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Simulation Learning and Transfer to the Clinical Environment in Undergraduate Nursing Students

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SIMULATION LEARNING AND TRANSFER

TO THE CLINICAL ENVIRONMENT IN

UNDERGRADUATE NURSING STUDENTS

A DISSERTATION SUBMITTED TO

THE FACULTY OF THE GRADUATE SCHOOL

IN CANDIDACY FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

PROGRAM IN NURSING

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To my grandparents Joseph and Helen

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ABSTRACT

Simulation learning is an integral component of many undergraduate nursing programs throughout the country. Experiential learning through simulation allows students to improve their cognitive, affective, and psychomotor skills. Some clinical experiences lack significant practice of clinical skills for students; including the inability to assume the role of the nurse. A recent literature review revealed a need to advance the understanding of simulation learning and transfer; with many questions still remaining unanswered. The aim of this study was to conceptualize the process by which simulation learning transfers to the clinical environment in undergraduate nursing students. Twenty-five, fourth-year traditional nursing students, who had completed at least one medical-surgical simulation experience, were interviewed using a semi-structured interview guide. Through data analysis, using constant comparison, a model emerged that explained the simulation learning transfer process. The core category was Acting Like A Nurse and the model had ten categories. The categories reflected stages in the model. The beginning stages of the model included in the categories of *Being in Simulation* and *Being in Clinical.* The middle stages of the model reflected interaction between the student and simulation included in the categories of *Being Able to Practice, Getting Feedback, Making Sense of My Learning ,Fitting Together,* and *Applying My Learning.* The final stages were *Gaining Confidence* and *Becoming More Comfortable* with the outcome category being *Knowing What to Do.* Of particular importance it was determined that the

greater exposure of participants to simulation learning, the more likely knowledge and skill acquisition would occur. Simulation learning and transfer to the clinical environment was a sequential process, beginning with simulation experiences. Acting Like A Nurse impacted the development of transfer of learning and contributed to the unique findings in this study. The findings of this study have implications for nurse educators to enhance educational strategies and student learning. Furthermore, implications for future research are the study of simulation learning and the process of transfer in various student groups and development of an empirically derived tool to assess the transfer process.

CHAPTER ONE

INTRODUCTION

The clinical challenges faced by new graduate nurses can be overwhelming. To help students address these challenges with greater skill and confidence, many schools of nursing provide experiential learning through simulated experiences. Simulation allows students to experience patient care situations never or rarely encountered such as: cardiac arrest, pediatric, and obstetrical emergencies. Simulation has the potential to improve psychomotor, affective, and cognitive skills while allowing students the ability to engage in significant deliberate practice (Parker et al., 2011). Despite the widespread use of simulation learning in nursing education, many questions remain unanswered about how this learning transfers to the clinical environment.

Over the last decade, simulation has become a common component of nursing education. Many questions about simulation learning still remain unanswered and require quality nursing research to optimize the understanding and use of simulation educational resources in undergraduate nursing education. Some nursing scholars assert that simulation technology has been used in advance of sufficient research evidence to justify integration of simulation activities into nursing education (Schiavento, 2009).

Challenges confronting the field of nursing include shortened patient stays, high acuity levels, and critical staffing shortages, making the clinical environment an

incredibly stressful one for both the nursing student and practicing nurse. Simulation has a relevant and important place in supporting and facilitating student learning in this challenging environment. With task trainers or standard mannequins, beginning students can practice skills and caregiving in a safe environment that allows them to make mistakes, learn from those mistakes, and develop confidence in their ability to approach patients and perform in the clinical setting. For advanced students, who have engaged in some clinical or simulation activities and developed mastery of some basic skills, simulation training allows them to explore more complex and challenging clinical problems.

An increased interest in innovative teaching modalities has propelled simulation learning to the forefront of undergraduate nursing education in many nursing programs throughout the country. Additionally, the complexities of the modern health care environment have encouraged nurse educators to seek ways to better prepare nursing students for the realities of clinical practice. Nursing faculty need to design an undergraduate nursing curriculum that meets the needs of nursing students and various stakeholders.

An extensive review of the simulation literature in nursing, medicine, and related disciplines leaves the unanswered question of how simulation learning transfers to the clinical environment, with the most important question being does it produce results? The question is important because the resources devoted to simulation learning are tremendous, and need to be justified. Nursing faculty should have evidence to support the use of simulation learning as a necessary and relevant component of the undergraduate

curriculum. Evidence generated by further simulation research will allow the effective and targeted use of educational resources. Nurse educators need to be made aware what activities specific to simulation learning will provide the most benefit to their nursing students.

Simulation Defined

In nursing education, the term simulation encompasses a broad range of techniques and technologies. Generally speaking, simulation is a representation of reality. Morton (1995) defined simulation as a process "to replicate some or nearly all of the essential aspects of a clinical situation so that the situation may be more readily understood and managed when it occurs for real in clinical" (p. 76). Gaba (2004) defined simulation as a "technique, not a technology to replace or amplify real experiences with guided experiences that evoke or replicate substantial aspects of the real world in a fully interactive manner" (p. i2). The options of simulation were defined by Gaba (2004) as, (a) role playing, (b) standardized patients, (c) part-time task trainers, (d) computer screen/patient, (e) electronic patient replica of the clinical site, (f) manikin based and, (g) full virtual reality.

The gaps in the quantitative and qualitative nursing simulation literature, prominent nursing organizations' position on simulation, skill acquisition and deliberate practice, and transforming nursing education will be discussed in the introduction.

Gaps in the Nursing Simulation Literature

An examination of recent simulation studies undertaken in nursing revealed that the evidence to support the widespread adoption of simulation activities across nursing

education needs to be critically examined and further explored. The National League of

Nursing multisite study conducted by Jeffries and Rizzolo, (2006) with 403 associate and

baccalaureate nursing students, explored simulation learning in nursing education. Best

education practices of collaboration, fidelity, and feedback (Chickering & Gamson, 1987)

were used as a component of the simulation framework in this study. Students engaged in

simulation were more satisfied and confident than the control group and enjoyed the

more diverse and active ways of learning using simulation. No significant differences

were found in knowledge gains between the three groups (paper/pencil case study

simulation, static manikin, and high fidelity patient simulator) as measured by pre-testing

and post-testing. However, students were not expected to acquire new knowledge

during their participation in one of the three simulation group experiences (Jeffries &

Rizzolo). The simulation was designed to give students an opportunity to apply their

existing knowledge, as learning with simulations is typically directed toward synthesis

and application of current knowledge, rather than to the acquisition of new knowledge

(Jeffries & Rizzolo). Additionally, a number of new instruments were used, raising

questions of the validity and reliability of instrumentation, although Cronbach's alphas

for all instruments were reported greater than .80. No difference between groups on

knowledge scores using the Education Practices in Simulation Scale (EPSS) was

identified, although the instrument used to measure knowledge gains among the three

groups was only a two item exam. Multi-causality was also an issue when examining this

research study because extraneous variables may have accounted for group differences.

An examination of the effectiveness of intermediate fidelity simulation training

technology in undergraduate nursing students was conducted in the United Kingdom by Alinier, Hunt, Gordon, and Harwood (2006). The Objective Structured Clinical Examination (OSCE) was used to compare students engaged in the traditional nursing curriculum and clinical practice (control group) with a second group that added simulation training (experimental group). The sample was composed of 99 nursing students who were in the second year of a three-year program. A pre-test/post-test design was employed using a 15 – station OSCE and students were randomly assigned. In addition to the normal curriculum, the experimental group completed simulation training. Subsequently, all students were retested and completed a questionnaire. The control and experimental groups improved their performance on the second OSCE (post-test). Mean test scores increased by 7.18 (control) and 14.18 (experimental) percentage points, respectively. The difference of seven percentage points between the means (CI 4.5-9.5) was statistically significant but this difference of seven percent between the control and experimental group may not translate to objective and clinical significance. Since the data were collected over a two-year period, extraneous variables may have also accounted for some group differences.

Human Patient Simulation (HPS) was used to evaluate knowledge in senior baccalaureate nursing students in the United States (Hoffman, O'Donnell, & Kim, 2007). The authors used a pre-test, post-test, repeated measures design to determine the effects of HPS on basic knowledge of critical care nursing. A convenience sample of 29 students enrolled in an advanced medical-surgical course completed the Basic Knowledge Assessment Tool 6 (BKAT-6). There was no comparison group. Prior to beginning the

simulation learning experience and traditional clinical training and again on the last day

of the human simulation experience, students completed the BKAT-6, which is a 100-

item paper and pencil test that measures both the recall of basic information and the

application of basic knowledge in critical care practice situations. Students

completed seven weeks of traditional clinical experience (45 hours total) and seven

weeks of high fidelity human simulation (45 hours total). There was significant

improvement on the BKAT-6 overall (total score pre-test) M=52.52, SD=8.40 vs. post-

test M=62.76, SD=7.18 (p<.0001) and a significant improvement in the six subscales of

the BKAT-6; although no control group brings into question whether the improvement

was the result of HPS.

The effects of simulation training on cognitive skills and confidence levels were

examined by Brannan, White, and Bezanson (2008). A prospective quasi-experimental,

pre-test/post-test design with a comparison group was used. A total of 107 baccalaureate

nursing students were enrolled in the study. The control group consisted of 53 students

(traditional lecture) and the experimental group received only instruction with the Human

Patient Simulator (HPS). Students were not randomly assigned to groups. The Acute

Myocardial Infarction Questionnaire (AMIQ) and the Cognitive Skills Test and

Confidence level (CL) measures were used to assess learning, and had reliability

coefficients of 0.74 and 0.89, respectively. The students who received the HPS

instructional method achieved significantly higher AMIQ post-test scores compared to

students who received the traditional lecture teaching approach, M=15.88, SD=2.13 vs.

M=14.7, SD=1.86 (p<.002). The confidence level among students who participated in the

HPS instructional method did not differ significantly from those students who received the traditional lecture approach (M=106.29, SD=19.71) vs. (M=113.5, SD=17.87) (p=NS). This finding supports the cognitive gains with HPS. Although the difference of one point on the AMIQ between the lecture and HPS groups is statistically significant, the question remains whether this result is clinically significant.

A clinical simulation laboratory was used as an adjunct to clinical teaching in the study of Johnson, Zerwic, and Theis (1999). The purpose of the clinical simulation experience was to allow students to synthesize and apply knowledge across a variety of settings, specialties, and age groups. The course served as a culmination of concepts and processes central to the curriculum. Simulations were developed to encompass content and experiences that new nurses may encounter. The authors asserted that students need a variety of clinical experiences to encourage problem solving and decision making skills in clinical situations. Videotaped and telephone simulations depicting various clinical situations were role played by senior nursing students in their final clinical course. Fifty-one students worked in groups of four and each student played a patient, nurse, and additional roles as needed. Telephone simulations were done in a similar manner. Faculty members offered cues if needed to prompt students as what to do next. The outcomes of the simulation revealed that the students' response to simulation was positive with a mean rating of 5.39 using a six-point Likert scale. Eighty- percent of the students responded positively to the simulation experience.

In conclusion, the authors determined that videotaped and telephone clinical simulations allowed students to experience essential clinical learning experiences and

helped them focus on problem solving and critical thinking skills (Johnson, Zerwic, and Theis, 1999). Some limitations of the study were no control group, a small sample size, and qualitative information without sound qualitative methodology, although this early study may have provided some evidence of the potential value of simulation learning.

The use of human patient simulators (HPS) was investigated in novice nursing students (Bremner, Aduddel, Bennett, & VanGeest, 2006). The purpose of the study was to determine the value of using HPS in novice nursing students. The sample consisted of fifty-six nursing students enrolled in their first clinical nursing course in a baccalaureate curriculum. The authors asserted that HPS was a risk free method to experience clinical events, helped developed expert reasoning, had the potential to reduce medical errors, and helped evaluate specific skills. No research design was specified. The authors concluded from the qualitative data that the HPS allowed beginning nursing students the opportunity to decrease anxiety and practice skills in a supportive environment. A limitation of the study was qualitative data without the rigor of sound qualitative research methodology.

Another nursing study examined the effectiveness of simulation learning in providing a realistic experience for students (Schoening, Sittner, & Todd, 2006). The purpose of this study was to examine students perceptions of preterm labor. The authors asserted that simulation learning may help better prepare nursing students when they enter the work force. Simulation was used as a high fidelity modality and a further defined simulated clinical experience (SCE) as the student assuming the role of the nurse in a realistic reenactment of a clinical situation. A preterm labor SCE was used because

students are rarely able to care for obstetrical patients with this high-risk condition. The sample consisted of 60 baccalaureate students in the second semester of their junior year, all female, with an average age of 22 years. Six hours of clinical time was replaced with SCE in the sample.

The grand scores for the student perceptions of the simulation was 3.75 on a four-point Likert scale. Students used reflective journal entries about their SCE experience and content analysis was used to analyze the data (Schoening et al., 2006). The qualitative data in this study indicated that simulation allowed: (a) hands on learning, (b) led to gains in confidence, self-efficacy, and practice in a non-threatening environment, (c) realistic practice, critical thinking and knowledge application, (d) valuable experience, helped transfer concepts, and was satisfying, and (e) enhanced teamwork activities, communication, and preparedness. The authors concluded that simulation may be an effective and innovative teaching strategy in nursing students. A limitation of the study was a non-rigorous qualitative methodology.

High fidelity simulation and the development of clinical judgment was explored in a mixed methods study with 48 junior-level nursing students by Lasater (2007). The purpose of the study was to examine the effect of high-fidelity simulation experiences on the development of clinical judgment in undergraduate nursing students. Clinical judgment was defined in this study as the: "thinking and evaluative processes that focus on a nurse's response to a patient's ill-structured and multilayered problems" (p. 29). The study was a mixed-method design using qualitative and quantitative dimensions. A convenience sample of 48 nursing students enrolled in a medical-surgical nursing course

composed the final group. A focus group was used to collect qualitative data and provide a retrospective data analysis.

Lasater concluded that the simulation activities served as an integrator of learning, provided realism, helped students gain experience in varied settings, and practice psychomotor skills. Some limitations of the simulation experience expressed by the nursing students were: no male voices, the simulator had no visual or nonverbal communication, and the inability of the manikin to give feedback on certain physical examination assessments. Students also had an increased level of anxiety and felt ill prepared during some scenarios. A significant limitation of the study was the lack of qualitative methodological rigor.

Many qualitative studies in the nursing simulation literature lacked qualitative methodological rigor (Bremner et al., 2006; Johnson, Zerwic, & Theis, 1999; Lasater, 2007; Schoening et al., 2006;). These studies illustrated the necessity of future research utilizing sound, rigorous qualitative methodologies.

A recent qualitative study with methodological rigor explored the influence that high fidelity simulation has on students' perceptions related to simulation and real life patient care experiences (Panunto, 2009). The convenience sample consisted of eight baccalaureate nursing students. Panunto used a constant comparison method of data analysis to identify themes, patterns, and concepts. Three themes emerged from the data: (a) simulation augments clinical instruction with sub themes of the opportunity to practice in a safe learning environment, to learn from mistakes, and to work hand in hand, (b) an unrealistic simulation environment hinders students' learning with sub themes of

constant faculty scrutiny and distracting surroundings, and (c) instructional inconsistencies necessitate standardized teaching methods. The author concluded that participants felt simulation improved their learning and added variety and depth to nursing education. This qualitative study generated relevant data about the perception of simulation in undergraduate education.

Prominent Nursing Organizations' Position on Simulation

The National League for Nursing (NLN), National Council of State Boards of Nursing (NCSBN), and the American Association of Colleges of Nursing (AACN) have supported simulation as an important component of nursing education.

In 2003 the NLN emphasized that nursing education needs to facilitate an environment that fosters reflection, critical thinking, and the use of technology to educate nursing students (NLN, 2003). Current nursing students have grown up with technology, expect technology, and rely on it to learn. Using simulation to engage and interest nursing students has the potential to better prepare students for the complexities of clinical practice.

An alliance between the NLN and the Laerdal Corporation was formed in 2003 to conduct a study of the use of simulation in nursing education. This study, conducted between 2003 and 2006, explored simulation as an educational tool to foster nursing student preparation for the realities of clinical practice. The NLN has remained the strongest proponent of simulation usage in nursing education, although evidence to support simulation as a useful and effective technique is still emerging (Schiavento, 2009).

Recently, the NLN/Jeffries Simulation Framework (Jeffries, 2016) described a theory to inform practice to allow simulation to be fully integrated into nursing education. The NLN/Jeffries Simulation Framework, a mid-range theory, provided an effective guide to foster and enhance optimal learning in simulation.

The National Council of State Boards of Nursing (NCSBN) works to ensure the protection of the public's health and welfare. In 2006, the NCSBN discussed the role of simulation in nursing programs. The NCSBN determined that the published research supported a variety of teaching strategies, including simulation (NCSBN, 2006). NCSBN supported simulation as a complement to, or replacement for, clinical hours in nursing programs throughout the US and explored the role of high fidelity simulation in basic nursing education in relation to real clinical experience. The NCSBN also determined that an important research objective was to compare and contrast the effects of simulation alone and in combination with clinical experience on knowledge acquisition/retention, self-confidence, and clinical performance.

The resulting NCSBN (2006) simulation usage report revealed that clinical simulation time had replaced or supplemented clinical hours for nursing students nationwide. However, the significant state-to-state variability of simulation activity revealed the controversy and unanswered questions that existed regarding simulation as a replacement for nursing student's clinical time. Six states permitted no simulation as a substitute for clinical time. Twenty-eight states had no board of nursing regulation addressing simulation. Four states were addressing the simulation issue but had no policy in place. Six states had approved simulation as a supplement to clinical care. Substitution

of simulation for clinical hours ranged from an unspecified percentage of time in Texas, to up to 50 percent in Connecticut, to between nine and 30 percent in six other states (NCSBN).

Recently, the landmark NCSBN national simulation longitudinal study (Hayden, Smiley, Alexander, Kardon-Edgren & Jeffries, 2014) explored simulation learning as a substitution for clinical time. Ten pre-licensure nursing programs with a total of 666 students completed the study. Students were randomized into three groups: (a) control: students who had traditional clinical experiences with no more than 10% of clinical hours spent in simulation, (b) students who had 25% of their clinical traditional clinical hours replaced by simulation, and (c) students who had 50% of their traditional clinical hours replaced by simulation (p. s6).

The results were that at the end of the nursing program: (a) there were no statistically significant differences in clinical competency as assessed by clinical preceptors and instructors (p=0.688), (b) there were no statistically significant differences in comprehensive nursing knowledge assessments (p=0.478), (c) no statistically significant differences in NCLEX® pass rates (p=0.737), and (d) no difference in manager ratings of overall clinical competency and readiness for practice at any of the follow-up survey time points: six weeks (p=0.527) in new nurse practice (p. s3).

Hayden et al. (2014) concluded that there was substantial evidence that substituting simulation experiences for up to 50% of traditional clinical hours produces comparable readiness for practice and end-of-program educational outcomes.

A survey of simulation usage in pre-licensure nursing programs, Hayden (2010)

determined in the last ten years simulation usage in undergraduate nursing has increased significantly. In pre-licensure nursing programs 87% (N=917) of the respondents were using high or intermediate fidelity simulation in their programs. Katz, Peifer, and Armstrong (2010) also documented the increasing integration of simulation learning in many nursing programs throughout the country, although no data were available that determined the amount of simulation usage that was substituted for clinical hours.

