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The Impact of Simulation-Based Learning Experience on Critical Thinking Acquisition

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The Impact of Simulation-Based Learning Experience on Critical Thinking Acquisition

by

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CAPSTONE APPROVAL PAGE

This is to certify that the capstone project prepared by Candice Rome, entitled *The Impact of Simulation-Based Learning Experience on Critical Thinking Acquisition* has been approved by this committee as satisfactory completion of the requirement for the degree of Doctor of Nursing Practice.

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Abstract

The purpose of this comparative experimental project was to compare the impact of simulation-based learning experiences to traditional clinical rotations on critical thinking acquisition of associate nursing students within a maternal-child course. Innovative pedagogies have been integrated in nursing programs to augment inadequate clinical placement and instructor availabilities. A longitudinal convenience sample of 45 second year associate level nursing students enrolled in a maternal-child course was utilized. Four experimental groups, 24 students were exposed to an eight-hour simulation-based learning experience in place of one clinical rotation. During the eight hour simulation day, students participated in three various maternal-child centered simulations. Three control groups, 21 students were exposed to only traditional clinical rotations. A pretest, posttest design utilizing the Health Science Reasoning Test was used to measure critical thinking in relation to learning experiences. Results of the study indicate simulation and traditional clinical experiences are equivocal regarding critical thinking acquisition of nursing students.

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Chapter I

Introduction

A phenomenon has taken place among pre-licensure school of nursing programs where students are receiving a reduced amount of exposure to traditional clinical experiences augmented by increased exposure to simulation-based learning experiences (Bambini, Washburn, & Perkins, 2009). Bambini et al. (2009) detailed the multifaceted rationale for this phenomenon as being centered on decreasing numbers of experienced nursing faculty and inaccessible healthcare facilities. Even with a 12% deficit of nursing faculty (American Association of Colleges of Nursing [AACN], 2011) to instruct and healthcare facilities to host clinical rotations, Bambini et al. (2009) affirmed nursing programs should be as, if not more, effective in the development of students' critical thinking in order to prepare students to provide care for increasingly complex patients. Instilling nursing students with knowledge and experience required to manage and to care for intricate patients is a recurrent theme noted for increased utilization of simulation-based learning experiences as lives are dependent upon competent clinical reasoning of nurses (Facione & Facione, 2008).

Cioffi, Purcal, and Arundell (2005) stated simulations facilitate the development of clinical reasoning skills by providing students with experiential learning for decision making focused on utilizing, processing and combining clinical information to reach a decision. Based on this and parallel statements found within current literature, it is known simulation-based experiences provide students educational strategies to develop clinical reasoning skills equivalent to traditional clinical experiences. What is lacking within the literature is the impact simulation-based experiences have on nursing students' ability to apply clinical reasoning skills to think critically in health care

situations. Research is needed to understand the relationship between critical thinking and simulation-based experiences as critical thinking is defined as a fundamental attribute required of health care professionals (Wetmore, Boyd, Bowen, & Pattillo, 2010).

An extensive review of literature was conducted which explored utilization of simulation-based learning experiences within academia and clinical facility settings. Bambini, Washburn, and Perkins (2009) evaluated simulated clinical experiences to determine their effect on self-efficacy. Bambini et al. (2009) found simulations increased students' self-efficacy regarding their ability to perform nursing skills on human patients and solve similar clinical problems. Cioffi, Purcal, and Arundell (2005) investigated clinical decision making of midwifery students utilizing simulations and concluded students' exposed to simulation reached clinical decisions quicker, collected more and reviewed clinical data less often, made less inferences, and reported higher levels of confidence. Schlairet and Pollock (2010) compared knowledge gained from simulated and traditional clinical experiences, which revealed an equally significant gain in knowledge from each experience. Huhn and Deutsch (2011) researched the effect of computer-simulated software on clinical reasoning and discovered an increase in the ability of analysis and inductive reasoning, data processing, and reaching conclusions.

There was a noted lack in the evidence of existing research regarding the level of essential knowledge attainment students received when exposed to simulation-based learning experiences (Schlairet & Pollock, 2010). A limited amount of research was found focused on utilizing simulation-based learning in maternal-child pre-licensure nursing programs as well. Jeffries, Bambini, Hensel, Moorman, and Washburn (2009)

confirmed additional empirical data and research are needed regarding simulation in maternal-child nursing to validate usage of this type of pedagogy.

Statement of the Problem

Simulation usage has and continues to increase among pre-licensure programs while traditional clinical experiences are being utilized at a reduced rate. However, it is still unclear if this alteration is in the best interest of student nurses' education and the safety of their future patients. A well-educated nurse displaying adequate critical thinking capabilities is associated with fewer mortality rates, decreased medication errors, and positive patient outcomes (AACN, 2011). Literature fails to depict if simulation-based experiences are equivalent to traditional clinical experiences to facilitate nursing students' ability to apply clinical reasoning skills to think critically in health care situations. The primary purpose of this doctoral project was to determine if maternal-child simulation exposure had a measurable impact on critical thinking acquisition in Associate Degree nursing (ADN) students. Simulation emphasis was placed on the following maternal-child situations: (a) care of an adolescent with a sexually transmitted infection (STI), (b) care of a laboring patient through the four stages of labor, and (c) care of a healthy newborn. These maternal-child situations were selected based on content included in the NCLEX-RN test plan according to National Council of State Boards of Nursing (2012). The Health Science Reasoning Test (HSRT) was administered to ADN students to measure critical thinking.

Justification of Study

According to the literature, there are numerous strengths which support the utilization of simulation-based learning experiences as a means to augment traditional clinical experiences. Strengths include an increase in reported student nurse self-

efficacy and clinical judgment, increased opportunities to practice new procedures and experience critical events, and proven equivalent knowledge acquisition to traditional clinical experiences. Uncontestably, simulation-based learning includes limitations such as limited research on effects of simulation to human patient care competencies, making comparison of the two difficult. Within current literature there are limited studies focused on outcomes not self-reported by students, such as critical thinking capabilities in relation to simulation-based experiences.

The need to augment student nurses' traditional clinical experiences is increasing with the preferred method being simulation-based learning experiences. Based on strengths and limitations within current literature, simulation-based learning appears to be an appropriate augmentation for traditional clinical rotation. Incorporating simulations provides students the opportunity to practice psychomotor and clinical reasoning skills in a nonthreatening, safe setting (Jeffries, et al., 2009). However, to adequately validate simulation as a suitable alternative additional research gathering empirical data which is not solely self-reported by students is warranted. Validation permits students are prepared to function safely when caring for current and future patients (Jeffries et al., 2009).

Pedagogy styles within nursing programs require substantiation to ensure each meets educational objectives to advance students' knowledge attainment, enhance clinical reasoning, and promote critical thinking. Jeffries et al. (2009) believes simulation-based experiences could clear maternal-child knowledge gaps by allowing students opportunities to provide care for simulated patients with realistic, critical, and rare conditions.

Conceptual Framework

The conceptual framework used to guide this capstone project was Pamela Jeffries' (2005) Nursing Education Simulation Framework. Jeffries' (2005) simulation framework was used to guide the project design, select simulations used, and analyze collected data.

Within Jeffries' (2005) Nursing Education Simulation Framework there are five conceptual components, each containing various variables. The five conceptual components of the Nursing Education Simulation Framework are (a) teacher (b) student (c) educational practices; (d) simulation design; and (e) expected student outcomes (Jeffries, 2005; Jeffries, 2007). Jeffries' framework was used to guide this project since it was written with the intentions of being a guiding framework for the development, implementation, or evaluation of simulation-based learning experiences (Jeffries, 2007). Because its variables include: (a) learning (knowledge); (b) skill performance; and (c) critical thinking, the component focused upon was expected student outcome (Jeffries, 2005; Jeffries, 2007). Jeffries' framework was intended to be a guiding framework for the development, implementation, or evaluation of simulation-based learning experiences (Jeffries, 2007), making it a remarkable framework for this capstone project. Through participation in various simulations nursing students were exposed to all five of Jeffries' conceptual components, as well as multiple component variables. Jeffries (2005) framework was also utilized to implement and guide each of the three simulations students participated in on each group's scheduled simulation day. A conceptual-theoretical-empirical diagram is included below as Figure 1 to assist in visually describing the relationship between this capstone project's design and Jeffries' Nursing Education Simulation Framework.

Conceptual Model Concepts	→	Theory Concepts	→	Empirical Indicators
Teacher	→	Facilitator and evaluator of simulation	→	Health Science Reasoning Test
Student	→	Self-directed and motivated participants in simulation experiences	→	Health Science Reasoning Test
Educational Practices	→	Active learning, learning styles, collaboration, and expectations to be considered in simulation design	→	Health Science Reasoning Test
Simulation Design	→	Objectives, fidelity, problem solving, student support, and reflective thinking of simulation experience	→	Health Science Reasoning Test
Outcome	→	Learning outcome to be achieved from simulation experience	→	Health Science Reasoning Test

Figure 1. *Conceptual-Theoretical-Empirical Diagram: Nursing Education Simulation Framework.*

Assumptions

For conduction of this capstone project, the following assumptions guided the study:

- Supplementing traditional clinical rotations with simulations has become necessary due to limited resources and limited exposure to rare or critical patient situations.
- Simulations provide students with a nonthreatening environment to master psychomotor skills.

- Schools of Nursing are expected to graduate competent students that can obtain licensure and care for multiple complex patients.
- Critical thinking is an essential quality nurses must possess.

Project Questions

The project administrator sought to answer the following three research questions through completion of this capstone project:

1. Is there a significant impact on ADN students' ability to critically think when exposed to simulation-based learning experiences while enrolled in a maternal-child course?
2. Is there a significant impact on ADN students' ability to critically think when exposed to traditional clinical experiences while enrolled in a maternal-child course?
3. Do simulation-based learning experiences and traditional clinical experiences have equivocal impacts on critical thinking acquisition of ADN students in a maternal-child course?

The empirical indicator for each of the three research questions asked in this capstone project was Health Science Reasoning Test as permitted by Insight Assessment (2011). Statistical analysis of collected data was performed through independent and paired sample *t*-tests. For this capstone project the independent variable was simulation-based learning experience and the dependent variable was critical thinking.

Definition of Terms

The following variables were defined to prevent complication or perplexity by the reader: (a) simulation-based learning experience; (b) human patient simulator (HPS); (c) traditional clinical experience; and (d) critical thinking. Within the confinements of this

study, the phrase simulation-based learning experience was defined as a hands-on learning exercise that imitates a realistic clinical experience with the intention of facilitating psychomotor skills, critical thinking and decision making through such techniques as role playing various healthcare personnel, utilizing manikins and interactive equipment, and participating in debriefing. The terms simulation-based learning experience, simulation-based experience, simulation learning experience and simulation were used interchangeably throughout this project. The idiom HPS referred to manikins which replicate authentic human patient anatomy to various degrees. Traditional clinical experience was defined as a teaching exercise taking place within a healthcare facility in which student nurses provide nursing care for live, human patients under supervision of a clinical instructor employed by a school of nursing. The terms traditional clinical experience, traditional clinical rotations and traditional clinical settings were used interchangeably throughout this project. Critical thinking was defined as a complex phenomenon composed of analysis and interpretation, inference, evaluation and explanation, deductive and inductive reasoning, and application. Figure 2 visually details this study's definition of critical thinking.

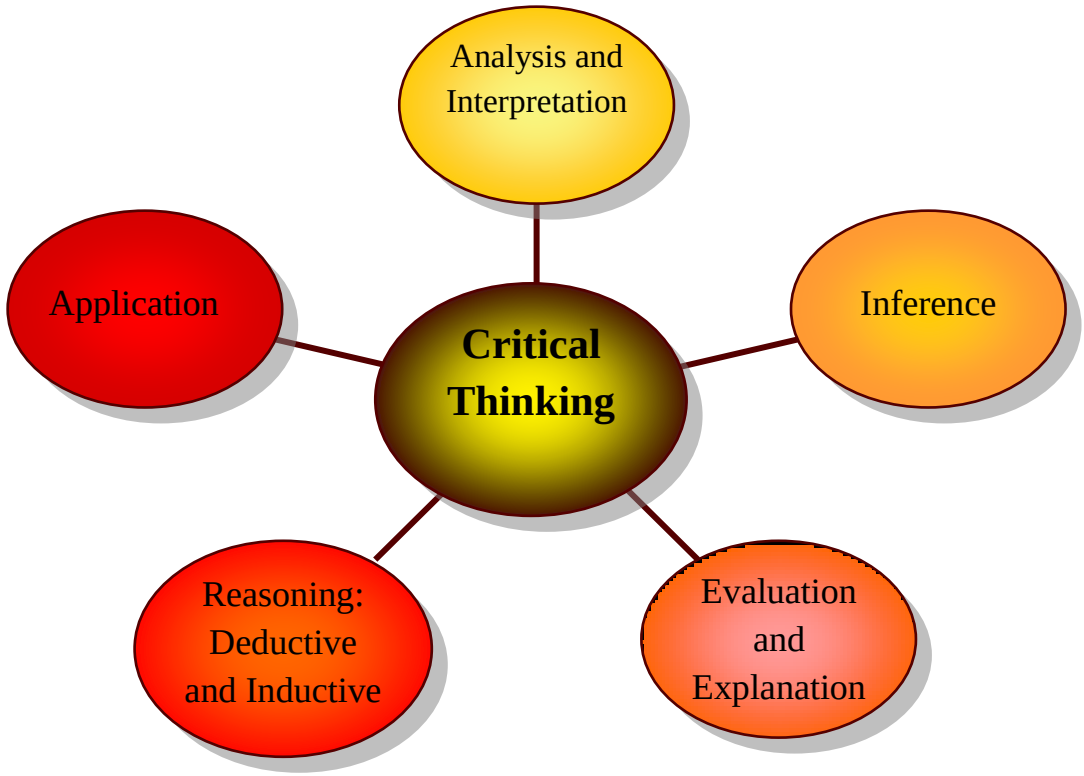


Figure 2. *Critical Thinking Defined.* Critical thinking was defined for purposes of this project due to existence of multiple variations of its definition among the literature.

Conceptual components defined for purposes of this study were: (a) teacher; (b) student; (c) educational practices; (d) simulation design; and (e) outcomes. Teacher referred to the nursing instructors who led the simulation-based learning experiences or leading traditional clinical rotations. Student consisted of fourth semester ADN students enrolled in a community college nursing program in western North Carolina. The expression educational practices referred to active, diverse learning methods of simulation-based learning experiences. Simulation design described objectives, complexity, and reflective thinking processes involved with each simulation experience utilized throughout the project progression. The final term of outcomes was defined as

knowledge gained by students through the learning experience, simulation or clinical, and its impact on critical thinking skills.

Summary

Due to increasing difficulty of acquiring adequate traditional clinical settings to allow student patient care experiences, nursing educators have been challenged to find alternative methods to prepare students in patient care techniques and nursing skills (Jeffries, 2005). The teaching methodology implemented should promote clinical competence while simultaneously assist students in critical thinking skill development (Herrman, 2008). One methodology increasing in popularity is simulation-based learning experiences (Smith & Roehrs, 2009; Jeffries, et al., 2009). Adept utilization of problem-based learning, role-playing, team problem solving and reflective thinking which are all components of simulation-based learning, has each been proven to engage students in the concepts of critical thinking (Facione & Facione, 2008). According to the literature, more research needs to be completed and prior research replicated to validate and prove the equivalence of simulation learning experiences to traditional clinical experiences (Bantz, et al., 2007; Jeffries, et al., 2009; Jeffries et al., 2012). Future research investigating the success of nursing student's critical thinking, decision making, and psychomotor skills after exposure to simulation learning experiences is in critical demand based on the increasing popularity of simulations and the decreasing opportunities for traditional clinical experiences (Bantz, et al., 2007; Bambini et al., 2009; Jeffries, et al., 2009; Jeffries et al., 2012). The purpose of this capstone project was to determine if exposure to simulation-based experiences had a measurable impact on ADN students' ability to critically thinking.

Chapter II

Research Based Evidence

The essence of this literature review was constructed around the capstone project "The Impact of Simulation-Based Learning Experience on Critical Thinking Acquisition." The purpose of this literature review was to examine and present insight into currently available literature regarding variables relating to the capstone project. The capstone project, guiding framework, and critical analysis of current literature are discussed in detail in the remainder of this chapter.

Background

Significance

The phenomenon which has occurred among pre-licensure school of nursing programs involves students receiving a reduced amount of exposure to traditional clinical experiences augmented by increased exposure to simulation-based learning experiences (Bambini, Washburn, & Perkins, 2009). Jeffries et al. (2009) detail an increase in competition for utilization of traditional clinical sites for undergraduate students has led to supplementation of traditional clinical experiences with simulations. Maternal-child educators are also coupled with preparing student nurses to care for increasingly complex obstetric and newborn patients (Jeffries et al., 2009). In maternal-child settings students are often permitted to simply observe in place of providing tangible patient care, limiting their ability to develop and practice critical thinking skills (Jeffries et al., 2009). As stated previously, critical thinking is an essential skill for health care professional to provide evidence-based patient care (Wetmore et al., 2010). In fact, a moral imperative for health care professionals should be to improve critical thinking related to patient care judgment (Facione & Facione, 2008).

While conducting this literature review, it was noted a gap exists within the current available research regarding knowledge attainment (Schlairet & Pollock, 2010) and critical thinking (Lasater, 2007; Wetmore et al., 2010) of nursing students when exposed to simulation-based learning experiences. The literature stated simulation experiences provide students with the tools and methodologies needed to develop nursing and reasoning skills equivalent to traditional clinical experiences (Lasater, 2007; Schlairet & Pollock, 2010). However, it is unknown if simulation learning experiences impact critical thinking acquisition of ADN students while enrolled in the maternal-child course.

Overview of Capstone Project

Determining if maternal-child simulations had a measurable impact on critical thinking capabilities of ADN students was the primary purpose of this doctoral project. The population for this study consisted of 45 ADN students within a maternal-child course from a nursing program in western North Carolina. A total sample size of 42 participants, with at least 21 in each group, was needed for validity of this study (Faul, Erdfelder, Buchner, & Lang, 2009). This particular nursing course consisted of weekly didactic lecture and a weekly clinical component over a 16-week semester. Students were randomly separated into two separate groups by the project administrator, based on prior assigned clinical groups. A group of 24 students served as the intervention group and the alternate 24 students functioned as the control group. The intervention group was exposed to simulation-based learning, while the control group had no simulation exposure of any style during the semester.

Both groups were given HSRT prior to implementation of simulation-based learning as well as at the conclusion of their clinical component for comparison of potential

effects on critical thinking. The outcome of this capstone project was the student nurses' level of critical thinking in relation to maternal-child simulation exposure.

Conceptual Framework

The conceptual framework used to guide this doctoral capstone project was Pamela Jeffries' (2005) Nursing Education Simulation Framework. The pedagogy style of simulation-based learning is the essential element and the heart of Jeffries' framework (Jeffries, 2005; Jeffries, 2007). Jeffries (2005) defines simulation 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 videos or mannequins" (p. 97) or simply "activities or events that replicate clinical practice" (Jeffries et al., 2009, p. 613). Jeffries' (2005) simulation framework was used to guide the project design, select simulations used, and analyze collected data for this doctoral project.

There are five conceptual components within Jeffries' (2005) Nursing Education Simulation Framework, each containing variables. The five conceptual components of the Nursing Education Simulation Framework are (a) teacher factors; (b) student factors; (c) educational practices that need to be incorporated into the instruction; (d) simulation design characteristics; and (e) expected student outcomes (Jeffries, 2005; Jeffries, 2007). Expected student outcome was the component focused on within this capstone project due to it variables including (a) learning (knowledge); (b) skill performance; and (c) critical thinking (Jeffries, 2005; Jeffries, 2007). Critical thinking was the variable of primary focus from Jeffries' framework, being it was the independent variable of this capstone project.

