and performing physical assessment, as well as the number of years teaching and evaluating students regarding physical assessment.

#### Protection of Human Subjects

The study received expedited approval from the Institutional Review Boards of Western Carolina University (WCU) as well as Haywood Community College (HCC). The WCU and HCC IRB letters of approval are located in Appendices A and B. After agreeing to participate in the proposed study, each participant was required to sign an informed consent that detailed the nature of the study. To protect confidentiality of all study participants, and to reduce bias, an identification (ID) number was randomly assigned to students, clinical faculty, and clinical sites. These ID numbers were coded by a graduate assistant student not participating in the study and assigned to the completed data collection forms. The code for the ID numbers and matching student names, faculty names, and participating clinical sites were kept in a locked drawer in a sealed envelope in the principal investigator's office. Following dissemination of the study results, the principal investigator will shred the coded data sheets. No participation risks were identified for this study and an informed consent (Appendix C) for participation was obtained prior to all data collection.

## CHAPTER FOUR: RESULTS

Descriptive statistics were used to analyze group differences on frequency counts and timed items of the CPAT. Also, descriptive statistics were applied to demographic information of participants for each group. Analysis of the data was performed using IBM SPSS (Statistical Package for the Social Sciences) software version 20.

### Sample Characteristics

Prior to the beginning of the study, one student withdrew from the class. The remaining participants ( $N = 32$ ) were randomly assigned to an intervention ( $n = 16$ ) or control group ( $n = 16$ ). The control group consisted of 5 males (31.2%) and 11 females (68.8%) while the intervention group consisted of 1 male (6.2%) and 15 (93.8%) females. Additionally, 6.2% (1/16) the control group were high school educated, 50.0% (8/16) reported having received “some college,” education and 43.8% (7/16) reported earning a college degree. Conversely, 6.2% (1/16) of the intervention group were high school educated, 62.5% (10/16) reported having received some college education, and 31.2% (5/16) reported earning a degree. Furthermore, 62.5% (10/16) of participants in the control group and 93.8% (15/16) of subjects in the intervention group reported prior experience in health care services; the age of participants ranged from 19-53 years (intervention group  $M = 27.88$  years; control group  $M = 32.06$  years). All participants were CNAs prior to admission into the school of nursing and none of the study participants had received prior nursing instruction.

## Results

Frequency counts for nominal variables (listed in Table 1) of the CPAT were assessed for differences between groups. Fisher's Exact tests were conducted if any cell sizes were less than 5. Alpha was two-tailed and set at .05 for all tests. As table 1 demonstrates, none of the categories data were significantly different according to group. Group differences on variables that were timed were examined via independent t tests. Levene's equality of variances tests for all ratio measures, except bowel sounds, indicated variances were equal. Results indicated no significant differences between groups ( $p = .08$ ) on mean age (in years) (control group  $M = 32.06$ ,  $SD = 7.85$ ; intervention group  $M = 27.88$ ,  $SD = 5.06$ ). Noteworthy was the finding that significant differences between groups existed with mean duration of assessment in heart sounds (sec)  $p < .001$ ; as the control group ( $M = 178.88$ ,  $SD = 60.96$ ) was found to be much slower and more variable than the intervention group ( $M = 106.25$ ,  $SD = 38.62$ ) with this dependent variable (see Figure 2).