A more recent multi-site simulation survey (Breymier et al., 2015) of substitution of clinical experience with simulation in pre-licensure nursing programs determined that a standard substitution ratio for simulation hours to supervised clinical hours was not uniform among pre-licensure nursing programs throughout the country. The authors concluded that significant ambiquity exists between institutions with some schools of nursing adopting the standard 1:1 ratio substituting (safer approach according to the authors) simulation for supervised clinical instruction time (Breymier et al.).

The move by some states to replace nursing students' clinical time with simulation activities was just recently supported by research evidence. Integration of simulated experiences across the curriculum may now be warranted, although replacing nursing students' clinical rotations with simulation activities may still not provide the variation, dynamic professional experiences, and patient diversity encountered in clinical practice. Nurse educators need to continue to explore the relationship between simulation teaching and evaluation, from the student's perspective, to optimize the use of faculty resources.

In 2008, AACN asserted the sixth *Essential* of baccalaureate nursing education was interprofessional communication and collaboration for improving patient outcomes.

Simulation was specifically recommended as a way to improve student communication and assessment abilities (AACN, 2008). In 2009, the AACN also determined active learning could be enhanced with simulation.

Three prominent nursing organizations support the adoption of simulation activities in nursing education, and there is a significant evidence that has recently emerged, to support its use in the nursing curriculum. The discipline of nursing has an obligation to continue to address and explore same existing gaps in the simulation literature. Adopting simulation as a necessary part of the nursing curriculum, with still emerging evidence, may lead to the inefficient use of educational, faculty, and financial resources.

Skill Acquisition and Deliberate Practice

The question of how simulation learning transfers to the clinical environment remains unanswered. In 2010, the NLN supported the model of skill acquisition/clinical judgment of Benner's (2004) and Ericsson's (2004) positions of deliberate practice in connecting theoretical knowledge to clinical practice. The NLN further determined that future nursing research should explore how learning in the simulation laboratory transfers to the clinical environment.

The model of nursing practice developed by Patricia Benner (1984) emphasized development from novice to expert practice. This theoretical framework uses the Dreyfus and Dreyfus (1986) model to describe the acquisition of knowledge and skills crucial to expert nursing practice. The five levels of expertise include novice, advanced beginner, competent, proficient, and expert.

Benner (1982) defined the progression across two levels of skilled performance as:

(a) movement from reliance on abstract principles to the use of past concrete experiences as paradigms, and (b) a change in the perception and understanding of a demand situation so that the situation is seen less as a compilation of equally relevant bits and more as a complete whole in which only certain parts are relevant (p. 403). In 1984, Benner also asserted that undergraduate nursing students need faculty to place a greater emphasis on clinical experiences and not just lecture. Simulation may help the formation of clinical judgment in a realistic environment.

Benner's model depends on the acquisition of expertise through clinical experiences, but does not specifically define how an individual might gain these experiences, or how more rapid progression to higher levels of practice could be facilitated. This weakness in the theory was highlighted by Field (2004) in an analysis of the value of learning from clinical experience alone. Field identified several key elements of clinical skill development. The elements, mentor support within a robust clinical experience and the need for both rich dialogue and adequate time for student reflection could be provided through simulation.

Benner's framework and the "novice to expert" model was used in the development of a unique nursing simulation training protocol. Larew, Lessans, Spunt, Foster, and Covington (2006) utilized a simulation format that incorporated a simulated patient with several cues pointing to the actual problem to allow all levels of nursing students the ability to learn from simulation. Students were given ascending prompts to help them progress from recognition to intervention. This study supported the use of Benner's theory and simulation to help augment and foster student learning.

Nursing leadership supports the Ericsson, Krampe, and Tesch-Romer (1993)

position of connecting theoretical knowledge to clinical practice. Research into the

acquisition of expertise (Ericsson, 2004) consistently shows the importance of intense

deliberate practice in a focused domain, in contrast to reliance on innate abilities for the

acquisition, demonstration, and maintenance of skills mastery. The development of

expertise in all disciplines requires the application of the four-ten rule: Ericsson

determined that it takes four hours of deliberate practice everyday for 10 years to become

a word class performer such as an Olympic athlete, renowned scientist, chess master,

patient care clinic provider, or a writer. Deliberate practice using simulation can be used

as an introduction to the assessment of skill/understanding and provide a learner-centered

modality; although deliberate practice using simulation is still being investigated.

The nursing and medical literatures reveal that significant differences exist between

novice and advanced learners in simulation learning and in the ability of simulation to

affect skill and knowledge development. Four studies support the use of deliberate

practice using simulation as a method to advance knowledge and performance

of novice and advanced health care professionals.

The effects of deliberate practice on the retention of cardiopulmonary resuscitation

(CPR) psychomotor skills among nursing students was explored by Oermann et al.

(2011). The purpose of this study was to examine the effects of deliberate practice on

CPR skills using Voice Activated Manikins (VAM) on the number of detected

compressions and ventilations at an appropriate depth and volume. The sample consisted

of 606 undergraduate nursing students from 10 schools of nursing throughout the U.S.

After receiving initial training and certification in Basic Life Support (BLS), students were randomly assigned to groups. The once-monthly practice sessions were six minutes in length for the experimental group. Differences in performance between the experimental and control group were compared at three, six, nine and twelve months. The control group engaged in no deliberate practice. Data analysis relied on linear mixed models. Students in the experimental group demonstrated improved performance compared to the control group at six months (Oermann et al., 2011). The authors concluded that the goal of skill instruction in nursing is to enhance learning and skill transfer to clinical practice. This study utilized a controlled randomized design.

Advanced practice nurses (APN) were exposed to deliberate practice using simulation to explore if assessment skills and knowledge improved following a cardiovascular assessment curriculum. Jeffries et al. (2011) asserted that with APN students an effective instructional method in cardiovascular assessment skills was lacking. The deliberate practice model (Ericsson, 2004) provided a framework to guide the authors study.

Evaluation of a cardiovascular assessment curriculum for APN's was the purpose of the study. This study utilized a quasi-experimental multi-centered design that included four institutions with a sample of 36 nurses. The intervention consisted of Harvey® (computerized manikin) cardiopulmonary simulations (CPS), a multimedia, computer-based CD-ROM program and faculty led case presentations (Jeffries et al., 2011). Expert judges utilized essential cardiovascular assessment findings to compute passing scores. A 31-item multiple-choice and matching written examination was used for pre-test and

post-testing. A 13-item cardiopulmonary skills performance check list was also used.

Mean training time on the Harvey ® simulator was of 9.8 hours outside of formal

instruction with a range of 30 minutes to 56 hours. Learner and instructor self-confidence

and satisfaction were also measured (Jeffries et al.).

The APN students who completed the Harvey curriculum and simulation had an

overall 22 percent gain in knowledge from pre- to post-testing across all four institutional

groups. The deliberate practice enhanced APNs satisfaction. On the five-item satisfaction

scale, mean scores ranged from 4.6-5.0 (strongly agree) (Jeffries et al., 2011). Confidence

was assessed with a three item post-intervention survey, and scores ranged from 2.9-3.9

(5.0 strongly agree). Instructors' ratings also reflected high levels of satisfaction and

confidence with teaching cardiovascular assessment techniques using the curriculum

survey on the five-item satisfaction and three-item confidence surveys: 4.8-5.0 (5.0

strongly agree) (Jeffries et al.). The authors concluded that APN students benefited from

both simulation experiences and deliberate practice. Overall deliberate practice with the

Harvey® curriculum helped APN students improve their cardiovascular knowledge and

skills. This finding is in conflict with the NLN study in 2006 which concluded that

simulation was not expected to enhance knowledge and skill. The study was somewhat

limited by its small sample size, and reliability of instrumentation was not reported.

Finally, not all institutions may have the resources to use Objective Structured Clinical

Examination (OSCE) as part of the critical skills demonstration (Jeffries et al.).

Medical residents engaged in a simulation learning experiences to enhance central

venous catheter (CVC) insertion. Catheter related blood stream infection (CRBSI) from

CVC insertion were compared pre and post simulation. The CRBSI were significantly

less after simulator training (.50 infections per 1000 catheter days vs. 3.20 per 1000

catheter days p = .001) in the same unit. The authors concluded that CRBSI was

significantly reduced in the intensive care unit as a result of simulation-based training.

In another study in medical education, Fraser et al. (2011) explored whether

training on a cardiopulmonary simulator improved diagnostic performance on real

patients. A prospective intervention design was used with 86 first year medical students

in a three year medical school program in Canada. Students were randomly assigned to

one of three clinical scenarios: pulmonary embolism with right ventricular strain and no

murmur (PE), symptomatic aortic stenosis (AS), or myocardial ischemia causing mitral

regurgitation (MR).

The authors concluded that mitral regurgitation (MR) diagnosis was enhanced with

simulation. The three group mitral regurgitation results for accuracy identification were:

MR (*M*=74.0 *SD*=36.4) vs AS (*M*=56.2 *SD*=34.3) vs PE (*M*=36.8 *SD*=33.1) (*p*=.0005).

For diagnosing MR the accuracy scores were: MR *(M*=68.0 *SD*=45.4) vs AS (*M*=51.6

SD=50.0) vs PE (*M*=29.9 *SD*=40.7) (*p*=.01) (Fraser et al., 2011). Students trained on MR

were more likely to identify these clinical features on a real patient than those not who

had not heard a cardiac murmur. The effect size was 1.07. The study was limited by a

small sample size and lack of generalizability due to a single study site (Fraser et al.). The

authors concluded that to maximize learning gains situated learning principles should be

applied with simulation.

The four studies described provide evidence of the advantage of deliberate practice

using simulation. How educators design learning activities and provide relevant cognitive and psychomotor challenges can influence positive outcomes using simulation. The question still remains if other educational modalities would be equivalent to simulation. Simulation is an expensive, time-consuming, and intense method of teaching; consequently, the questions of how and whether simulation learning transfers to the clinical environment remains an important issue of concern.

Transforming Nursing Education

The Institute of Medicine (IOM, 2008) report indicated that the issues of quality and safety need to be examined to improve health care. Jeffries (2007) asserted that, simulation, if well designed, can set the stage for students to work with authentic problems, synthesize data, make good clinical decisions, and reflect on their practice. Simulation can enhance or supplement learning in the classroom, laboratory, and clinical settings (Jeffries).

The expanded expectations created by government, nursing regulatory bodies, and society have placed a significant obligation on nurse educators to improve nursing education. Benner, Sutphen, Leonard, and Day (2010) consider simulation and high stakes learning similar to experiential learning that can help produce the complex, open-ended skill and knowledge required for the patient variability encountered in clinical situations. Simulation can also contribute to learning in context, and requires that the student to take into account the response of a simulated patients that will help students develop care skills and lead to a sense of salience (Benner et al.). As a teaching tool, simulation can build on theoretical knowledge, help make connections, and provide

clinical referents for acquired knowledge in undergraduate nursing education.

The transformation of nursing education using simulation will allow nurse educators the opportunity to evaluate students competence in basic nursing skills and more complex clinical problems. Issenberg, Ringsted, Ostergaard, and Dieckman (2011) concluded that decision makers and stakeholders must see evidence that the use of simulation leads to desired and demonstrable learning outcomes. Issenberg et al. also asserted that the global community needs a better understanding of conceptual issues and evidence of effectiveness to guide simulation use within health care. Empirical investigation into how simulation learning transfers to the clinical environment will contribute to the body of knowledge that presently exists in simulation research.

The grounded theory method of Glaser and Strauss (1967) will be used to answer the research question: What is the process by which simulation learning transfers to the clinical environment in undergraduate nursing students? Using the grounded theory method will yield a theoretical model explicating the basic social processes inherent in the simulation learning experience and transfer of learning in undergraduate nursing students. The grounded theory method will also provide conceptual clarity about the student simulation experience and transfer of learning.

The grounded theory method should satisfy four criteria (Glaser & Strauss, 1967) to assess the merits of a theory: fit, workability, relevance, and modifiability. The method used in ground theory research consists of data collection, concept category identification, concept development, integration and modification of the concept, and writing the research report (Glaser & Strauss). Stern (1980) identified that grounded

theory was different from other qualitative methodologies by five important points, which were: (a) a conceptual framework will be generated from the data, (b) a dominant process will be discovered in the social scene, (c) the data will be compared with all other data, (d) modification of data collection will be conducted as needed, and (e) the researcher immediately begins to code, categorize and conceptualize the data.

The foundations of grounded theory are symbolic interactionism and the post-positivist movement. Symbolic interactionism originated from the philosophy of Charles Pierce and William James. George H. Mead developed the premises inherent in symbolic interactionism. Herbert Blumer (1969) further advanced the theory of symbolic interactionism and is credited with the advancement of describing symbols that have meaning and value to individuals. Blumer (1969) asserted that symbolic interactionism consists of certain essential components, which were: (a) human beings act on the basis of meanings, (b) meaning derives from or arise out of social interaction and, (c) meanings are modified through and interpretive process (p. 2). Symbolic interactionism allows clarification of apparent social problems and complex situations (Chenitz & Swanson, 1986). Examining the human nature in interaction leads to understanding. Researchers can examine the setting for social rules, ideologies, and events that illustrate shared meanings held by the interacting of the people. The present study will take into account the simulation setting for undergraduate nursing students and the implications it has for clinical practice.

The nonlinear process utilizing the grounded theory method, as described by Glaser (1978), was: collection of data, open coding, theoretical sampling, generating memos

with as much saturation as possible, and emergence of core social psychological problems and processes. The core processes then become the basis of more selective theoretical sampling, coding, and meaning as the analyst focuses on the core. Steps of the process occur iteratively and simultaneously in a progression beginning with data gathering and ending with writing of a substantive or formal theory. Grounded theory is a dynamic process with subsequent sampling decisions, based upon ongoing analysis of data as collection proceeds.

The quantitative studies examined revealed the methodological limitations of single research settings, small and nonrandom samples, potential confounding and extraneous variables, untested measurement tools, potential contamination between groups, lack of control groups, and small statistical group differences which may not translate into clinical significance. Numerous studies examined qualitative data without the rigor of qualitative research methodology. Research focusing on variables that relate more directly to specific learner outcomes is needed, and rigorous research studies are still needed to determine if simulation learning transfers to actual clinical settings, and makes a difference in the quality of nursing practice.

In summary, many questions remain unanswered about the value and necessity of simulation usage in nursing education. Identified gaps in the nursing simulation literature include the following: (a) unknowns regarding the benefit of simulation learning, (b) identification of how simulation learning transfers to the clinical environment, and (c) clarity surrounding the optimal fidelity level for student learning. Few qualitative studies employed methodological rigor. Although the quantitative studies examined provided

some evidence in support of simulation usage (Alinier et al., 2006; Hoffman et al., 2007; Brannan et al., 2008), questions remain about the objective and clinical significance of the results.

Conclusion

This introduction provided an overview of the issues and gaps in the simulation literature. Further research is needed to explore simulation learning and its ability to prepare nursing students for clinical practice. The question of how simulation learning transfers to the clinical environment remains unanswered particularly with undergraduate nursing students.

Simulation in nursing education has been used as a teaching activity and recently as an evaluation tool (Bensfield, Olech, & Horsley, 2012). It is obvious nursing needs to bridge the gap between theory and practice. Evidence is still needed to provide a clear understanding of the value and role of simulation in nursing programs. Insight into understanding of the process of simulation will be beneficial to nurse educators who seek to enhance student learning.

Examination of the literature also revealed the methodological limitations in the existing quantitative and qualitative research. The methodological limitations in the quantitative studies were single research settings, small and nonrandom samples, potential confounding and extraneous variables, untested measurement tools, lack of a control groups, and small statistical group differences. The methodological limitations of the qualitative research revealed conclusions based on qualitative data without the rigor of a defined qualitative research methodology. A grounded theory study conceptualizing

the experience of simulation among undergraduate nursing students could generate useful findings and a theory about simulation learning, provide clarity about simulation learning, and define how simulation learning transfers to the clinical environment.

The subsequent literature review chapter will present a concise review, synthesis, and critique of the relevant simulation literature in nursing and other disciplines. A summary of the present state of simulation knowledge and what gaps exist in simulation research will be described.

CHAPTER TWO

LITERATURE REVIEW

A literature review was conducted to analyze simulation research in nursing, medicine, and related disciplines. The research literature review was also undertaken to determine the deficits present in the existing simulation literature, to provide supporting evidence for the research question, and to synthesize and analyze the present state of simulation knowledge. A summary was compiled to identify the evident gaps in simulation research, and to justify the need for more simulation research studies in nursing, and the proposed study.

The concept of simulation was investigated by conducting a systematic literature search using: Cumulative Index of Nursing and Allied Health Literature (CINAHL), Educational Resources Information Center (ERIC), MEDLINE, PSYCINFO , and Dissertations and Theses through ProQuest. Keywords included simulation, nursing education, and medical education. Using simulation as a keyword yielded almost 5,000 results. Combining nursing and medicine with simulation identified 160 articles to begin the literature search.

The criteria for inclusion of articles in the literature review was predominately literature between 2000-2012, although literature in other disciplines (medicine) extended back to 1993. The literature review was updated to include literature that has emerged

since the initial review, including literature up to 2016. The reference lists of articles allowed further database searches to obtain articles relevant to the research question. Articles and dissertations within the discipline of nursing were the predominant components of the literature review. Quantitative and qualitative research were investigated with an emphasis on articles with an experimental research design with sound methodology, although some descriptive articles were included in the review.

The non-digital library was also utilized to examine any simulation literature from a low-fidelity to high-fidelity perspective. Many articles were obtained from an ancestry search of more recent article reference sections. A total of 32 simulation articles and three dissertations constituted the literature review. For the purpose of this review, simulation was examined and analyzed across a variety of disciplines to provide a comprehensive perspective on the existing simulation literature.

The literature review of simulation research will be organized from a low fidelity to high fidelity sequence to help organize the relevant literature and gain a perspective on the existing simulation studies across multiple disciplines.

<div align="center">**Simulation**</div>

Simulation can be conducted in a low, intermediate, or high fidelity manner depending upon the desired educational outcome. A continuum has been used to describe the levels of simulation. Low fidelity simulation has been described as using case studies or role playing. Intermediate fidelity simulation refers to partial task trainers, unidimensional manikins, or a computer screen that enlists cognitive and psychomotor activities and that encourages problem solving and decision making. High fidelity

simulation has some of the characteristics of intermediate fidelity simulation with more realistic responses to create a high level of realism (Jeffries, 2007).

A systemic review and meta-analysis of technology-enhanced simulation in health professions education was conducted by Cook, et al. (2011). Technology-enhanced simulation training for health professionals was compared to no intervention. The authors (2011) asserted that, although simulation techniques had been introduced widely in educational settings, more research was needed to justify its use. In their meta-analysis, Cook, et al. used 609 studies, of which 408 were a single group pre-test/post-test, 137 were randomized, and 67 were nonrandomized. The results showed that educational activities, using simulation, produced significant learning outcomes and were associated with moderate to large effect sizes. The pooled effect sizes (ES) were 1.20 for knowledge outcomes; 1.14 for time skills; 1.09 for process skills; 1.18 for product skills; 0.79 for time behaviors; 0.81 for other behaviors, and .50 for direct patient effects. All calculated ES were at a 95 percent confidence interval. This meta-analysis and review revealed the value of technology-enhanced simulation in enhancing the transfer of knowledge, skills, and behaviors in health care professionals.