Jeffries' framework was intended to be a guiding framework for the development, implementation, or evaluation of simulation-based learning experiences (Jeffries, 2007). Implementation and evaluation of the three simulations also was based on Jeffries' (2005) framework. The simulation model Jeffries developed for her Nursing Education Simulation Framework is displayed in Figure 3 (Jeffries, 2007).

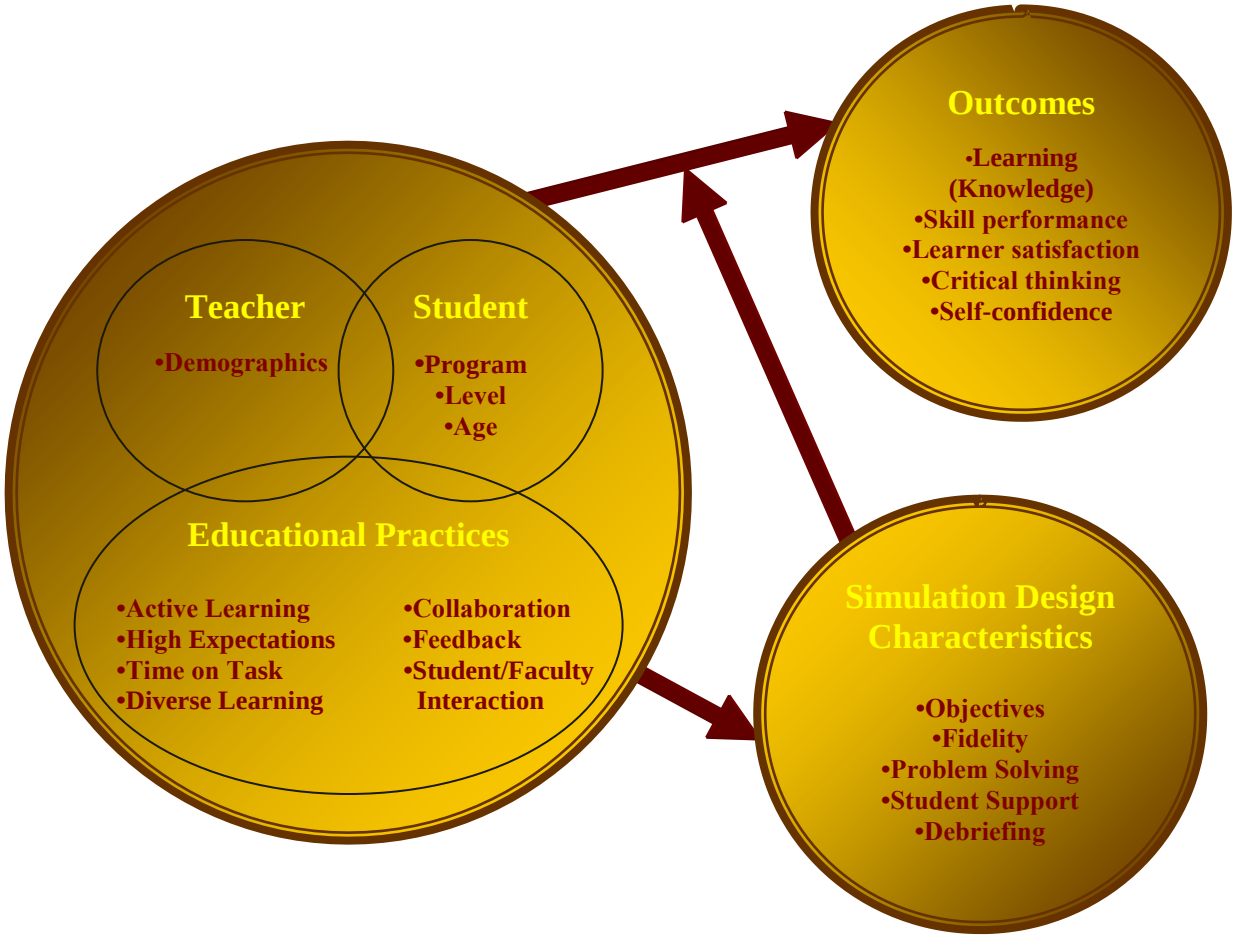


Figure 3. The Nursing Education Simulation Framework by P. Jeffries (2007). *Simulation in nursing education: From conceptualization to evaluation*. New York, NY: National League for Nursing.

ADN students within the experimental group were exposed to each of Jeffries' five conceptual components when they participated in the three maternal-child simulations of this doctoral project. Teacher exposure transpired through student interaction with clinical faculty and simulation administrator. Student exposure related to working among other students in clinical and simulation environments. Education practices were traditional clinical and simulation-based learning experiences. Simulation design characteristics included pre-simulation activities, pre-conference, actual simulation, and debriefing. Student outcome of focus for this capstone project was critical thinking.

Method

The critical analysis of literature explored utilization of simulation-based learning experiences within academia and clinical facility settings. The review also examined student nurses' evaluation of simulation experiences in relation to self-efficacy and knowledge intensifications, critical thinking aptitude, as well as the relation between providing nursing care in a simulation setting and care for tangible human patients within clinical settings. In addition, the framework guiding the capstone project and the empirical instrument were explored. The literature review for this doctoral project was conducted using the research databases Academic OneFile, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Education Resource Information Center (ERIC), Google Scholar, Medical Literature On-Line (Medline), Ovid, ProQuest, PubMed, and Sage Premier 2011.

Multiple key terms were utilized in performing database searches including ADN student, nursing student, critical thinking, traditional clinical rotation, simulation, simulation-based learning experiences, clinical simulations, human patient simulator, clinical judgment, Jeffries Nursing Education Simulation Framework, and HSRT.

Literature pertaining to the variables published within the previous 10 to 15 years was analyzed. From the analyzed literature, selected research studies, studies of interest and discussion, and clinical trials related to the fundamentals of this doctoral capstone project were selected for utilization.

Literature Summary

Student Evaluation of Simulations

Simulated clinical experiences were evaluated as a teaching and learning method to determine if simulations increase self-efficacy of nursing students in a study by Bambini, Washburn, and Perkins (2009). The population consisted of a convenience sample of 112 four-year baccalaureate nursing students from a midsized college located in a Midwestern state; enrolled in their obstetrical course. Quantitative and qualitative measures designs were both used to conduct the study. Researchers developed pretest, posttest and follow-up surveys to collect empirical data; the posttest and follow-up surveys contained open-ended questions to enhance validity. Data were gathered from the surveys over a four semester time span, in which 112 students returned the pretest and posttests, only 20 returned the follow-up surveys. Bambini et al. (2009) focused on obstetrical clinical components due to finding a lack of current research regarding the subject. The study consisted of a three hour simulation lab which involved eight postpartum, fetal and newborn care stations. The pretest was completed prior to the simulation lab and the posttest was completed at the conclusion of the lab. Follow-up surveys were collected subsequent to students' first traditional clinical rotation but were excluded due to a lack of returned follow-up surveys. Completion of *t*-tests revealed students had a considerable increase in self-reported self-efficacy in performing postpartum and newborn nursing skills following the simulation lab. Three themes were

discovered from participant answers to open-ended questions related to communication, psychomotor skill confidence, and clinical judgment. Overall, Bambini et al. (2009) found simulations to increase students' self-efficacy regarding their ability to perform nursing skills on human patients and solve similar problems within clinical settings. The limitations regarding the study included the fact data collected were self-reported which allowed it to be subject to social-response bias. There was no control over which students completed and returned surveys, which had potential to affect validity of the results. Furthermore, simulation labs were completed in small groups leading to variations to each student's simulation experience.

An eight station, six-hour clinical simulation day was developed, implemented and evaluated by Bantz, Dancer, Hodson-Carlton, and Van Hove (2007). The study population consisted of an undisclosed amount of baccalaureate nursing students from Ball State University. Stations were designed to provide students a medium to transfer classroom theory into clinical-based simulation settings and focused on maternal-newborn care since this area was found to be lacking in the literature. Prior to the laboratory experience, students were given a packet containing learning objectives, individual station instructions and possible station discussion questions. After finishing all eight stations, students completed a faculty developed, 18-item Likert scale tool with ten open ended questions. According to the analyzed data, students felt simulations were more beneficial than receiving lecture alone on content. Also stated by students was an increase in their confidence to perform practical obstetrical and newborn skills in clinical settings after they had the opportunity to perform the skills in a safe simulation setting. Limitations of this study were equipment capability restrictions and students' repeatedly stated anxiety in communicating with HPSs.

Clinical decision making of midwifery students who utilized simulation within their educational experience was investigated by Cioffi, Purcal, and Arundell (2005). The research question explored was "Do midwifery students who receive the simulation strategy arrive at assessment decisions more quickly, revisit information less often, make more inferences, and report higher confidence levels than students who receive the usual lecture material?" (Cioffi et al., 2005, p. 131). A pilot study was developed and implemented using a posttest design with 36 volunteer midwifery students enrolled in their second semester from a university near Sydney, Australia. Students were randomly assigned to an intervention or control group; the intervention group participated in two simulations in place of traditional lecture and the control group was exposed only to traditional lecture of the same two topics. Simulations and posttests were evaluated by proficient midwives to ensure adequacy, sufficiency and validity of scenarios before implementation. Once validity was established, the experimental group participated in a simulation based on normal labor. Students were divided into groups of two with one assuming the role of a midwife and the other a client. Student's assuming the role of client was given a master sheet from which to answer the student midwife's questions. Simulation exercises were audio recorded with students being encouraged to think aloud during scenarios to allow for critical reflection of performance and thought process during the simulation exercises. The student pairs remained constant during participation in the second scenario of neonatal physiological jaundice, with roles reversed. Following each simulation, students in the midwife role completed self-reported confidence level forms. Experimental and control groups completed the posttest at the end of their third semester. Audiotapes were then transcribed and categorized into measurable groups of data collection, data review, and inference. Based

on the findings, students who received simulation arrived at decisions quicker for normal labor, but not in the jaundice scenario. Students in the intervention group obtained more clinical information from patients, revisited information less, and made fewer inferences than the control group. The intervention group of students also reported higher self-confidence levels than the control group of students. The authors discovered students which participated in simulation strategies reached clinical decisions quicker, collected more clinical data, reviewed clinical data less often, made less inferences, and reported higher levels of confidence than students in the control group. Cioffi et al. (2005) concluded simulation strategies promote increased learning and meet challenges of incorporating innovative, experiential learning methods similar to clinical situations encountered during traditional clinical rotations. However, due to the small size of participants within the pilot study, additional research is still needed before a definite conclusion can be reached on this matter.

Perceptions' of nursing students regarding the usage of video analysis within simulations in a three-year nursing program were explored by Brimble (2008). A self-completion questionnaire to acquiring quantitative and qualitative results prior to and following a pediatric simulation experience was developed. Twenty-nine students anonymously completed the pre-questionnaire and 24 completed the post-questionnaire due to absenteeism. The questionnaires investigated supportive needs and perceptions' of student nurses prior to, during and after a video assessment of a simulation learning experience. Prior to the initial video analysis the majority of student expressed apprehension of such an assessment technique. However, after the experience student's personal opinions towards the technique changed to more positive and accepting opinions. Students concluded video analysis was useful, informative, and a preferred

method of obtaining feedback regarding skill performance within a simulation. Students also stated this method of feedback appeared more consistent than traditional instructor feedback. Therefore, video analysis was declared as an appropriate, beneficial and functional method for nursing instructors to utilize in simulation-based learning experiences. A small sample size was a reported limitation of this study.

Simulation Usage in Academia and Clinical Facility Settings

The ability of high fidelity simulations to facilitate the application of knowledge of clinical midwifery skills in relation to obstetric emergencies was investigated by Norris (2008). This pilot study was performed at Napier University in Edinburgh, Scotland where 27 student midwives participated and role-played in real-life obstetric emergency simulation scenarios for one day. To increase the realistic level of simulation scenarios, the setting was a hospital facility with actual hospital equipment and Noelle® high fidelity simulator. The simulation day consisted of four stations covering the following topics: shoulder dystocia, adult resuscitation, postpartum hemorrhage patient, and a breech birth. To prepare, students were provided reading material based on the emergency situations simulation scenarios would cover. Emergency topics, except adult resuscitation, were also covered through didactic teaching approach prior to the simulation day. Students were allowed to practice skills for a breech birth and shoulder dystocia and observe faculty perform a postpartum hemorrhage scenario prior to the simulation day. Students were divided into small groups and proceeded to rotate through each 40 minute scenario station. At each station the students were assigned to either the role of midwife, registrar, senior house officer, or anesthesiologist and encouraged to communicate aloud while working as a team. A debriefing period was provided at the end of each scenario to allow for feedback. A questionnaire was given to

each student at the end of the simulation day to take, complete and return for evaluation. Out of 27 participates, 23 completed and returned the questionnaire for an 84% response rate. The data suggested students valued the opportunity to practice learned skills and integrate theory with practice in a safe, controlled environment. Study conclusions were "traditional didactic teaching methods employed to teach obstetric emergencies result in passive students often with little opportunity to develop decision making, communication or team working skills" (Norris, 2008, p. 235). Through incorporating simulations within midwifery education, students obtain essential knowledge and confidence in dealing with real-life obstetric emergencies in clinical settings. Restricting this study were small sample size and limited time permitted for each station.

A quantitative synthesis study consisting of 31 research studies regarding high-fidelity simulation usage among medical education was completed by McGaghie, Issenberg, Petrusa, and Scalese (2006). A total of 670 research studies were screened utilizing five exclusion and inclusion criteria to decipher usable research data for this study. Participants among selected research studies included a wide range of medical professionals consisting of, but not limited to the following: (a) students, (b) residents, and (c) clinical specialists. Selected studies were then blindly coded for data analysis, which was conducted utilizing a three step process. From the analysis, researchers discovered two main elements were present in the literature. The first element to emerge was repetitive practice regarding medical situations lead to improved learning outcomes. The second element to emerge was few published research studies exist with enough thoroughness and worth to produce useful statistics and findings. A limitation to this study was that no new data was determined, only prior data was analyzed.

A prospective, quasi-experimental study to compare effects of two instructional methods used to teach particular nursing educational material on confidence and cognitive skills was conducted by Brannan, White, and Bezanson (2008). Two instruction modalities selected for this study were traditional didactic lecture and simulation-based exercises with a HPS. Study design consisted of a pretest and posttest administered to 107 junior level baccalaureate nursing students enrolled in an adult health course at Kennesaw State University. The design utilized a control group, which were those students enrolled in the selected course during fall semester and an intervention group which were enrolled in the course during spring semester. There were 53 students included in the control group and 54 in the intervention group. The nursing content focus was centered on acute myocardial infarctions for purposes of the study. Prior to receiving lecture or simulation material on this subject, all participants completed a researcher developed pretest "Acute Myocardial Infarctions Questionnaire: Cognitive Skills Test (AMIQ)…the Confidence Level tool (CL) and the Demographic Data Form" (Brannan et al., 2008, p. 496). Two versions of the AMIQ were developed and validated to be administered as the pre and posttests. After completing each of these questionnaires, students partook in the designated learning format for their group. Lecture consisted of a two hour presentation, while simulation consisted of five stations lasting two hours. Upon completion of their designated format, students were administered the posttest to determine any alterations in knowledge attainment. Findings support the utilization of HPSs and simulation exercises. Students in the intervention group achieved higher posttest scores on the AMIQ than those in the control group. One surprising finding was confidence levels between the groups were not statistically different. Students should be re-tested following actual care of a patient

with acute myocardial infarction to determine true effects on student confidence. The fact students were not randomly assigned to intervention and control groups was the only noted limitation.

Resources and learning outcomes for traditional simulations versus computer-based simulations was compared by McKeon, Norris, Cardell, and Britt (2009). For purposes of this study, traditional simulation refers to simulations utilizing HPSs or another manikin-style device. The population of this study was 53 baccalaureate nursing students at the University of Tennessee Health Science Center-Methodist LeBonheur Healthcare. The study design consisted of a pretest and posttest format, which were 10 minute simulation case studies to test students' patient-centered care competence. The pretest subject was a pediatric patient experiencing a sickle cell crisis and the posttest was an adult patient with closed head trauma in an intensive care unit. The pretest, posttest and computer-based simulation were developed based on personal experience and through computer assisting software. Content validity of each component was established by experts in relating fields. Following completion of the pretest, students were randomly assigned to the intervention group, which participated in computer-based simulations; or the control group which participated in traditional simulation-based learning experiences. All students completed the posttest at the conclusion of both scenarios. The results displayed significant improvement in patient-centered care competency scores for both groups. No significant statistical differences were noted between groups, providing insight into the effectiveness of simulations regardless of the format utilized. Small population size and the lengthy time span between the pre and posttest are the listed limitations of the study.

Simulation Compared to Traditional Clinical Settings

Benefits and limitations of using a HPS in place of one day of traditional clinical experience were explored by Bearnson and Wiker (2005). The population group for this exploratory, descriptive study was first-year baccalaureate nursing students at Brigham Young University. The simulation experience occurred and took place of the students' fifth of six postoperative patient care clinical rotations. Students were divided into groups and rotated through three simulation scenarios focused on postoperative patients complaining of severe pain. During each scenario students had to select and administer appropriate pain medication and evaluate its effects, while working as a team. The overall objective was for students to realize various patients respond to the same medication in differing ways. Students completed a researcher developed Likert scale survey to determine the results of utilizing the HPS. Results were positive in that students stated increases in their knowledge of medication side effects, various patient responses' to the same medication, and ability to safely and confidently administer medications. The majority of students reported an increase in personal confidence regarding medication effects and proper administration following the simulations. Limitations included only a small number of students could be incorporated into each simulation, causing simulations to be time consuming for faculty, no control group was studied and data was collected only through self-reported surveys.

Impacts of high-fidelity simulation on the development of students' clinical judgment were investigated by Lasater (2007) as a study embedded within a larger study. This study included 39 junior level students at Oregon Health & Science University. Students were divided into two groups of 12 and participated in simulation activities in lieu of clinical one day each week. Three students performed simulation

activities while the other nine simultaneously watched the scenario from the debriefing room; each simulation was also video recorded. Simulations were comprised of actual engagement with the scenario and debriefing periods to discuss actions performed during each scenario. Following participation in simulations, 15 non-traditional students volunteered to partake in 90 minute focus group sessions. However, only nine students were able to actually meet at a designated time to complete the study. Students were video recorded during the sessions, as well as received incentives for participating. Thirteen themes were discovered from analysis of the focus groups including themes such as, but not limited to "debriefing was the most important phase for determining clinical judgment, but not enough time was spent on it" (Lasater, 2007, p. 272), "scenarios required students to think for themselves and intervene accordingly" (Lasater, p. 272), and "assessment and reassessment were key to successful clinical judgment" (Lasater, p. 272). The study found students' clinical judgment increased through the following three methods during simulation: (a) performing the scenario, (b) observing fellow students, and (c) debriefing. Limitations of this study were mostly centered on the incapability's of a HPS. Students were dissatisfied that voices for male and female HPSs always belonged to female faculty members and HPSs had no visual or nonverbal communication modalities.