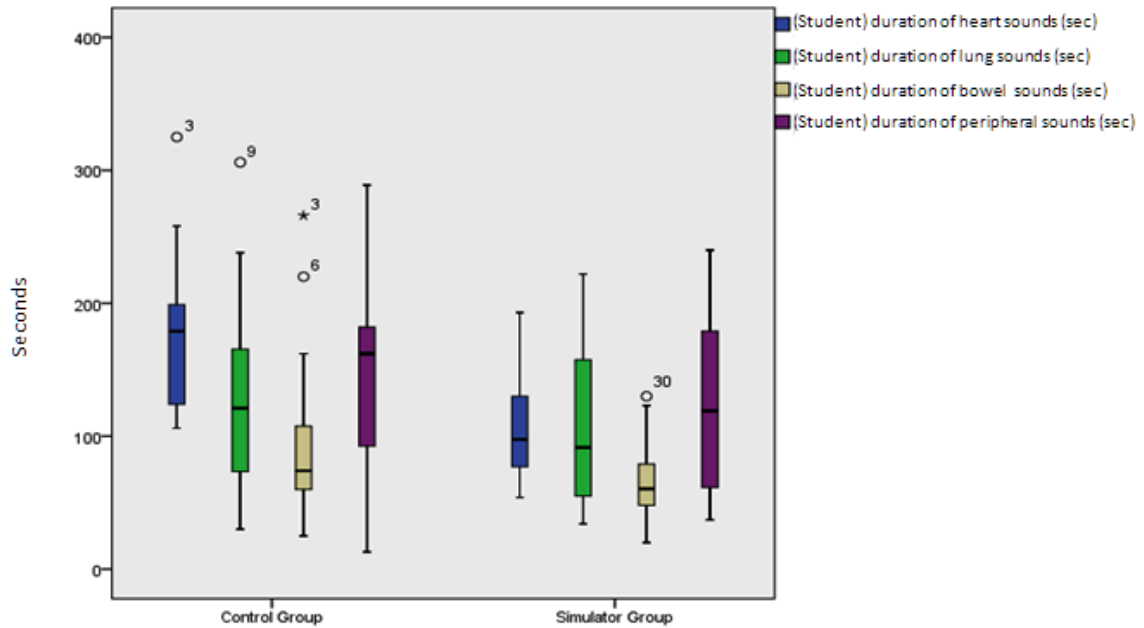


Figure 2: Timed Assessment of Dependent Variables

Additional results showed no significant differences between groups on 1) mean duration of assessment of bowel sounds (sec)  $p = .13$  (control group  $M = 98.47$ ,  $SD = 67.64$ ; intervention group  $M = 68.25$ ,  $SD = 31.42$ ), 2) mean duration of assessment of lung sounds (sec)  $p = .54$  (control group  $M = 126.63$ ,  $SD = 76.73$ ; intervention group  $M = 111.19$ ,  $SD = 63.82$ ) and 3) mean duration of assessment of peripheral pulses (sec)  $p = .33$  (control group  $M = 147.44$ ,  $SD = 72.18$ ; intervention group  $M = 122.94$ ,  $SD = 68.46$ ).

Table 1: Frequency Counts For Nominal Variables

<b>Table 1</b>			
<b>Variables</b>	<b>Control Group</b>	<b>Intervention Group</b>	<b>P value</b>
Positioned Patient for heart sounds (HS)	14/16	15/16	1.000
Correct placement of stethoscope	13/16	16/16	.226
Correct placement of stethoscope for Aortic HS	15/16	15/16	1.000
Correct placement of stethoscope for	15/16	14/16	1.000

Pulmonic HS			
Correct placement of stethoscope for Erbs point HS	11/16	13/16	.685
Correct placement of stethoscope for Tricuspid HS	9/16	14/16	.113
Correct placement of stethoscope for Mitral HS	12/16	14/16	.654
Placement of stethoscope on skin for lung sounds	14/16	16/16	.484
Correct placement of stethoscope for Bowel sounds	14/16	16/16	.484
Bowel sounds present	14/16	16/16	.484
Radial artery right	15/16	15/16	1.000
Radial artery left	16/16	16/16	Not significant

<u>Variables</u>		<u>Control group</u>	<u>Intervention group</u>	<u>P value</u>
Aortic HS findings	Normal	14	14	.2347
	Abnormal	0	2	
	Unsure	2	0	
Pulmonic HS findings	Normal	13	14	.5996
	Abnormal	1	2	
	Unsure	2	0	
Erbs point HS findings	Normal	11	11	.4934
	Abnormal	1	3	
	Unsure	4	2	
Tricuspid HS findings	Normal	8	12	.306
	Abnormal	1	2	
	Unsure	6	2	
Mitral HS findings	Normal	11	12	.7301
	Abnormal	1	2	
	Unsure	4	2	
Checked posterior lung sounds	Yes	10	9	.7848
	No	3	2	
	Condition precluded	3	5	
Lung Findings	Normal	11	13	.3944
	RUQ	0	1	

	Unsure	5	2	
Dorsalis Pedis Artery right	Yes	12	10	.4331
	No	3	6	
	N/A	1	0	
Dorsalis Pedis Artery left	Yes	13	9	.1134
	No	2	7	
	N/A	1	0	

Note: p values are via Fisher's exact test. (HS=Heart Sounds, RUQ=Right Upper Quadrant; N/A=Not Applicable as patient was a bilateral amputee)

## CHAPTER FIVE: DISCUSSION

## Summary of Major Findings

While analysis of the data between the control and intervention groups revealed no significant differences in most of the dependent variables it did indicate a significant group difference on mean duration of assessment of heart sounds (sec) ( $p < .001$ ); the control group was shown to be much slower ( $M = 178.88$ ,  $SD = 60.96$ ) with at least one significant outlier compared to the intervention group ( $M = 106.25$ ,  $SD = 38.62$ ). Also, although not statistically significant, the intervention group was found to spend less time with completing all the other assessment areas (lungs sounds, bowel sounds, peripheral pulses) than the control group (see Figure 3).