After a systematic review of the nursing simulation literature from 2000-2007, Kaakinen and Arwood (2009) asserted that it was important to design learning opportunities for nursing students that focused on knowledge and skill acquisition. The authors also determined that simulation needed to be shifted from a teaching to a learning paradigm. Planning learning experiences to help students develop cognitive and psychomotor skills is preferred to the teaching paradigm approach that provides

outcomes, methods, objectives, and goals (Kaakinen & Arwood). Of the 16 articles analyzed, only two articles, Lasater (2007) and Wong and Chung (2002), considered student cognitive changes as a result of simulation participation. A focus on the teaching paradigm that emphasized goals, objectives, and outcomes may have failed to provide students a foundation to build on and provide level appropriate learning experiences (Kaakinen & Arwood). The evidence provided by Kaakinen and Arwood clearly illustrated the need to identify how and what about simulation learning is transferred to the clinical environment among undergraduate nursing students.

A Historical Perspective on Simulation

Simulation is not a new concept and has been used effectively for many years. Old military games, such as chess, simulate various aspects of battle. Aviation strategies are another example of the early use of simulation, progressing to high fidelity simulations. Space programs have adopted many aspects of simulation to prepare astronauts for the challenges that may be encountered in space. Simulation has been employed in the fields of commercial and military aviation, space flight, automotive driving, locomotive control, ship handling, fire-fighting, combat, and operation of nuclear power or petrochemical plants (Gaba, 1992).

The aviation profession has fully integrated the use of simulated aircraft into the training of pilots. Rolfe and Staples (1986) described American Airlines' use of simulation to train all cockpit crews in a centralized location in Texas. Nine flights simulators are used in ground training with the expectation that the flight crews demonstrate the knowledge and skill necessary to function in their designated roles. Rolfe

and Staples further stated that simulated aviation training, using extensive experiences, fully prepares pilots for their initial flight experiences. The military has a much larger number of simulators in use for training than do civilian airlines due to the complex demands for performance, operations, and maintenance (Rolfe & Staples).

Nevertheless, questions have been raised about the rational use of simulation and the many assumptions that exist about its use in aviation (Salas, Bowers, & Rhodenizer, 1998). The questioning of various assumptions about simulation was also apparent in the nursing literature. The authors asserted that there are three assumptions that characterized simulation usage; (a) simulation is all that is necessary, (b) more simulation is better than less, and (c) the field of aviation uses it, so it is great. When examining the assumption that simulation is sufficient, Salas et al. further asserted that the significant financial resources devoted to instructional technology advancement does not necessarily mean that knowledge and skill acquisition will occur. The assumption that more simulation is better than less in aviation, may not ensure training success and HFS does not contribute to better training nor does it assure learning and skill transfer (Salas et al.).

The third assumption, that aviation personnel enjoy it, so it is good, may be deceptive. Simulation may not translate to improved performance of the trainee (Salas et al., 1998). Students may enjoy or be satisfied with simulation activities, but the question remains whether performance on the simulator will predict skilled performance in the aviation environment. This article summarized simulation in aviation in 1998 when many questions about simulation remained unanswered. In 2016, many questions still remain unanswered about simulation and more research is needed to provide clarity about the

relevant and effective aspects of simulation learning.

Simulation and flight deck disturbance management were investigated by Nikolic and Sarter (2007). The study sample consisted of 12 commercial pilots who were recruited through commercial aviation and by an airplane manufacturer. A simulator was used to recreate a cockpit environment. The simulation intervention was initiated after pilots received a briefing of the one-hour flight plan to fly during daylight hours from San Francisco to Los Angeles in a simulated scenario. The intent of the study was to examine pilot's ability to deal with errors. The intervention consisted of three aviation maneuvers. All pilots in the study were able to accomplish a safe landing. Both experienced and less-experienced pilots exhibited no significant difference in performance. The authors concluded that pilots need to engage in more deliberate practice to deal with crisis events in aviation. This study brings into question whether simulation has a relevant and necessary place in aviation, although the ability to create crisis events with simulation does allow deliberate practice in a realistic environment.

Simulation flight training is also extensively used in aeronautics. It was obviously prohibitive to send humans into space to train for missions, so the aeronautical industry recognized that simulation was the best way to train aeronautical crews for space travel. The development of training devices was undertaken by United States National Aeronautics and Space Administration (NASA) and simulator manufacturers. Simulation played a key role in the Skylab and Shuttle operations and the Apollo Mission 15 trained 59 crew members with almost 100,000 hours of simulation time. Many missions in space travel were supported by simulation including Mercury, Gemini, and Apollo (Rolfe &

Staples, 1986).

The advanced trauma life support course was developed in 1980 by the American College of Surgeons (ACS) to prepare individuals to address the early management of trauma patients. The mannequin used for military training, Trauma Man®, was used to teach the essential skills of trauma management such as diagnostic peritoneal lavage, cricothyroidotomy, chest tube insertion, and cut down for venous access. (Block, Lottenburg, Flint, Jakobsen, & Liebnitzky, 2002). Rosenthal and Owen (2004) described the use of mannequins to teach the necessary skills for beginning airway management. Simulation of airway anatomy provided military personnel opportunities for deliberate practice with simulated patients, made logical sense, and had the potential to improve outcomes (Rosenthal & Owen).

Establishing objective performance measures, and using deliberate practice with simulation, has the potential to improve the knowledge and skills of the military personnel involved in the care of the trauma patients. Simulation has an important place in the training of military personnel who need to function at an optimal level and enhance performance in an emergency situations. Military trauma care is uniquely challenging. For instance, team members must be able to respond to severe injuries in multiple patients, simultaneously. An early study by Ali et al. (1993) explored how trauma outcome variables compared before and after the institution of the Advanced Trauma Life Support (ATLS) training for the largest hospital in Trinidad and Tobago from July 1981 through December 1985 (pre-ATLS) and from January 1986 to June 1990 (post-ATLS). Trauma scenarios were simulated to facilitate improvement in the cognitive,

psychomotor, and affective domains of learning. The authors concluded that the ATLS program significantly improved trauma patient outcomes in a developing country and supported the institution of ATLS as a beneficial program for physician and staff trauma training. To address the need for extensive and high-quality trauma skills training, the US military has incorporated simulation technologies to augment existing training.

Simulation has also been used to enhance training in veterinary medicine. Realistic models were used to expose veterinary students to clinical experiences that may be unavailable in the condensed clinical training of veterinary medicine. Scalese and Issenberg (2005) described the effective use of simulation to enhance veterinary medicine students' ability to acquire and refine clinical skills while still allowing consideration of animal welfare. Preparing veterinary students for situations encountered in practice, after training, is similar to the problem faced by students in other disciplines. The veterinary training curriculum is only 12 to 18 months of clinical time. Zemljic (2004) determined that veterinary students may need more deliberate practice to refine their skills. The authors also asserted that there is a need for simulation learning in veterinary education and the integration of the Best Evidence Medical Education (BEME) model that could certainly apply to veterinary education.

The use of the simulation in the healthcare arena has expanded rapidly in the past 50 years. In Norway, Asmund Laerdal developed the "Reusci-Anne" manikin. This manikin became central to basic life support simulation, or cardio-pulmonary-resuscitation (CPR). Two American researchers attempted to develop a high-fidelity manikin in the 1960s, and received very little notice of their work. At that time, learning

by doing was the accepted method for teaching, and the expense of the technology was exorbitant (Alinier et al., 2006: Bradley, 2006). In the 1980s, two groups of physicians at Stanford University and the University of Florida developed manikins that could be used for simulating anesthesia situations. Thus, the concept of human patient simulators for medical scenarios became a reality in the U.S. (Bradley).

Medical educators described the necessity to develop high fidelity simulation (HFS) as a representation of clinical reality in undergraduate medical education due to the animal rights movement that discouraged the use of animal models (Euliano, 2000). Medical education has preceded many other health care professions in simulation usage. With the discontinuation of animal laboratories to teach physiology to medical students in the mid-1980s, full scale human patient simulation (HPS) became essential (Euliano). Euliano described teaching respiratory physiology to first year medical students in small groups using HPS. The HPS allowed the medical students to observe realistic clinical situations such as opioid-induced hypoventilation, pneumothorax, and pulmonary edema. Students were able to obtain information through physical examination, arterial blood gas analysis, and chest radiography. Interventions were practiced and fundamental concepts of respiratory physiology were reviewed. The authors described the HPS as an adjunct to experiential learning that stimulated small group learning, one-on-one interaction, and encouraged a cooperation/team approach.

Medical school accrediting organizations have supported simulation as a risk-free learning strategy that encourages deliberate practice (ACGME, 2007). Proper timing of simulation material is critical to optimizing the learning experience of medical students.

Acquisition of theory and knowledge relevant to the simulation learning experience should precede the simulation scenarios. Similar to first and second year nursing students, some medical students may not have had the clinical experiences to help them gain maximal benefit from some simulation scenarios. Rogers (2004) asserted that developing an educational curriculum, that incorporates simulation, could help medical students learn to manage and assess life-threatening illness more effectively. The IOM (2000) report indicated that medical educators need to focus educational efforts on preventing the 44,000 to 98,000 patient deaths that occur each year due to the inexperience of medical personnel. Rogers determined that traditional medical education, using the lecture approach, has been ineffective as a teaching strategy because it is authoritarian and noninteractive, and may not contribute to the development of critical thinking. Rogers also asserted that simulation learning will require students to demonstrate and incorporate safe practice in their patient management.

Weller (2004) determined that a major challenge in undergraduate medical education is the application of theoretical knowledge to patient management scenarios. In a study with 33 fourth-year medical students, Weller determined that medical students value simulation learning. Weller (2004) also concluded that medical students value the opportunity to apply their knowledge in a realistic and safe environment, and to develop systematic approaches to solving problems. This study was limited by questionnaire data only and its small sample size.

Simulation training has become part of the training requirements in surgery, anesthesiology, emergency/trauma medicine, and critical care medicine (Issenberg,

McGaghie, Petrosa, Gordon, & Scalese, 2005). Hammond, Bermann, Chen, and Kushins (2002) determined that these high risk areas were difficult to gain deliberate practice in because of the variables of pressure, time, and stress. Hammond et al. also asserted that clinicians in high risk areas are confronted with complex problems, variable patient acuity, and a large amount of uncertainty. Consequently, this is a poor context for novice learners. Ziv, Wolpe, Small, and Glick (2003) concluded that simulation use in medicine will continue to increase due to the increasing sophistication of simulation technologies, a greater potential for rehearsal and skill evaluation, the ability to decrease the risk to real patients, and the necessity to practice a wider range of skills.

The history of simulation provided a perspective on the evolution and usage of simulation across a variety of disciplines. The stakeholders in health care have encouraged the use of simulation as a method of deliberate practice to enhance quality and safety in health care. Using simulation in a low fidelity manner creates learning outcomes that emphasize the connection of theory to practice. Basic skills practice and evaluation, through simulation, provides an introduction to clinical care for undergraduate nursing students.

Low Fidelity Simulation

Low fidelity has been defined as using role playing or case studies (Jeffries, 2007). Low fidelity simulation is generally used to teach and evaluate basic skills and reinforce basic nursing competencies (Seropian, Brown, Gavilanes, & Driggers, 2004). Articles related to basic medication administration, the utility of deliberate practice with intravenous medications, and using low fidelity simulation to prevent medication errors

will be discussed in this section of the review.

Deliberate practice is important in medication administration, calculation, and handling various medication formulations. Using simulation, as a method of deliberate practice, could reinforce the cognitive and psychomotor skills necessary to prevent medication errors. Brennan et al. (1991) asserted that medication errors were considered to be one of the most preventable adverse medical events. The 2006 Institute of Medicine (IOM, 2006) report identified medication administration as a significant patient safety issue.

The use of low fidelity simulation in nursing education allows deliberate practice in medication administration, which can be an anxiety provoking and overwhelming experience. Four studies will be presented that identify the value of low fidelity simulation in presenting pharmacology principles to student and practicing nurses. Connecting theory to practice, through simulation, has tremendous value in medication administration learning and the reinforcement of more complex pharmacology principles.

Intravenous medication administration and calculation can be overwhelming for students and nurses. Deliberate practice in intravenous medication administration and calculation, using simulation, was determined to be beneficial activity for nurses at multiple hospitals (Crimlisk, Johnstone, & Sanchez, 2009). Ideal practice guidelines for administering intravenous continuous infusion (IVCI) medication and dosage calculations for nurses were examined since intravenous medication administration resulted in 60% of the most critical and adverse medication errors in the health care environment when handling medications (Hicks & Becker, 2006). This study was undertaken to explore the

benefits of an educational intervention that utilized simulation and practice evidence to reduce the potential for IVCI medication errors (Crimlisk et al.).

Static simulation was used to practice the correct sequence of IVCI medication administration. Dimensional analysis and learned formulae were used to calculate drug dosages. Medication errors were compared two months before the intervention and for a two-year period after the intervention. Static simulation was used to practice IVCI medication administration.

After the hospital-wide instructional program, IVCI category errors decreased. A decrease in severity level errors (error that resulted in no patient harm) and more serious medication errors decreased significantly. Even though there was an increase in the volume of IVCI medication orders, medication error rates decreased from 0.55 percent in 2005 to 0.21 percent in 2006 and to 0 in 2007 on one campus (Crimlisk et al., 2009). Some limitations of the study were that only category C errors (errors that affected the patient) or greater were examined, and only medication errors investigated by incident reporting forms were used.

The value of deliberate practice using simulation was evident in a study to examine the use of simulation to teach medication administration principles to nursing students (Sears, Goldsworthy, & Goodman, 2010). Students were randomly assigned to groups (30 students in the control group and 24 students in the experimental group). Students in the experimental group engaged in a total of eight hours of medication simulation experience, and students in the control group experienced medication administration in the clinical setting. Instrument inter-rater reliability was established prior the study and

face validity of the evaluation instrument was established by several experts.

No actual medication errors were made, because medication errors were reported as potential errors. Instructors intervened to prevent actual medication administration in the clinical environment. Lack of deliberate practice and knowledge was the common element evident in the control group. Medication administration can be overwhelming to novice students and simulation provided a realistic and targeted medium for medication administration (Sears et al.). Some limitations of the study were the single research setting, potential variability in clinical exposure, student self-selection, and the large amount of simulation time necessary to educate students.

In another study, low-fidelity simulation instruction was used to improve students' (N = 26) medication calculation test grades from baseline (Costello, 2011). Faculty set up a total of eight medication administration stations to calculate oral and intravenous medication dosages. The students' medication calculation scores improved considerably, with a mean score increase of 9.76 from pre-test scores to those measured at six-months. No student pre-test mean scores were presented in the article. Costello determined that a three- hour medication calculation simulation class had measurable impact on student's scores, even six months following the simulation experience, although clinical experiences would also affect student medication knowledge and skills. One finding of this study would suggest that the knowledge and skills required to safely administer medications in the clinical environment would require a much greater amount of deliberate practice. Additional limitations were single a research setting and only testing of first-year nursing students.

The studies described, Crimlisk et al., (2009), and Costello (2011), demonstrated that deliberate practice with simulation was beneficial to nursing students and practicing nurses. Training that provides realism and contextual reference points, reinforced by simulation, could benefit nurses in understanding the many issues that are important in medication administration and lead to a reduction in medication errors in clinical practice.

Simulation was again used in health care in a creative way in another low fidelity simulation study related to providing quality and insightful patient care. The authors utilized a creative simulation design to help staff gain insight into patients' neurological impairments (Wilson et al., 2009). A diverse group of 78 health care providers in the United Kingdom engaged in simulation training. Experiencing impairment, similar to that of head injured patients, provided staff with a relevant and insightful perspective. Individuals completed a three-hour neurodisability simulation that was composed of seven components: visual impairment, sensory impairment, dyspraxia, immobility, divided attention/overstimulation, sustained attention, and dysphagia. Debriefing was conducted at the end of the simulations. The number of participants and length of experience in neurodisability were almost evenly divided, with 40 individuals who had 0-3 years' experience and 38 individuals with three to more than 10 years experience. Questionnaire data were collected pre-/post-study and again at three-months after completion of the study. A significant finding on post-testing was that station D (immobility) was rated most difficult to complete (mean 6.75 – 6.79) in the 0 – 6 months and greater than 10 years compared to the 6 months to 10 year group (mean 3.57 – 4.92).

The qualitative results revealed that health care providers gained greater insight into the experience of patients confronted with neurodisability immediately following the simulation intervention. At three months, 35 participants revealed increased awareness and greater empathy towards patients with brain injuries. The authors concluded that simulation exercises were a benefit to health care providers because they encouraged empathy and personal reflection.

The value of low fidelity simulation as a method of learning is supported by the recent simulation literature. Allowing students to practice unfamiliar and new course content with simulation, with pharmacology principles being just one example, provides a method to allow learning to progress in a way that helps students initiate self-assessment and a learner-centered approach to knowledge and skill acquisition. The next section will analyze the recent literature in intermediate fidelity simulation.

Intermediate Fidelity Simulation

Intermediate fidelity simulation is used to help students practice with low technology mannequins, computer-based scenarios, and provide more than a one dimensional experience to problem solve and practice psychomotor skills (Jeffries, 2007).

In one study, undergraduate nursing students in the United Kingdom were exposed to intermediate simulation to determine the effect of simulation training on clinical skills and competence (Alinier et al., 2006). The sample consisted of 99 second year nursing students enrolled in a three-year program who were randomly assigned to a control group (only OSCE) or an experimental group (OSCE and a 6-hour simulation training). An Objective Structured Clinical Examination (OSCE) was used to assess practical skills of

the nursing students. The 15-station OSCE lasted a total of 90 minutes. After a second OSCE, six months later, the experimental group mean score increased 14.8 percent and the control groups' mean score increased 7.18 percent, a statistically significant difference. There was no statistical difference between the control and experimental group in perception of stress and confidence. The authors concluded that simulation requires appropriate use to be effective. This was one of the early intermediate simulation studies in nursing to use an experimental design although the study took over two years to complete.

Simulation was also used to explore knowledge and confidence in heart and lung assessment among APN students (Tiffen, Corbridge, Shen, & Robinson, 2011). A randomized controlled design with a convenience sample of 28 APN students (14 in the experimental and 14 in the control group) was used. All students received an instructor-led lecture on heart and lung assessment and laboratory practice time. The experimental group completed a one hour simulation session.

Students in the simulation session had the opportunity to assess abnormal heart and lung sounds in simulator scenarios. All students completed a knowledge exam and confidence survey one week after the simulation experience. Researchers developed a 10-item knowledge test of heart and lung physical assessment, modeled after the NCLEX-RN exam questions. Results revealed that the mean knowledge scores in the simulation group were greater than the control group which relied on usual strategies. The simulation group mean score was 7.36 ± 1.15 compared to the control group mean which was 6.21 ± 1.72. The differences were statistically significant ($p < .05$). Students in both

groups reported no difference in confidence, although the simulation group was very satisfied with the simulation experience. Some limitations of the study were a lack of pre-test data for comparison and a knowledge test used in undergraduate nursing students. Also, validity of the knowledge test used in this study could be questioned.