Knowledge gained from simulated clinical experiences versus knowledge gained from traditional clinical rotations was explored by Schlairet and Pollock (2010). This intervention study included 71 volunteer baccalaureate students enrolled in a nursing fundamentals course. Participants were first oriented to the study and then completed a knowledge pretest. They were then randomly assigned to either an intervention or control group. The knowledge test consisted of 25 North Carolina Licensure

Examination – Registered Nurse (NCLEX-RN) style questions based on components likely to be encountered during simulated or traditional experiences, validated by faculty. The intervention group participated in simulations for two weeks, while the control group simultaneously went to traditional clinical settings. Each group was then retested to determine any increase in knowledge levels. The groups then switched learning locations for two weeks and took another knowledge test following their experiences. Data was analyzed through *t*-tests which revealed an equally significant gain in knowledge associated with both simulated and traditional clinical experiences. Knowledge test results remained analogous throughout the course of conducted research, providing insight that simulation settings provide comprehension equivalent to clinical settings. Small sample size and overall low knowledge test scores were both limitations to the study. Further research is needed incorporating increased participants and time between simulation and clinical setting alternations to prove validity of these findings.

Effects of simulation practice against traditional clinical rotations were evaluated by Radhakrishnan, Roche, and Cunningham (2007). The pilot study had a quasi-experimental design with a convenience sample of 12 senior baccalaureate nursing students obtaining second degrees. Students were randomly separated into an intervention or control group, with six students placed in each. It was customary for all students within this nursing program to participate in 320 clinical hours during the studied semester, followed by a mandatory simulation evaluation posttest. Posttest performance of the intervention group, whom was exposed to two, two-hour practice simulation exercises divided equally during the semester along with 320 clinical hours, was compared against posttest performance of the control group whom only completed 320 clinical hours. The practice simulations were developed by researchers utilizing

software obtained from a HPS manufacturing company and prior personal experiences. Practice simulations followed the format of the customary posttest simulation consisting of two patients with complex diagnoses and one transpiring into a medical emergency. Faculty who had no previous experience with any participating students developed the Clinical Simulation Evaluation Tool (CSET) to measure students' performance during the posttest simulation. The evaluated objectives were "safety, basic assessment, prioritization, problem-focused assessment, ensuring interventions, delegation, and communication" (Radhakrishnan et al., 2007, p. 3). Differences between the intervention and control group's CSET scores were compared using a Chi square test. Results revealed students in the intervention group had significantly greater scores in both the safety and basic assessment categories; while the remaining categories' results were similar between the groups. Results prove simulation exercises increase students' performance in obtaining patient identification factors and their ability to monitor impending patient condition changes leading to medical emergencies. The limitations included small sample size, no available alternative experience for the control group, and not administering any form of pretest to study participants.

Collaboration between National League for Nurses (NLN) and Laerdal Corporation which explored, implemented, and evaluated the utilization of simulations in nursing education was reported on by Childs and Sepples (2006). The study was completed over three years with a total of eight nursing schools participating in the study, all of which received a Laerdal SimMan® high fidelity HPS for participating. A simulation experience was developed to instruct students on cardiac arrhythmias and nursing interventions for patients enduring cardiac dysfunction. Overall, there were 55 undergraduate nursing students which participated in the simulation experience. Four

simulation scenario stations were developed by faculty, which increased in complexity. Three of the scenarios had been previously developed and tested; however, the mock code scenario was newly developed for this study and had no prior testing before the students participated in the experience. Each session consisted of 12 to 17 students attending a two hour lecture on recognizing and responding to cardiac arrhythmias; students then went to the simulation laboratory where they were divided into groups of four to five and rotated through the four stations. Of the four stations, two were dependent and required faculty involvement. Data was collected with the Educational Practice Scale for Simulations (EPSS); a 16-item instrument utilizing a 5-point Likert scale to measure if four educational practices are present within the simulations and the importance of these practices to the students. The Simulation Design Scale (SDS) instrument was also utilized to collect data; a 20-item scale that asked students to evaluate five design features of the simulations. The five design features were as follows: (a) objectives/information, (b) support, (c) problem solving, (d) feedback, and (e) fidelity. Students also completed one other instrument to determine the level of confidence gained from the experience, the usefulness of the simulation experience, and their feeling regarding the teaching methods utilized. Based on the collected data, it was found that students believed feedback and objectives/information were the most imperative features within simulations; the level of complexity and fidelity followed closely. Students ranked feedback as the most important educational practice of simulations, closely followed by collaboration, active learning, high expectations, and diverse learning opportunities. However, the study also found too much content was incorporated individual simulation experiences based on the inability to complete each station in the allotted time and student responses. The study also found a realist scenario

is required for students to conceive the scenario as real-life; this finding was based on the complaints that SimMan® was male in the scenarios and had a female faculty voice. It was concluded these interactive, energetic simulation experiences provided students with a valuable experience to learn psychomotor skills and develop critical thinking skills, which are both vital to the nursing profession. Limitations consisted of students' inability to complete each simulation station prior to data submission and the small sample size.

Simulation Impact on Student Self-Efficacy

Impacts of simulation learning on nursing students' self-efficacy in relation to performing health teaching to patients was investigated by Goldenberg, Andrusyszyn, and Iwasiw (2005). Three questions were investigated: (a) What are the differences in mean self-efficacy scores before and after participating in simulated health teaching through case study and role play? (b) What are the relationships between self-efficacy scores and selected demographic variables? (c) What ratings do students' ascribe to the effectiveness of case study and role play simulation as a teaching method? An exploratory, descriptive design with a nonprobability, convenience sample of third-year baccalaureate nursing students from a university located in southwestern Ontario was utilized in this study. Method of research conduction consisted of two half-day workshops where students participated in case studies and role play simulations developed and validated by faculty. Students completed and analyzed case studies and role playing simulations in small groups with faculty assistance and guidance. Sessions concluded with a discussion of summarizing points and constructive feedback among faculty and the entire class. In order to answer the three questions under investigation, Goldenberg et al. (2005) developed and validated a two-part questionnaire. Part I

focused on determining students' degree of self-efficacy in relation to patient teaching before and after the workshop using a four-point scale; while Part II focused on demographic information. Of a possible 66 participants, 22 volunteered and completed the faculty-developed pre and post-questionnaires. A *t*-test was utilized to analyze the research data regarding self-efficacy pre and post-workshop, which resulted in a significantly greater increase in overall student confidence related to patient teaching. Pearson's correlation was used to determine any relation to demographic information; however no relationships were discovered. Descriptive statistics were completed to rate students' rankings of simulation effectiveness resulting in the majority of students ranking simulations as effective or very effective. Overall, this study proved students' self-efficacy did increase after participating in the workshop. Conversely, the small convenience sample from only one university greatly limited the generalizability of these findings. Also questionnaires were completed simultaneously after the completion of the workshop, which could have led to unreliable results from the students. At the conclusion of the study, Goldenberg et al. (2005) felt more research was needed to conclude actual impacts on self-efficacy.

Effects of educational activities using genitourinary teaching associates (GUTA) on nurse practitioner (NP) students' personal confidence levels was assessed by Jenkins, Shaivone, Budd, Waltz, and Griffith (2006). Bandura's self-efficacy theory was used as the guiding framework for this study because it was found to have been utilized previously with success to predict and explain the performance of various behaviors. A pretest and posttest format to evaluate NP student's responses to the GUTA activities, which were simulated learning exercises where NP students performed simulated female breast and pelvic examinations and male genital and prostate examinations with the

guidance of faculty. The study population consisted of a convenience sample of 107 NP students enrolled in their first clinical core course with all having limited previous experience performing any of the examinations. Confidence and learning comfort levels of NP student participants were measured for each examination immediately prior to and following the GUTA activities using an 11-point confidence scale. The researchers used paired *t*-tests to compare results of the pretests and posttests. Findings showed a significant increase in NP students' confidence levels following all GUTA activities. The NP students also reported 99-100% comfort levels regarding personal learning levels following the GUTA activities. Jenkins et al. (2006) concluded GUTA simulation activities increased NP student preparedness for completing examinations on patients in actual clinical settings. A limitation of this finding was NP students self-reported their increase in confidence and comfort levels.

Nursing Education Simulation Framework

A comparison of student perspectives of simulation and review of faculty perceptions of simulation implementation was conducted by Kardong-Edgren, Starkweather, and Ward (2008). It was discovered faculty of an undergraduate nursing program were reluctant to implement simulation within the curriculum. Therefore, eight faculty decided to design three simulation scenarios and implement into the curriculum to better comprehend faculty's perceptions of the process and determine student views of simulation. The Nursing Education Simulation Framework developed by Jeffries (2007) was the guiding framework of this non-experimental pilot project. A convenience sample of 100 undergraduate nursing students enrolled in their first clinical course comprised the student population of the project, 64 to 99 students partook in one or more of the simulation scenarios. A total of eight faculty participated in the project, six were

new to simulation usage. Faculty wrote simulation to build in a progressive format based on clinical skills recognized as problematic for prior clinical students. Scenarios concentrated progressively on the following skills: (a) infection control and isolation precautions, (b) added wound care, proper body mechanics, bed making, mobility exercises, and asepsis, (c) added sterile specimen collection and cardiopulmonary resuscitation (CPR). Students completed learning modules, practiced skills and were oriented to the VitalSim® HPS prior to clinical simulations. Random role assignment was utilized to determine student roles, and then each group of five participated in simulation for 15 minutes followed by 15 minutes for debriefing. Immediately after debriefing the group repeated the scenario in a differing role. Three surveys, Educational Practices Questionnaire (EPQ), Simulation Design Scale (SDS), and Student Satisfaction and Self Confidence in Learning (SSSCL) were completed for data collection after each simulation session. To determine statistical significance, repeated measures ANOVA was completed for these questionnaires. EPQ results showed students perceive best practices were incorporated in each simulation. SDS showed students felt the second scenario lacked in realism, proper objectives and feedback, support, and problem solving. SSSCL remained consistent throughout simulation progression with no significant differences found. Faculty also completed a feedback form after each simulation session for qualitative data. Emergent themes were: (a) creative environment, (b) interactive environment, (c) required additional preparation time by faculty, (d) repetitive practice assisted students to critically think and cultivate skills. Design was a limitation of this project, since no control group was simultaneously researched.

Examining self-confidence and student satisfaction outcomes after exposure to high-fidelity simulation (HFS) was researched by Smith and Roehrs (2009). The descriptive, correlational study was guided by Jeffries Nursing Education Simulation Framework, with focused placed on measuring learner satisfaction and self-confidence outcomes of the model. A total of five research questions were investigated which included: (a) how satisfied are BSN students with HFS, (b) what is the effect of HFS on BSN students' self-confidence, (c) how do BSN students evaluate HFS in terms of Jeffries' five simulation design characteristics, (d) is there a correlation between perceived presence of design characteristics and reports of satisfaction and self-confidence, and (e) is there a correlation between demographic characteristics and reports of satisfaction and self-confidence. Participants consisted of 68 junior level BSN students in a medical-surgical course; simulation was incorporated into the laboratory component. Although simulation participation was mandatory, research participation was not. Students were divided into groups of four, two students provided care to a patient with chronic obstructive pulmonary disease while two students observed. Students were asked to complete a demographic form, Student Satisfaction and Self-Confidence in Learning Scale and Simulation Design Scale (SDS) after simulation and debriefing participation. Analysis of student satisfaction subscale data revealed students were satisfied with HFS experience; students with no prior similar patient experience were significantly satisfied. Self-confidence subscale showed students felt confident in their ability to care for a similar patient after this experience. SDS revealed students had a positive feeling about the presence of Jeffries' five design characteristics, Guided Reflection scored highest followed by Objectives. Moderate correlation was found between satisfaction and self-confidence outcomes and Objectives based on Spearman's rho. Multiple linear

regression analysis indicated Objectives significantly contributed to satisfaction and Problem Solving significantly contributed to self-confidence. No significant correlations were found between any demographic characteristics. Based on results of this study, Objectives and Problem Solving emerged as significant simulation design factors for predicting outcomes of satisfaction and self-confidence. Limitations included small sample size, use of only one simulation scenario, and no comparison group.

Health Science Reasoning Test

Effects of reflective blogging on critical thinking among first-year dental hygiene students were researched by Wetmore, Boyd, Bowen, and Pattillo (2010). A total of 58 first-year students participated, 28 were placed in the intervention group and 30 were in the control group. Each group took HSRT at the beginning and end of a ten-week course. During the course both groups provided care for dental patients for eight weeks; however, the intervention group also completed weekly reflective blogs. Reflective blogs were blindly analyzed by course instructors, whom used a reflective blog rubric developed for this study to consistently analyze each blog posting. An analysis of variance (ANOVA) test was completed on the pre and post HSRT data to determine any statistical significance. It was discovered no statistical difference existed between the two group's HSRT composite scores. However, statistically significant improvements were found using ANOVA in both group's analysis and deductive reasoning subscale scores. A group analysis of blog rubric scores was performed to determine levels of reflection. The analysis showed 40% of students' reflection level improved, 56% did not improve, and 4% had no status change after eight weeks of blogging participation. This study determined blogging has no effect on dental hygiene students' critical thinking skills. Blogging was found to be an advantageous instrument for reflective learning

through analysis of data. Limitations of this study included the small sample size and use of a nonrandomized sampling method. The lengthy timespan of data collection also served as a limitation due to the possibility of maturation occurring among student participants.

What effect recognized knowledge, information sources, and temperament toward critical thinking and reasoning skills has on student nurses' ability to accurately develop nursing diagnoses was evaluated by Paans, Sermeus, Nieweq, and Schans (2010). A randomized trial on nursing students at an undisclosed university was completed. To determine the impact of information sources on critical thinking and reasoning skills a knowledge inventory questionnaire was used. The California Critical Thinking Disposition Inventory and HSRT were used to determine effects of recognized knowledge and personal temperament on critical thinking and reasoning skills. Research data collected from the knowledge inventory questionnaire concluded information sources had sparse influence on nursing student's ability to accurately develop nursing diagnoses. Data concludes only one of the five domains of HSRT, analysis domain, effect the accuracy of nursing diagnosis development significantly. The conclusion of this study revealed nursing students were unable to effectively use reasoning skills or exploit information sources to accurately develop nursing diagnoses. A limitation to this study was that no comparison group was utilized in the design of the study.

A comparison of the effectiveness and efficiency of an internet-based simulation to didactic lecture among physical therapy students was completed by Huhn and Deutsch (2011). Clinical reasoning software, DxR Clinician, utilized by medical schools was altered for use in a physical therapist program by adding evaluation tools and interventions a physical therapist uses to care for patients. A usability analysis was

conducted on the adjusted software by five faculty members and five second-year students. Participants reported the program was useful and expressed desire to see more cases. A feasibility study was then completed to gauge the practicability of integrating the software into a current physical therapy course. A total of 45 students completed a simulation case with the software then evaluated its ease of use, satisfaction with the software, and rated their desire for future use of the software for the feasibility study. Beyond minor technical issues, satisfaction and desire for future use were high. Based on those results, a pilot study was conducted to compare the effectiveness and efficiency of the simulation software and traditional lecture among 36 students enrolled in a therapeutic exercise course. Students were randomly separated into a control and experimental group of 17 and 19 respectively. The control group completed three cases in a didactic lecture format, while the experimental group completed three Internet-based simulation cases on corresponding content. Each group completed HSRT prior to and after completing their case to determine its effect on critical thinking. A practice exam was administered to evaluate students' performance to determine transfer of knowledge. Timespan needed to complete cases was measured to determine efficiency of learning of both groups. HSRT data was analyzed using a two factor ANOVA with repeated measures. Pre-intervention HSRT were insignificant between the two groups. Post-hoc analysis of HSRT using *t*-tests showed statistical significance in the experimental groups evaluation subscale. The experimental group scored slightly higher on practical exam scores and proved to be more efficient in completing cases. Initial research on simulation software suggests using internet-based cases is feasible and student may benefit from increased exposure to an objective method of providing patient care.

Limitations of this study were boundaries on technical modification capabilities and the small sample size.

Critical Thinking

Development and implementation of a Nurse Practitioner (NP) cardiovascular curriculum, referred to as deliberate practice curriculum (DPC), focused on cardiovascular assessment skills was performed by Jeffries et al. (2012). Five research questions were asked, which concentrated on skill performance, clinical reasoning, self-efficacy, and student and faculty satisfaction with simulation and DPC. DPC was developed by modifying the Harvey curriculum, simulation curriculum used by medical students, to teach nursing students to assess cardiovascular patients and understand pathophysiology of their cardiovascular findings. Students and faculty recruited by a convenience sample from four universities within the United States participated in the study. Approximately 10 participants from each university were recruited for a total of 36 participants. To measure knowledge and nursing assessment skills participants completed two pretests and a self-confidence questionnaire to measure self-efficacy. Logbooks were distributed to students to note all learning time utilized throughout the study. Participants were then divided into groups of independent learners and faculty-led learners. Independent learners were given a CD-ROM, PowerPoints, and a learner manual, while faculty-led learners completed eight hours of didactic lecture and simulation; each group focused on twelve case studies containing nursing cardiovascular assessments findings and diagnoses. About a week after each learning session ended, participants completed two posttests a satisfaction and self-efficacy questionnaires, and submitted logbooks. Results showed an equal gain in knowledge among all groups. However, the faculty-led learners also had statistically significant improvement in

clinical assessment, and increased self-efficacy regarding skill performance and reasoning skills. Faculty also reported confidence and satisfaction with DPC and simulation. Limitations to this study included small sample size, varying resources among the four universities, and finding faculty willing to teach according to the DPC method with a HPS.

The need to determine concept mapping's impact on critical thinking skills compared to traditional linear care planning was the basis of a study performed by Maneval, Filburn, Deringer, and Lum (2011). Instructors were trained how to teach and evaluate concept maps prior to implementing their usage within a practical nursing program in place of traditional care plans. Sample population consisted of a convenience sample of 156 practical nursing students from a community college. The control group consisted of 41 graduates from 2004, which were taught traditional care plans. The experimental group consisted of 55 graduates from 2005 and 56 graduates from 2006 which were taught concept maps. The National League for Nursing Critical Thinking in Clinical Nursing Practice/PN Examination (NLNCT) was administered to measure critical thinking skills of each group at the end of their 12-month program. Chi square analysis showed no statistical significant demographic differences between the groups. Independent samples *t*-test found the traditional care plan group scored significantly higher than the concept map groups on the NLNCT with $p = .012$. ANOVA analysis found nursing grade point average to be the highest indicator of achieving a high score on NLNCT. Overall, students taught traditional care plans demonstrated a greater ability to critically think than those taught concept mapping. However, it should be noted all groups surpassed the national average for NLNCT. Limitations of this study included the use of a convenience sample, use of an instrument

not prior used in a similar research design, and limited faculty exposure to concept maps prior to study conduction.

Discussion

Gaps in Literature

An extensive search of present literature revealed various gaps amidst simulation application in nursing curriculum. Diminutive research has been conducted to determine the impact of simulation on critical thinking abilities of undergraduate nursing students. A lack of research was discovered utilizing Nursing Education Simulation Framework as a conceptual framework. Jeffries et al. (2009) and Bantz, Dancer, Hodson-Carlton, and Van Hove (2007) noted a lack of empirical evidence for incorporating simulation pedagogy into maternal-child academic courses; this was also eminent as the project administrator reviewed literature. Simulation practice has escalated amid nursing programs in the US; however, standardized recommendations are non-existent for simulation implementation at this point. Limited amounts of research were found based on methods of simulation debriefing inside nursing curriculum. Few studies focused on effects of simulation in relation to human patient care competencies which makes comparing the two difficult.