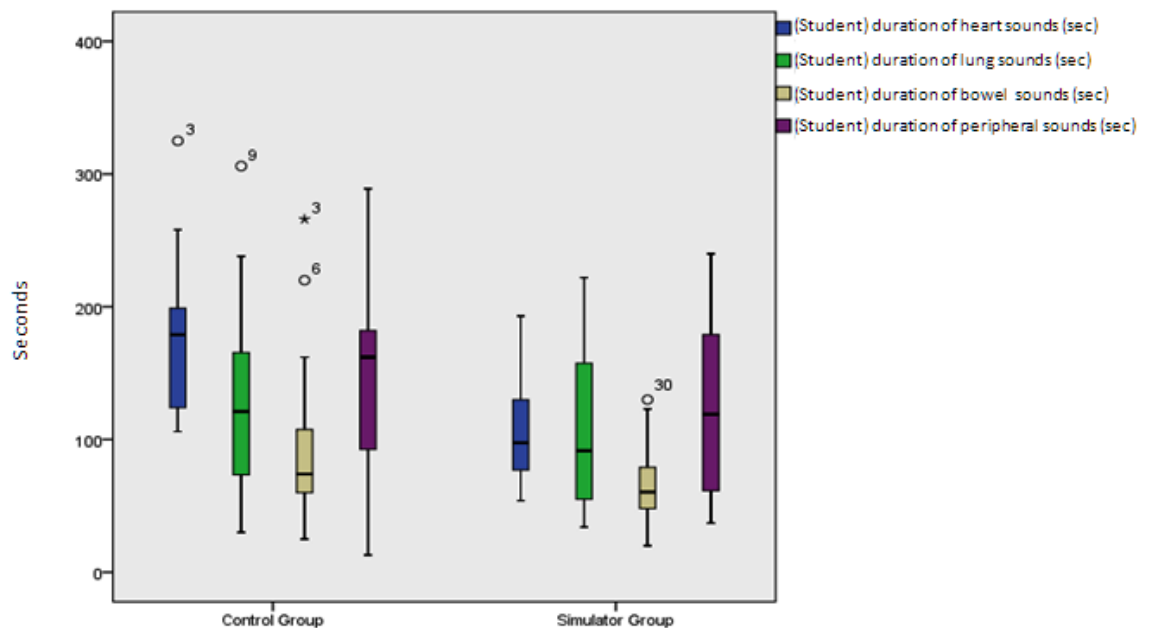


Figure 3: Timed Assessment of Dependent Variable

These findings appear consistent with the current body of knowledge that suggest that HFHS can in some circumstances assist students in acquiring basic clinical skills

(Bambini et al., 2009; P. R. Jeffries, 2005; Lasater, 2007; Schlairet & Pollock, 2010).

Additionally, the analysis of demographic data did not identify any significant differences among study groups or clinical faculty.

Furthermore, as the intervention took place over the course of four hours, a longer and more frequent intervention period in the simulation lab may have resulted in more significant group differences relative to the measured variables.

It should be recognized as well that by not achieving statistically significant differences in all but one dependent variable, “significant” conclusions may still be drawn. Such that, perhaps the reason for “no difference” was due to the design of the CPAT(f) and CPAT(s). However, it may be correct to assume these assessment tools actually functioned accurately- were reliable; and the lack of differences in the efficiency and accuracy between groups regarding the assessment of lung sounds, bowel sounds, and peripheral pulses indicates HFHS would be better utilized with other outcome variables (cognitive and psychomotor skills).

#### Limitations

Limitations that should be considered in the interpretation of the results of this study include sample size, potential inconsistencies among 1) clinical faculty in their evaluation of students as well as 2), the patients assigned to students while in the long term care facilities. As the enrollment for this study included 32 subjects, a larger sample size of students may have yielded more statistically significant differences between the control group and the intervention group. However, this assertion is speculative knowing one study published in 2010 with slightly more than twice the number of students (n = 74), and using objective outcome measures, found that simulation benefited



undergraduate students no more than traditional clinical experiences (Schlairet & Pollock, 2010).

Internal validity of the study could also have been strengthened if the type of patient students' were asked to perform their physical assessment on were "standardized" (e.g., similar pathophysiology, age, gender, admitting diagnosis). Perhaps standardization of patients could have been achieved by selecting only a few patients with similar diagnoses to participate in the study. Of course the tradeoff for implementing such a change would be a compromise to the external validity of the study; in that, the results would then be applicable to only a narrow subgroup of patients. Retrospectively, it was recognized that a future study would benefit from scheduling the control group with additional clinical skills lab time that is equivalent to the time spent by the intervention group with HFHS; thus mitigating a potential advantage of more instruction time for the intervention group.