While the authors concluded that simulation was an effective strategy in APN physical assessment knowledge acquisition their conclusions may be questioned. A slightly greater than one point mean difference in knowledge scores between the experimental and control group may not be objectively and clinically significant (Tiffen et al.).

Intermediate simulation was used as an educational modality in electrocardiographic (ECG) recognition in physical therapy students. Smith, Prybylo, and Conner-Kerr (2012) used simulation in physical therapy education to teach ECG recognition. In the past, a standardized patient (SP) or a problem-based learning educational approach was used to teach physical therapy students. The intent of the authors was to determine the preferred method of learning for physical therapy students, its impact on confidence, and the effect of human patient simulation (HPS) or SP on decision making, when confronted with an ECG. A posttest only crossover design was used. Students from a convenience sample were randomly assigned to one of two groups consisting of 24 and 29 students, for a total sample size of 53. The groups consisted of the SP, played by the instructor with an ECG paper tracing, or HPS using a computer enhanced mannequin (CEM) with a SP actor that presented an identical ECG strip. Both groups participated in debriefing sessions. Paired *t*-tests revealed that there was a

strong preference for HPS. The HPS and SP groups showed no significant group differences. No knowledge test was conducted. This research supports the use of simulation as a method that PT students were satisfied with and preferred, although the absence of any measurement of knowledge limits the conclusions that can be drawn about the use of simulation resources to assist in PT student ECG recognition.

Simulation was used as a tool to improve knowledge and skills in young drivers. Deliberate practice with simulated driving events has a significant place in keeping novice drivers safe. The realism provided by driving simulation has the potential to improve the performance and decrease the anxiety of inexperienced drivers.

In the discipline of psychology, simulation was used to enhance young adults driving skills. Ivancic and Hesketh (2000) explored error training versus guided error training in driving simulation. The authors described the two ways of training with errors, which were: (a) error training in which learners make mistakes and are exposed to varied scenarios that provide cognitive skill acquisition, and (b) guided error training in which analogies are created that allow abstract thoughts and analogical transfer. Two experiments were conducted to explore learning from errors in driving simulation. In the first study, 44 individuals (with a mean age of 20) were divided in two groups. Group A received error training and group B received errorless training.

The intervention consisted of training and testing sessions using simulation for both groups. Analogical and adaptive transfer were examined. Analogical transfer involves using a familiar circumstance to solve a similar problem in the future and adaptive transfer involves using an existing cognitive schema to generate a solution to a future

problem (Ivancic & Hesketh, 2000). Both groups completed equal time in training

sessions with the simulator. An analysis of the number of errors committed, accidents or

police citations for speeding, recalled strategies and self-perceived confidence, revealed

the error training group had a mean 1.27 (SD = 0.77) compared to the errorless learning

group mean 1.86 (SD=0.89) with a p=0.01, which revealed that error training group made

significantly fewer errors. No difference existed between the error training and errorless

learning group regarding recalled strategies. Post-test confidence remained at a mean of

5.73 (SD=1.41). The authors determined error training promoted significant transfer to

analogical problems.

In experiment number two, participants were divided into two groups of 16, (mean

age, 20). Guided error training was compared to errorless learning using an identical

procedure to experiment number one. The data revealed that the guided error groups

mean was 1.50 (SD=0.89) and the errorless learning group had a mean of 1.75 (SD =

0.93), p = 0.22. The guided error groups made fewer errors on the test than the errorless

group, but the difference was not significant, nor were differences in confidence detected

between the groups. Ivancic and Hesketh (2000) concluded that the simulator was a

positive technological innovation in driver training although advanced knowledge and

skills would still be required for the dynamic task of driving. This study emphasized

that the process of skill and knowledge transfer becomes increasingly more difficult as

the complexity of the task increases. In experiment one the mean difference was small,

but statistically significant.

Intermediate simulation provided realism across disciplines and added a varied dimension to deliberate practice. Alinier et al. (2006) and Tiffen et al. (2011) utilized intermediate simulation in health care, although group differences in both studies were marginal. Physical therapy students were exposed to simulation (Smith et al., 2012), although methodological limitations of the study preclude real justification of simulation usage in PT education. Driving skill refinement was explored by Ivancic and Hesketh (2000) in the psychology literature. Intermediate fidelity simulation created realism and encouraged advancement in driving skill and hazard recognition.

Overall, intermediate simulation studies across disciplines presented significant methodological issues, such as small sample size, non-random samples, and statistical differences between groups that may not be objectively and clinically significant. Research evidence about the use of high fidelity simulation will be examined in the subsequent section to evaluate evidence of the potential for simulation as a learning method to produce significant learning outcomes.

High Fidelity Simulation

High fidelity simulation is a method of learning that offers the highest level of realism to the participant (Gaba, 2004). The fidelity created by the experience, and feedback encountered, encourages ideal cognitive and psychomotor performance.

In an early study in nursing, Farnsworth, Egan, Johnson, and Westenskow (2000) utilized a Human Patient Simulator (HPS) to teach practicing nurses analgesic and sedation skills for conscious sedation techniques. Twenty nurses completed the training session that was an introduction to sedation and analgesia, with four clinical crisis

teaching scenarios, using the anesthesia simulator. The mean scores on the written pretest were 22.9 (SD = 3.54) and the mean score on the post-test was 26.0 (SD = 4.24) respectively, out of a possible score of 30. The authors asserted that the anesthesia simulator was an excellent tool for teaching conscious sedation to hospital nurses. The nurses test performance improved following the session and they rated the simulator experiences as excellent. Some limitations of the study were a small sample size and no control group. Demonstrating the transfer of skill and knowledge using a nontraditional education approach helped build a case for the use of simulation in nursing education, although the lack of a control group prevented the comparison of simulation to another teaching method. This early study in the nursing literature provided some evidence that HPS could be beneficial in educating nurses.

High fidelity simulation was utilized to reinforce safe medication administration in nursing students. Thompson and Bonnel (2008), in case report, described the use of simulation as a unique method to help transfer and reinforce pharmacology principles to enhance safe medication administration abilities for nursing students. Students completed a pharmacology scenario that was developed to strengthen principles taught in the classroom weeks earlier. The scenario used by the authors reinforced the basic principles of drug administration. Students were presented with a patient experiencing extreme pain due to a renal calculus. The students were given the incorrect dose of a narcotic, that would lead to respiratory depression with impending cardiac arrest. After administration of a narcotic antagonist, the HPS patient used in medication administration reinforced the importance of the safety issue surrounding narcotic administration and the necessity of

theoretical knowledge to support clinical practice. The dynamic component of simulation learning has obvious relevance in identifying the vigilance required to safety administer pain medications. Although the case study of the authors was a not an experimental design, the report nevertheless provided an example of the benefit of high fidelity simulation in learning basic skills.

In another nursing simulation study, interactive case studies (ICS) were compared to HPS in undergraduate nursing students (Howard, 2007). Knowledge gained, critical thinking, and the learners' perspectives on the experiences were assessed. A multi-site, quasi-experimental, two group pre-test/post-test design was utilized with a sample size of 49 nursing students from two different nursing programs (diploma and baccalaureate). A custom Health Education System Incorporated (HESI) exam was administered as a pre-test. Analysis of covariance (ANCOVA) revealed a significant difference with respect to knowledge gained and critical thinking ability. With respect to the mean pretest HESI score, the case study group started at an advantage (786.17) as compared to the simulation group (713.12). Even with this advantage, the case study scores decreased 116.09 points (670.08), while the simulation group scores increased 24.88 points (738.00). The adjusted posttest scores showed an even greater, significant difference between the pretest and posttest scores of both groups (p = .037) (Howard). This finding suggested that the HPS was a more beneficial educational strategy with respect to increasing knowledge of medical-surgical nursing when compared to the ICS approach.

When using the HESI conversion score, the results were similar. With respect to the mean pretest conversion score, the ICS group started at an advantage (72.34%) as

compared to the simulation group (67.25%). Even with this advantage, the mean case study score decreased 4.56% (67.77%), while the mean simulation group scores increased 5.91% (73.16%). The adjusted post-test scores calculated revealed a significant difference between the pre-test and post-test scores of both groups (p = .018). The calculated effect size was .37 (Howard, 2007).

There were also significant differences between the groups with respect to their perspective on the simulation experience as compared to the case study approach. Students had significantly higher scores (p = .010) when asked if the HPS experience helped them to better understand concepts (mean 3.72 (SD = .46) as compared to the case study group (mean 3.25 (SD = .74) although both groups reported positively with responses being "agree" or "strongly agree." The calculated effect size was .44 (Howard). These results were similar to the ANCOVA analysis that was performed with the HESI and conversion post-test scores demonstrating significantly more knowledge gain in the simulation group. According to Howard, the results supported the use of simulation technology in undergraduate nursing education, demonstrated the use of simulation technology as an innovative teaching strategy, and validated a positive student experience.

Another nursing simulation study investigated the effectiveness of a simulated clinical experience on knowledge acquisition, transfer of learning, and promotion of learning, including active learning, collaboration, and engagement (Ruggenberg, 2008). The study used a two group pre-test post-test experimental design, with 88 pre-licensure nursing students randomly assigned to either the simulation group or a comparison group

that completed a video/case study matching the respiratory content of the simulation group. A combination of multivariate techniques were used to explore the effect of the intervention. The independent variable, learning method, included two levels, simulation and comparison. There were six dependent variables: knowledge acquisition, near transfer, far transfer, active learning, collaboration, and engagement. The pre-test and SAT scores were used as covariates in the regression model. Pre-test scores of the pre-licensure nursing students provided a measure of prior academic achievement and SAT scores provided a measure of prior academic ability in analysis of demographic data.

Ruggenberg (2008) determined through data analysis that there were: (a) no differences between the groups on initial cognitive variables, (b) simulation group scores were higher for the two affective measures of active learning and engagement; active learning (simulation M = 27.0, SD = 2.55 vs. comparison M = 24.96, SD = 2.31), calculated effect size was .76, and engagement (simulation M = 20.80, SD 2.31) vs. comparison M = 15.54, SD = 2.82) with a calculated effect size of 2.0; the simulation group (M = .73, SD = .45) scores for near transfer were significantly higher than those of the comparison group (M = .33, SD = .48) ($p < .05$). There was no difference in any of the other dependent variables compared to the control group. Simulation offered the single advantage of effective learning practice (Ruggenberg).

Another large quasi-experimental study compared traditional teaching to clinical simulation and traditional teaching on critical thinking among nursing students engaged in their first clinical course (Linden, 2008). A group of 97 associate degree nursing

(ADN) students participated in the study. The traditional group and experimental group received pre-class assignments, Power Point/lecture/audiovisual class with the experimental group engaging in a clinical simulation experience.

To test the effect of adding simulation to the traditional teaching method, Linden (2008) used a one-way ANOVA on the examination scores of the comparison and experimental groups. There was statistically significant ($p < .001$) difference between the means of the two groups. The intervention sequencing was conducted over two days with day one being the comparison group A morning section and experimental group A evening section and on day two experimental group B morning section and comparison group B evening section. Further analysis using Tukey's HSD post hoc analysis revealed no significant difference between the experimental groups A and B ($p < .814$) or between the comparison groups A and B ($p < .881$) in terms of test scores (Linden). There was however significant differences between the experimental and comparison group on the 23-question multiple choice examination. The mean difference between comparison group A and experimental group A was -2.83, ($p < .001$) vs -2.21, ($p < .013$) for experimental group B. The mean difference between comparison group B and experimental group A was 3.40, ($p < .000$) vs -2.72, ($p < .001$) for experimental group B. The construct and content validity of the test questions was determined by three test development experts. The Spearman-Brown coefficient was .714 for the study test using odd-even split half tests of unequal length. Group A experienced only traditional teaching and scored lower on the multiple choice exam than group B, the group that experienced traditional teaching and a simulation experience. There was no difference between groups

in critical thinking scores. Some limitations of the study included a convenience sample and lack of a standardized instrument for measuring critical thinking.

Medical educators used airway management simulation to evaluate medical residents' abilities in an airway crisis situation. Mayo, Hackney, Mueck, Ribaudo, and Schneider (2004) evaluated house staff competence in emergency airway management using a patient simulator. A prospective randomized unblinded trial was conducted with 50 first year internal medicine residents. All residents completed advanced cardiac life support (ACLS) certification one month prior to the study. All residents were instructed in beginning airway management techniques and were randomly assigned to a delayed individualized training group four weeks later or the immediate beginning airway management techniques group. As expected, deliberate practice with airway management skills result in better airway management skills of the interns who received initial airway skill practice compared to the interns who received no practice after four weeks. Mayo et al. concluded the computerized patient simulator was an effective tool to teach airway management skills to novice medical interns. Some limitations of the study were no comparable teaching method for the control group and a small sample size. The value of this study comes into question because simulation was not compared to another intervention.

In another study, Wayne et al. (2005) used simulation to enhance medical residents' performance of ACLS procedures. A randomized controlled trial with 28 second year physicians was conducted using a crossover design. The study took place at a large Midwestern university hospital in Chicago. Participants in the trial were randomly

assigned to Group A (intervention; n = 19) residents and Group B (wait list-control; n = 19). Residents in Group A received four two-hour practice sessions and residents in Group B received no simulation practice but still worked clinically. The next testing occurred after three months, when Group B received simulation training and Group A continued with clinical responsibilities. ACLS skills testing was undertaken after another three months. Six scenarios from the ACLS provider manual were used: (a) pulseless electrical activity, (b) symptomatic bradycardia, (c) supraventricular tachycardia, (d) ventricular tachycardia, (e) ventricular fibrillation and, (f) asystole (Wayne et al.).

Group A mean ACLS scores after the intervention were M = 265.6 SD = 9.5 and Group B scores were M = 192.5 SD = 35.9 which is a 39% higher score for Group A p < .0001. When Group B completed a simulator practice session after crossover, the scores M = 256.15, SD = 20.28 (Group A) compared to M = 268.98, SD = 12.63 Group B which were statistically significant with a p < .05. HFS was beneficial to medical residents in improving their performance on ACLS events compared to the usual clinical events (Wayne et al.). The study had several limitations, which were: (a) single study site, (b) small sample size, (c) potential confounding of the education and testing due to HFS use in both, and (d) no comparison group in a static or low fidelity simulation. The multiple limitations of this study warrant further exploration of the value of simulation in medical education.

In nursing education, ACLS was explored in a diverse group of healthcare professionals. Hoadley (2009) compared low fidelity simulation (LFS) and high fidelity simulation (HFS) in a non-student sample of nurses, physicians, and various other health

care professionals. The author used an experimental, two-group design, with a total

sample of 53. The investigator used LFS and HFS to determine if the HFS and LFS

groups differed in their ACLS knowledge and skills test scores. The Advanced Cardiac

Life Support (ACLS) written examination and the Mega Code score sheet were used to

evaluate participants. Hoadley concluded: (a) no difference between the experimental

(HFS) and control (LFS) groups on the written examination knowledge test, (b) no

difference between groups on the Mega Code skills test, and equivalent satisfaction in

teaching methods between HFS and LFS groups. Some limitations of the study were a

small sample size and single research setting. Hoadleys' conclusions were similar to

Jeffries and Rizzolo (2006), which was no difference between groups in knowledge

gain. This study suggested that HFS may not be necessary in the ACLS training of

a diverse group of health care professionals, and LFS may provide an adequate level of

fidelity to foster learning.

ACLS was again examined in the recent nursing simulation study of King and

Reising (2011). High fidelity simulation (HFS) was compared to static simulation in

ACLS certification. A quasi-experimental design was used with a convenience sample of

49 senior baccalaureate nursing students at a large Midwestern university. The two

groups consisted of 25 students in the static simulation group and 24 students in the HFS

group. Students were tested at two weeks and two months after the ACLS course. The

measurement tools were the 25-question American Heart Association (AHA) multiple

choice exam and the Mega Code exam with a 17-procedure evaluation tool used in ACLS

final skills testing. Differences between the two groups were tested with a repeated

measures analysis of variance on written tests. No differences between the two groups on the written knowledge exam were discovered. The Mega Code checklist revealed that across all scenarios, the HFS group completed the mega code scenarios without error 65 percent of the time versus 12.5 percent for the static simulation group. The authors concluded the deliberate practice methods of HFS enhanced the active learning process of undergraduate nursing students. The insight about ACLS training comparing HFS to LFS requires further investigation because the results revealed no knowledge gains in either study.

Simulation was used to enhance interprofessional communication in the prospective descriptive study of Reising, Carr, Shea, and King (2011). The 2010 IOM report indicated that interprofessional communication is critical to preventing errors in patient care. A convenience sample of 41 senior nursing and 19 second year medical students participated in the study. The students were separated into two groups, each group consisting of medical students and nursing students for a total of 30 participants in each group. The intervention was a roundtable, facilitator-proctored, ACLS code scenario or HFS ACLS scenario. A facilitator was available to both groups. Quantitative and qualitative data were collected. The nominal-level data overwhelmingly supported both traditional and simulation learning. The qualitative data also supported both learning experiences as positive. The authors concluded that a sense of timing in ACLS critical event management was appreciated with HFS, and roles were more clearly defined with HFS ACLS scenarios, based on survey results. The authors also concluded that the medical and nursing students benefited from HFS by understanding their roles and

responsibilities. Some limitations of the study were a small sample size, unequal student groups, no measurement tool to capture the significant elements of collaboration, and the mixed methods utilized in the study. Using simulation to enhance nursing students understanding of the many issues present in nurse/physician interprofessional communication could potentially ease the transition from student to graduate nurse. Medical students could also gain a perspective on interprofessional communication and the value of teamwork in error prevention in the clinical environment. The multiple methodological limitations of this study requires further investigation of the value of simulation in enhancing interprofessional communication.

Simulation was used in medical education to compare medical students' and residents crisis management of acute medical events (Boulet et al., 2003). The sample consisted of 37 individuals; 24 medical students and 13 first year residents who were in emergency medicine (2), anesthesia (10), and surgery (1). Ten scenarios were used to evaluate performance of the different group of trainees and their clinical knowledge: femur fracture from a trauma with hypotension, myocardial infarction, chest trauma and pneumothorax, hypovolemia from an ectopic pregnancy, herniation after cerebral hemorrhage, ventricular tachycardia, intubation after respiratory failure, exacerbation of asthma, pulsatile abdominal mass, and heart block with syncope (Boulet et al.). The investigators used a high fidelity simulator (HFS) that had the ability to recreate 30 scenarios and varied the symptoms based on the experience level of the individual. Faculty members on the medical student curriculum committee prioritorized the utility of the simulations based on their expert opinions. The simulation performance exam scores

of the medical students were M = 57.1, SD = 9.0 and resident group M = 64.9, SD=5.9

with a p<.01. The effect size was .89. The authors concluded that simulation could be

used to establish and discriminate acute care skill levels of medical students and

residents. Some limitations of the study were a small sample size and lack of a control

group. Also, comparing medical students with resident physicians created unequal groups

with significantly different levels of clinical experience, so the value of the study could

be questioned.