Strengths and Limitations of the Evidence Base

There were numerous strengths according to the literature which supported utilization of simulation-based learning experiences to augment traditional clinical experiences. Student reports of simulation satisfaction were the prominent strength documented throughout literature. Additional strengths included, but were not limited to:

- increased self-reported student nurse self-efficacy and clinical judgment (Bambini, Washburn, & Perkins, 2009; Bantz et al., 2007; Goldenberg, Andrusyszyn, & Iwasiw, 2005; Jeffries, et al., 2012; Jenkins, Shaivone, Budd, Waltz, & Griffith, 2006; Kardong-Edgren et al., 2008; Smith & Roehrs, 2009)
- amplified opportunity to practice procedures, care for critical patients and experience critical events (Bantz et al., 2007; Bambini et al., 2009; Jeffries, et al., 2012; Reece et al., 2010)
- equivalent knowledge acquisition to traditional clinical experiences (Schlairet & Pollock, 2010)
- debriefing provided reflective discussion and immediate feedback of student performance (Brimble, 2008; Jeffries, et al., 2009; McGahie et al., 2006)
- safe environment for students to practice critical thinking, communication and psychomotor skills (Bearnson & Wiker, 2005; Goldenberg, et al., 2005; Huhn & Deutsch, 2011: Jeffries, et al., 2012; Jeffries, et al., 2009; Radhakrishnan et al., 2007)
- learning environment to integrate theory into practice (Lasater, 2007; Jeffries, et al., 2009)
- improved patient safety outcomes (Gantt et al., 2010; Jeffries, et al., 2009)

Literature also stated simulations provided students insight to anticipate patient needs once in similar clinical experiences (Bantz et al., 2007).

Numerous constraints were noted within the literature reviewed as well. Students' stated feeling "uneasy" and "anxious" when they communicated with manikins during simulation-based learning experiences (Bantz et al., 2007). Other limitations included, but were not limited to:

- decreased access to meaningful patient care experiences (Lasater, 2007)
- HPS only accommodated a few students at a time (Bearson & Wilker, 2005; Brannan et al., 2008; McKeon et al., 2009)
- challenges in using mid- to high-fidelity simulators (Bambini, Washburn, & Perkins, 2009; Radhakrishnan et al., 2007; Brannan et al., 2008; McKeon et al., 2009)
- decreased realism of skills (Broom, Lynch, & Preece, 2009)
- inability of HPSs to elicit nonverbal communications (Lasater, 2007)

The majority of studies reviewed faced the limitation of small sample size, which led to non-generalizable results (Goldenberg et al., 2005). Another restraint noted in portions of the literature was having no control group for comparison of findings from simulation-based learning experiences (Goldenberg et al., 2005; Smith & Roehrs, 2009).

Summary

Due to increased difficulty locating and scheduling adequate clinical settings and experiences for student nurses, nursing educators were forced to find alternative methods to prepare students in patient care techniques and nursing skills (Schlairet & Pollock, 2010). One method which increased in popularity quickly was simulation-based learning (Smith & Roehrs, 2009). According to the literature, more research needs to be done and replicated to prove the equivalence of simulation learning experiences to traditional clinical experiences (Schlairet & Pollock, 2010). Future research investigating impacts of simulation exposure on critical thinking, decision making, and psychomotor skills is in critical demand based on the increasing popularity of simulations (Bantz, et al., 2007; Bambini et al., 2009; Jeffries, et al., 2009; Jeffries et al., 2012). Several reviewed studies indicated a need for additional research due to limitations, such as inadequate

population sizes or unexpected findings. Authenticating prior research findings would substantiate the effectiveness and significance of simulation-based learning experiences. The primary purpose of this capstone project was to investigate if simulation exposure had a measurable impact on ADN students' critical thinking acquisition in maternal-child nursing. This doctoral project did not replicate a reviewed study, but took into consideration limitations and gaps denoted among current literature. A brief summary of literature reviewed and included within this chapter is provided in Appendix N.

Chapter III

Methodology

There is an increased necessity to supplement or enhance student nurse's traditional clinical experiences (Schlairet & Pollock, 2010). The choice by the majority of nursing schools was to provide simulation-based learning experiences, as evidenced within the literature (Jeffries, 2005). This capstone project lied in the fact that additional research was needed to compare the two learning environments for validating simulations as a suitable alternative to traditional clinical experiences.

Introduction

Implanting nursing students with the knowledge and experience needed to adequately care for complex patients is a task charged to all schools of nursing (Facione & Facione, 2008). Throughout the literature this was a recurrent theme noted for the increased utilization of simulation-based learning experiences among schools of nursing. The recurrent phenomenon which has occurred amid pre-licensure schools of nursing entailed students receiving decreased exposure to traditional clinical experiences supplemented with increased exposure to simulation-based learning experiences (Bambini, Washburn, & Perkins, 2009).

Bambini et al. (2009) was one of the many that stated the rationale for this phenomenon was primarily centered on decreased numbers of nursing faculty and limited availability of traditional clinical rotation locations. There was, and continues to be a decrease in nursing faculty and facilities to provide traditional clinical experiences; however, nursing programs are still charged to develop nursing students' clinical reasoning to prepare them for providing care for increasingly intricate patient assignments (Bambini et al., 2009).

There are noted strengths which supported the utilization of simulation-based learning experiences as a means of augmenting traditional clinical experiences such as (a) exposure to infrequent patient conditions (Jeffries et al., 2009), (b) a nonthreatening environment for practice of assessment and psychomotor skills (Bradshaw & Lowenstein, 2011), and (c) the ability to allow mistakes to occur to promote student learning (Huhn & Deutsch, 2011: Jeffries, et al., 2012). Conversely, simulations have their share of limitations as well. Limitations noted within the literature included (a) decreased exposure to therapeutic communication during patient care experiences (Lasater, 2007), challenges in using mid- to high-fidelity simulators (Bambini, Washburn, & Perkins, 2009; Radhakrishnan et al., 2007; Brannan et al., 2008; McKeon et al., 2009), and decreased realism of psychomotor skills (Lasater, 2007).

Statement of Purpose

The purpose of this capstone project was to examine the impact of simulation-based learning experiences had on the acquisition of associate degree nursing students' critical thinking. Simulation usage has continued to increase in pre-licensure nursing programs with traditional clinical settings being utilized less often. What continues to remain indistinguishable is if this alteration is in the best interest of student nurses' education and wellbeing of future patients. The objective of the project administrator was aimed at determining if simulations were as effective as traditional clinical experiences regarding students' critical thinking acquisition regarding maternal-child nursing skills. Critical thinking aptitude, simulation-based learning experiences and traditional clinical rotations were examined within this capstone project.

Capstone Project Description

Design

Jeffries' conceptual framework, Nursing Education Simulation Framework, guided this study as it was designed to guide development, implementation, or evaluation of simulation-based learning (Jeffries, 2007). This longitudinal study utilized a comparative experimental pretest posttest design with a comparison group to determine the impact simulation-based learning experience had on ADN students' critical thinking. Burns and Grove (2009) describe comparison experimental design to use a convenience sample consisting of randomly assigned groups. This study utilized a comparison experimental design. A convenience sample of 45 ADN students randomly assigned to a control or experimental group voluntarily participated in this capstone project and completed a HSRT pretest and posttest.

Setting

All students were assigned to one of two area inpatient facilities as scheduled by the maternal-child course coordinator for completion of the required 96 traditional clinical hours. Inpatient facilities consisted of a 241 bed acute care Level III trauma center and a 143 bed acute care center (Agape Center, 2008). Traditional clinical rotations were scheduled as six-hour days once a week, for 16-weeks with a designated clinical instructor. Sixty-six traditional clinical hours per student were completed on the assigned facilities' obstetrical unit. All students were also rotated through alternative clinical locations to meet clinical course objectives which incorporated: (a) an area public school for physically and mentally challenged children and adolescents for 12 hours, (b) one of two local health department maternal divisions for six hours, (c) a vision screening experience at an area public elementary school for six hours, and (d)

inpatient facility computer orientation for six hours. A total of 30 clinical hours were conducted at these various other locations.

Students that were randomly assigned to the experimental group participated in a simulation-based learning experience in place of six inpatient facility clinical hours. The setting for simulation-based learning experience was comprised of a simulation laboratory at a community college in Southeastern United States. The laboratory utilized was within the same community college as the ADN students' nursing courses during the concurred semester. The laboratory was comprised of a simulated hospital room; storage room; and large open room with four simulation stations, two hand washing sites, medication/supply cart, and a small student work area with three tables with chairs. Each simulation station contained a hospital bed, various fidelity HPS, bedside cabinet, over-bed table, and hospital replicated headwall unit.

The large open laboratory was selected as the optimal learning environment for conducting this capstone project. Simply one of the four simulation stations, which had a VitalSim® HPS, was utilized for purposes of completing simulations. As needed, supplementary equipment was brought into the simulation environment from storage to promote realism of simulation scenarios. The same station and identical equipment was utilized for conducting all experiment groups' simulation-based learning experiences.

Sample

A convenience sample of 45 second year ADN students from a nursing consortium in Southeastern United States was recruited for study participation. Inclusion criteria for the study sample included ADN students in a maternal-child nursing clinical who had no concurrent simulation exposure and were willing to participate and sign informed consent. The sample was divided into nine clinical sections with five to eight students in

each by the maternal-child course coordinator prior to project implementation. Of the nine appointed clinical sections, seven were randomly separated into control and experimental groups based on schedule coordination of resource availability for completion of planned simulation-based learning experiences. The remaining two clinical sections did not meet inclusion criteria due to previous maternal-child simulation exposure in the concurrent semester.

Power analysis. According to Nieswiadomy (2012), power analysis should be performed to determine needed sample size prior to research implementation. Statistical power analysis was performed by the project administrator utilizing the computer program GPower 3.1 developed by Faul, Erdfelder, Buchner, and Lang (2009). Power analysis was based on one-tailed test with an effect size of 0.8, significance level or alpha (α) of 0.05, and a power of 80%. Determination of effect size, power, and α used was based on adequate levels according to Munro (2005). Minimum sample size was determined to be 42 participants, with 21 each in control and experimental groups.

Control sample. Three of the seven clinical sections were randomly selected to comprise the control group. Twenty-one students were eligible, volunteered and participated in the study, which met criteria for minimum sample size. The control group was not exposed to any simulation-based learning experiences during the concurring semester.

Experimental group sample. Four of the seven clinical sections were randomly selected to comprise the experimental group. From an eligible 27 students, 24 volunteered and participated in the study, which exceeded criteria for minimum sample size. Clinical sections within the experimental group were all exposed to a six-hour

simulation-based learning experience, in place of a traditional clinical rotation at an inpatient facility during the concurring semester.

Protection of Human Services

Institutional Review Board (IRB) certification course through Gardner-Webb University's Doctor of Nursing Practice program was satisfactorily completed by the project administrator October 7, 2010. Prior to conducting any research, the project administrator completed and obtained approval from both Gardner-Webb University IRB and the nurse administrator of the community college nursing program of project conduction. The *Application to Conduct Research with Human Subjects* form was submitted September 20, 2011 and approved November 3, 2011 by Gardner-Webb University's IRB (see Appendix A). Approval to conduct research at the project conduction site, community college in Southeastern United States, was submitted September 20, 2011 and approved September 25, 2011 by the ADN program director since no formal IRB was established for the college (see Appendix B).

As stated in both research conduction request forms, there were no risks posed to participants and no deception or incentives. Subjects were mandated to participate in the simulation-based learning experience as replacement of a six-hour clinical rotation day. However, HSRT was taken on a volunteer basis by subjects. Participant confidentiality was protected by the project administrator; a non-identifiable numeric code was utilized to sign HSRT pretest and posttest CapScore™ response form which omitted names from accompanying test material. Only the project administrator had access to subject coding information as it was kept in a locked, secured container located in a confidential location. Students that volunteered to participate all signed *Consent to Participate in*

Research (see Appendix C) after it was explained. Any questions were addressed by the project administrator; students were also provided a copy of the consent form.

Instrument

The instrument utilized in this capstone project, the HSRT test code 06.1.06, was designed to measure critical thinking among health science and health care professional preparation programs (Insight Assessment, 2011). HSRT is available in multiple formats, but the project administrator selected paper and pencil format for study purposes. HSRT, which is a nationally standardized test, has been proven proficient from health science majors at the undergraduate university and community college levels (Insight Assessment, 2011). HSRT met the needs of this study due to its appropriateness for measuring critical thinking aptitudes of nursing students at a community college. A demographic survey allowed for collection of participant demographic characteristics to ascertain any influences on study results. The demographic survey was part of the HSRT CapScore™ response form participants completed.

HSRT is a 33-item multiple choice format test designed to be administered over 50 minutes (Facione, Facione, & Winterhalter, 2011). HSRT measures an individual's overall critical thinking skill level, known as the total score and five subscale scores of critical thinking which are: (a) analysis and interpretation, (b) inference, (c) evaluation and explanation, (d) deductive reasoning, and (e) inductive reasoning (Facione et al., 2011). Item selection for HSRT is based on critical thinking domains identified by the Dephi experts who have established content validity. Construct validity has been proven by pretesting among various health science students and professionals for measurement performance and test appeal, performance of psychometric item analysis and protocol analysis methods, and improvement of student scores after completion critical thinking

training (Facione et al., 2011). Criterion validity has been show through strong correlations with other California Critical Thinking Skills Tests (CCTST) that measure critical thinking components and standardized college entrance exams (Facione et al., 2011). Internal consistency was established from validation studies which produced a Kuder Richardson–20 (KR–20) that ranged from .77 to .84 with an overall internal consistency of .81 (Facione et al., 2011). A KR-20 above .70 is considered to be a high level of internal consistency for an instrument with multidimensional scales such as HSRT (Facione et al., 2011). Internal consistency coefficient or KR-20 for each subscale of HSRT is displayed in Table 1.

Table 1
Internal Consistency Coefficients for HSRT Subscales

Health Science Reasoning Test Subscale	Kuder Richardson–20
Inductive Reasoning	.76
Deductive Reasoning	.71
Analysis and Interpretation	.54
Inference	.52
Evaluation and Explanation	.77

Another component of data collection was the 5-item demographic section of the CapScore™ response form. This section was utilized to assess such participant characteristics as age, gender, college class level, educational background, ethnicity, and education major. Demographic data was utilized to determine homogeneity of the control and experimental groups and if there were statistically significant differences in critical thinking in terms of participant characteristics.

Method

Groundwork. Subsequent to obtaining *DNP Capstone Project Proposal Approval* (see Appendix D) and IRB approval the project administrator began implementation for the comparative experimental capstone project "The Impact of Simulation-Based Learning Experience on Critical Thinking Acquisition." The project administrator and maternal-child course coordinator finalized clinical instructor contact information, resources available at administration site, and division of clinical sections into project groups. The project administrator then contacted seven eligible clinical instructors for overall project explanation and detailed each clinical section's role in the capstone project. Pretest and posttest dates were scheduled based on clinical instructor recommendations. Clinical instructors of experimental groups were informed of the option to attend simulation-based learning experiences with corresponding groups; however, only two partook in the experience.

Three maternal-child simulations utilized for simulation-based learning experiences in this study were developed by the project administrator. Selected simulations had been utilized previously with two cohorts of ADN students in a maternal-child laboratory. Each simulation was reviewed for validity and utilized in both cohorts by two maternal-child experts. The *Simulation Observer Form* (see Appendix J) was developed by the project administrator's preceptor and had been utilized previously in conjunction with the simulations. The project chair also approved the simulation topics prior to use.

Control group. Pretest and posttest administration occurred at each group's concurrent clinical site during regularly scheduled clinical hours two and a half months into the semester. Two groups took the pretest and posttest at the start of their clinical day or 0700. One group took the pretest at the end of their clinical day or 1200 and the

posttest after their final examination in the community college setting between 1130 and 1330 due to an unforeseen cancellation of clinical hours by their clinical instructor on their final clinical day.

Experimental group. Pretest occurred immediately prior to simulation-based learning experiences for three of the four groups. One group took the pretest during the same week as other groups, but was unable to participate in simulation until three weeks later due to prior clinical scheduling arrangements and holiday interference.

Experimental students were sent via e-mail three pre-simulation activity sheets to complete prior and bring to their simulation-based learning experience. Following pretest administration to participating volunteers, all students were given a 20 minute break. During this break the project administrator setup the HPS for the Women's Health Simulation (see Appendix K) with moulage and needed equipment. Students were then oriented to the HPS, simulation roles and format, *Simulation Observer Form*, and objectives; followed by an opportunity to ask questions. Once orientation was completed, answers for the pre-simulation activity sheet on women's health (see Appendix G) were discussed. Students were then separated into groups of three or four. One group was assigned to be "first shift" and the other group was "second shift"; first shift provided patient care while second shift observed. While students observed simulations they were asked to fill out a *Simulation Observer Form* to assist with clinical reasoning of the simulated patient care experience. The group providing patient care was randomly assigned the role of "primary nurse," "secondary nurse," or "recorder". The project administrator ran the HPS and provided a scenario report regarding the patient; the group then provided care for the simulated patient according to their role for approximately 15 minutes. The first group then stopped and gave report on the patient

to “second shift,” who assumed care of the same patient for approximately 15 minutes. At the end of the 30 minute scenario *Simulation Observer Forms* were collected and the entire group participated in a 20 minute debriefing followed by a 20 minute break.

Debriefing was based on Jeffries’ framework. All students participated in the debriefing sessions after each simulation, with the project administrator opening the debriefing session. Students were assured their comments would not be reported to course instructors to ensure a safe environment for discussion. Students were asked open-ended questions from Jeffries (2007) framework such as (a) “How did you feel throughout the simulation?” (p. 30), (b) “Were you satisfied with your ability to work through the situation?” (p. 30), and (c) “What did the group do well?” (p. 30).

During the break the project administrator altered HPS moulage and equipment for the Intrapartum Simulation (see Appendix L). The exact format described above was followed for this simulation, except “second shift” provided care to the patient first and role assignment altered to an unperformed role. At the conclusion of the Intrapartum Simulation another 20 minute break was given to allow for preparation of the final simulation, Newborn Simulation (see Appendix M). Identical format was again followed for the Newborn Simulation, apart from “first shift” provided care first and role assignment altered to the unperformed role. At the end of the third simulation students were again provided an opportunity to ask question regarding the simulation experience or study and dismissed.

The posttest was administered on their final clinical day at their corresponding clinical facility. Three groups took the posttest at the start of clinical their clinical day, which ranged from 0700, 1500, and 1530; one group took at the end of their day or 1100.

Data Collection

Data collection occurred in a pretest posttest format by administration of HSRT, which was designed to measuring critical thinking among health science students at the undergraduate and community college levels (Insight Assessment, 2011). Data collection process lasted approximately seven weeks between November and December of 2011. Students were verbally invited to participate in the study by the project administrator. The purpose of this capstone project was thoroughly explained. Students which volunteered were asked to sign and return one of two copies of the consent form (see Appendix C).

Anonymity of participation and HSRT scores was assured and no anticipated risks to participants of this study were identified. Participating students were assigned a personal identification number which they used to sign their CapScore™ response form for the pretest and posttest. A master key of participants and personal identification numbers was retained by the project administrator. At the conclusion of data interpretation CapScore™ response forms were mailed to Insight Assessment for interpretation and HSRT test booklets were destroyed according to HSRT policy. All other forms were retained by the project administrator within an unmarked, locked container. The project administrator proctored administration of HSRT to all control and experimental groups. Administration of HSRT took approximately two hours total for each group. Pretesting for all groups occurred within a one week time period. Posttest administration began approximately six weeks later over a one week time frame.

Statistical Analysis

CapScore™ response forms were submitted to Insight Assessment for completion of basic reporting. Insight Assessment cleaned and transferred test result data to Microsoft

Excel Spread Sheets based on pretest, posttest group numbers assigned by the project administrator. Insight Assessment electronically provided descriptive statistics for both total scores and sub-scale scores of HSRT.

Electronic data received from Insight Assessment was analyzed using Statistical Packages for the Social Sciences (SPSS) version 19.0. The parametric *t*-test was used based on the need to test the statistical significance of a difference between the mean of two groups (Polit & Beck, 2010). Independent and paired sample t-tests were utilized to test the research questions. Utilization of a convenience sample augmented the risk of unequal groups, although random assignment was employed. Therefore, Levene's Test for Equality of Variances was utilized to determine if the experimental and control groups were similar or if the assumption of equal groups had been violated.