#### Implications for Nursing Education

The current study offers in small part further evidence for the inclusion of HFHS as an adjunct to nursing education. While not meant to replace traditional methods of nursing education, the results suggest that simulation is as effective as traditional classroom and lab modalities in teaching basic physical assessment skills. Additionally, the results of the study provide data for nurse educators on the relationship between HFHS and the acquisition of cardinal physical assessment skills in first year nursing students. This research will help nurse educators further define the role of HFHS in this specific area of undergraduate nursing education; currently, no researchers have examined these specific variables.

### Implications for Future Research

The results of this study presents new insight on the acquisition of fundamental nursing knowledge and the use of HFHS in first year associate degree nursing students that has not previously been defined in the literature. Additionally, outcomes of the study provide data for nurse educators on reasons to consider incorporating preclinical HFHS in undergraduate nursing curriculum; in that HFHS can produce differences in the acquisition of some cardinal physical assessment skills compared to students who do not receive preclinical HFHS. This study also introduces to faculty an uncustomary means (use of objective dependent variables) to investigate the potential relationship between HFHS and the development of nursing skills. In contrast, the prevailing means used to investigate simulation in this area of nursing education has involved subjective criteria (surveys/questionnaires). Future research is cardinal to answering such questions as: what is the optimal amount of time spent, number of interventions, specific type of HFHS learning activities, and optimal timeline for introducing HFHS in the nursing curriculum. In addition, when a statistically significant difference in objective dependent variables is ascertained, it remains to be established what the duration of the “positive effect” would be beyond the initial sampling time (e.g., one week, two months, 1 year).

### Conclusion

The purpose of this prospective quasi-experimental study was to determine the effectiveness of HFHS on first year associate degree nursing students’ ability to perform basic physical assessment skills. Currently, the literature reveals only a paucity of studies that critique the potential relationship between preclinical HFHS and its impact on the acquisition of cardinal undergraduate nursing skills through the use of objective

dependent variables. Further research to develop quantifiable, objective data will contribute to the current body of knowledge regarding HFHS. As future research continues to reveal best evidence of students' acquisition of nursing knowledge and skills related to the preclinical use of HFHS, nurse educators will be able to determine if a preferred intervention timeline, duration, and content for HFHS exists.

## REFERENCES

- Bambini, Deborah, Washburn, J. O. Y., & Perkins, Ronald. (2009). Outcomes of clinical simulation for novice nursing students: Communication, confidence, clinical judgment. *Nursing Education Perspectives*, 30(2), 79-82.
- Berragan, Liz. (2011). Simulation: An effective pedagogical approach for nursing? *Nurse Education Today*, 31, 660-663. doi: 10.1016/j.nedt.2011.01.019
- Blum, C. A., Borglund, S., & Parcels, D. (2010). High-fidelity nursing simulation: impact on student self-confidence and clinical competence. *International Journal of Nursing Education Scholarship*, 7(1), 14p. doi: 10.2202/1548-923X.2035
- Brewer, Evelyn P. (2011). Successful techniques for using human patient simulation in nursing education. *Journal of Nursing Scholarship*, 43(3), 311-317. doi: 10.1111/j.1547-5069.2011.01405.x
- Cant, R. P., & Cooper, S. J. (2010). Simulation-based learning in nurse education: systematic review. *Journal of Advanced Nursing*, 66(1), 3-15. doi: 10.1111/j.1365-2648.2009.05240.x
- Fero, L. J., O'Donnell, J. M., Zullo, T. G., Dabbs, A. V., Kitutu, J., Samosky, J. T., & Hoffman, L. A. (2010). Critical thinking skills in nursing students: comparison of simulation-based performance with metrics. *Journal of Advanced Nursing*, 66(10), 2182-2193. doi: 10.1111/j.1365-2648.2010.05385.x
- Garrett, Bernard, Macphee, Maura, & Jackson, Cathryn. (2010). high-fidelity patient simulation: Considerations for effective learning. *Nursing Education Perspectives*, 31(5), 309-313.

Gasper, M.L. , & Dillon, P.M. (2012). *Clinical Simulations for Nursing Education*.

Philadelphia: F.A. Davis.

IBM Corp. Released 2011. IBM SPSS Statistics for Windows, Version 20.0. Armonk,

NY: IBM Corp.