A prospective randomized simulation based-skills assessment study was conducted

by Henrichs et al. (2009), to compare the ability of anesthesiologists and certified

registered nurse anesthetists (CRNAs) to manage and recognize intraoperative critical

events. The sample consisted of 26 CRNAs and 35 anesthesiologists who were board

certified. The intraoperative emergencies consisted of twelve scenarios, which were: (a)

acute hemorrhage, (b) high potassium level, (c) acute loss of oxygen: supply central

pipeline, (d) total spinal block, (e) occluded endotracheal tube, (f) malignant

hyperthermia, (g) tension pneumothorax, (h) right mainstem intubation, (i) ischemic

myocardial event, (j) ventricular tachycardia with decreased blood pressure, (k)

anaphylaxis, and (l) bronchospasm (Henrichs et al., 2009). Eight events were scripted

intraoperative crisis events, and were used as simulation experiences. Two expert raters, a

physician and a nurse, reviewed video tapes and evaluated and scored participants after

eight simulation events. Raters were blinded to the identity of the participants and did not

know the participants.

The overall mean scores of the anesthesiologists were higher than the CRNAs by

approximately seven percent: 66.6 percent ± 11.7 (range = 41.7 − 86.7 percent) vs. 59.9

percent ± 10.2 (range 38.3 − 80.4 percent). Henrichs et al., (2009) concluded that

simulated intraoperative emergencies, comparing two groups of anesthesia providers'

proficiency in managing intraoperative crisis events, could lead to uniform competency

requirements for the practice of anesthesia. Some limitations of the study were a

nonrepresentative CRNA and MD sample and small sample size.

Using virtual reality in surgical education offers the optimal high fidelity needed to

refine the cognitive and psychomotor skills of surgeons. Simulation training is now

mandatory in most surgical training programs before surgical residents engage in

intraoperative surgical procedures (Prachand, personal communication 2012).

In the U.S. most surgical training programs use virtual reality to enhance surgical

resident operating skills. A randomized, double blinded study by Seymour et al. (2002)

used virtual reality (VR) simulation to improve surgical residents' psychomotor skills

when performing a laparoscopic cholecystectomy. A sample of 16 surgical residents was

randomly assigned to two groups of eight surgeons to test a method of deliberate practice

in minimal access surgery (MAS). Residents initially completed validated tests to assess

their fundamental skills and were stratified by post graduate year of training (PGY 1-4).

The Minimally Invasive Surgical Trainer − Virtual Reality (MIST VR) system was used

by the intervention group, VR-trained residents. The intervention group performed the

MIST VR procedure until a level of competency was achieved that had been established

by expert surgeons. The control group (Non-VR trained) and experimental group both

viewed a training video and completed a multiple choice exam consisting of eight

questions. Inter-rater reliability was established by two expert surgeons blinded to the participants. No fundamental ability difference between the two groups was discovered before the intervention. The results of the study revealed faster dissection by the VR resident group (29% less time), and five times the errors in cautery of non targeted tissues by the standard training (ST) group. In the VR group, errors were six times less likely occur; mean VR 1.19 vs. mean control 7.38, p<.006. Seymour et al. (2002) concluded that VR simulation training is valid, provides an avenue for deliberate practice, and should be included as an integral component of surgical resident education.

Driving simulation was again explored in the high fidelity simulation study conducted by Wang, Zhang, and Salvendy (2010). Simulation was used to conduct a road hazard handling study in young novice drivers. The authors asserted that young Chinese drivers needed driving practice to further the development of their cognitive and perceptual skills that are critical to safe driving. The study utilized a randomized, prospective experimental design, with a control group. A total of 32 individuals were randomly assigned to the simulation intervention group (16) or the control group (16) with no training. All individuals were male. A total of 16 scenarios were used for simulation training and testing. Out of the sixteen scenarios eight pairs were used for training and testing. The intervention group engaged in an introduction to virtual reality extensive training, and formal testing. The control group only engaged in the introduction to the virtual environment and testing.

Participants in the experimental group reported mean hazard handling scores of 4.30 for all hazards, compared to a mean of 2.84 for the control group. Higher mean

scores indicated that knowledge and skill transfer was evident. The calculated

effect size was 1.2. The Mann-Whitney U test was used with a $p < .05$. Hazard

anticipation scores were compared for four analogical and four equivalent scenarios using

analysis of variance (ANOVA) (Wang et al., 2010). The training and scenario effects

 were significant. The hazard anticipation scores for the four equivalent scenarios were:

trained mean 5.36 (SD = .68) and untrained group mean 4.41 (SD = 1.27). The analogical

scenarios for four groups were: trained mean 4.50 (SD = .81) and untrained mean 3.78

(SD = 1.14). For the equivalent and analogical scenarios the trained group performed

better the untrained group (Wang et al.). The authors determined that the simulation

intervention was effective in knowledge and skill transfer in novice drivers in China.

Simulation training allowed deliberate practice in a realistic setting, and resulted in a

statistically significant difference in hazard handling performance and hazard

anticipation. Some limitations to the generalizability of finding of the study were a small

sample size, a homogenous sample, and physical/behavioral validity issues.

Nursing faculty significantly delayed the widespread use of simulation in the

nursing curriculum compared to other disciplines until the NLN/Laerdal sponsored study

of Jeffries and Rizzolo (2006) examined the value of simulation as a new educational

modality in nursing education. Jeffries and Rizzolo (2006), in a multi-centered trial,

compared data obtained from 403 students during a multiple choice NCLEX-RN type

exam.

Jeffries and Rizzolo (2006) discovered that between the three groups (high fidelity

patient simulator, static mannequin, or pencil/paper case study) that there were no

significant differences in knowledge gains within these groups. Jeffries and Rizzolo stated, "this is not a surprising finding because students were not expected to acquire new knowledge (p. 155)" during participation in one of the three simulation group experiences. The authors also concluded that simulation is designed for synthesis/ application of knowledge, rather than knowledge creation. Simulation requires active involvement so students can discover and make sense of presented information. The students gained more confidence and enjoyed the diverse ways of learning (Jeffries and Rizzolo).

As educators, best practice is to provide a variety of teaching strategies to improve situated thinking, communication, and student satisfaction. Jeffries and Rizzolo's study was a multicenter trial but the NCLEX-RN type exam for knowledge assessment was only a two item multiple choice exam, which could raise issues of generalizability and validity. Also, if no knowledge is gained when engaged in simulation activities, then the value of simulation learning could be questioned because of the cost, faculty time, and effort necessary to utilize simulation as a beneficial learning experience.

The NCSBN (2014) study of Hayden, Smiley, Alexander, Kardong-Edgren, and Jeffries using simulation as a learning modality, contrasted with the conclusions of the NLN sponsored study of Jeffries and Rizzolo (2006). The experimental group substituted 20% to 50% of clinical hours with simulation learning. The control group completed 10% simulation and engaged in their required clinical hours. This resulted in no significant differences among the among the groups for NCLEX pass rates, end of program nursing knowledge, clinical competency, and overall readiness for practice. This multi-site study

(Hayden et al., 2014) revealed that simulation learning resulted in knowledge and skill acquisition that was equivalent to clinical time in nursing students.

Theoretical Issues in a Simulation Framework

The theoretical simulation framework of Jeffries (2005; 2007) was evaluated by LaFond and VanHulle-Vincent (2012). The five concepts of teacher, student, educational practices, simulation, and design characteristics required further testing to gain clarity about these framework variables (LaFond & VanHulle-Vincent, 2012). Fawcett's (2005) theory analysis and evaluation tool was used by the authors in the critique of the Jeffries simulation framework (JSF). Fawcett's theory analysis includes three steps-scope, context, and content-and six components: (a) significance, (b) internal consistency, (c) parsimony, (d) testability, (e) empirical adequacy, and (f) pragmatic adequacy.

The authors described the JSF as a middle range theory because it has a specific applications to nursing education, concrete concepts, and provides a description of the relationship between components. The authors further stated that the theory context is the relationship between individual and the environment. Also, the nursing NLN/JSF philosophical framework was also not explicitly stated.

Some significant criticisms were made using the six components of Fawcett's theory evaluation, which included: (a) the frameworks diagram is not nursing-specific, (b) semantic discrepancies are evident in defining student and teacher factors, (c) a lack of parsimony is evident because of no precise description of the variables of skill performance, learner satisfaction, critical thinking, and self-confidence, (d) issues of empirical adequacy identify the need to examine teacher and student demographics and

how these relate to outcomes, and (e) pragmatic adequacy/utility of practice. The authors concluded that favorable outcomes with simulation still have not been established because conceptual variables need further testing (LaFond & VanHulle-Vincent, 2012).

In conclusion, the authors asserted that the NLN/JSF has strong theoretical and empirical foundations but the various relationships among concepts and variables in the framework need further investigation. Outcomes of simulation learning, and the connection to favorable patient care still needs to be established (LaFond & VanHulle-Vincent, 2012).

Qualitative Simulation Research

Qualitative research can be naturalistic, interpretive, and humanistic, and often generates knowledge concerned with discovery and meaning. A unique understanding of phenomena can be obtained through individual interpretation and inductive reasoning (Speziale & Carpenter, 2007). After an extensive search for methodologically sound qualitative simulation research in the nursing literature, the study of Panunto (2009) was discovered. Panunto used a qualitative study to explore the influence that high fidelity simulation has on students' perceptions related to simulation and real life patient care experiences, relying on a case study approach: observation, field notes, writing prompts, and individual interviews. An attempt was made to explore the relationship between simulation and real life experiences.

Initially, a convenience sample of eight students from the third year class of a baccalaureate degree nursing program was selected to participate in the study, although one student withdrew for medical reasons. Direct observation was used to provide the

researcher a real-time and in-depth experience (Panunto, 2009). Open ended, semi-structured interviews allowed the investigator to focus and direct the student on an issue. Interviews were also tape recorded and transcribed. Field notes were completed immediately after an observation. Writing prompts were provided to the student after a simulation experience.

One study finding was that the faculty could not consistently provide the same learning experiences for students, especially in the clinical area. This may have been beyond the control of faculty because of the varied patient acuity, rapid movement of patients throughout the hospital, and shorter inpatient length of stay due to more innovative and specialized surgery with a reduction in hospitalized recovery time (Panunto, 2009). Through simulation, however, faculty could provide equivalent experiences to all students. Panunto concluded that simulation positively impacts learning, increases students level of critical thinking, mimics real life patient care, provides realism that is important to students, offers immediate feedback through debriefing, and meets the desire of students for faculty consistency in expectations of real life and simulation experiences. This qualitative study generated relevant data about the perception of simulation in undergraduate nursing students.

Summary of Simulation Research

A review of the simulation literature in nursing, medicine, and other disciplines revealed the need to conduct further research in simulation to advance the understanding of simulation learning. The literature reviewed identified a gap in simulation knowledge and qualitative research may fill that gap.

Analyzing simulation learning outcomes from a low fidelity to high fidelity sequence across disciplines revealed that simulation learning outcomes vary across the continuum of simulation fidelity. Low fidelity simulation was used to reinforce and practice unfamiliar tasks. Intermediate fidelity simulation created greater expectations, although the learning outcomes were marginally significant in Alinier, et al. (2006) and Tiffen, et al. (2011). This finding demonstrated that as the technology and complexity of the simulation increases, knowledge and skill may not transfer. The HFS across multiple disciplines revealed that simulation learning may improve learning outcomes, although the evidence to justify the widespread use of HFS simulation is inconsistent in support of universal HFS usage and also revealed significant gaps in the simulation research.

Medicine has a long history of simulation usage, with the concept of human patient simulation (HPS) becoming a reality in 1980. In the last decade, research has supported the use of simulation as an educational modality used to improve knowledge and skill (Boulet et al., 2003; Cook et al., 2011; Mayo et al., 2004; Seymour et al., 2002; Wayne et al., 2005). A significant issue discovered after an analysis of the medical simulation research is the frequent absence of a control group receiving only traditional education; it would be expected that no educational intervention would not result in a significant difference in knowledge and skill compared to the simulation group. Research in medical education has identified simulation performance as a measure of knowledge and skill when comparing medical students and residents. Medical residents could consistently be expected to have superior simulation performance due to the lack of clinical experience among medical students. Overall deficits and gaps still exist in the simulation research in

medicine. Research in other disciplines revealed the application of simulation in a variety of situations. For example, aviation has a long history of simulation usage to enhance performance and skill in pilots.

The qualitative study of Panunto (2009) explored the influence that HFS has on a student's perceptions related to simulation and real life patient care experiences. This qualitative study in the nursing simulation literature generated relevant and important findings. The process of simulation learning needs to be further explored to address the gap in qualitative simulation research in nursing. An inductive approach, using grounded theory, would add to the body of knowledge in nursing simulation research.

Many gaps were identified in this simulation literature review conducted in nursing, medicine, and other disciplines, although Hayden et al. (2014) demonstrated that simulation learning may be equivalent to clinical time in undergraduate nursing students. Simulation offers many challenges and requires an approach tailored to the specific educational needs of each specialty group. Demonstrating competence, knowledge, and skill has become a necessary precursor to practice in high risk environments. The use of simulation as a method of deliberate practice has the potential to ease the transition from student to practicing clinician. The complexity evident in the present health care environment may support the use of simulation as a tool to connect theory to practice and positively effect nursing student learning outcomes.

Transfer of Learning

Transfer of learning is the key to effective instruction and learning. A deeper understanding of learning transfer is required to optimize teaching strategies. Transfer of

learning is a fundamental goal of education (Marini & Genereux, 1995) and remains a significant issue in nursing. The widespread adoption of simulation learning in undergraduate nursing education may or may not be the ideal educational modality to enhance learning transfer. Simulation technology has replaced traditional clinical experiences for some undergraduate nursing students throughout the United States (NCSBN, 2006). The investment of financial and faculty resources in simulation training should be justified by research specifically focused on the transfer of learning phenomenon in simulation.

A common theme identified in the nursing literature was that the current educational curriculum may not be aligned with the needs of the active learner. Students should be encouraged to progress in a self-directed manner and apply knowledge and skills to clinically relevant problems. Active learning is encouraged by simulation activities and supports the constructivist position in student learning. Active learning is advantageous because it allows the teachers to overtly see student's struggles and explore misunderstandings. Simulation has the advantage of being an active approach to learning that encourages integration of cognitive and psychomotor skills; the interactive process allows active engagement of students, fosters discussions, and necessitates problem solving (Rogers, 2004).

Transfer of learning is at the foundation of learning, thinking, and problem solving. Transfer of learning is a core concept in learning and involves both process and outcome (Leberman, McDonald, & Doyle, 2006). Simulation may offer the advantage of fostering transfer of learning by relating theoretical knowledge to relevant clinical

problems, provide a context of recall to facilitate transfer, allowing students to discriminate relevant from nonrelevant knowledge, and providing a mental set useful in solving a clinical issue. The potential to enhance transfer of learning could become more evident if a simulation learning strategy is utilized that shows students how to organize and apply information learned in a variety of contexts. The process of simulation could produce beneficial learning outcomes for undergraduate nursing students. Simulation learning transfer requires further investigation because transfer of learning is difficult to achieve and involves the application of initial and past learning (Haskell, 2001).

A comprehensive review of the transfer of learning literature was conducted to define transfer of learning, explore the theoretical position of transfer of learning, provide an informed perspective on the present state of knowledge, and identify essential research that will contribute to the body of knowledge in the nursing literature.

Relevant Definitions

In exploring the definitions of transfer of learning, it was discovered that the term transfer of training equates to or is synonymous with the term transfer of learning (Cormier & Hagman, 1987). Research and theory generation in transfer of learning has been a neglected topic by educators and trainers. Transfer of learning, from a practical perspective, assumes that learners will apply knowledge and skills to the clinical setting. Transfer of learning has been defined as: "the ability to appropriately apply information and skills learned in one setting to a similar or different setting" (Thomas, 2007, p. 5).

Transfer of learning, from the classical perspective, is defined as transfer of knowledge from one context to another (Bransford, Brown, & Cocking, 2000). Also,

Lobato (2003) defined learning from the transfer perspective as application of prior learning to new and varied situations. Similarly, transfer of learning (Marini & Genereux, 1995) from a classical perspective, resulted in specific highly valued generalizations.

There are many definitions of transfer. The notion of transfer encompasses many things that are not stated in the definition, especially relevant dimensions. Transfer is: "the carrying over of an act or way of acting from one performance to another" (p. 734) according to Woodworth and Scholsberg (1954). Transfer has also been described as: "the ability to extend what has been learned in one context to new contexts" (Bransford et al., 2000, p. 39). Far transfer is transfer to a dissimilar context. Barnett and Ceci (2002) described near transfer as transfer to a similar context. The important point about transfer is that far transfer is the how to best train for transfer of learning. Educators should desire to teach what is applicable over time and contexts, not just to a similar or immediate context.

Transfer of learning was also defined in management, psychology, and education. These varied contexts offered a significant number of definitions of transfer of learning, which were: (a) effective and continuing application by trainees to their jobs of knowledge and skills gained in training, (b) carryover of something learned in one context to a significantly different context, (c) application of knowledge learned in one setting or for one purpose to another setting and/or purpose, (d) a fundamental assumption of educators; whatever is learned will be retained or remembered over some interval of time and used in appropriate situations (p. 1) (Leberman et al., 2006).

In a review of transfer of learning, Baldwin and Ford (1988) defined transfer of

learning as: "for transfer to have occurred, learned behavior must be generalized to the job context and maintained over a period of time on the job" (p. 63). Positive transfer was defined as the degree to which an individual effectively applies knowledge, skills, and attitudes gained in a training context to the job (Baldwin & Ford).

Many definitions exist defining learning. Slavin (1988) defined learning as a change in a person as a result of a particular experience. Billings and Halstead (2009) defined learning as "a process of understanding, clarifying, and applying the meanings of the knowledge acquired; learning occurs when a persons behavior or knowledge changes" (p. 190).

Transfer is the ability to learn a behavior that will be repeated in a new situation. Transfer is distinguished in two important ways: (a) near transfer is transfer to an identical situation with minor variation, in other words, similarity between the original learning and the new situation, and (b) far transfer is transfer of a learning activity, that may be dissimilar to a new situation. Conceptualizing transfer on a continuum of situations progressively more different from the original learning experience can be a helpful reference point when thinking about near and far transfer (Detterman, 1993).

Clark and Voogel (1985) determined near transfer would be likely if: (a) the workplace is reflected in training, (b) increase specificity of training, (c) over learning content, (d) emphasize the procedural nature of the task, and (e) the trainee needs to be explicitly prepared (p. 119).

Detterman (1993) described transfer situations that were surface or deep in structure. An example with patient care is: two patients in respiratory distress have

increased respirations and shortness of breath. One patient has chronic obstructive

pulmonary disease and the other patient has increased anxiety. The surface structure is

that both patients are the same but the deep structure (underlying etiology) is much

different.

Nurse educators need to improve teaching strategies to increase the potential for

far general transfer of deep structure and not near transfer of surface structure. General

principles of transfer between markedly different situations is most desirable; although

transfer of deep structure is difficult to achieve. Further, Detterman (1993) asserted that

transfer of training is often the exception rather than the rule, no matter what the

circumstances.

Thorndike and Woodworth (1901) proposed the theory of identical elements.

According to the authors, transfer is enhanced with explicit connections between the

training and performance setting. Laker (1990) asserted that technical training was most

aligned with near transfer.

Far transfer supports transfer through principles that emphasize the importance of

creating variety and explaining the *why* that underlies what an individual is being taught.