Limitations

Simulation scenarios were modified by the project administrator during the experience in order to present scenarios at a simplified level based on students expressing limited or no prior exposure to a HPS. Extensive time was focused on how the manikin operated, its abilities (such as vital sign and internal sound capabilities), and increasing student comfort levels communicating and caring for a HPS. Each group completed all three simulation scenarios on a single occasion instead of over several experiences, limiting prolonged comfort. The small, homogenous sample was also a limitation for this study. The project administrator had no control over possible cancellations or rescheduled clinical experiences.

Summary

This longitudinal study used a comparative experimental design with a pretest posttest comparison group format to determine if maternal-child simulation-based

learning experiences impact critical thinking acquisition of ADN participants. A lack of literature regarding the equivalence of simulation learning experiences to traditional clinical experiences regarding students' critical thinking prompted this study. The sample consisted of a convenience sample of 45 fourth-semester ADN students from a community college. A synopsis of study design, instrumentation, and ethical considerations have been discussed thoroughly.

Chapter IV

Results

Innovative pedagogical approaches have been used by pre-licensure nursing programs to compensate for limited exposure to traditional clinical experiences. Increased competition for space at traditional clinical sites and shortage of nursing educators are two factors that have led to supplementation of traditional clinical rotations. Limited abilities to provide care to obstetric and newborns patients for various reasons has also lead to clinical augmentation (Jeffries et al., 2009). The pedagogy of increasing popularity for clinical subsidization has consistently been simulation-based learning experiences (Bambini, Washburn, & Perkins, 2009).

Overview of Capstone Project

A gap was noted among current research regarding the essential nursing skill critical thinking of nursing students when exposed to simulation-based learning experiences (Wetmore et al., 2010). Determining if maternal-child simulations had a measurable impact on critical thinking capabilities of ADN students was the primary purpose of this doctoral project. The population consisted of a convenience sample of 45 fourth-semester ADN students enrolled in a maternal-child nursing course from a nursing consortium at a community college setting. Participants were randomly assigned to a control or experimental group. HSRT was administered to both groups prior to simulation implementation in the experimental groups, and again at the conclusion of clinical rotations for comparison of potential impacts on critical thinking. The outcome of interest for this capstone project was the student nurses' level of critical thinking in relation to maternal-child simulation exposure.

Quantitative data detailing demographics and the three research questions are reported in the results chapter. The following research questions guided the study:

1. Is there a significant impact on ADN students' ability to critically think when exposed to simulation-based learning experiences while enrolled in a maternal-child course?
2. Is there a significant impact on ADN students' ability to critically think when exposed to traditional clinical experiences while enrolled in a maternal-child course?
3. Do simulations-based learning experiences and traditional clinical experiences have equivocal impacts on critical thinking acquisition of ADN students in a maternal-child course?

Sample Characteristics

The population designated for this capstone project was second year nursing students enrolled in the maternal-child clinical component of an ADN program with no concurrent exposure to simulation learning. The selected sample was second year ADN students in a nursing consortium at a community college in Southeastern United States. Sample selection by the project administrator occurred due to convenience of location, limited simulation utilized throughout the nursing program with none scheduled during the maternal-child semester, and potential for adequate sample size.

Out of a possible 61 students, 48 were eligible for participation and 45 students volunteered and fully participated in the capstone project, which exceeded required sample size. Two students completed the pretest process but chose not to participate in the posttest; those pretests were omitted from statistical analysis procedures. Students which participated were beginning the fourth of five nursing semesters in a community

college consortium. All participants in the study were enrolled in two nursing courses: family health concepts and health systems concepts. Each nursing course lasted for eight weeks and consisted of three didactic hours, zero laboratory hours and six clinical hours for a total of 10 semester credit hours.

The sample population contained an overall total of 38 (84%) females and seven (16%) males, 43 (96%) were Caucasian, one (2%) was African-American, and one (2%) was Hispanic. All were senior ADN students. Prior to entering the ADN program, 31 (69%) students had received high school diplomas, six (13%) received non-nursing related Associate's Degree, and eight (18%) had received a Bachelor's Degree. Age ranged widely among the sample, one (2%) was 18-20 years of age, 12 (26%) were 20-25 years of age, seven (16%) were 26-30 years of age, eight (18%) were 31-35 years of age, eight (18%) were 36-40 years of age, and nine (20%) were older than 40 years of age. Table 2 provides sample characteristics for the entire sample population.

Table 2
Sample Characteristics of Entire Sample Population (n=45)

Sample Characteristics	Frequency	Valid Percent
Group:		
Control (*n* = 21)	47%	46.6
Experimental (*n* = 24)	53%	53.3
Gender:		
Male	16%	15.5
Female	84%	84.4
Ethnicity:		
Caucasian	96%	95.5
African American	2%	2
Hispanic	2%	2
Highest Education Level Completed:		
High School Diploma	69%	68.8
Associate's Degree	13%	13.3
Bachelor's Degree	18%	17.7
Age Group:		
18-20 years of age	2%	2
20-25 years of age	26%	26.4
26-30 years of age	16%	15.5
31-35 years of age	18%	17.7
36-40 years of age	18%	17.7
> 40 years of age	20%	20

Control group sample

A total of 21 students consented and participated in the study's control group. There were 18 (86%) females and three (14%) males in the control group, 20 (95%) were Caucasian and one (5%) was African-American. Prior to entering the ADN program, 17 (81%) students had received high school diplomas, one (5%) received a non-nursing related Associate's Degree, and three (14%) had received a Bachelor's Degree. Age ranged from one (5%) was younger than 20 years of age, five (24%) were 20-25 years of age, four (19%) were 26-30 years of age, one (5%) was 31-35 years of age, four (19%) were 36-40 years of age, and six (28%) were older than 40 years of age. Table 3 provides a comparison of the sample characteristics of the control and experimental group sample populations.

Experimental group sample

A total of 24 ADN students signed consent and participated in the experimental group. There were 20 (83%) females and four (17%) males in the experimental group, 23 (96%) were Caucasian and one (4%) was Hispanic. Prior to entering the ADN program, 14 (58%) students had received high school diplomas, five (21%) received a non-nursing related Associate's Degree, and five (21%) had received a Bachelor's Degree. Age ranged from seven (29%) were 20-25 years of age, three (13%) were 26-30 years of age, seven (29%) was 31-35 years of age, four (16%) were 36-40 years of age, and three (13%) were older than 40 years of age. Table 3 provides a comparison of the sample characteristics of the control and experimental group sample populations.

Table 3
Sample Characteristic Comparison of the Control (n=21) and Experimental (n=24) Group Populations

Sample Characteristics	Frequency		Valid Percent	
	Control Group	Experimental Group	Control Group	Experimental Group
Gender:				
Male	14%	17%	14.3	16.7
Female	86%	83%	85.7	83.3
Ethnicity:				
Caucasian	95%	96%	95.2	95.8
African American	5%	0%	4.8	0
Hispanic	0%	4%	0	4.2
Highest Education Level Completed:				
High School Diploma	81%	58%	81.0	58.3
Associate's Degree	5%	21%	4.8	20.8
Bachelor's Degree	14%	21%	14.3	20.8
Age Group:				
18-20 years of age	5%	0%	4.8	0
20-25 years of age	24%	29%	23.8	29.2
26-30 years of age	19%	13%	19.0	12.5
31-35 years of age	5%	29%	4.8	29.2
36-40 years of age	19%	16%	19.0	16.4
> 40 years of age	28%	13%	28.4	12.5

Major Findings

Research Question Findings

Assumptions for paired-samples *t*-test were reviewed prior to performing a statistical analysis on collected data for research questions one and two to ensure analysis was not incorrect or deceptive. Underlying assumptions of the paired-samples t-test are the two assumptions of normal distribution and independence (Munro, 2005). The distribution of the dependent variable must be normal to meet the assumption of normal distribution. Collected data for this capstone project were analyzed for skewness using a frequency histogram. The frequencies approximated the bell-shaped normal curve; therefore meeting this assumption.

The independent variable must be categorical and contain two levels to meet the assumption of independence for paired-samples *t*-test. Collected data for this capstone project were categorical as HSRT pretest and posttest results were not restricted or modified. The data was representative of two levels as two distinct groups, control and experimental, participated in HSRT completion providing numerical data; participants contributed one numeric score to the pretest and posttest.

Research question 1. Is there a significant impact on ADN students' ability to critically think when exposed to simulation-based learning experiences while enrolled in a maternal-child course?

Paired-samples *t*-test was conducted on HSRT pretest and posttest scores of the experimental group to determine if simulation-based learning experience impacted ADN student's critical thinking acquisition. For the experimental group, the mean HSRT pretest score was 22.38 (SD = 3.04) and the mean HSRT posttest score was 21.17 (SD =

3.46), for a mean difference of 1.20 (SD = 4.34). There was no statistical significant difference between the pretest and posttest HSRT scores for the experimental group (t (23) = 1.36, p = .186). The 95% confidence interval for the mean difference between the pretest and posttest HSRT total score was -.626 to 3.04. Table 4 shows results of the paired-samples t-test for the experimental group's pretest and posttest HSRT score and subscale scores.

Table 4
Paired-Samples t-test Results of the Experimental Groups' Pretest Posttest HSRT Scores

HSRT Subscale	Mean	Standard Deviation
Inductive Reasoning:		
Pretest	8.13	.850
Posttest	7.96	1.36
Deductive Reasoning:		
Pretest	6.67	1.60
Posttest	6.71	1.85
Analysis and Interpretation:		
Pretest	4.50	.933
Posttest	4.29	1.12
Inference:		
Pretest	3.46	.658
Posttest	3.08	.717
Evaluation and Explanation:		
Pretest	5.29	.859
Posttest	5.08	1.10
Total HSRT Score:		
Pretest	22.38	3.04
Posttest	21.17	3.46

Table 5 shows the paired differences for the experimental group's pretest and posttest HSRT score and subscale scores.

Table 5
Paired-Samples t-test Paired Differences among Pretest Posttest HSRT Results of the Experimental Group

HSRT Subscale	Mean	Standard Deviation	95% Confidence Interval	*p*
Inductive Reasoning	.167	1.78	-.587 to .921	.652
Deductive Reasoning	-.042	2.56	-1.12 to 1.04	.937
Analysis and Interpretation	.208	1.35	-.362 to .779	.458
Inference	.375	1.01	-.053 to .803	.083
Evaluation and Explanation	.208	1.56	-.450 to .867	.519
Total HSRT Score	1.20	4.34	-.626 to 3.04	.186

Research question 2. Is there a significant impact on ADN students' ability to critically think when exposed to traditional clinical experiences while enrolled in a maternal-child course?

Paired-samples *t*-test was conducted on HSRT pretest and posttest scores of the control group to determine if traditional clinical experience impacted ADN student's critical thinking acquisition. For the control group, the mean HSRT pretest score was 22.29 (SD = 3.21) and the mean HSRT posttest score was 22.24 (SD = 2.91), for a mean difference of .048 (SD = 4.09). There was no statistically significant difference between the pretest and posttest HSRT scores for the control group (t (20) = .053, p = .958). The 95% confidence interval for the mean difference between the pretest and posttest HSRT total score was -1.81 to 1.91. Table 6 shows results of the paired-samples *t*-test of the control group's total pretest and posttest HSRT score and subscale scores.

Table 6
Paired-Samples t-test Results of the Control Groups Pretest Posttest HSRT Scores

HSRT Subscale	Mean	Standard Deviation
Inductive Reasoning:		
Pretest	8.19	.190
Posttest	8.10	.248
Deductive Reasoning:		
Pretest	6.90	.390
Posttest	7.00	.359
Analysis and Interpretation:		
Pretest	4.43	.213
Posttest	4.57	.202
Inference:		
Pretest	3.05	.176
Posttest	2.90	.181
Evaluation and Explanation:		
Pretest	5.29	.184
Posttest	5.19	.190
Total HSRT Score:		
Pretest	22.29	.701
Posttest	22.24	.636

Table 7 shows the paired differences for the control group's pretest and posttest HSRT score and subscale scores.

Table 7
Paired-Samples t-test Paired Differences among Pretest Posttest HSRT Results of the Control Group

HSRT Subscale	Mean	Standard Deviation	95% Confidence Interval	*p*
Inductive Reasoning	.095	1.33	-.514 to .704	.748
Deductive Reasoning	-.095	2.42	-1.20 to 1.01	.859
Analysis and Interpretation	-.143	1.10	-.647 to .362	.561
Inference	.143	1.31	-.456 to .741	.624
Evaluation and Explanation	.095	1.22	-.460 to .651	.724
Total HSRT Score	.048	4.09	-1.81 to 1.91	.958

Assumptions for independent-samples *t*-test were reviewed prior to performing a statistical analysis on collected data for research question three to ensure analysis was not incorrect or deceptive. Underlying assumptions of the independent-samples t-test are the three assumptions of normal distribution, independence, and homogeneity of variance (Munro, 2005). The distribution of the dependent variable must be normal to satisfy the assumption of normal distribution. The data collected for this capstone project were analyzed for skewness using a frequency histogram. The frequencies approximated the bell-shaped normal curve; therefore satisfying this assumption.

The independent variable must be categorical and contain two levels to fulfill the assumption of independence. The data collected for this capstone project were categorical as HSRT pretest and posttest results were not restricted or modified. The data was representative of two levels as two separate groups, control and experimental, participated in HSRT completion providing numerical data; participants contributed one numeric score to the pretest and posttest.

The variances of the dependent variable for the two groups must be similar to fulfill the assumption of homogeneity of variance. Levene's Test of Equality of Variance was performed to evaluate population variances for the two groups (Green & Salkind, 2008). No significance was found between the control and experimental groups for total HSRT score or subscale scores as depicted in Table 8.

Table 8
Levene's Test of Equality of Variance for Pretest Posttest HSRT Scores

HSRT Subscale	*t*	*p*
Inductive Reasoning:		
Pretest	43	.800
Posttest	43	.719
Deductive Reasoning:		
Pretest	43	.640
Posttest	43	.582
Analysis and Interpretation:		
Pretest	43	.803
Posttest	43	.371
Inference:		
Pretest	43	.066
Posttest	43	.443
Evaluation and Explanation:		
Pretest	43	.981
Posttest	43	.722
Total HSRT Score:		
Pretest	43	.924
Posttest	43	.271

The two groups had equivalent variance on all six pretest measures with *p* ranging from .066 to .981 and on all six posttest measures with *p* ranging from .271 to .722. For these measures the *t*-value for equal variances was utilized to determine significance.

Research question 3. Do simulation-based learning experiences and traditional clinical experiences have equivocal impacts on critical thinking acquisition of ADN students in a maternal-child course?

Independent-samples *t*-test was conducted on HSRT pretest and posttest scores of the control and experimental groups to evaluate if simulation-based learning experience was equivocal to traditional clinical experiences regarding the impact on ADN student's critical thinking acquisition. For the experimental group, the mean HSRT pretest score was 22.38 (SD = 3.04) and mean HSRT pretest score for the control group was 22.29 (SD = 3.21), for a mean difference of .089. There was no statistically significant difference between the experimental and control group's pretest HSRT scores (t (43) = -.096, p = .924). The 95% confidence interval for the mean difference between the pretest and posttest HSRT total score was -1.79 to 1.97. Table 9 shows results of the independent-samples *t*-test of both the experimental and control group's HSRT pretest score and subscale scores.

Table 9
Independent-Samples t-test Results of the Experimental and Control Groups Pretest HSRT Scores

HSRT Subscale	Mean	Standard Deviation
Inductive Reasoning:		
Experimental Group	8.13	.850
Control Group	8.19	.873
Deductive Reasoning:		
Experimental Group	6.67	1.60
Control Group	6.90	1.78
Analysis and Interpretation:		
Experimental Group	4.50	.933
Control Group	4.43	.978
Inference Score:		
Experimental Group	3.46	.658
Control Group	3.05	.805
Evaluation and Explanation:		
Experimental Group	5.29	.859
Control Group	5.29	.845
Total HSRT Score:		
Experimental Group	22.38	3.04
Control Group	22.29	3.21

Table 10 shows the results of independent-samples *t*-test equality of means of the experimental and control group's pretest HSRT score and subscale scores.

Table 10
Independent-Samples t-test for Equality of Means among Pretest HSRT Results of the Experimental and Control Groups

HSRT Subscale	Mean Difference	95% Confidence Interval	*p*
Inductive Reasoning	-.065	-.584 to .453	.800
Deductive Reasoning	-.238	-1.25 to .782	.640
Analysis and Interpretation	.071	-.504 to .646	.803
Inference	.411	-.029 to .851	.066
Evaluation and Explanation	.006	-.508 to .520	.981
Total HSRT Score	.089	-1.79 to 1.97	.924

Independent-samples *t*-test revealed the experimental group's mean HSRT posttest was 21.17 (SD = 3.46) and mean HSRT posttest score for the control group was 22.24 (SD = 2.91), for a mean difference of -1.07. There was no statistically significant difference between the experimental and control group's posttest HSRT scores (t (43) = -1.11, p = .271). The 95% confidence interval for the mean difference between the pretest and posttest HSRT total score was -3.01 to 0.867. Table 11 shows results of the independent-samples *t*-test of both the experimental and control group's HSRT posttest score and subscale scores.

Table 11
Independent-Samples t-test Results of the Experimental and Control Groups Posttest HSRT Scores

HSRT Subscale	Mean	Standard Deviation
Inductive Reasoning:		
Experimental Group	7.96	1.36
Control Group	8.10	1.13
Deductive Reasoning:		
Experimental Group	6.71	1.85
Control Group	7.00	1.64
Analysis and Interpretation:		
Experimental Group	4.29	1.12
Control Group	4.57	.926
Inference Score:		
Experimental Group	3.08	.717
Control Group	2.90	.831
Evaluation and Explanation:		
Experimental Group	5.08	1.10
Control Group	5.19	.873
Total HSRT Score:		
Experimental Group	21.17	3.46
Control Group	22.24	2.91

Table 12 shows the results of independent-samples *t*-test equality of means for the experimental and control group's posttest HSRT score and subscale scores.

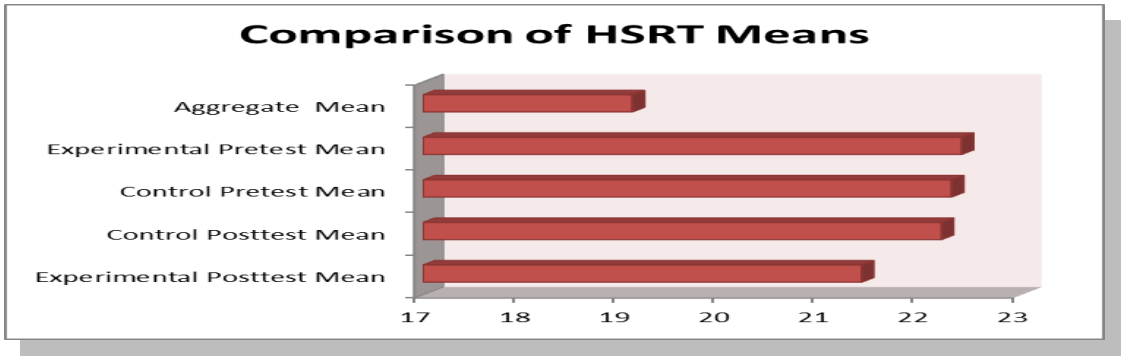
Table 12
Independent-Samples t-test for Equality of Means among Posttest HSRT Results of the Experimental and Control Groups

HSRT Subscale	Mean Difference	95% Confidence Interval	*p*
Inductive Reasoning	-.137	-.899 to 6.25	.719
Deductive Reasoning	-.292	-1.35 to .768	.582
Analysis and Interpretation	-.280	-.904 to .344	.371
Inference	.179	-.287 to .644	.443
Evaluation and Explanation	-.107	-.710 to .496	.722
Total HSRT Score	-1.07	-3.01 to .867	.271

Comparison to HSRT National Statistics

Results from control and experimental groups of this study were also compared to an aggregate sample of two year college level health sciences students. Insight Assessment determined the mean score for an aggregate sample was 19.1. The control group for this project had a pretest mean score of 22.29 and posttest mean score of 22.24. The experimental group for this project had a pretest mean score of 22.38 and a posttest mean of 21.17. The mean scores for the control and experimental group's pretest and posttest results as compared to Insight Assessment's aggregate sample are provided in Table 13.