Jeffries, P. R. (2005). A framework for designing, implementing, and evaluating:

simulations used as teaching strategies in nursing. *Nursing Education*

*Perspectives*, 26(2), 96-103.

Jeffries, P.R. (2007). *Simulation in Nursing*. New York: NLN.

Lasater, K. (2007). High-fidelity simulation and the development of clinical judgment:

students' experiences. *Journal of Nursing Education*, 46(6), 269-276.

Leigh, G. T. (2008). High-fidelity patient simulation and nursing students' self-efficacy: a

review of the literature. *International Journal of Nursing Education Scholarship*,

5(1), 17p.

Luctkar-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.

Maas, Nancy A., & Flood, Lisa Sue. (2011). Implementing high-fidelity simulation in

practical nursing education. *Clinical Simulation in Nursing*, 7(6), e229-e235. doi:

10.1016/j.ecns.2010.04.001

McCallum, Jacqueline. (2007). The debate in favour of using simulation education in pre-

registration adult nursing. *Nurse Education Today*, 27(8), 825-831. doi:

10.1016/j.nedt.2006.10.014

- McCaughey, Caroline S., & Traynor, Marian K. (2010). The role of simulation in nurse education. *Nurse Education Today*, 30(8), 827-832. doi: 10.1016/j.nedt.2010.03.005
- Norman, Jamil. (2012). Systematic review of the literature on simulation in nursing education. *ABNF Journal*, 23(2), 24-28.
- Pacsi, A. L. (2008). Human simulators in nursing education. *Journal of the New York State Nurses Association*, 39(2), 8-11.
- Ricketts, Barry. (2011). The role of simulation for learning within pre-registration nursing education — A literature review. *Nurse Education Today*, 31(7), 650-654. doi: 10.1016/j.nedt.2010.10.029
- Rourke, L., Schmidt, M., & Garga, N. (2010). Theory-based research of high fidelity simulation use in nursing education: a review of the literature. *International Journal of Nursing Education Scholarship*, 7(1), 14p. doi: 10.2202/1548-923X.1965
- Sanford, Pamela G. (2010). Simulation in Nursing Education: A Review of the Research. *Qualitative Report*, 15(4), 1006-1011.
- Schlairet, M. C., & Pollock, J. W. (2010). Equivalence testing of traditional and simulated clinical experiences: undergraduate nursing students' knowledge acquisition. *Journal of Nursing Education*, 49(1), 43-47. doi: 10.3928/01484834-20090918-08
- Smith, S. J., & Roehrs, C. J. (2009). High-fidelity simulation: factors correlated with nursing student satisfaction and self-confidence. *Nursing Education Perspectives*, 30(2), 74-78.

- Weaver, Amy. (2011). High-fidelity patient simulation in nursing education: An integrative review. *Nursing Education Perspectives*, 32(1), 37-40. doi: 10.5480/1536-5026-32.1.37
- Wotton, K., Davis, J., Button, D., & Kelton, M. (2010). Third-year undergraduate Nursing students' perceptions of high-fidelity simulation. *Journal of Nursing Education*, 49(11), 632-639. doi: 10.3928/01484834-20100831-01
- Yuan, H. B., Williams, B. A., & Fang, J. B. (2012). The contribution of high-fidelity simulation to nursing students' confidence and competence: a systematic review. *International Nursing Review*, 59(1), 26-33. doi: 10.1111/j.1466-7657.2011.00964.x

## APPENDICES

## Appendix A

## WCU IRB Letter

Western Carolina University  
 Institutional Review Board  
 c/o Office of Research Administration  
 109 Camp Building  
 Cullowhee NC 28723  
[irb@wcu.edu](mailto:irb@wcu.edu) | 828-227-7212



**IRB number:** 2013-0051

Date of review: 09/21/12

**Investigators:** Dr. Mark Kossick, Mr. Michael Youngwood

**Project Title:** An Evaluation of the Effectiveness of High Fidelity Simulation on the Acquisition of Physical Assessment Skills in First Year Associate Degree Nursing Students

Your IRB protocol has been reviewed and determined to be exempt from ongoing IRB monitoring, effective today, under the following category as authorized by 45 CFR 46.101(b):