Goldstein, and Musicante (1986) and Noe (1986) determined that the following factors

may hypothetically influence the acquisition of far transfer: (a) the better trainees

understand the underlying principles, concepts, and assumptions of the skills and

behaviors they are learning, the more successful the far transfer, (b) when trainees

practice in different contexts and use novelty in their practice exercises, the more

successful the far transfer, (c) the more encouragement trainees receive during training to

discuss and apply the training in situations of their own choosing, the more successful the

far transfer, and (d) the more encouragement trainees receive after training to apply the

training to situations other than those for which they were trained, the more successful far

transfer (p. 736).

New challenges and unfamiliar problems relate to the principles theory because

principles and concepts that are practiced can be applied in different situations.

Management training relates to far transfer because it involves problem solving (Laker,

1990).

Design content and design of the training can enhance near and far transfer,

although training application should guide the components that support transfer of

training. The transfer of learning data from this section was from non practice

professions, so this demonstrated the need to conduct research on learning transfer in

practice professions.

The Importance of Transfer of Learning in Nursing Education

Nurse educators need to utilize varied educational resources to enhance the

potential to transfer problem solving and critical thinking skills to undergraduate nursing

students. Understanding the educational needs of nursing students is essential. Transfer of

learning is important for two reasons (Hunter, 1971) which are: (a) transfer is the core of

problem solving, creative thinking, and other higher mental processes, and (b) provides a

basis to facilitate new learning (p. 6).

The Institution of Medicine (IOM, 2008) report indicated that nursing education

should be transformed to meet the demands encountered by nurses in the present day

health care environment. Expectations by various stakeholders suggest a change in nursing education is needed to optimize transfer of learning and is critical to safe and quality nursing care. This mandate then requires that nurse researchers justify the use of faculty resources and expense needed to conduct all learning activities, including simulation. An empirical investigation into simulation learning and transfer could help guide the effective integration of simulation learning in nursing education.

Understanding Transfer of Learning

Nurse educators support the value of active learning. Constructivism supports the learners knowledge structure as a way to interpret, reflect, and evaluate meaningful experiences. Transfer of learning is more likely to occur if students are engaged in active earning. Schema theory and information processing are relevant in the transfer of knowledge.

Schema is knowledge stored in memory, in the form of mental models or symbols and is an essential data structure for representing the generic concepts stored in memory (Macaulay & Cree, 1999). Schema are like theories and enable the interpretation of events and phenomena surrounding us (Macaulay & Cree). Schemata provides the basis for making inferences about unobserved events. The nature of schema is composed of two elements: (a) packets of knowledge similar to theories and procedures, and (b) mental models that guide and govern performance (Lobato, 2003). Defining transfer requires a general scheme to understand the levels and kinds of transfer.

Transfer is predicated on the application of previously acquired knowledge and is based in memory. Cormier and Hagman (1987) provided a helpful blueprint to determine

transfer performance, which was: (a) the structure of the task learned and its relationship to the transfer task, (b) assessing whether the conditions at encoding foster learning of the material and are appropriate for transfer; using generalization and discrimination to represent the training task, (c) conditions at retrieval that influence access to and application of appropriate knowledge; intentional or incidental retrieval of knowledge, and (d) background knowledge of the subject; expertise in an area many result in successful application of knowledge and transfer. The impact of these factors on memory, and subsequent transfer is dependent on similarity of situations (Cormier & Hagman).

Transfer of learning was explored from a conceptual and process perspective by Macaulay and Cree (1999). They investigated transfer of learning across the disciplines of education psychology, social work, and nursing. A basic definition of transfer of learning was explored and the concept of active learner defined. Cognitive models were examined, specifically schema theory, which described the transfer task. The authors concluded the article by identifying the importance of mindfulness, reflection, and metacognitive awareness in transfer of learning. Transfer of learning was very relevant in social work education (Macaulay & Cree). The discipline of nursing and social work are practice disciplines that need to prepare students to deal with the constantly evolving practice environment (Macaulay & Cree). The authors described the three elements that are essential in transfer: learner, task, and context. The learner needs to apply learned information of problems to new problems. The learning task materials and practice problems need to be relevant to bring concepts and principles to general applicability. The context is where the practice will take place and includes the physical and social

setting, support and instruction provided by the teacher, other student behavior, and norms and expectations that exist in a setting.

High-road and low-road transfer are somewhat congruent with near and far transfer (Detterman, 1993 & Laker, 1990). Low-road transfer occurs because of extensive and a well learned behavior application to a new context. High-road transfer involves the mindful abstraction to a new context (Perkins & Salomon, 1988).

The cognitive element in low-road transfer is automatic and flexible (Perkins & Salomon, 1988). The authors compared driving a car to a truck and the application of automaticity and flexibility to adapt to also driving a truck. The key aspects of this process of low-road transfer are *varied practice* and practice to *automaticity* (Perkins & Salomon).

High-road transfer occurs with varied practice that allows expanding abilities application, different from the original context with broadening ability (Perkins & Salomon, 1988). Expertise is evident when a varied and flexible repertoire emerges.

When describing the transfer of learning as a low-road or high-road, Perkins and Salomon (1988) are conceptually aligned with the near and far transfer of learning definitions of Detterman (1993). Near transfer is transfer to situations that are similar to the original learning situation (Detterman). Low-road learning transfer, similar to near transfer, is the triggering of well learned behavior in a new context, when cognitive elements of low-road transfer become automatic because of extensive practice (Perkins & Salomon).

When comparing high-road and far transfer, Perkins and Salomon' (1988) and

Detterman (1993) are also conceptually aligned. High-road occurs with varied practice and allows for mindfulness and understanding. Abstraction and metaphorical abilities are used in the application to new circumstances. Far transfer, in a similar manner, occurs when general skills or principles help transfer to dissimilar circumstances. Cognitive skills have been gained to apply to varied learning experiences. It is important to understand the characteristics and types of transfer when developing a curriculum that will be most beneficial to students.

Gick & Holyoak (1983) asserted that the person must genuinely grasp the relationship between decontextualization and abstraction. The authors also asserted that when abstraction is achieved by active learning better learning outcomes are likely. Gick and Holyoak (1983) further described that high-road transfer is likely to occur by either metaphorical or literal matches between the application and learning context. The authors further concluded that analogy can lead to theory development.

Bransford and Schwartz (1998) asserted transfer is an essential component of our educational system and that transfer with occur continuously throughout the year when students are enrolled in school. Broudy (1977) further described that an education that utilizes an expansive approach is better than specific task training.

A paradigm to study transfer utilizing an analogy was provided by Gick and Holyoak (1980, 1983). Information about a problem were presented and participants were expected to solve problems. Broudy (1977) determined that often spontaneous transfer from one problem to the next is not evident.

A Historical Perspective of Transfer

In reviewing the transfer of learning literature over the last century it was discovered that many individuals have contributed significant research related to understanding of transfer of learning. The formal disciplines approach was supported by classical education theory. In early educational theory, it was thought that the components of the discipline would automatically transfer to everyday reasoning and performance.

E.J. Thorndike (1924), early in his career, was interested in the association between sensation and impulse. Central to traditional approaches to transfer is dominant methodology that asks whether people can apply something they have learned to a new problem or situation. Thorndike and colleagues' classical studies of transfer used this paradigm. Individuals took a pretest on judging the area of rectangles and then were given opportunities to improve their performance through practice plus feedback. Following these learning tasks, individuals were tested on the related task of estimating the areas of circles and triangles. Thorndike and Woodworth (1901) found little evidence of transfer in this setting and argued that the ability to estimate area was not a general skill.

Thorndike (1924), additionally, with his program of research, discovered that little transfer of training occurs across tasks and that training of the mind means the development of a large number of independent capacities. Bybee and Sund (1982) described that Piaget, since the 20th century, had general rules that underline reasoning with the use of formal and propositional operations. Piaget also asserted that learning was

mainly by induction and self-discovery which occurs sequentially as an individual ages.

Another goal of Thorndike's (1924) research was to challenge the doctrine of formal discipline that was prevalent in the early 20th century. Practice was assumed to have general effects on individuals' general skills of learning and attention. It was presumed, when engaged in a formal or mental discipline, that the brain could be strengthened, similar to a muscle, by mental exercise. In agreement with the work of Thorndike, Haskell (2001) espoused that the formal disciplines approach is antiquated and presently nonexistent and determined that to assume transfer of learning is incorrect. Learning should be linked to the specific context in which the subject matter was learned. The formal discipline approach is an extreme generalist view of transfer (Haskell).

Thorndike (1924), Haskell (2001), and Judd (1908) determined that certain types of learning have pervasive and enduring effects on the mind and foster generalized cognitive benefits. The general principles model was supported by Judd's (1908) classic research. Judd's early experiment separated young children into experimental and control groups. The experimental group received instruction on how water refracted light. The control group engaged in practice but received no instruction. The experimental group outperformed the control group on transfer tests. Attitudinal or dispositional characteristics of the learner were considered the most important factor in transfer and understanding led to significant transfer. The study of Judd provided evidence of the value of understanding while learning versus duplication of procedures. Cox (1977) asserted that the beginning of the conflict between cognitivists and behaviorist originated from Judd's classic study.

A significant group of other researchers supported the work of Judd (1908). Wertheimer (1959) discovered the conceptual approach to learning facilitated application and transfer to future problems. Bransford and Stein (1993) and Brown and Kane (1988) asserted that enhancing performance on future tasks was predicated on learning with understanding. Studies revealed that simple facts were less likely to be used than information presented in the context of problem solving.

The generalization approach occurs when one situation may be applicable to another. This is learning by understanding and allows application to new situations if initial learning was meaningful and mastered by the individual. The Gestalt theory provided a further extension of the generalist approach.

Gestalt theory was developed by German theorists primarily interested in perception. Gestalt psychologists believed that the acquisition of knowledge requires the organization of sensory data. Kohler (1925) described a gradual build up of correct associations as insight. A perspective in Gestalt theory is that the sum of its parts less than the whole (Kohler). Similarities and common themes can be applied to different situations. The Gestalt theory supports the use of total patterns of behavior and rejects the notion of parts functioning in isolation. Certain principles remain the basis for Gestalt theory and some common elements are perception, intelligence, and insight. Driscoll (2005) defined the four features of insightful learning as: (a) after trial and error or inactivity, then a learner grasps the solution, (b) the learner performs the solution in a smooth and error free manner, (c) retention of the solution by the learner, and (d) easy application of a principle gained through insight to a similar problem (p. 22). In transfer

of learning, Gestalt theory has provided a framework for the development of cognitive approaches when discussing learning transfer.

The cognitive approach to the transfer of learning is a complex and dynamic phenomenon, driven by cognitive processes. When learners are confronted with a new situation, they bring with them a unique collection of knowledge from previous experience and learning (Leberman et al., 2006). Conceptual, procedural, strategic, and tacit knowledge are applied to situations that require new learning, as previously described by Haskell (2001). Bransford and Schwartz (1998) and Eraut (1994) asserted that the acquisition of new learning involves the reconstruction of existing and newly encountered knowledge.

Information processing models of learning and transfer describe the mind as a computer and provide a way of thinking and problem solving. Singley and Anderson (1989) used the information processing model to understand thinking and asserted that the failure of transfer is inevitable because of the limited power and generality of human knowledge. Individuals must learn how to apply knowledge to a task in a specific situation. The information processing framework of Singley and Anderson is a model of cognitive architecture and provides an analysis of the transfer of cognitive skill. Adaptive Control of Thought (ACT) or ACT-STAR (ACT *) is a general model of skill acquisition. This model emphasized adaptation and transformation as opposed to the stimulus-response mechanistic conception of the mind proposed by Thorndike (1924). The approach of Singley and Anderson provided an influential guide to educators in a theoretical and empirically based approach to guide the understanding of cognitive

learning.

Controversy Surrounding Transfer

The domain of transfer of learning is varied and large. Many authors are pessimistic about the ability to teach for the transfer of learning (Broudy, 1977; Detterman & Sternberg, 1993; Kelly, 1967). Being overly pragmatic is not a useful position to adopt to foster transfer of learning.

Kelly (1967) asserted that transfer of learning rarely occurs and that low level transfer should not be considered transfer of learning. Kelly also considered transfer of learning as just metaphorical and that nothing gets transferred. The author asserted that transfer is an empirically meaningless and non-valuable notion, and further described that all prior learning either enhances or inhibits learning. In conclusion, the author espoused that all learning is clear and simple; there is no conceptual basis for the transfer of learning claim, and the concept of transfer is vague and ambiguous.

Broudy (1977) asserted that transfer of learning was inconsistent. Broudy was doubtful that formal schooling yielded significant benefits, and knowledge acquisition through formal schooling, was not truly beneficial. Broudy noted that individuals schooling has not provided the ability of students to apply knowledge and replicate educational experiences. Broudy asserted that there is a need to evaluate educational experiences with a focus on knowledge and learning. The position that little to no transfer of learning occurs in most educational settings was again espoused by Detterman and Sternberg (1993). The authors provided the following analysis of the transfer literature:

> First, most studies fail to find transfer. Second, those studies claiming transfer can only be said to have found transfer by the most generous of criteria and would not

meet the classical definition of transfer...In short, from studies that claim to show transfer and that don't show transfer, there is no evidence to contradict Thorndike's general conclusions: Transfer is rare, and its likelihood of occurrence is directly related to the similarity between two situations. (p. 15)

The classic study of Judd (1908) claimed to show general or far transfer of learning. As expected, the experimental group used a strategy to improve their performance. No real transfer had taken place and no evidence of spontaneous transfer was present. This experiment only demonstrated that subjects could follow directions when told to use a strategy. Some significant methodological limitations of the study were systematic bias and a non blinded experimenter to the subjects condition.

The two classic theories of education: the doctrine of formal discipline and teaching for transfer are the predominant themes in classical education. The doctrine of formal discipline purports that individuals are taught the general principles of learning and problem solving. Selecting challenging and rigorous material exercises the mind and is the basic philosophy of classical education. This approach was discredited by Thorndike (1924) when it was demonstrated that learning geometry and Latin were no more useful in improving reasoning than bookkeeping courses. The modern approach of teaching for transfer purports that if you want somebody to know something you teach it to them. Thorndike and many educators believed we learn what we are taught. The evidence to support the doctrine of formal discipline is lacking. There is no good evidence that people produce a significant amount of transfer or individuals can be taught to do so (Detterman, 1993).

Another study of general transfer was conducted by Woodrow (1927). The purpose of the Woodrow study was to compare the improvement in memorization that

would occur with practice in memorization as compared to gains produced by instruction in the general principles and strategies of memorization. Both the training and practice group participated for about 3 hours. Nearly half the time, the training group received instruction in principles of memorizing. During that time the experimenter told subjects that certain strategies would be useful in memorizing certain kinds of material. They were not given practice in using these strategies on the exact kinds of material testing was to be on. Subjects were told certain techniques would be useful for memorizing Turkish vocabulary words on the posttest. Subjects practiced these techniques on nonsense syllable-paired associates during training (Woodrow).

While training group subjects were being told the strategy to use on the upcoming posttest, the practice group memorized poetry and nonsense syllables. It is not surprising that, on some posttests, the control subjects performed more poorly than they had on the pretest. The effect of extended practice on the subsequent learning of similar material was demonstrated by Woodrow (1927).

Some limitations of the Woodrow study were all groups performed differently on the pretests suggesting initial group differences and the control group received no filler task to provide an attentional control. One obvious conclusion, similar to the Judd (1908) study, is that if you tell subjects to use a particular strategy on a particular kind of material and follow this instruction with a test on that kind of material, improvement in performance will be evident. According to Detterman (1993) these finding are not evidence of general transfer but that students followed instructions.

An early study of college students by Reed, Ernst, and Banerji (1974) investigated

the effect of transfer between two problems having similar (homomorphic) problem states. When subjects initially were given a missionary cannibal problem to solve, and then switched to a jealous husbands problem, there was no significant transfer. When the problems were in the opposite order, there was some transfer, but only when subjects get hints about the similarity of the problems (Reed et al.).

The authors concluded that despite enormous similarities individuals failed to transfer a learned solution to the isomorphic problem, and that the role of analogy was a complex issue, and a detailed theory was unable to be proposed (Reed et al., 1974).

In another study with college students, Reed, Dempster, and Ettinger (1985), used four experiments in students in a college algebra class to solve various problems. Four experiments were conducted to examine a solution to an algebra word problem. In experiments one and two students were unsuccessful in applying a solution to similar problems. Authors modified the procedure and provided elaborated solutions in experiments three and four, the students used the elaborated solution to transfer (Reed et., 1985).

In experiment three no transfer to similar circumstances was discovered. Students in experiment four modified values in the practice equation. Students continued to make errors in matching (Reed et al., 1985). In conclusion, Reed et al. determined that four experiments showed the ability to solve similar problems was not possible unless a sample problem was available during solution. Subjects infrequently solved the similar condition, even under the best of conditions. Subjects were all students in a college algebra class. Reed at al. stated when transfer occurs, it requires heroic efforts to produce

and even with significant measures, the amount of transfer was small.

An analogy from a remote domain to guide the problem solving process was investigated in the often cited study of general transfer by Gick and Holyoak (1980). Individuals participated in five experiments to solve the classic Duncker (1945) radiation problem. Prior to hearing the radiation problem, individuals heard a study involving a military problem of a castle being attacked by a military force. Roads radiated out from the castle and a force strong enough to invade the castle could not be sent to the fortress for various reasons. The solution was that the leader assigned invading forces, divided into smaller units, to advance to the castle using different access roads. The military scenario provided a hint about, and was similar to, the radiation problem (Gick & Holyoak). In experiment one analogy was used in problem solving. In all experiments subjects were read stories about the military and students were given clues to allow problem solving. Eventhough the military and radiation problem were not analogous, transfer occurred with less frequency (experiment two) (Glick & Holyoak).

Subjects in experiment three were able to form an analogy between the military and radiation problem (experiment four) (Gick & Holyoak, 1980). Subjects required a clue to transfer. A recall task decreased transfer (experiment four), regardless of presentation (experiment five) (Gick & Holyoak).

Analogical problem solving, noticing analogies, and analogical reasoning compared to other tasks were examined. For example, a doctor's patient is confronted with a malignant tumor of stomach. An operation is not feasible, although the patient will die without destruction of the tumor (Gick & Holyoak, 1980). A single radiation ray

could destroy the tumor but at the risk of a high intensity radiation ray destroying healthy tissue. A very abstract and open-minded goal was specified. The possible solutions vary considerably. This was a test. The solution was to give the patient radiation rays that were smaller from several directions to converge on the tumor (Gick & Holyoak). The study was designed to explore the process by which subjects use analogies between remote domains to generate problem solutions.

The authors concluded that a mapping process using analogy may be beneficial in developing a variety of cognitive skills. Gick and Holyoak (1980) further suggested that a person equipped with a general schema could solve new dispersion type problems by mapping them directly on to it. Further, the authors concluded that an analogy may often guide the development of a new theory.

Some limitations of the study were that individuals were explicitly told that the first story should serve as a hint to solving the second. Some individuals still failed to solve the second problem and the solution to a new problem using previous information which is not considered transfer of learning.

Representational transfer in problem solving was explored by Novick (1990). The author investigated whether transfer may occur at a more general level of description using a common representation or matrix for two problems. Novick distinguished three types of solution aids: general solution strategies, solution procedures, and problem representation. General solution strategies are means-ends analyses or setting subgoals. Mathematical formulas represented the solutions, (Novick).