Table 13
Comparison of Aggregate and Study Group Means



Summary

This study aimed to evaluate the impact of simulation-based learning experience on ADN student's critical thinking acquisition. The information presented in Tables 3 through 5 descripted sample characteristics for both population groups. In order to answer the study's three research questions, paired-samples *t*-test and independent-samples *t*-test calculations were completed on HSRT testing results. The information presented in Tables 6 through 14 revealed the statistical data found. Levene's Test of Equality of Variance was performed to compare the two group's HSRT scores as represented in Table 10. Study findings revealed no significantly statistical difference HSRT pretest and posttest scores for the experimental or control group, as well as no significantly statistical difference between the two group's HSRT scores.

Chapter V

Discussion

This study investigated if maternal-child simulation exposure had a measurable impact on critical thinking acquisition in ADN students in a maternal-child course. Jeffries' Nursing Education Simulation Framework (2005) was used to guide this doctoral project. Simulation emphasis was placed on such maternal-child situations as: (a) care of an adolescent with a sexually transmitted infection (STI), (b) care of a laboring patient through the four stages of labor, and (c) care of a healthy newborn. Forty-five ADN students volunteered and participated from a consortium in Southwestern United States. The instrument utilized to measure critical thinking of participants was Health Science Reasoning Test (HSRT). Paired-sample *t*-test and independent-samples *t*-test were utilized to determine if statistical significance existed amid or between experimental and control groups; result data were reported in Chapter IV.

Review of Significance

Significance of this study arises from the obligation of nursing schools to prepare students to safely deliver quality care for complex patients. The ability to critically think is essential to capably care for these increasing critical patients (Facione & Facione, 2008; Maneval et al., 2011; Wetmore, et al., 2010). Obstacles nursing programs are faced with include the changing nature of healthcare systems, decreased access to inpatient facilities, inadequate quantities of nursing faculty, and fluctuating admission status of inpatients, especially on maternal-child units (Jeffries et al., 2009). Such impediments are expected to proliferate in intensity with a 30% enrollment increase needed among nursing programs to meet healthcare demands and an anticipated shortage

of 260,000 registered nurses by 2025 (American Association of Colleges of Nursing [AACN], 2011). To contest such hindrances, simulation-based learning experiences have become a prominent teaching methodology within nursing to improve education opportunities in educational and professional settings (Bantz, et al., 2007).

Prior research has shown simulation-based experiences provide students educational strategies to develop clinical reasoning skills equivalent to traditional clinical experiences (Brannan, et al., 2008). What is lacking within the literature is the impact simulation-based experiences have on nursing students' ability to apply clinical reasoning skills to think critically in health care situations. This chapter offers an examination into this impact through discussion of study results indicated in chapter IV. In addition, this chapter includes discussion of implications for nursing education, propositions for future research and study limitations.

Discussion

Sample

The participants utilized for experimental and control groups were proven homogeneous through Leven's Test for Equality of Variances. However, the overwhelming majority of participants were Caucasian females with high school diplomas, only one participant was Hispanic and one was African American.

Other dissimilarities were eminent between the control and experimental groups utilized within this study. High school diploma was the highest level of education for the majority of the control group. Almost half of the experimental group had either a non-nursing Associate's or Bachelor's Degree. The largest age group of the control group population was over the age of 40, while the largest age group of the experimental group population was tied for 20 – 25 years of age or 31 – 35 years of age.

Results

Research question 1. The first research question sought to determine if ADN students' ability to critically think was impacted by exposure to simulation-based learning experiences while enrolled in a maternal-child course. The results of a paired-samples *t*-test of the HSRT pretest and posttest scores and subscale scores for the experimental group were analyzed. The analysis revealed no significant difference amid student's pretest and posttest HSRT score or subscale scores. Deductive reasoning HSRT subscale score increased among the experimental participants; however, it was not statistically significant.

Based upon these findings, simulation exposure had no significant impact on participant's critical thinking. These findings may be attributed to a variety of project constituents, such as sample characteristics of age, ethnicity, and educational background and project design. The majority of experimental group participants were between the ages of 20 – 25 and 31 – 35 and highest level of education was high school diploma. Younger age could indicate diminished life-experiences, combined with limited education could have hindered experimental participant's ability to adequately develop critical thinking acquisition. No research was found discussing potential linkage between ethnicity and critical thinking among ADN students. The project design faltered by administration of posttest HSRT occurring at clinical locations on participant's final traditional clinical day. Participants could have been fatigued by semester's end causing lower HSRT posttest scores. Even though no statistical significant difference was found amid the experimental group's pretest posttest HSRT scores, the experimental group did score higher than the aggregate sample compare to by Insight Assessment. This indicates the experimental group's critical thinking level was

above that of the normal level prior to and following simulation-based learning experience.

Research question 2. The second research question searched to determine if ADN students' ability to critically think was impacted by exposure to traditional clinical experiences while enrolled in a maternal-child course. The results of a paired-samples *t*-test of the HSRT pretest and posttest score and subscale score for the control group were analyzed. The analysis revealed no significant difference within student's pretest and posttest score or subscale scores. Deductive reasoning, inference, and analysis and interpretation subscale score all increased amid the control group; however not significantly.

Based on these findings, traditional clinical had no significant impact on participant's critical thinking. These findings may be ascribed to a variation of project elements, such as sample characteristics of age, ethnicity, and educational background and project design. About half of control group participants were 30 years of age or under. The highest level of education for three-fourths of the control group population was high school diploma. Again, it is questioned if critical thinking development could be hindered by control participant's younger age joined with limited education. The project design was abated by administration of posttest HSRT immediately after a final exam for a portion of participants. The remainder of participants completed HSRT posttest on the final traditional clinical day at the clinical locations. Participants could have been fatigued by semester's end and test exhaustion causing lower HSRT posttest scores. Even though no statistical significant difference was found amid the control group's pretest posttest HSRT scores, the control group did score higher than the aggregate sample compare to by Insight Assessment. This indicates the control group's

critical thinking level was above that of the normal level prior to and following traditional clinical experiences.

Research question 3. The final research question looked to determine if simulation-based learning experiences and traditional clinical experiences have equivocal impacts on critical thinking acquisition of ADN students in a maternal-child course. Independent-samples *t*-test was performed to compare experimental and control group's HSRT pretest posttest scores. The analysis revealed no significant difference within the groups' pretest and posttest HSRT score or subscale scores.

The pretest score means for the experimental and control groups were equal for evaluation and explanation. The experimental group scored higher for analysis and interpretation and inference HSRT subscales. The control group scored higher for inductive and deductive reasoning HSRT subscale scores. Based on these findings, the experimental and control group participant's critical thinking acquisition were equivocal prior to exposing the experimental group to simulation-based learning experiences. This finding was positive in that equal abilities prior to an intervention allows for adequate comparison following the intervention. The homogeneity of the experimental and control groups are probably the contributing factor for the basis of this finding.

The posttest score mean for the experimental group was higher for inference. Posttest score means were higher for the control group for inductive and deductive reasoning, analysis and interpretation, and evaluation and explanation. Based on these findings, the experimental and control groups were equivocal after exposure of the experimental group to simulation-based learning experiences. Therefore, exposure to traditional clinical experiences and simulation-based learning experiences are equivocal on critical thinking acquisition of ADN students. These findings may be attributed to

project constituents of sample characteristic homogeneousness and project design. The experimental and control group characteristics were substantially similar. The project design was based on Jeffries' Nursing Education Simulation Framework, which served to appropriately structure simulation experiences and evaluation. Simulations utilized in this study were also used with two separate ADN cohorts in a university setting, as well as validated by maternal-child experts. The project administrator had also utilized the simulations prior, increasing comfort with the scenarios. Although no statistical significant difference was found amid the experimental and control group's pretest posttest HSRT scores, both group's scored higher than the aggregate sample compare to by Insight Assessment. This indicates the experimental and control group's critical thinking level were above that of the normal level prior to and following simulation-based learning experience.

Summary. Overall, findings of this study show simulation-based learning experiences are equivocal to traditional clinical rotations regarding critical thinking acquisition of ADN students in a maternal-child course. There were no statistical differences between the two sample groups of this study. However, each group displayed critical thinking capabilities based on HSRT standards above that of an aggregate population. These findings indicate simulation experiences are as effective as traditional clinical experiences regarding the essential skill required of all nurses, critical thinking.

Also essential to consider are anecdotally, ADN students reported a great degree of satisfaction and excitement with simulation learning experience. Students expressed excitement with having the opportunity to autonomously provide patient care, practice clinical decisions-making skills (critically think), and perform psychomotor skills in a

nonthreatening environment. Several students communicated increased confidence in providing care to future patients with similar health care situations.

Implications for Nursing Education

This capstone project supports incorporation of simulation as an instructional pedagogy within pre-licensure maternal-child nursing education. Significant differences were not discovered in various HSRT subscales or overall HSRT score for experimental students. Conversely, nor were statistical differences discovered among control students' HSRT scores. Results indicate simulation-based experiences are equivocal to traditional clinical rotations. This study validates simulation to augment traditional experiences in an effort to ensure students receive educational opportunities geared toward promoting critical thinking, ultimately leading to quality patient care. Nursing Education Simulation Framework (Jeffries, 2005; 2007) is also validated in its utilization for implementing and evaluating simulations in relation to the outcome critical thinking.

Studies also comparing critical thinking procurement of ADN students were not found by the project administrator within current literature. Similar studies were found which compared or evaluated instructional pedagogies, among undergraduate and graduate nursing students, which showed a positive correlation between knowledge comprehension and simulation exposure (Schlairet & Pollock, 2010). Based upon these continued findings, simulation appears to be substantiated as a method for increased critical thinking acquisition.

Unanticipated events which may have negatively impacted test taking ability of participants included having to administer one control group's posttest immediately following their health systems concepts final exam. The group was unexpectedly dismissed early on their final clinical day, resulting in the posttest having to be

rescheduled. This occurred at the end of the semester resulting in limited options for rescheduling. Students may have been fatigued by semester's end, resulting in poor testing. Another unanticipated event was sudden reassignment of a control group to an experimental group. Reassignment occurred in relation to a clinical group needing to supplement their limited clinical experience. The group either had to be omitted from the study due to supplemental simulation exposure, or changed to partake in study simulations with the program administrator. The decision to reassign and supplement limited clinical experience for this group was made by the program administrator in consult with the preceptor after careful consideration. Beneficence of students' needs for the course outweighed compromise of study outcomes. Ultimately, poor test taking resulted for the group exchanged.

Limitations of Research

Unanticipated clinical experience rescheduling was a limitation regarding HSRT administration. A simulation limitation was several students stated no prior utilization of or exposure to a HPS, which lead to simplification of scenario material during simulations. This could explain the lack of significant difference regarding critical thinking between the two groups. Extensive time was focused on how the manikin operated, their capabilities, and increasing student comfort levels communicating and caring for a manikin. Higher level scenarios may have permitted and required amplified critical thinking skills from participants.

While these results cannot be generalized to the majority of ADN students due to the small study sample of 45 participants, this may be an important consideration for those seeking information about simulation in a similar population. A common demographic

for nursing programs within this state is Caucasian females (North Carolina Boards of Nursing, 2011).

Delimitations. Utilizing a small sample size of only ADN students was a planned delimitation due to time constraints faced by the project administrator. Performing all scenarios during a single experience was also delimitation to this study.

Recommendations. Based upon study limitation, it is recommended to schedule simulation experiences over a period of time as an alternative to multiple scenarios on a single occasion. Another recommendation would be to provide students an opportunity to practice using a HPS prior to performing simulation scenarios. For future studies with simulation, a recommendation is to utilize students from multiple sources rather than only one program, to increase generalizability.

Implications for Findings

Nurse educators are amidst changing health care and in need of additional quantitative research to substantiate supplementation of traditional clinical with simulated clinical experiences. Critical thinking instruments specific to clinical reasoning of nursing students is needed to accurately determine the impact simulation has on critical thinking achievements of pre-licensure students. Such data would assist in improving clinical reasoning of future nurses and quality of care for future patients. Further research using medium fidelity HPSs is needed to promote increased comfort among nurse educators and reduce simulation expense for smaller nursing programs. In order for nurse educators to best prepare students using simulation, it is essential to be familiar with student outcomes of interest associated with simulation (Smith & Roehrs, 2009).

Conclusion

This study revealed simulation-based learning experiences are equivocal to traditional clinical experiences in critical thinking acquisition amid ADN students in a maternal-child course. However, caution should be taken when interpreting the results of this study based on the small, homogenous sample. Since results of this study confirm there is no statistically significant difference between simulation and traditional clinical, simulation should not be utilized as an alternative with the expectation to increase student's critical thinking acquisition. Rather, simulations offer a viable option to supplement traditional clinical rotations, especially in circumstances when actual exposure to patient situations is limited. Carefully planned simulations are a dependable complement to learning and provide opportunity for students to practice psychomotor skills in a controlled, non-threatening environment.

References

Agape Center. (2008). *Hospitals in the United States*. Retrieved from http://www.theagapecenter.com/Hospitals/index.htm

American Association of Colleges of Nursing. (2011). *Nursing shortage*. Retrieved from http://www.aacn.nche.edu/media-relations/fact-sheets/nursing-shortage

Bambini, D., Washburn, J., & Perkins, R. (2009). Outcomes of clinical simulation for novice nursing students: Communication, confidence, clinical judgment. *National League for Nursing*, *30*(2), 79-82.

Bantz, D., Dancer, M. M., Hodson-Carlton, K., & Van Hove, S. (2007). A daylong clinical laboratory. *Nurse Educator*, *32*(6), 274-277.

Bearnson, C. S., & Wiker, K. M. (2005). Human patient simulators: A new face in baccalaureate nursing education at Brigham Young University. *Journal of Nursing Education*, *44*(9), 421-425.

Bradshaw, M. J., & Lowenstein, A. J. (Eds.). (2011). *Innovative teaching strategies in nursing and related health professions* (5th ed.). Sudbury, MA: Jones and Bartlett Publishers.

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

Brimble, M. (2008). Skills assessment using video analysis in a simulated environment: An evaluation. *Paediatric Nursing*, *20*(7), 26-31.

Broom, M., Lynch, M., & Preece, W. (2009). Using online simulation in child health nurse education. *Paediatric Nursing*, *21*(8), 32-36.

Burns, N., & Grove, S. K. (2009). *The practice of nursing research: Appraisal, synthesis, and generational of evidence* (6th ed.). St. Louis, MI: Saunders Elsevier.

Childs, J. C., & Sepples, S. (2006). Client teaching by simulation: Lessons learned from a complex patient care scenario. *Nursing Education Perspectives, 27*(3), 154-158.

Cioffi, J., Purcal, N., & Arundell, F. (2005). A pilot study to investigate the effect of a simulation strategy on the clinical decision making of midwifery students. *Journal of Nursing Education, 44*(3), 131-134.

Facione, N. C., & Facione, P. A. (2008). *Critical thinking and clinical reasoning in the health sciences: An international multidisciplinary teaching anthology*. Millbrae, CA: The California Academic Press.

Facione, N. C., & Facione, P. A. (2011). *The Health Sciences Reasoning Test*. Millbrae, CA: The California Academic Press LLC.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A.G. (2009). Statistical power analyses using G*Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods, 41*, 1149-1160.

Gantt, L. T., & Webb-Corbett, R. (2009). Using Simulation to teach patient safety behaviors in undergraduate nursing education. *Journal of Nursing Education, 49*(1), 48-51. doi:10.3928/01484834-20092918-10

Goldenberg, D., Andrusyszyn, M., & Iwasiw, C. (2005). The effects of classroom simulation on nursing students' self-efficacy to health teaching. *Journal of Nursing Education, 44*(7), 310-314.

Green, S. B., & Salkind N. J. (2008). *Using SPSS for Windows and Macintosh: Analyzing and understanding data*. Upper Saddle River, NJ: Pearson Prentice Hall.

Herrman, J. W. (2008). *Creative teaching strategies for the nurse educator*. Philadelphia, PA: F. A. Davis Company.

Huhn, K., & Deutsch, J. E. (2011). Development and assessment of a web-based patient simulation program. *Journal of Physical Therapy Education, 25*(1), 5-10.

Insight Assessment. (2011). Health Science Reasoning Test. Retrieved from www.insightassessment.com

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 education*: *From conceptualization to evaluation*. New York, NY: National League for Nursing.

Jeffries, P. R., Bambini, D., Hensel, D., Moorman, M., & Washburn, J. (2009). Constructing maternal-child learning experiences using clinical simulations. *Journal of Obstetrics, Gynecological, & Neonatal Nursing*, *38,* 613-623. doi:10.1111/j.1552-6909.2009.01060.x

Jeffries, P. R., Beach, M., Decker, S. I., Dlugasch, L., Groom, J., Settles, J., & O'Donnell, J. M. (2012). Multi-center development and testing of a simulation-based cardiovascular assessment curriculum for advanced practice nurses. *Nursing Education Perspectives*, *32*(5), 316-322.

Jenkins, L. S., Shaivone, K., Budd, N., Waltz, C. F., & Griffith, K. A. (2006). Use of genitourinary teaching associates (GUTAs) to teach nurse practitioner students: Is self-efficacy theory a useful framework? *Journal of Nursing Education*, *45*(1), 35-37.

Kardong-Edgren, S. E., Starkweather, A. R., & Ward, L. D. (2008). The integration of simulation into a clinical foundations of nursing course: Student and faculty perspectives. *International Journal of Nursing Education Scholarship*, *5*(1), Article 26.

Lasater, K. (2007). High-fidelity simulation and the development of clinical judgment: Students' experiences. *Journal of Nursing Education, 46*(6), 269-276.

Maneval, R. E., Filburn, M. L., Deringer, S. O., & Lum, G. D. (2011). Concept mapping: Does it improve critical thinking ability in practical nursing students? *Nursing Education Perspectives, 32*(4), 229-233.

McGaghie, W. C., Issenberg, S. B., Petrusa, E. R., & Scalese, R. J. (2006). Effect of practice on standardized learning outcomes in simulation-based medical education. *Medical Education, 40*, 792-797. doi:10.1111/j.1365-2929.2006.02528.x

McKeon, L. M., Norris, T., Cardell, B., & Britt, T. (2009). Developing patient-centered care competencies among prelicensure nursing students using simulation. *Journal of Nursing Education, 48*(12), 711-715. doi:10.3928/01484834-20091113-06

Munro, B. H. (2005). *Statistical methods for health care research* (5th ed.). Philadelphia, PA: Lippincott Williams & Wilkins.

National Council of State Boards of Nursing (2012). *2010 NCLEX-RN detailed test plan: Item writer/item reviewer/nurse educator version*. Retrieved from https://www.ncsbn.org/1287.htm

Nieswiadomy, R. M. (2012). *Foundations of nursing research* (6th ed.). Upper Saddle River, NJ: Pearson Education Inc.

Norris, G. (2008). The midwifery curriculum: Introducing obstetric emergency situations. *British Journal of Midwifery*, *16*(4), 232-235.