- Research conducted in established or commonly accepted educational settings, involving normal educational practices, such as (i) research on regular and special education instructional strategies, or (ii) research on the effectiveness of or the comparison among instructional techniques, curricula, or classroom management methods.
- Research involving the use of educational tests, survey procedures, interview procedures or observation of public behavior, unless: (i) information obtained is recorded in such a manner that human subjects can be identified; and (ii) any disclosure of the human subjects' responses outside the research could reasonably place the subjects at risk of criminal or civil liability or be damaging to the subjects' financial standing, employability, or reputation.
- Research involving the use of educational tests, survey procedures, interview procedures, or observation of public behavior that is not exempt under the previous category, if: (i) the human subjects are elected or appointed public officials or candidates for public office; or (ii) federal statute(s) require(s) without exception that the confidentiality of the personally identifiable information will be maintained throughout the research and thereafter.
- Research involving the collection or study of existing data, documents, records, pathological specimens, or diagnostic specimens, if these sources are publicly available or if the information is recorded by the investigator in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects.
- Research and demonstration projects which are conducted by or subject to the approval of department or agency heads, and which are designed to study, evaluate, or otherwise examine public benefit programs.
- Taste and food quality evaluation and consumer acceptance studies

Your protocol is not subject to any further IRB monitoring. However, if you wish to make changes to your protocol, including recruitment procedures, sampling, consent, interventions, data collection methods, and investigators, please use the amendment request located on the IRB website (<http://www.wcu.edu/6801.asp>) to submit your request in advance.

This approval does not cover research conducted prior to the approval date.

A handwritten signature in black ink, appearing to read "Brian Byrd".

Brian Byrd, PhD, MSPH ([bbyrd@wcu.edu](mailto:bbyrd@wcu.edu); X2607)



## Appendix B

### Haywood Community College

#### IRB Letter

---

#### Michael Youngwood

**From:** Marlowe Mager  
**Sent:** Monday, September 17, 2012 12:51 PM  
**To:** Michael Youngwood  
**Subject:** RE: IRB info

Michael,

The Administrative Council, which serves as our Research Review Committee, had no concerns about your research project. You have approval to conduct this study at Haywood Community College.

Marlowe

Marlowe Mager  
 Coordinator of Research & Institutional Effectiveness  
 Haywood Community College  
 185 Freedlander Drive  
 Clyde, NC 28721

828.565.4077  
[mmager@haywood.edu](mailto:mmager@haywood.edu)

[www.haywood.edu](http://www.haywood.edu)  
 1.866.GoToHCC

*\*\*\*All e-mail correspondence to and from this address is subject to the North Carolina Public Records Law, which may result in monitoring and disclosure to third parties, including law enforcement.\*\*\**

---

**From:** Michael Youngwood  
**Sent:** Friday, September 07, 2012 8:43 AM  
**To:** Marlowe Mager  
**Subject:** IRB info

Marlowe,  
 I am attaching the IRB form for HCC as well as my abstract and methodology here for your reading pleasure. Please feel free to let me know if you need anything more from me.  
 Thank you so much for your help,

Michael A. Youngwood, RN/BSN  
 Region A Nursing Consortium  
 Nurse Educator  
 Department Health and Human Services  
 Haywood Community College  
 185 Freedlander Drive  
 Clyde, North Carolina 28721  
 828-627-4694 (Office)

## Appendix C

### Participant Informed Consent

Western Carolina University  
School of Nursing  
28 Schenck Parkway - Suite 307  
Biltmore Park Town Square  
Asheville, NC 28803  
Phone: 828-654-6499  
Fax: 828-654-6507

Principal Investigator (PI): Michael A. Youngwood.  
Phone: 828-627-4694

Project Title: AN EVALUATION OF THE EFFECTIVENESS OF HIGH FIDELITY SIMULATION ON THE ACQUISITION OF PHYSICAL ASSESSMENT SKILLS IN FIRST YEAR ASSOCIATE DEGREE NURSING STUDENTS

#### **Purpose of Study:**

You are invited to participate with no obligation in a research study intended to determine the effectiveness of high fidelity human simulation (HFHS) on first year associate degree nursing students' ability to perform basic physical assessment skills.

#### **Description of Participation:**

This intervention will consist of training through the use of staged simulation scenarios that address specific components of basic physical assessment (i.e., heart sounds, lung sounds, bowel sounds and peripheral pulses). The duration of the simulation training will be for one clinical lab day (approximately 6 hours). The control group of 24 students will receive the same HFHS training but only after the dependent variables of the study have been recorded. The dependent variables will be statistically analyzed to assess the impact of HFHS on the accuracy and efficiency of students' performance of basic physical assessment skills. The data collection tool used by full-time and adjunct clinical faculty will allow the researcher to measure each student's ability to accurately and efficiently assess heart sounds, lung sounds, bowel sounds, and peripheral pulses (see attached data collection form) at their assigned clinical sites. All students will be informed not to share with clinical faculty if they have received HFHS prior to beginning their respective clinical rotations.