Two problems that are represented by the same solutions are more likely to be

similar (Novick, 1990). The matrix provided a blueprint for information representation. The sample consisted of a total of 30 undergraduates from University of California, Los Angeles (UCLA) and was composed of 12 males and 18 females. The experimental group was composed of 16 subjects and the control group 14 subjects (Novick).

Three probability problems were given to 16 subjects and 16 subjects were given a matrix to solve the probability problem with both being in the experimental condition (Novick, 1990). The 14 subjects in the control condition received three unrelated problems related to the target problem, whereas the experimental group received two problems that were inappropriate for the target problems and a problem where the matrix would be helpful to solve the problem. Subjects were presented with three problems five minutes apart. The experimenter instructed the subjects that there was an interest in how individuals use various representations to solve problems. The benefits of representation were written after problem solving. The main experiment would proceed after the third problem was completed. Thirty minutes was then given to work on a problem that required deductive reasoning (Novick).

The results provided evidence that exposure to the matrix probability problem provided an increased potential of subjects to use matrices in a reasoning problem (75% vs. 21%) χ^2 (1, n=30) = 8.57, p< .005. Novick (1990) determined that the matrix was an often used representation of the problem and subjects could make use of general level similarities. The author also concluded that analogy may not be needed for a solution to the problem and spontaneous representation occurs more frequently than the solution.

Many limitations of this study were evident. The transfer problem and second

practice problem required different solution methods but the use of a matrix would be useful in different ways in solving both problems. The fact that all the experimenter supplied methods in the control condition were inappropriate might have discouraged the subjects from seeking other solutions to use. Only one of the experimenter supplied methods was usable in the experimental condition. The contrast must have made the usable solution particularly salient. The assertion that only 21% of the control subjects used a matrix to solve the problem was not valid because the control group never saw a matrix in the practice problems. Other limitations of the Novick (1990) study were a small sample size, single site study, and no data were given about the number of control subjects who attempted to transfer the incorrect solutions they learned to the transfer problem. Finally, this study has limitations that make the results potentially context sensitive which effects generalization to other situations. Novick may have been unreasonable in concluding that representational transfer is a general phenomenon.

For transfer of learning to take place, measurement of transfer should be established and many variables considered. Cormier and Hagman (1987) asserted that several variables need to be explored, which were (a) an understanding and awareness of the formulas used across different transfer studies for accurate interpretation of results, (b) the kind of performance being measured, which will limit conclusions that can be made about results and should be considered when comparing the results of different studies, (c)concern with the reliability and validity of experimental and control group performances, and (d) the applied environment, which often poses obstacles to the implementation of particular transfer paradigms or methodologies, regardless of their

accepted validity (p. 2).

A mechanism of transfer was also defined by Sternberg and Frensch (1993). The authors asserted that the degree of transfer obtained from one setting to another depends on four mechanisms: encoding specificity, organization, discrimination, and set.

The mechanisms of transfer asserted by the authors (Sternberg & Frensch, 1993) were further defined as: (a) e*ncoding specificity:* this mechanism asserted that whether or not an item is retrieved will depend upon the way in which the item was encoded. Also, the principle states that whether an item will be transferred will depend upon how the item was encoded, (b) *organization:* specifies that whether or not retrieval will occur will depend on how information is organized in memory. The notion is that organizations of information from old situations can either facilitate or impede transfer to new situations; (c) *discrimination:* this mechanism specifies that whether or not retrieval will occur will depend on whether information to be recalled is tagged as relevant for the given recall. The notion is that discrimination affects transfer by tagging an item as either relevant or non relevant to a new situation in which that item might be applied; and (d) *set:* this mechanism, in the context of problem solving, specifies that whether someone sees a useful way of doing something depends in part upon the mental set with which he or she approaches the task. The idea is that whether transfer occurs will depend in part upon whether the individual has a mental set to achieve transfer (p. 26).

Similar to nursing, the human resource development literature revealed the importance of translating training into performance. Transfer of learning, similar to transfer of training, describes the ability to make good decisions, think, reason, and plan

(Haskell, 2001). Yamnill and McLean (2001) reviewed theories and conceptual frameworks to describe factors affecting transfer of training.

The strategies to foster transfer of training were described (Yamnill & McLean, 2001) as: (a) collaborating with key stakeholders in the organization at each step of the process to provide links to strategic goals, reinforce organizational priorities, and support performances related factors; (b) encouraging managers to provide clear performance objectives so that employees know exactly with they are expected to do, and, (c) assigning high priority to learners as full stakeholders in the design and implementation of training (p. 18). Learners may be responsible for identifying training objectives, assessing their learning needs, developing action plans, and identifying organization wide strategies to support full transfer to new contexts.

In summary, recommendations from the human resource development literature could provide a framework to use in nursing education. Nurse educators need to create knowledge acquisition expectations, reinforce important concepts, provide concise performance expectations, and utilize active learning techniques.

Conclusion

Transfer of simulation learning is necessary to prepare new nurses to deal with the situational and contextual variables encountered in clinical practice. Discovering the what and how about simulation experiences transferring to the clinical environment is still a question that needs to be answered. In a comprehensive review of the transfer of learning literature, it was discovered that transfer of learning may be difficult to achieve and is presumed to occur in many situations without evidence to support this premise. Also, it

was identified that transfer of learning is at the foundation of learning and conceptually equivalent to transfer of training. Far transfer supports transfer through the emphasis of underlying principles and concepts, use of different contexts and novelty, encouragement to discuss and apply information, and application to other situations. Using simulation as an innovative teaching tool for nursing practice requires advanced planning and an understanding of the educational needs of nursing students. Through this literature review, it was discovered that transfer of learning may be rare, transfer is more likely to occur if students are explicitly taught information, strategy and reasoning could augment transfer, and the premise of transfer of learning needs further investigation.

Early studies of Judd (1908) and Woodrow (1927) demonstrated students could follow directions, although showed no evidence of significant transfer. Reed et al. (1974) concluded students failed to transfer a learned solution to an isomorphic problem. Reed et al. (1985) asserted in four experiments that if transfer of learning occurred it was small and infrequent. Novick (1990) used representational transfer in problem solving, although methodological limitations make the study context sensitive.

In conclusion, transfer of learning was a rare phenomenon and many methodological limitations are still evident in the literature. Research on transfer of learning, specifically related to simulation, should be conducted to explore some of the gaps in the literature and guide nurse educators in curriculum development. Furthermore, the process by which simulation learning transfers to the clinical environment in undergraduate nursing students needs clarification. The aim of this research study is to validate the use of simulation learning in nursing education. The literature review

provided strong evidence to support the necessity to explore transfer of learning, further

contribute to the body of knowledge in simulation learning and transfer, and implement

educational strategies to optimize and enhance nursing students educational experiences.

CHAPTER THREE

METHODS

The purpose of this study was to generate a middle range theory of how simulation learning transfers to the clinical environment in undergraduate nursing students. Nurse educators need empirical evidence to support the use of simulation learning as a necessary and relevant component of the undergraduate nursing curriculum. Using well defined educational resources, in an effective and targeted way, will allow educators to enhance student learning. A rapidly changing health care environment requires an undergraduate curriculum that meets the needs of nursing students and various stakeholders. The specific elements addressed in this chapter are research design, setting and sample, recruitment of participants, data collection, management and analysis, and ethical considerations.

Research Design

A qualitative research study utilizing a naturalistic design was used to answer the research question, What is the process by which simulation learning transfers to the clinical environment in undergraduate nursing students? Naturalistic researchers gather information by talking with and listening carefully to people. The naturalistic design utilized in this study allowed the discovery of nursing students' simulation learning experiences and perspectives. Meaning was constructed that was fundamentally

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interpretive and emergent rather than tightly prefigured (Marshall & Rossman, 2006). A naturalistic design also defined the simulation experience and transfer process in depth, with rich and realistic detail. Interviews were structured and responsive to allow the discovery about the what, how, and meaning of simulation learning transfer.

The grounded theory method of Glaser (2001), and Glaser and Strauss (1967) was used to answer the research question. Using the grounded theory method yielded a theoretical model explicating the basic social processes inherent in the simulation learning experience and transfer of undergraduate nursing students. Basic social processes (BSP) are fundamental and patterned processes that are durable and stable over time (Glaser, 1978). Further, the defining properties of BSP are: stages, pervasive, full variability, and change over time. BSPs provide basic uniformies of social life and allow conceptual organization of the social world (Glaser). The grounded theory method provided conceptual clarity about the student simulation experience, transfer of learning, and allowed further clarification of significant categorical data.

Setting

The study took place at the Loyola University Chicago (LUC) Lake Shore Campus in Chicago, Illinois. LUC is a Midwestern Jesuit University with an Ignatian heritage. LUC Marcella Niehoff School of Nursing (MNSON) offers an undergraduate pre-licensure program in a four-year format; which leads to a bachelor of science in nursing (BSN). The school of nursing also offers an accelerated bachelors of science in nursing in a 16 month format, and RN to BSN format for associate degree nurses.

The MNSON is located within Loyola's Health Science Division. The School of

Nursing offers degrees that include Bachelor of Science in Nursing (BSN), Master of Science in Nursing (MSN), Doctor of Nursing Practice (DNP) and Doctor of Philosophy (PhD). The School of Nursing also offer three non-nursing degrees: Master of Sciences Degree in Dietetics, a Bachelor of Science in Exercise Science, and a Bachelor of Science in Health Systems Management.

Traditional nursing students in the third and fourth year of the program use simulation in a variety of challenging clinical scenarios. The adult SimMan® manikin, manufactured by Laerdal Medical Corporation and a variety of other Laerdal manikins are used at the Lake Shore campus. The faculty utilize a wide range of manikins from infant to geriatric. The manikins are realistic in size and are programmed to mimic real life patient conditions.

A wide variety of simulation clinical scenarios are used at the MNSON to engage nursing students in dynamic learning experiences. An example of commonly used simulation scenarios in the Loyola curriculum include: (a) a psychiatric patient experiencing suicidal ideations, (b) an obstetrical patient experiencing postpartum hemorrhage, (c) a child with a history of asthma presenting to the emergency room with respiratory distress, (d) a community health setting involving an elderly patient medication management issue, (e) a postoperative bowel surgery patient with impending ileus and obstruction, and (f) a complex cardiopulmonary arrest scenario. Simulation begins for second-year nursing students in a low fidelity simulation format with students initially doing procedures in the skills lab with a static manikin.

Students are presented the relevant simulation content in the classroom, by the

nursing faculty, prior to engaging in simulation scenarios. Physical assessment, community and mental health, obstetrical, pediatric, geriatric, and a cardiopulmonary arrest scenario are all simulated to reinforce the clinical experiences of the students and to enhance students critical thinking and psychomotor skill development prior to graduation. The typical simulation learning scenario focuses on a students ability to integrate basic nursing and physical assessment skills for patient care. Faculty and other nursing students are assigned various roles depending on the scenario. As a scenario is initiated, students respond to programmed responses from the manikin. Positive feedback from the human patient simulator reinforce correct responses such as a normal blood pressure reading, a normal and regular heart rate of 60-100 bpm, a normal and regular breathing pattern, and skin coloration reflecting a normal oxygen saturation level. Negative feedback from the human patient simulator is offered for incorrect responses such as abnormal blood pressure readings, elevation of heart rate paradoxical and rapid respiration, and cyanotic appearance of the nail beds with skin color indicating decreased oxygen saturation. Feedback is provided by the human patient simulator which results in an escalation of the scenario to further reinforce the implications of implementing appropriate interventions. Students are encouraged to use critical thinking skills to implement the best plan of care for their patient. Simulation scenarios typically conclude in thirty minutes and are followed by structured debriefing.

Loyola traditional nursing students presently engage in a significant amount of simulation learning. Over 50 hours of simulation learning is a requirement for Loyola nursing students. LUC utilizes the standard 1:1 ratio substituting clinical time. Beginning

in The Fundamentals of Nursing skills lab, medium fidelity manikins are used in an unfolding case study that is used throughout the semester. In the students final year they complete a complex cardiopulmonary arrest scenario.

Simulation learning is used as an integral part of the undergraduate nursing curriculum in the Marcella Niehoff School of Nursing. LUC follows the International Nursing Association of Clinical Simulation and Learning (INACSL, 2013). Best practices which include simulation, facilitation, debriefing, and evaluation. The Loyola University simulation laboratory allows nursing students the ability to develop proficiency in clinical skills and collaborative practice. Learning takes place in a safe environment where students have the ability to engage in deliberate practice. Formative assessment is utilized at LUC to help faculty determine the next steps in the learning process, identify strengths and weakness, and target skills that need improvement. Simulation at LUC is not used for evaluating student performance. Structured learning activities provide immediate and useful feedback to undergraduate nursing students.

Sample and Sample Size

Data were collected for the purpose of generating theory. Participants comprised a purposeful sample, selected based on their experience of the social process under investigation. The final sample size was determined by the data generated and final analysis. It was expected that the sample size would be 10-20 students based on a review of several grounded theory studies in the ProQuest Dissertations and Theses database (Cook, 2010; MacWilliams, 2010; Wilkin, 2010; Wilson, 2010; Wright, 2010). The inclusion criteria for the study was students: (a) enrolled in the pre-licensure traditional

four-year nursing program at Loyola University Niehoff School of Nursing, (b) fourth-year nursing students who completed at least one semester of a medical-surgical nursing course and at least one clinical rotation, and (c) a minimum age of 18 years old. Exclusion criteria were students who have not completed a medical-surgical nursing class.

Recruitment of Participants

Participants were recruited with notices posted in the Marcella Niehoff School of Nursing, to inform students about the study. The researcher also attended senior level nursing classes where students were given the opportunity to discuss the study in more detail. The students were informed that participation or lack of participation in the study would have no effect on their grade. Students willing to participate in the study were given a further explanation of the study and a copy of the consent form to review if they desired to enroll in the study. All questions were answered to assure that the students were available and agreed to a face-to-face or phone interview. They received a thirty dollar gift card upon completion of the interview as a token of appreciation for their participation.

Data Collection and Management

Individual interviews were conducted face-to-face in a private conference room at the Lake Shore Campus of Loyola University Chicago or via telephone. Data collection occurred over two time periods. Fifteen interviews were conducted from October 2014 through November 2014 and ten interviews were conducted from October 2015 through November 2015. A total of twenty-five interviews were completed that were between 26

to 42 minutes in duration. Fifteen interviews were via telephone and ten were face-to-face. Sixteen participants had no experience in health care. Nine participants had from three weeks to four years experience in health care. Out of that nine, six participants had six months as a patient care technician at various hospitals in med-surg, the emergency room, or labor and delivery. Two participants had minimal experience as a volunteer at a nursing home for less than three months and three months experience as a volunteer at an urgent care facility. Only one participant had significant health care experience (five years), which was working as an emergency medical technician part-time for two years and three years part-time as an emergency room patient care technician.

Interviews were digitally recorded with a cassette tape recorder as a backup. Participants were encouraged to discuss specifically their simulation learning and clinical experiences, both positive and negative. To start the interview, basic demographic information was asked as an additional method to establish rapport. Basic demographic information collected included age, work experience, years of school completed, and the number of simulation experiences. Interviews were conducted using a responsive approach, the *tree* and *branch* approach, as described by Rubin and Rubin (2005). Using the *tree* and *branch* approach allowed the researcher to divide the research problem into more or less equal parts, with each part being covered by the main question. The research problem was likened to a tree trunk with the branches as the main questions each dealing with a separate, but more or less equal, concern. Data collection commenced with an open-ended question about simulation and clinical experiences as a nursing student. An interview guide was used to help the participant focus on the simulation learning

experience. After the first basic question, to help the participant focus on simulation, the participants were asked about the application of simulation learning to clinical experiences. In this way, the participant focused on transfer rather than simulation learning experience.

All participants were assigned a participant number. This number was then assigned to the transcripts, to ensure confidentiality. The link between the participant and an interview transcript was kept in a locked file in the researcher's private residence. After digitally recording and tape recording the interviews, both tapes contained the participant number. The interviews were transcribed verbatim by the researcher. Accuracy of the transcripts was verified by the researcher by listening to the recordings while reading the transcripts. Names and locations were replaced with a pseudonym or deleted if not needed to understand the context of the statement. A locked file cabinet at the researcher's residence was used to provide security for copies of transcriptions. CDs and tape cassettes were stored separate from the transcripts. A password protected computer was also used to store the downloaded digital recordings at the researcher's residence. Consent forms were stored in a separate locked file cabinet at the researcher's residence. The dissertation chair had access to the transcripts. The tapes are being maintained until completion of the dissertation and then will be destroyed within six months.

Data Analysis

Data were analyzed using the constant comparative method (Glaser & Strauss, 1967). Data analysis was supervised by the dissertation chair, Dr. Lee Schmidt. Data

analysis began after the first interview was transcribed and checked for accuracy. The researcher used the constant comparative method to code and analyze the data. Two levels of coding were used in data analysis: open and axial coding. Open coding involved examination of the transcripts line by line using words, phrases, and sentences as units of analysis to identify as many codes and processes as possible. Data analyzed in each new transcript were compared with codes from previous interviews to identify similarities and variability in the codes generated. Codes provided a way of thinking about data in the theoretical terms. Axial coding, the second level of coding involved clustering of first level codes into conceptual categories. Theoretical memos were recorded during the entire data collection and analysis process. Theoretical ideas and observations of the researcher were captured in the entire process of data reduction and comparison.

Data collection continued until no new information was yielded and emergent categories were saturated (Glaser & Strauss, 1967). Major categories emerged with a clustering of subcategories that represented the properties of, and contributed to, the definitions of each category. A reduction and comparison then took place that led to significant properties of the identified categories and patterns in the data. A core category emerged that identified the basic social process, or central category in the data related to the students experience with simulation learning and transfer of this learning to their clinical experiences. Once the core category emerged, the constant comparative method was used to sort categories and review theoretical memos to identify how major categories and subcategories related to each other and the core category.

Rigor

Rigor is defined as a structured analytic process to gain an understanding of what and the data convey (Glaser & Strauss, 1967). Rigor in qualitative research is associated with consistent and competent data collection, meeting the stated objectives of the investigation maintaining a rigid philosophical perspective, and allowing the data to represent the emergent basic social process (Glaser & Strauss).

Glaser and Strauss (1967) also defined rigor as *credibility, plausibility, and trustworthiness. Credibility* is accuracy in fit and relevance. *Plausability* is detailed elements of the actual strategy for data collection. *Trustworthiness* is when a conceptual framework forms a systematic theory. Glaser and Strauss (1967) further concluded that rigor is evident because qualitative data often result in a *de facto* (p. 235) conclusive analysis rather than a preliminary one.

The goal of rigor is to accurately represent the participants experience. Guba (1981) and Lincoln and Guba (1985) defined general processes that contribute to rigor and a judgment of trustworthiness in qualitative research: *credibility, dependability, confirmability, and transferability. Credibility* includes activities that will increase the probability that credible findings will be produced. *Dependability* is the consistency once researchers have demonstrated the credibility of the findings. *Confirmability* is a process criterion that uses an audit trail. Researchers need to illustrate as clearly as possible the evidence and thought processes that led to the conclusions. *Transferability* refers to the probability that the study findings have meaning to others in similar situations. With fittingness users determine whether the findings are transferrable. Evidence to support

these criteria of rigor is present in chapter four.