North Carolina Board of Nursing (2011). North Carolina trends in nursing education: 2005-2010. Retrieved from http://www.ncbon.org/content.aspx?id=398

Paans, W., Sermeus, W., Nieweq, R., & Schans, C. (2010). Determinants of the accuracy of nursing diagnosis Influences of ready knowledge, knowledge sources, disposition toward critical thinking, and reasoning skills. *Journal of Professional Nursing, 26*(4), 232-241. doi:10.1016/j.profnurs.2009.12.006

Polit, D. F., & Beck, C. T. (2010). *Essential of nursing research: Appraising evidence for nursing practice* (7th ed.). Philadelphia, PA: Wolters Kluwer Health Lippincott Williams & Wilkins.

Radhakrishnan, K,. Roche, J. P., & Cunningham, H. (2007). Measuring clinical practice parameters with human patient simulation: A pilot study. *International Journal of Nursing Education Scholarship, 4*(1), 1-11.

Reese, C. E., Jeffries, P. R., & Engum, S. (2010). Learning together: Using simulations to develop nursing and medical student collaboration. *Nursing Education Perspectives, 31*(1), 33-37.

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.

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.

Wetmore, A. O., Boyd, L. D., Bowen, D. M., Pattillo, R. E. (2010). Reflective blogs in clinical education to promote critical thinking in dental hygiene students. *Journal of Dental Education, 74*(12), 1337-1350.

Williams, K. B., Schmidt, C., Tilliss, T., Wilkins, K., & Glasnapp, D. R. (2006). Predictive validity of critical thinking skills and disposition for the National Board Dental Hygiene Examination: A preliminary investigation. *Journal of Dental Education*, *70*(5), 536-544.

Appendix A: GWU IRB Approval

THE INSTITUTIONAL REVIEW BOARD
of
GARDNER-WEBB UNIVERSITY

This is to certify that the research project titled
Effects of Simulation Exposure on Associate Degree Nursing Students' Ability to Critically Think

being conducted by __Candice Rome

has received approval by the Gardner-Webb University IRB.

Date__11/3/11

Exempt Research

Signed Cindy Miller
Department/School/Program IRB Representative
Mary Alice Hodge
Department/School/Program IRB Member

Expedited Research

Signed
Department/School/Program IRB Representative

Department/School/Program IRB Member

IRB Administrator or Chair or Institutional Officer

Non-Exempt (Full Review)

Signed
IRB Administrator

IRB Chair

IRB Institutional Officer

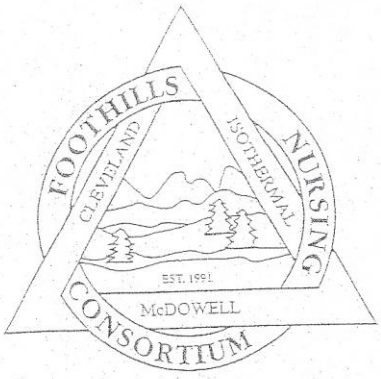
Expiration date 11/3/12

IRB Approval:

__X___ Exempt _____Expedited _____Non-Exempt (Full Review)

Revised 09-09

Appendix B: ICC IRB Approval



I give Candice Rome permission to work with Lynn Rowland in simulations with Foothills Nursing Consortium students as part of her Doctoral Capstone project.

Date 9/25/2011

Jeanette Murray Cheshire, Director, Foothills Nursing Consortium, Isothermal Community College

Jeanette Murray Cheshire, DNP, RN

Signature

Appendix C: Consent to Participate in Research

CONSENT TO PARTICIPATE IN RESEARCH

"Effects of Simulation Exposure on Associate Degree Nursing Students' Ability to Critically Think."

You are asked to participate in a research study conducted by Candice Rome, RN, MSN; guided by faculty chair Dr. Kelly Jones, from the School of Nursing at Gardener-Webb University. Candice Rome, RN, MSN is currently a Doctor of Nursing Practice student at Gardner-Webb University. This study is being conducted by as part of a doctoral capstone project. Your participation in this study is entirely voluntary. Please read the information below and ask questions about anything you do not understand, before deciding whether or not to participate.

- **PURPOSE OF THE STUDY**

This capstone project is aimed at determining student nurses' critical thinking ability when exposed to simulation-based learning experiences as opposed to traditional clinical rotation experiences.

- **PROCEDURES**

If you volunteer to participate in this study, you will be asked to do the following things:

- Complete the Health and Science Reasoning Test, a 33 question pre-test designed to test critical thinking skills of health science students.
- Clinical groups will be randomly divided into an intervention group and a control group by the course instructor. The intervention group will participate in a 6-hour simulation day in place of one hospital clinical day. The control group will complete all hospital clinical days as assigned.
- Once all intervention groups have completed a simulation day, the same Health Science Reasoning Test will be administered again to both groups.

- **POTENTIAL BENEFITS TO SOCIETY**

Results of this study will provide nursing educators knowledge about the effects of simulation on a student nurses ability to critically think. More insight will be gained into the effects of simulation experiences versus traditional clinical rotations on critical thinking skills of nursing students. Determining this outcome is crucial for appropriate healthcare of forthcoming generations.

- **CONFIDENTIALITY**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of utilizing a non-identifiable coding system on all collected documents. Collected data will also be kept in a locked, secure container with only the researcher having access to the data. Insight Assessment will be given the pre- and post-test to score, with the results being reported only to the researcher. The researcher plans to submit study results for publication in a nursing educational journal. No identifiable participant information, including institution name or photography will be utilized in the publication, only demographic and statistical data will be utilized in the publication.

- **PARTICIPATION AND WITHDRAWAL**

You can choose whether or not to be in this study. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you do not want to answer. There is no penalty if you withdraw from the study.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about this research, you may contact either of the following:

- Principal Investigator: Candice Rome, MSN, RN
  - Phone: (828) 245-5638
  - Address: 4563 NC Highway 226 Bostic, NC 28018
  - E-mail: crome@gardner-webb.edu
- Faculty Chair: Dr. Kelly Jones, DNP, CNM, RN
  - Phone: (704) 484-4110
  - Address: Cleveland Community College
  - E-mail: kjones@isothermal.edu

- **RIGHTS OF RESEARCH SUBJECTS**

The Gardner-Webb University and Isothermal Community College Institutional Review Boards have reviewed my request to conduct this project. If you have any concerns about your rights in this study, please contact the Gardner-Webb University or Isothermal Community College Institutional Review Boards.

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____
Printed Name of Subject

_____ _____
Signature of Subject Date

_____ _____
Signature of Witness Date

Appendix D: DNP Capstone Project Proposal Approval Form

Gardner-Webb University

School of Nursing

DNP CAPSTONE PROJECT PROPOSAL APPROVAL

Doctoral Student: Candice Rome

Capstone Project: Simulation Exposure on Associate Degree Nursing Students' Ability to Critically Think

CAPSTONE PROJECT COMMITTEE:

Dr. Kelly Jones **Chairperson** *(type/print)*	Kelly Jones *(Signature)*	9/25/11 **Date**
Dr. Mary Alice Hodge **Committee Member** *(type/print)*	Mary Alice Hodge *(Signature)*	10/17/2011 **Date**
Dr. Reimund Serafica **Committee Member** *(type/print)*	Reimund Serafica *(Signature)*	10/17/2011 **Date**

Appendix E: Letters of Support

Gardner-Webb University

Faith ✦ Service ✦ Leadership

October 18, 2011

To whom it may concern:

Candice Rome is a doctoral student at Gardner-Webb University in the Doctor of Nursing Practice program. Candice is now in the beginning stages of the capstone research project process. Her research study is titles "Effects of Simulation Exposure on Associate Degree Nursing Students' Ability to Critically Think". I am serving as the Research Chair on Candice's project committee and am overseeing all aspects of her research. I have read and approved her research proposal and approve of the utilization of the Health Science Reasoning Test as the empirical indicator for her research. I agree to oversee Candice's usage of the Health Science Reasoning Test and will ensure the integrity of the test is not jeopardized in any fashion. Please contact Candice or myself with any further questions regarding her usage of the Health Science Reasoning Test.

Sincerely,

Kelly Jones DNP

Dr. Kelly Jones, DNP

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Appendix F: Permission for use of tool

Hello Candice,
We are pleased to inform you that you have been approved for a special discounted price on tests and testing services for the purpose of gathering data for your doctoral dissertation.

I have prepared a price quote for the materials you inquired about. I have attached your quote request for the possible adoption of the HSRT. I have made this quote to reflect our new client package. This includes your requested 60 HSRT, one HSRT specimen kit for review before adoption (can be purchased separately), and our one time Capscore orientation, as well as a complimentary copy of the book *Critical Thinking and Clinical Reasoning in the Health Sciences* by test authors Peter and Noreen Facione.
If you have any questions or would like to place an order please feel free to contact me directly. I have included an order form here for your convenience. Enjoy your afternoon I look forward to working with you soon.

Best regards,
Sierra

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Appendix G: Women's Health Pre-lab Activity

Simulation – Women's Health

Fill in the Blank: Fill in the following normal laboratory values for female clients.

1. Hemoglobin _____
2. Hematocrit _____
3. WBC _____
4. Platelets _____
5. Calcium _____
6. Sodium _____
7. Chloride _____
8. Potassium _____
9. BUN _____
10. Creatinine _____
11. Magnesium _____

Define: Define the following.

12. Sexually transmitted infection: _____

_____

_____

13. List at least 3 common signs and symptoms of the following sexually transmitted infections:

    a. Chlamydia:

    _____

    b. Gonorrhea:

    _____

    c. Genital herpes:

    _____

    d. Syphilis:

    _____

    e. Trichomoniasis: _____

14. Nucleic acid amplification test (NAAT): _____

_____

_____

Appendix H: Labor Pre-lab Activity

Simulation – Intrapartum Client

Matching Part I: Match the terms with the appropriated definition, example, or statement.

1. ___Cephalopelvic disproportion (CPD)
2. ___Cervical ripening
3. ___Oxytocin
4. ___Dystocia/Dysfunctional labor
5. ___McRobert's maneuver
6. ___Vacuum extraction
7. ___Uterine inversion
8. ___Pathologic retraction ring
9. ___Amniotomy
10. ___Suprapubic pressure
11. ___Episiotomy

a. Disadvantage is that it causes a marked caput on the newborn head
b. Ridge across abdomen that signals possible uterine rupture
c. Artificial rupturing of membranes
d. Surgical incision of the perineum
e. Turing of the uterus inside out
f. Drug used to induce or augment labor
g. Measure involving sharp flexion of the woman's thighs onto the abdomen
h. May help the infant's shoulder escape from beneath the symphysis pubis and be born
i. Fetal head too large for passage through pelvis: narrow, small pelvis
j. Change in consistency from firm to soft
k. Difficult labor, sluggishness of contraction or force of labor

Multiple Choice:

12. Which assessment finding would lead the nurse to suspect a postpartal complication?
    a. Lochia rubra 12 hours after birth.
    b. 24 sanitary pads saturated in 24 hours.
    c. 12 sanitary pads saturated in 20 hours.
    d. Passing a few blood clots the size of a dime.

13. A client is experiencing signs of shock 3 hours after delivery. Which of the following would the nurse expect to find when assessing this client?
    a. Decreased pulse rate.
    b. Rapid respirations.
    c. Flushed face.
    d. Decreased temperature.

14. Which medication would the nurse expect to administer as ordered for a client who is experiencing postpartum hemorrhage from uterine atony?
    a. Apresoline.
    b. Proventil.
    c. Methergine.
    d. Terbutaline.

15. Which of the following is viewed as a risk for a woman developing a postpartal infection?
    a. Excessive blood loss.
    b. Thyroid toxicosis.
    c. Pregnancy-induced hypertension.
    d. Gestational diabetes.

16. Which of the following are potential complications of a shoulder dystocia? Select all that apply.
    a. Vaginal or cervical tears.
    b. Increased maternal blood pressure.
    c. Compression of the umbilical cord.
    d. Precipitous delivery of the newborn.
    e. Fractured clavicle or brachial plexus injury of the newborn.

17. Which of the following are predisposing factors for a shoulder dystocia? Select all that apply.
    a. Pregnancy induced hypertension (PIH).
    b. Gestational diabetes.
    c. Increased multiparity.
    d. Post-dates pregnancy.
    e. Placenta previa.

18. Which of the following signs may cause the nurse to suspect a shoulder dystocia? Select all that apply.
    a. Turtle sign (fetal head crowns, and then retracts instead of protruding with each contraction).
    b. Prolonged second stage of labor.
    c. Arrest of descent.
    d. Increased maternal blood pressure.
    e. Precipitous cervical dilation and effacement.

19. Which of the following are common causes of postpartal hemorrhage? Select all that apply.

    a. Maternal infection.
    b. Uterine atony.
    c. Perineal lacerations.
    d. Retained placental fragments.
    e. Uterine inversion.

Appendix I: Newborn Pre-lab Activity

Simulation – Newborn Patient

Matching: Match the terms with the appropriated definition, example, or statement.

1. ___ Subconjunctival hemorrhage
2. ___ Brown fat
3. ___ Neonatal period
4. ___ Apgar score
5. ___ Physiologic jaundice
6. ___ Acrocyanosis
7. ___ Milia
8. ___ Caput succedaneum
9. ___ Central cyanosis
10. ___ Erythema toxicum

a. A special tissue found in mature newborns to conserve or produce body heat.
b. Yellowing of the skin as a result of the breakdown of red blood cells.
c. Indicates decreased oxygenation.
d. Pressure during birth causing a red spot on the sclera.
e. Time from birth through the first 28 days.
f. A normal phenomenon in the first 24-48 hours after birth.
g. Completed at 1 and 5 minutes after birth.
h. Plugged or unopened sebaceous glands.
i. Caused by the newborn's eosinophils reacting to the environment as the immune system matures.
j. Edema of the scalp at the presenting part of the head.

True or False:

11. ___The average respiratory rate for the neonate is 30-60 breaths per minute.
12. ___ Infants who are fed by propping the bottle are in potential danger of aspirating fluids.
13. ___ Neonates with lengths greater than 20 inches should be monitored carefully.
14. ___The chest circumference in the term neonate is about 1 in greater than the head circumference.

Multiple Choice:

15. An infant's temperature is 97.4˚ one hour after birth. Which action should the nurse take first?
    a. This is a normal finding, therefore no action is needed.
    b. Place a second hat on the infant's head.
    c. Place the infant under a radiant warmer.
    d. Call the infant's pediatrician.

16. Which assessment finding would cause the nurse to notify the physician?
    a. Central cyanosis.
    b. Breast tissue slightly engorged.
    c. Heart rate of 160 beats per minute.
    d. Lack of ear recoil on bending.

17. Calculate the following apgar score:
    a. Heart rate 160
    b. Strong cry, good respiratory effort
    c. Well flexed tone
    d. Withdraws foot with stimulation of sole
    e. Acrocyanosis

    Score:_____

18. Calculate the following apgar score:
    a. Heart rate 110
    b. Slow respirations, weak cry
    c. Well flexed tone
    d. Grimace with stimulation of sole of foot
    e. Acrocyanosis

    Score:_____

Appendix J: Observer record

Simulation Observer Record

Name_____ Date_____

As an observer in the simulation, please make notes on this form during the simulation experience. When possible, cite specific examples that you observed.
What were the chief complaints or concerns of patient?

What specific assessments were performed by the student(s)?

Pulse		Skin Assessment	
Respirations		Respiratory assessment	
Blood pressure		Cardiac assessment	
Temperature		Abdominal assessment	
Other		Neuro assessment	

What other assessments were needed?

Potential problems identified

Problems identified in simulation	Additional potential problems identified by you

Discuss how problems were managed and prioritized

Problems managed and prioritized in simulation	Other ways to prioritize the problems by you

Interventions performed

Interventions performed	Any problems with intervention noted?

List professional behaviors noted by group- communication, patient focused care, dress, demeanor, etc.

Appendix K: Women's Health Simulation

Simulation- Women's Health Simulation

Julie Brown is a 17 year old adolescent. Date of Birth is May 22, 1994. She comes to the emergency department accompanied by her mother. She describes intense vulvar itching and irritation. Julie has been sexually active for one year. Her mother doesn't know she is sexually active.

Student Actions If student does this…	**Sim Noelle Responses or Ancillary Dept. Responses** Sim Noelle will say or do this…	**Prompts** The student should be doing this…	**Safe**	**Unsafe**
Student nurse gets initial examination information and performs first assessment.	Sim Noelle displays: • T 99.0 • P 88 • B/P 128/68 • R 16 • Pain 2 out of 10 in vaginal area • O2 sat 98% on RA • Height 5'7" Weight 160 lbs • Breath sounds clear bilaterally • Regular heart rate • Peripheral pulses regular • Vulva reddened and excoriated • Heavy, grayish yellow discharge at vaginal opening • Skin is warm and dry • No edema	The student should perform a complete assessment.	Hand hygiene upon entering room Introduce self to client and mother Identifies client Asks mother to step out of the room in order to provide privacy Student performs thorough head to toe assessment.	Hand hygiene not completed Student does not properly identify self or patient. Performs partial or no head to toe assessment
Student should ask Julie if she is sexually active and the date of her LMP	Sim Noelle (instructor) should answer all questions Julie states she has been sexually active for 1 year and uses condoms some time. Her LMP was 4 days ago. She has been having vaginal discharge, itching, & pain X3 days.	If student doesn't ask mother to leave the room, have client prompt mother to leave. Prompt student to ask sexual activity question and date of	Student assesses all questions	Student does not properly assess all questions

		LMP.		
Student should call MD and report assessment information	MD orders: ~Obtain clean catch UA & C&S for gonorrhea and Chlamydia ~Urine pregnancy. ~Obtain NAAT(Nucleic acid amplification test) on the vaginal discharge	Student is able to report assessment using SBAR format and transcribe and prioritize orders.	Student utilizes SBAR format and transcribes orders correctly. Student obtains UA, C&S and NAAT using proper technique.	Student does not use SBAR format and does not transcribe orders correctly. Student does not obtain UA, clean catch and NAAT using proper technique.
Shift Change: 1st group reports off to 2nd group who now will assume care of client	1st group provides 2nd group with a shift report utilizing SBAR format.	Student s should report using SBAR	Students report using the SBAR format	Student doesn't utilize the SBAR format and information is missing from report.
2nd group performs complete head to toe assessment	Sim Noelle displays: • T 99.4 • P 78 • B/P 118/68 • R 18 • Pain 3 out of 10 to vaginal area • O2 sat 98% on RA • Breath sounds clear bilaterally • Regular heart rate • Peripheral pulses regular • Vulva reddened and excoriated • Heavy, grayish yellow discharge at vaginal opening • Skin is warm and dry. • No edema	The student should perform a complete assessment.	Hand hygiene upon entering room Introduce self to client and mother Identifies client Asks mother to step out of the room in order to provide privacy Student performs thorough head to toe assessment.	Hand hygiene not completed Student does not properly identify self or patient. Performs partial or no head to toe assessment
Inform students that Urine and	Students should review labs and interpret UA and NAAT results	Student should note that MD needs to be	Student interprets labs correctly and	Student is unable to correctly

NAAT results are now on the chart		notified of lab results and calls MD for orders	calls MD	interpret labs and doesn't call MD
Student nurse calls MD and reports lab results	MD orders: ~Ceftriaxone (Rocephin) 250 mg IM X1dose ~Doxycycline 100mg now & Q 12 hrs X7 days ~Educate Client about STI ~Follow up with Primary HCP in one week	Student is able to report assessment using SBAR format and transcribe and prioritize orders.	Student utilizes SBAR format and transcribes orders correctly	Student does not use SBAR format and does not transcribe orders correctly.
Student should review MD orders and prioritize	Julie and her mom want to know what is going on.	Student should discuss STI with Julie privately and administer medications per MD orders	Student is able to prioritize orders, calculate medication doses and administer medications using the 5 rights.	Student is unable to calculate medication doses and does not utilize the 5 rights for medication administration.