**Confidentiality:**

To protect confidentiality, assure anonymity of, (including clinical sites and faculty) and reduce bias, an identification (ID) number will be randomly assigned by faculty not involved in the study. These ID numbers will be used with research data collection forms in the study. The code for the ID numbers and matching student names, faculty names, and participating clinical sites will be kept in a locked drawer in sealed envelope in the principal investigator's office. Following dissemination of the study results, the principal investigator will shred the coded data sheet.

**Voluntary Participation:**

Your participation is strictly voluntary. If you decide not to participate there will be no penalties or negative consequences. Your course grade or the way you are treated in this course will not be effected if you decide not to participate in this study. You may choose to withdraw from the study at any time. If you choose to withdraw, all data concerning you will be destroyed.

Do you have any questions? (Circle one) NO YES

If you circled YES, please contact the Principal Investigator, Michael A. Youngwood, at the above phone number or by email at [mayoungwood@haywood.edu](mailto:mayoungwood@haywood.edu) before signing this form. If you have questions or concerns regarding your rights as a research participant, you may also contact the chair of the WCU Institutional Review Board at 828-227-7212. Do not sign this form until these questions have been answered to your satisfaction.

YOU ARE MAKING A DECISION WHETHER OR NOT TO ALLOW THE PRINCIPAL INVESTIGATOR TO USE THE DATA COLLECTED IN THIS STUDY FOR RESEARCH PURPOSES ONLY. YOUR SIGNATURE BELOW ALSO INDICATES THAT YOU ARE OVER THE AGE OF 18.

I AGREE DO NOT AGREE (Circle one) to participate in this research study.

Participant's name (please print) \_\_\_\_\_ Date: \_\_\_\_\_

Participant's Signature: \_\_\_\_\_

## Appendix D

## Demographic Questionnaire Student

**Demographic Data for students enrolled in research study**

Name:

Age:

Gender:

Ethnicity:

Education Level:

Prior degree (associates, bachelors):

Prior experience as a healthcare provider (CAN):

Setting and number of years:

Marital status:

## Appendix E

## Demographic Questionnaire Faculty

**Demographic Data for clinical faculty evaluating students enrolled in research study**

1. Highest educational degree obtained (associate degree, bachelor's degree, masters degree):
2. Number of years employed as an RN providing bedside care / performing physical assessments:
3. Age:
4. Gender:
5. Ethnicity:
6. Number of years teaching and evaluating students regarding their physical assessment skills of patients:

## Appendix F

## Faculty Data Collection Form

**CLINICAL PERFORMANCE ASSESSMENT TOOL (CPAT)f****Faculty**

**-Physical Assessment Research-  
Michael A. Youngwood, RN, BSN  
Dr. Mark A. Kossick**

*\*Faculty physical assessment findings will serve as the gold standard for each respective patient; a LEARNING STETHOSCOPE to be used with auscultation of heart, lung, and bowel sounds*

Date: \_\_\_\_\_

Faculty Name \_\_\_\_\_

Student Name \_\_\_\_\_

Name of Clinical Site \_\_\_\_\_

**I. Auscultation of Heart Sounds**

Duration of Heart Sound Assessment by Student (time recorded with stop watch [START with student placement of stethoscope on patient's chest and STOP when student finishes giving report to faculty on auscultation of ALL heart sound findings):

Min \_\_\_\_\_ Sec \_\_\_\_\_

Student had patient in correct position for auscultation of heart sounds:

Yes \_\_\_\_\_ (High Fowlers- 45° min to 90° max)

No \_\_\_\_\_

Pt condition precludes positioning High Fowlers \_\_\_\_\_

Student had correct placement of stethoscope (use of diaphragm only required) in the aortic area, pulmonic area, Erb's point, tricuspid area, and mitral area

Student placed stethoscope directly on patient's skin

Yes \_\_\_\_\_

No \_\_\_\_\_ (e.g., reason for marking no: student placed stethoscope over patient's gown)

**1. Aortic area**

Yes \_\_\_\_\_ No \_\_\_\_\_

Faculty Findings: Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

**2. Pulmonic area**

Yes \_\_\_\_\_ No \_\_\_\_\_

Faculty Findings: Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

**3. Erb's Point area**

Yes \_\_\_\_\_ No \_\_\_\_\_

Faculty Findings: Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

**4. Tricuspid area**

Yes \_\_\_\_\_ No \_\_\_\_\_

Faculty Findings: Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

**5. Mitral area**

Yes \_\_\_\_\_ No \_\_\_\_\_

Faculty Findings: Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

**II. Auscultation of Lung Sounds**

Duration of Lung Sound Assessment by Student (time recorded with stop watch [START with student placement of stethoscope on patient's chest and STOP when student finishes giving report to faculty on auscultation of ALL lung sound findings):