Stop Simulation and Debrief.

Appendix L: Intrapartum Simulation

Simulation- Complicated Labor and Delivery Patient
Shoulder Dystocia

31 year-old Beth Fulp was admitted to the L&D unit 9 hours ago in labor. The following report is given to the oncoming shift: Uterine contracts occurring Q 2-3 minutes, lasting 50-60 seconds that palpate moderate to strong. FHR has been good with moderate variability and mom's vitals are stable. Beth is a gravida 3, para 1and is currently 41 weeks gestation. She appears to be in extreme pain and is breathing heavily. Her membranes are intact. Labs have been sent only the urinalysis has resulted and it was normal. She has a 20 gauge IV and got climdamycin 7 ½ hours ago, so she needs another dose soon. Her last dose of stadol was 2 hours ago.

Student Actions If student does this…	**Sim Noelle Responses or Ancillary Dept. Responses** Sim Noelle will say or do this…	**Prompts** The student should be doing this…	**Safe**	**Unsafe**
Instructions for Noelle setup: ***Place the fetus in the ROA (Right Occiput Anterior) position. Lubricate fetal head, shoulders, inside of cervix, and inside of vulva. Inflate bladder lifting fetal head and shoulders. Set the prenatal monitor to show FHT 140 with accelerations, average FHRV, and no decels.***				
Student nurse performs head-to-toe and cervical assessment.	Sim Noelle displays: • T 98.6 • P 76 • B/P 126/77 • R 20 • O2 sat 99% on RA • Breath sounds clear bilaterally • Regular heart rate • Bowel sounds present • No clonus • DTR 2+ • Skin is warm and dry. • Peripheral pulses regular • 1+ pitting edema in bilateral lower extremities • FHT 140 with accels, no decels, good FHRV • Scant amount of thick, blood tinged vaginal secretions	The student should perform a complete assessment. Student should recognize patient is still in active phase of the first stage of labor.	Hand hygiene upon entering room. Introduce self to client. Identifies client. Student performs thorough head to toe assessment. Student explains cervical assessment to patient and performs correctly.	Hand hygiene not completed. Student does not properly identify self or patient. Performs partial or no head to toe assessment. Student does not properly explain procedure or perform cervical assessment.

	noted • C/O abdominal pain 4/10 • UCs – Q 2-3 minutes, lasting 60-65 seconds and palpate moderate to strong • Cervical assessment shows: ~ 5-6 cm dilation ~ 50% effacement ~ 0 station, vertex presentation (5-6cm/50%/0) ~Membranes intact			
Inform students that CBC and RPR lab results are now in chart.	Student should review labs and interpret CBC and RPR as WNL.	Student should note labs are WNL and state MD does not need to be notified at this time.	Student interprets labs correctly and does not notify MD.	Student is unable to correctly interpret labs or notifies MD.
MD enters unit to assess patient.	MD states patient and fetus look great and decides to rupture patient's membranes. MD assess cervix after AROM • Fluid is clear and odorless • No prolapsed cord • 7-8cm/100%/0 MD leaves unit and states to call when pt is ready to deliver.	Student should explain AROM procedure to patient.	Student properly explains AROM.	Student does not understand AROM.
Student reassesses patient.	Sim Noelle states "*I am feeling a lot of pressure in my bottom and I need more pain medication!*" • Cervix exam: Complete/+1 • Pain rating 9/10 • FHT 150 with accels, no decels, good FHTV • UCs – Q 2 minutes, lasting 70-75 seconds and palpate strong	Student recognizes patient is in the transition phase of the first stage of labor.	Student does not administer pain medication due to stage of labor.	Student administers pain medication.

Student should notify MD and begin patient pushing.	Student calls MD utilizing SBAR and MD states *"Be right there."* Patient pushes effectively with student nurse support, but fetal decent is slow. FHT remains 140-150 BPM, mild early decels are noted. The presenting fetal part finally reaches the perineum, but patient is unable to "crown out" and turtle sign is noted.	Student should instruct and position patient to push. Student recognizes that the patient is in the second stage of labor. Student recognizes shoulder dystocia.	Student notifies MD of patient's labor progress and prepares for delivery. Student recognizes sign of shoulder dystocia and calls again for MD when Turtle sign noted.	Student does not notify MD. Student does not realize Turtle sign indicates shoulder dystocia and necessitates notification of MD.
Instructor: To simulate Turtle sign, pause Noelle. You can allow students to deliver fetus (3minutes or less) or resume Noelle to deliver fetus if students unable to deliver fetus.				
MD enters room and prepares for delivery of infant.	MD requests vacuum extractor and is able to deliver head with vacuum. FHT 100-110 with early decels noted. MD encounters shoulder dystocia and is unable to deliver the anterior shoulder with downward traction on the fetal head. MD requests for student nurse to perform McRoberts maneuver (flex patient's legs onto her abdomen) and apply suprapubic pressure. MD performs a 3rd degree episiotomy and the anterior shoulder is delivered following rotation, the posterior shoulder is delivered without difficulty.	Student should assist MD with delivery and patient with leg positioning, obtains and utilizes step-stool to perform suprapubic pressure.	Student assists MD and properly positions patient.	Student does not assist MD or position patient.
Fetus is delivered. (Instructor: report these findings to students)	Sim Noelle delivery healthy baby girl weighing 10 lbs 2oz. Patient's perineum is repaired & cleaned. IV			

	infusion is now LR with 20 units Pitocin @150mL/hr.			
Instructor: Change IV fluid to be LR with 20 units Pitocin @150 mL/hr. Apply moderately saturated peripad to Noelle.				
Shift Change: 1st group reports off to 2nd group who will now assume care of patient.	1st group provides 2nd group with a shift change report utilizing SBAR format.	Students should report using SBAR.	Student properly reports and utilizes SBAR format.	Student does not reports correctly or utilize SBAR.
Student nurse gets initial examination information and performs first assessment. (1st 30 minute postpartum check)	Sim Noelle displays: • T 98.6 • P 80 • B/P 106/72 • R 16 • O2 sat 98% on RA • Breath sounds clear bilaterally • Regular heart rate • Bowel sounds present • Skin is warm and dry. • Peripheral pulses regular • No edema in bilateral lower extremities • Lochia: Moderate, rubra • C/O abdominal cramping 3/10 • Fundus: Firm and midline • Breast: WNL	The student should perform a complete BUBBLE assessment.	Hand hygiene upon entering room. Introduce self to client. Identifies client. Student performs thorough head to toe assessment.	Hand hygiene not completed. Student does not properly identify self or patient. Performs partial or no head to toe assessment.
Student should review MD orders and prioritize.	See PP order sheet for Kelly Potts. VS; lochia/fundus; administer pain med; Regular diet; OOB	Student should prioritize orders.	Student should prioritize orders- student should state rationale for orders.	Student cannot rationalize and does not prioritize orders correctly.
Instructor: Change position of fundus in Noelle to allow students to assess as boggy. Apply saturated peripad to Noelle.				
Sim Noelle calls out to	Sim Noelle states "*I feel something gushing and wet*	Student assesses	Student reassesses	Student does not reassess

nurse's station.	*down there. Can my nurse come in here?*" Student enters room to assess patient. Sim Noelle displays: • Lochia: peripad saturated with overflow on bed pad – student should change peripad and bed pad • Fundus: boggy • Skin: pale and clammy	patient's lochia and fundus.	patient's condition.	patient.
Student should call for assistance and massage fundus. (2nd 30 minutes check.)	Student calls out on call bell for assistance and requests MD to be notified. Student continues to massage fundus noting no change in lochia with steady flow of bright red blood. Fundus remains boggy. Sim Noelle displays: • P 100 • B/P 98/66 • R 20 • O2 sat 97% on RA • Pain 2/10	One student should remain in room massaging fundus and assessing lochia and VS.	One student does not leave patient and realizes patient is hemorrhaging.	Student leaves patient; does not realize signs of hemorrhage.
Another student calls MD.	MD orders: ~ Methergine 400mcg (0.4mg) IM x1 dose ~ CBC and Type and Hold stat	Student transcribes and performs orders.	Student utilizes SBAR, explains procedures to patient, and completes orders using 5 rights of medication administration.	Student does not use SBAR, perform orders, or use 5 medication rights.
Student reassesses fundus after performing MD orders. (3rd 30 minute check.)	Sim Noelle displays: • T 98.2 • P 100 • B/P 94/66 • R 22 • O2 sat 97% on RA • Fundus: firm with massage • Lochia: peripad	Student should reassess fundus and lochia after medication administration. Student realizes patient's	Student reassesses fundus and lochia, realizing stabilization of patient's condition.	Student does not realize change in patient's condition or perform reassessment.

	moderately saturated with bright red blood with no continuous flow – student changes peripad • Pain 4/10 – refuses pain meds	condition is now stable and can leave room.		

Stop Simulation and Debrief.

Appendix M: Newborn Simulation

Simulation - Newborn Patient

The Labor & Delivery unit just called requesting that the nursery nurse come to an imminent delivery. The L&D nurse states that the patient, Ellen Whitaker has just started pushing with Ann Hill, CNM and should deliver within the next 15 minutes. The L&D nurse states that the fetal monitor strip has looked great with FHT 130-140 with accelerations, good FHRV, and no decelerations noted at this point. Ellen Whitaker is a 31 year old GTPAL 3-1-1-0-2 who is planning to breast feed this infant. She has been in labor for 5 hours, progressing well with AROM 2 hours ago.

Student Actions If student does this…	**Sim Infant Responses or Ancillary Dept. Responses** Sim Infant will say or do this…	**Prompts** The student should be doing this…	**Safe**	**Unsafe**
Ask the student if there is any other information they would like to have from the L&D nurse.	Student should request to know: • Gestation?- *39 5/7 weeks* • Color of fluid when ruptured? – *Clear with no odor* • What and when last pain medication was given to patient? – *Pt has an epidural placed 3 hours ago* • Any complications during pregnancy? - *None*	Student should obtain appropriate information before delivery of infant and be able to give rationales for why information is necessary.	Student asks appropriate questions and provides rationales.	Student does not ask for any further information.
Student nurse enters labor suite and prepares area for delivery of infant.	Student should turn on radiant warmer (state that they would turn it on); obtain bulb suction, thermometer, and stethoscope; and ensure emergency equipment is at bedside (bag & mask, suction, face mask).	Should assess area to ensure that all needed equipment is available.	Hand hygiene upon entering room. Introduce self to laboring patient. Student ensures that emergency equipment is at bedside.	Hand hygiene not completed. Student does not properly identify self or patient. Student does not check for emergency equipment.
Awaiting delivery of infant.	Ann Hill, CNM delivers a male infant without complications, cuts the cord and clamps it with hemostats, and hands the infant to the student nursery nurse.	Dons gloves prior to touching infant. Takes infant in blanket to	Student applies gloves. Places infant under warmer immediately	Student does not apply gloves. Student does not place infant under

		radiant warmer.	after delivery.	warmer.
Student nurse performs 1 minute Apgar assessment. Ask student about what would be assessed to determine Apgar score.	Sim Infant displays: • P- 140 • RR- 50; crying vigorously • no retraction or grunting • Some flexion of the extremities noted • Body is pink, with blue extremities Apgar score: HR: 0- Absent 1- slow, below 100 2- Above 100 Resp effort: 0- Absent 1- Slow, irregular 2- Good crying Muscle tone: 0- Flaccid 1- Some flexion 2- Active motion Reflex/Irritability: 0- None 1- Grimace 2- Vigorous cry Color: 0- Pale blue 1- Body pink, extrem. blue 2- Completely pink	Should quickly assess infant's condition and perform 1 minute Apgar score assessment. Student should obtain HR either apically or via cord. 1 minute Apgar score should be 8.	Student correctly performs 1 minute Apgar score assessment.	Performs partial or no 1 minute Apgar assessment.
Student nurse continues with initial examination and performs assessment.	Sim Infant displays: • Temp 99.0 Rectal • Cord – 2 arteries, 1 vein, no anomalies • Sole creases involving the heal • Scant vernix • Lanugo on upper back • Both testes palpate in lower scrotum • No cleft palate/ lip. • No anomalies noted • (Above information still applies)	The student should perform a complete assessment.	Student performs a complete assessment.	Perform partial of incomplete assessment.

Student nurse performs 5 minute Apgar score assessment.	Sim Infant displays: • P- 135 • RR- 48; crying intermittently • no retraction or grunting • Active motion • Body is pink, with blue extremities	Should perform 5 minute Apgar score assessment. Apgar at 5 minutes - 9	Student correctly performs 5 minute Apgar score assessment.	Performs partial or no 5 minute Apgar assessment.
Student clamps infants cord.	Student recognizes that infant's condition is stable at this point and clamps cord with cord clamp.	Student should clamp infants cord.	Student correctly clamps cord.	Student does not clamp cord.
Student finishes collecting data on infant.	*Instructor: Students can actually measure the mannequin to demonstrate technique, but should be able to state what the normal findings should be; as listed below.* Sim Infant displays: Chest circumference: 12" to 13" / 30.5 to 33cm Head circumference: 13" to 14" / 33 to 35.5cm Length: 18" to 21" / 46 to 53cm Weight: 5 lb 8oz to 8 lb 13oz / 2500 to 4000 grams	Student obtains weight, length, and head and chest circumference.	Student performs measurements accurately and is able to state what normal findings should be.	Student does not perform accurate measurements or does not know normal findings.
Student allows Mom to breastfeed infant.	Mom asks "*Is my baby okay?"* and "*Can I start breastfeeding now?"* Sim Infant displays: • Infant in no distress.	Student should wrap infant in blanket, then allow and assist Mom to begin breastfeeding.	Student recognizes infant is stable and allows breastfeeding.	Student does not recognize infant is stable and can leave warmer.
Student reviews MD orders and prioritize.	See nursery admission order sheet for Baby Boy Whitaker. Administer Erythromycin ophthalmic ointment & Phytonadione. (Already completed: VS; obtain ht, wt, and head/chest circumference; begin feeding).	Student should review MD orders and prioritize correctly, explaining rational for each order performed.	Student prioritizes correctly and properly administers medication using 5 med rights.	Student does not prioritize or properly administers medication using 5 med rights.

Stop simulation and debrief.

Appendix N: Summary of Reviewed Literature

Summary of Reviewed Literature

Author and Year	Purpose	Population	Tool	Limitations	Outcome
Bambini, Washburn, and Perkins, (2009).	Determine if simulation increases self-efficacy.	Convenience sample of 112 nursing students.	Pretest, posttest and follow-up survey.	Self-reported data, limited survey response, simulation variations.	Increased self-efficacy.
Bantz, Dancer, Hodson-Carlton, and Van Hove, (2007).	Develop, implement and evaluate a simulation day.	Undisclosed amount of BSN students.	Likert scale tool, open-ended questions.	Equipment restrictions, student anxiety.	Simulations supplement lecture and increase confidence in skills.
Cioffi, Purcal, and Arundell, (2005).	Investigate effect of simulation on decision making.	36 volunteer midwifery students.	Posttests.	Small sample size.	Simulations increase self-confidence & prompt decisions.
Brimble, (2008).	Investigate effects of video analysis.	29 volunteer BSN students.	Questionnaire.	Small sample size.	Video feedback consistent and preferred.
Norris, (2008).	Investigate simulation effect on knowledge application and skills.	27 under-graduate student midwives.	Questionnaire.	Small sample size.	Simulations increase confidence.
McGaghie, Issenberg, Petrusa, & Scalese, (2006).	Research high-fidelity simulation usage.	31 medical professionals.	Blind coding.	No new data was utilized.	Repetitive practice improves learning outcomes.
Brannan, White, and Bezanson, (2008).	Compare effects of instructional methods.	107 junior level BSN students.	Posttest, Confidence Level tool, and demographic data form.	Non-random group assignment.	Simulation increased knowledge; confidence levels of groups equivocal.

Author and Year	Purpose	Population	Tool	Limitations	Outcome
McKeon, Norris, Cardell, and Britt, (2009).	Compare tradition and computer simulations.	53 BSN students.	Pretest and posttest.	Small population size, time span between pretest and posttest.	Computer simulation increased competence.
Bearnson and Wiker, (2005).	Explore use of human patient simulator (HPS).	Undisclosed amount of first-year BSN students.	Likert scale survey	Small number of students in each simulation, no control group, self-reported data.	HPS increases knowledge and confidence.
Lasater, (2007).	Investigate effect of simulation on clinical judgment.	39 junior level BSN students.	Video recording.	HPS limitations.	Simulation increased clinical judgment.
Schlairet and Pollock, (2010).	Compare simulation and traditional clinical.	71BSN students.	Pretest and post-test.	Small sample size, low knowledge test scores.	Equivocal knowledge acquisition.
Radhakrishnan, Roche, and Cunningham, (2007).	Evaluated simulation and traditional clinical.	12 senior BSN students.	Clinical Simulation Evaluation Tool.	Small sample size, no alternative for control group, no pretest.	Simulation increased knowledge retention and monitor skills.
Childs and Sepples, (2006).	Implement and evaluate simulation.	55 students from 8 nursing schools.	Educational Practice Scale for Simulations (EPSS), Simulation Design Scale (SDS), and a confidence instrument.	Excessive simulation content, HPS limitations.	Simulation develops psychomotor and critical thinking skills.
Goldenberg, Andrusyszyn, and Iwasiw, (2005).	Evaluate effects of simulation on self-efficacy.	22 third-year BSN students.	Questionnaire, demographic sheet.	Small sample size, time of questionnaire completion.	Simulation increases self-efficacy.

Author and Year	Purpose	Population	Tool	Limitations	Outcome
Jenkins, Shaivone, Budd, Waltz, and Griffith, (2006).	Determine effects of activities on confidence.	107 nurse practitioner students.	Pretest and posttest.	Self-reported data.	Activities increased confidence levels.
Kardong-Edgren, Starkweather, and Ward, (2008).	Examine student perspectives of simulation.	100 undergraduate student nurses.	Educational Practices Questionnaire, Simulation Design Scale, Student Satisfaction and Self-Confidence in Learning Scale.	No control group.	Simulation includes best practice, lack in realism and feedback, support, and problem solving.
Smith and Roehrs, (2009).	Examine factors correlated to simulation outcomes.	68 junior level BSN students.	Demographic form, Student Satisfaction and Self-Confidence in Learning Scale, Simulation Design Scale.	Small sample size, limited scenario content, no control group.	Simulation design effects satisfaction and self-confidence.
Wetmore, Boyd, Bowen, and Pattillo, (2010).	Determine effect of blogging on critical thinking.	58 dental hygiene students.	Reflective blogs.	Small sample size, nonrandomized sampling method, and timespan.	No effect on critical thinking.
Paans, Sermeus, Nieweq, and Schans, (2010).	Effects of critical thinking on nursing diagnosis development.	Nursing students at a university.	Questionnaire, California Critical Thinking Disposition Inventory, and Health Science Reasoning Test.	No comparison group.	Analysis effects ability to develop nursing diagnosis.
Huhn and Deutsch, (2011).	Compare internet simulation to lecture.	45 physical therapy students.	Health Science Reasoning Test.	Small sample size, modification capabilities.	Simulation software may increase critical thinking.

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Jeffries, Beach, Decker, Dlugasch, Groom, Settles, and O'Donnell, (2012).	Effect of cardiovascular curriculum on assessment skills.	36 nurse practitioner students.	Questionnaire, pretest, and logbooks.	Small sample size, varying resources, faculty limitation.	Equal gain in knowledge, improved skills.
Maneval, Filburn, Deringer, and Lum, (2011).	Compare effect of teaching methods on critical thinking.	156 practical nursing students.	Posttest.	Tool, faculty experience, sample	Teaching care plans increase critical thinking.