Min \_\_\_\_\_ Sec \_\_\_\_\_

Faculty Findings: Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

If abnormal- indicate below the location of "abnormal breath sounds" (circle response)

RUQ            RLQ            LUQ            LLQ

### **Auscultation of Bowel Sounds**

Duration of Bowel Sound Assessment by Student (time recorded with stop watch  
[**START** with student placement of stethoscope on patient's abdomen and **STOP** when  
student finishes giving report to faculty on auscultation of ALL bowel sound findings):

Min \_\_\_\_\_ Sec \_\_\_\_\_

Faculty Findings: Present \_\_\_\_\_ Absent \_\_\_\_\_

If absent- indicate below the location of the absent bowel sounds (circle response)

RUQ            RLQ            LUQ            LLQ

### **III. Assessment of Peripheral Pulses**

Duration of Peripheral Pulse Assessment by Student (time recorded with stop watch  
[**START** with student placement of finger on patient's pulse and **STOP** when student  
finishes giving report to faculty on assessment of ALL peripheral pulse findings):

Min \_\_\_\_\_ Sec \_\_\_\_\_

#### **Radial Artery**

Faculty Findings:

Present on the RIGHT      Yes \_\_\_\_\_      No \_\_\_\_\_

Present on the LEFT      Yes \_\_\_\_\_      No \_\_\_\_\_

#### **Dorsalis Pedis Artery**

Faculty Findings:

Present on the RIGHT      Yes \_\_\_\_\_      No \_\_\_\_\_

Present on the LEFT      Yes \_\_\_\_\_      No \_\_\_\_\_



## Appendix G

## Student Data Collection Form

**CLINICAL PERFORMANCE ASSESSMENT TOOL (CPAT)s**  
**Student**  
**(Accuracy & Efficiency)**

\*Reviewed with Students Prior to Starting 1<sup>st</sup> Clinical Rotation

**-Physical Assessment Research-**  
**Michael A. Youngwood, RN, BSN**  
**Dr. Mark A. Kossick**

Date: \_\_\_\_\_

Student Name \_\_\_\_\_

Name of Clinical Site \_\_\_\_\_

A stopwatch will be used by clinical faculty to determine the student's efficiency of completing each of the four designated areas of physical assessment. The student's efficiency measured in time with the stopwatch will not include time spent with the preliminary introduction of student's to patients. For example, the **START** time will begin when the student first places their learning stethoscope on the patient's chest to auscultate for heart sounds. The time will **END** when the student has finished giving a report of their findings (e.g., all heart sounds) to the clinical faculty.

**IV. Auscultation of Heart Sounds with patient in correct position**

Assess Heart Sounds in the following sequence (use of diaphragm only)

6. Aortic area

Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

7. Pulmonic area

Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

8. Erb's Point area

Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

9. Tricuspid area

Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

10. Mitral area

Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

**\*Give report to clinical faculty of findings**

**V. Auscultation of Lung Sounds in all 4 quadrants**

Normal \_\_\_\_\_ Abnormal \_\_\_\_\_ Unsure \_\_\_\_\_

If abnormal- indicate below the location of "abnormal breath sounds" (circle response)

RUQ          RLQ          LUQ          LLQ

**\*Give report to clinical faculty of findings**

**VI. Auscultation of Bowel Sounds in all 4 quadrants**

Present \_\_\_\_\_ Absent \_\_\_\_\_ Unsure \_\_\_\_\_

If absent- indicate below the location of the absent bowel sounds (circle response)

RUQ          RLQ          LUQ          LLQ

**\*Give report to clinical faculty of findings**

**VII. Assessment of Peripheral Pulses****Radial Artery**

Present on the RIGHT Yes \_\_\_\_\_ No \_\_\_\_\_ Unsure \_\_\_\_\_

Present on the LEFT Yes \_\_\_\_\_ No \_\_\_\_\_ Unsure \_\_\_\_\_

**Dorsalis Pedis Artery**

Present on the RIGHT Yes \_\_\_\_\_ No \_\_\_\_\_ Unsure \_\_\_\_\_

Present on the LEFT Yes \_\_\_\_\_ No \_\_\_\_\_ Unsure \_\_\_\_\_

**\*Give report to clinical faculty of findings**

**RUQ** = right upper quadrant

**RLQ** = right lower quadrant

**LUQ** = left upper quadrant

**LLQ** = left upper quadrant

Rev. 9/18/2012 1558