Ethical Considerations

The institutional review board (IRB) of Loyola University reviewed the approved research proposal. Informed consent was obtained from all students prior to the beginning of the research study. Students were informed that they had a right to refuse to participate, that they could refuse to answer any questions, and that they could discontinue participation at any time, without consequence.

The ethical challenges evident in qualitative research may expose thoughts, feelings, knowledge, and experiences of the interviewee (Patton, 2002). Confidentiality was a significant ethical consideration in this qualitative research proposal because participants may reveal significant personal information. The consent form was reviewed with each participant including permission to transcribe the interview. Participants were informed that there would be minimal risks and benefits associated with participation. A consent form was signed and maintained in the researchers locked the cabinet. All questions were answered about the research study prior to data collection. Participants were assured that confidentiality would be maintained throughout and after the study.

There were no anticipated risks to students participating in the study. Students participating in the study continued with simulation activities necessary to complete their nursing course work. Participants were again reminded that responses during the open ended semi-structured interviews would remain confidential. The interview data obtained from the participants were identified by a code number and were secured in a locked file cabinet separate from other data that consisted of memos and categorical data.

Transcribed tapes and demographic information were stored in a locked and secure location.

Chapter Summary

In this chapter, the grounded theory method has been presented as appropriate for this study. The setting, process of recruiting, sampling, data collection, management, and analysis has been discussed. Finally, rigor and ethical considerations have been described. In Chapter Four, the sample, findings, process and model, core and subsequent categories will be discussed.

CHAPTER FOUR

RESULTS

The purpose of this chapter is to present the study findings to explain the basic

social process by which simulation learning transfers to the clinical environment in

undergraduate nursing students. The sample, process and model, categories, and

properties of the categories are presented. The chapter concludes with a discussion of the

necessary elements used to demonstrate methodological rigor of the study.

Sample

Twenty-five traditional fourth-year nursing students at Loyola University Chicago

participated in phone or face to face interviews. The participants (23 females, 2 males)

ranged in age from 21 years to 22 years with a mean age of 21.2 years. All participants

had over three years of college education. The inclusion criteria for the study were

students: (a) enrolled in the pre-licensure traditional four-year nursing program at Loyola

University Marcella Niehoff School of Nursing, (b) fourth-year nursing students who

have successfully completed at least one semester of a medical-surgical nursing theory

course with associated clinical rotation, and (c) a minimum age of 18 years old. Fourth-

year nursing students were the purposeful sample to ensure the students had a reference

point by which to discuss their experiences with simulation learning and clinical

experiences.

Process and Model

  The data indicated that the process of simulation learning and transfer to the clinical environment in undergraduate nursing students involves the students to experience Act Like A Nurse. The process is illustrated in Figure 1. (below)

Acting Like A Nurse
(core category)

Getting feedback

which led to

Being in simulation ⟷ Being able to → Making sense of → Gaining confidence
practice   my learning

Fitting together

Being in clinical   Applying my learning   Becoming more
comfortable

Getting feedback

Knowing what to
do
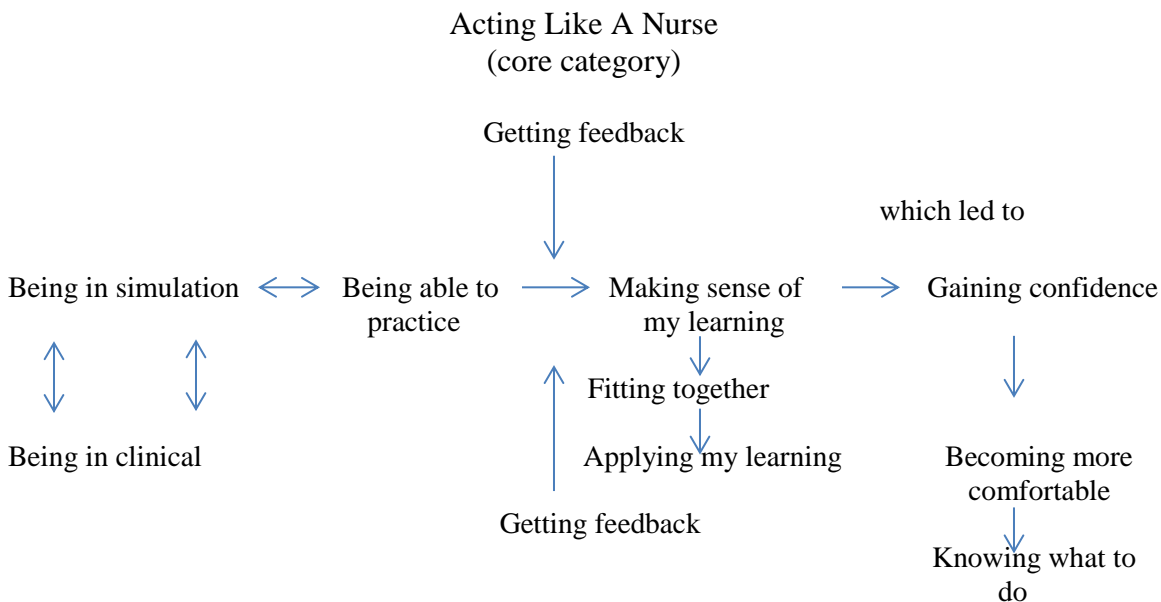
Figure 1. The basic social process, Acting Like a Nurse

  The process begins with students experiencing simulation (Being in Simulation) learning and clinical (Being in Clinical) learning. Simulation learning allows students to apply information, and learn how to handle clinical situations; where they are often required to do everything. In contrast, clinical experiences are variable because students are working as a student. Students when engaged in clinical rotations may not be doing, seeing, or allowed to engage in patient care activities and may be just observing. Students when engaged in simulation and clinical experiences are able to practice (Being Able to Practice) which can lead to them to get feedback (Getting Feedback). This process of receiving student feedback allows students to make sense of their learning (Making Sense

of My Learning). Students then see things that seem to fit together (Fitting Together). Simulation, classroom, skills lab, and clinical experiences all complement each other to contribute to transfer of learning to the clinical environment. When students are able to apply their learning (Applying My Learning) material, things become more salient and students gain confidence (Gaining Confidence) in their ability to complete clinical work. When students consistently experience significant learning events they gain comfort (Becoming More Comfortable). The outcome is that students learn to Act Like A Nurse and know what to do (Knowing What To Do) in various clinical situations.

The process by which simulation learning transfers to the clinical environment is sequential process that starts with students being in simulation and concludes with the outcome of students knowing what to do when exposed to a clinical event.

Core Category: Acting Like A Nurse

The core category that emerged from the data was: Acting Like A Nurse, which emerged from the data as the participants assuming the role of the nurse when engaged in simulation activities. The quotes are used to represent and illustrate the properties of the associated category. The categories are identified by participant and page numbers. Properties of Acting Like A Nurse included "being in charge," [4.3] and "in the role of the nurse." [17.2]

Using simulation, participants learn to prioritize, anticipate, and focus on the level of work needed to complete patient care. Participants then engage in a self-evaluation process that helps them develop the ability to anticipate clinical events. Assuming the role of the nurse, as discovered from the data, is important in learning to take

responsibility for a patient. The properties of the category have explanatory scope and are able to capture the essence of a substantive theory (Glaser & Strauss, 1967). Acting Like A Nurse emerged as the basic social process used by undergraduate participants as they engage in simulation learning, which allows transfer to the clinical environment.

The term "acting like" a nurse reflects the key role that simulation learning plays in a participant's ability to take responsibility for their actions, apply classroom and skills lab knowledge to simulation scenarios, and learn how to handle clinical situations. Participants then are able to progress to Acting Like A Nurse and doing everything a nurse would do when confronted with a clinical problem.

Simulation is unique in the fact that it allows the participants the ability to do exactly what the nurse would do, as described by one participant:

> I feel like simulation gives us more of a chance to, like, actually act as a nurse and do the things like the nurse would do, because it is not a real patient we could practice with that so we are not as limited. [1.3]

The same participant again stated:

> So then, like simulation I actually had the opportunity to do what the nurse would do in that situation. [1.12]

The opportunity to function as the nurse and engage in nursing care was determined to be a key component of simulation. Taking responsibility and doing everything was explained by a participant as an advantage of simulation learning:

> Right, yes definitely you are giving medications by yourself in simulation, you are the nurse when the doctor comes in and tells you to do something it is your responsibility to do it. Where in clinical you are just a student and you hang back, um, there is always double checking everything you do where in simulation it's your job to check and help each other out. It is your job to call the doctor if something is going wrong and update them; that is definitely different we had a couple weeks ago in med-surg there was a code blue on a patient; it was my

friends patient so she was very far back, not doing anything, she could barely see anything, obviously not the role of the nurse because she is a student. It is definitely different in simulation, you are the nurse. [10.5]

The same participant described Acting Like A Nurse as:

So it is the kind of stuff we are learning in class that we wouldn't see in clinical so we do it in simulation which is great because you get to see what is happening and you know it is different learning it in a book and seeing it in practice so it will show us what could happen and what the role of the nurse is. [10.5]

Simulation allowed the participant to be independent and assume the role of the nurse and

engage in quick thinking, which is in contrast to participants role in clinical.

Simulation is very helpful because it allows us more of an opportunity to be independent and in the role of the nurse. So for the OB one, for example they had a patient that was hemorrhaging so it really helps you with that quick thinking and really what do I need to do because, alot of the times you are in clinical, you don't ever have to think like that. [17.2]

Another participant described doing as a nurse versus acting like a student which are

contrasting roles with the benefit of simulation learning being obvious:

Similar because they would do what you're doing as a nurse in the hospital in simulation; different because as a student you are more of an extra set of hands for your nurse; so I think you get a little more freedom, you get to act like the nurse as opposed to the student following the nurse. That is cool to do that because you have to be faster and no one is over your shoulder saying this is what you need to do that was real helpful um, you just kind of felt like you we're playing the role of the nurse; not like the clinical setting. [18.7]

Another participant explained that higher level thinking is required when Acting Like A

Nurse compared to being in the role of a student:

Like I said, definitely it fits together; we get to explore things in simulation we don't get to experience in clinical, so, it gives us that opportunity, and it also gives us that opportunity to think for ourselves because we don't have a nurse seeing over us and we can make those errors. Some, we have to critically think like a nurse instead of like a technician. We have to figure out what is wrong, how do we fix it. Who do we contact; you know it gives us the opportunity to be independent and take those risks. [25.4 – 25.5]

Being able to Act Like A Nurse was also explained by a participant using simulation learning:

> In simulation you have more of an opportunity to be the nurse. I think this is happening; what do I have to check for instead of going with your nurse. This is happening because of this … This person is decelerating quickly and I need more help. [19.6]

Acting Like A Nurse emerged from the data primarily when participants were engaged in simulation learning, although participants also Acted Like A Nurse on some clinical rotations. This method of deliberate practice exposed participants to taking responsibility and being in charge.

The core category Acting Like a Nurse encompasses the ten categories in the model. The ten categories are: *Being in Simulation, Being in Clinical, Being Able to Practice, Getting Feedback, Making Sense of My Learning, Fitting Together, Applying My Learning, Gaining Confidence, Becoming More Comfortable, and Knowing What to Do.* The ten categories and their properties are discussed in the following sections.

Being in Simulation

Being in Simulation reflects the participants engaging in simulation learning activities and doing things that they "need to know" [3.3]. Being exposed to an enriched environment encouraged participants to focus and take responsibility for the development of their affective, psychomotor, and cognitive skills, which are important in the clinical environment. The three properties of *Being in Simulation* are: *experiencing things, being able to make mistakes, and being in a safe environment.*

Experiencing things, as a property of *Being in Simulation*, emerged from the data as participants engaging in simulation learning; doing, seeing, and having things happen

to them that are unique to simulation, but reflect clinical experience. *Experiencing things*

in simulation were "situations that we might be in during clinical days" [13.7]. The

experience participants are exposed to in simulation may be unique, and something they

might not experience in their nursing clinical experience, with the potential to acquire the

knowledge and skill that is relevant to clinical practice.

A participant explained the importance of experiencing things in simulation as:

> We did a code in med-surg I and again in med-surg II; a little more in depth,
> because a code situation doesn't happen unless you work more, it doesn't happen
> in clinical everyday or even every clinical year, but if you practiced it before it
> happens on the floor, and it is someone's life, and everyone is doing the general
> flow of events so that it is kind of spontaneous. For OB, we did assessment of the
> baby which is good to learn and then, um, problems after a C-section like
> hemorrhaging which is good, because when I was in OB (obstetrical) there wasn't
> a single mother who was hemorrhaging which is like the number one problem; so
> it is good to learn on a dummy before you deal with a real person. [24.2]

Another participant described the importance of experiencing things in simulation

because it would be difficult to experience it in clinical:

> So one of them was mental health and we did a cool thing we got to listen to like
> schizophrenic voices and walk around for a while; I don't think we would have
> experienced it anywhere else, just like understand what they are going through to
> make it easier to care for them; we did, what else, um, something about the
> talking to people where you had to bring up hard topics that, you wouldn't as
> student talk about; the nurse takes care of that, so it is like to practice our
> end of life topics. [25.4]

Further, the same participant stated:

> Like I said, definitely it fits together we get to experience things in simulation we
> don't get to experience in clinical, so, it gives us that opportunity to think for
> ourselves because we don't have a nurse seeing over us and we can make those
> errors. Some, we have to critically think like a nurse instead of… [25.4]

The opportunity and necessity to experience things is simulation was again expressed by

same participant:

Very relevant we go over exactly what we would be experiencing in that field; whether or not we experience it in clinical would be the ideal patient for us to experience, things like for a Mental Health in the Veterans Administration. We don't get those patients with schizophrenia on the floor we were on, we get that in simulation, we do experience those things, yeah. [25.6]

Simulation represented what participants did on a daily basis and will do in the future:

Um, medical-surgical II um, also I haven't dealt with a code or a gunshot wound but I am personally thinking about working in the ER after I graduate; so those are two things that are just new to me, for my future very significant. Then the community health was very representative of what I'm doing in community health learning, how to go into a patients room, build rapport with them, teach them about their medications, calling their doctor; learning information about different wellness things they be interested in. I believe that sim was very representative of what I do on a daily basis. [9.2]

Another participant reiterated the importance of *experiencing things*, especially when the only experience participants would get with crisis management is in simulation:

Yes definitely, it was very good mostly because we were in situations that we might not be in during our clinical days. During the mock code there was a good chance that we might not see one during our clinical. [13.7]

Another participant explained that seeing things in simulation is "much more hands on" and allows students to experience things you want to get in the hospital as a nursing student:

It depends, like in OB the clinical was definitely like the experiences I had in simulation or the experiences that I had in the hospital proceeded the, um, simulation. And I should have had that simulation before to prepare me for what I could have done just to give me a fundamental basis of what there is but it is actually not the same as doing it. Like for mental health, I think it in as a great simulation where you listen to the earphones and the voices; was much more hands on like in terms of dealing the patient that has a bag of alcohol; things like that. I have dealt with things like that in the hospital. When I did have it in the hospital I did have it in simulation. It was pure luck that I had it in the hospital and that I had it in simulation and in medical-surgical I; it was like when the person passed away and you had to put them in the body bag. You don't experience that as much in the hospital as a nursing student and dealing with death and all that. You may experience it in simulation but you won't

experience it as a nursing student. [16.3]

Being able to make mistakes was another property of *Being in Simulation* that emerged from the data as participants being given the opportunity to make errors when engaged in simulation learning. *Being able to make mistakes* was also not "worrying about the consequences of your actions" [6.10]. The ability to learn without the potential to harm a patient allowed participants to engage in important and unique learning experiences in simulation. Participants, when in clinical, were limited in the experiences that they could engage in because it might harm the patient. A participant expressed that simulation was beneficial and that they preferred to make mistakes on a manikin:

> Yeah, I feel like that simulation is a big help. I feel like, if we had more simulation, if may be more beneficial to the students. Just because it's just more practice. And I would prefer to make mistakes on manikin during simulation rather than have it happen in real patient. [1.16]

Another participant didn't worry about the consequences of their actions when engaged in simulation:

> I don't want to hurt anyone or cause problems, but in simulation we are just one set pace and don't think about the consequences of our actions. It is more fast paced, we don't worry about the consequences of our actions. [6.10]

This statement identified the necessity of participants also experiencing clinical rotations. Multiple participants expressed the value of simulation learning as a place to make their own decisions and make mistakes. Being able to learn without hesitation and make mistakes reinforced learning and allowed participants to not forget things:

> Yes, definitely, clinical; as the semester goes on it is easier you know what to expect and you know the drill. In simulation it is kind of like you feel free to

make mistakes and when you make mistakes you don't forget it. So it is kind of nice too. [17.9]

Another participant explained that simulation is an environment where you can make mistakes and get feedback to allow for performance improvement:

Still positive feedback and a constructive environment. It's not here to make you stressed out. You can make mistakes here, um, but also really specific feedback for improvement. [22.10]

Being in a safe environment was another property of *Being in Simulation* that emerged from the data as participants being aware that no negative consequences existed from their actions. Participants indicated that they felt safe when engaged in simulation learning; which was a favorable component of simulation learning. Participants believed they would not harm a patient or put a patient in danger because they were in a simulation learning environment. The ability of students to Act Like A Nurse was enhanced when practicing in a safe environment. A participant described simulation as a place to learn where a patient would not be harmed and where participants can progress to feeling a degree of competence:

But when I think about it, I would have done what they would have done, but I feel like my competence is a little bit lower in simulation, but I feel better about it because it is just a chance to learn and I am not yelled at or hurt the patient. (I feel competent to the point that it is ok to mess up). Where as in clinical I need to know everything. [20.9]

Another participant described simulation as a safe place to engage in team learning and to prepare students for the therapeutic communication they need to practice to deal with patients and families in crisis:

Um, it's helpful, it is one of those safe places were you get to try new things and work as a team because you are working with four people on one patient, unless it is a code or a rapid response you bounce ideas off each other and you are stuck

and I don't know what to do now; someone else has the idea; it is always good and you learn to ask other people, um, I know we did alot of stuff like the end of life conversation like it's hard to do unless it is a real situation, but it was interesting to practice because you didn't know how to tell that to someone, that ... their loved one has passed away, it is a good experience to do that in a safe setting. You might word it wrong the first time but you get once, that part of that being weird, but when you actually have to have that conversation it will run smoothly. [24.5]

New learning was enhanced by a safe environment that allowed this participant to refine

their skills:

Like today in clinical I had to do trach care and I have not done trach care; learned it in skills lab sophomore year, so having those skills to practice in a safe setting that I can mess up in. [19.4]

Another participant described that no negative repercussions will result from practicing in

a simulation environment:

Simulation they make it an environment that's comfortable and you feel safe there; you may come in and make mistakes. The first clinical is scary and we are all real nervous for it; but um after that I don't feel nervous going into simulation because we get opportunities to go again and they are all there to support you in the learning process, where clinical if you make a mistake there are repercussions for that. [17.9]

Another participant determined that simulation was a safe environment that they could

learn essential obstetrical experiences:

Important information that I need to know in clinical that I more than likely won't experience, but it will probably be a sad time if I would experience that; or a situation that I won't be pushed to the side. In OB sim our patient hemorrhaged; with that patient in the hospital even after going through an OB simulation, I would be pushed to the side because it is a life threatening situation but having that simulation in a safe environment is very beneficial because next year at this time I won't be pushed to the side and it will be my patient and I have to know what do; it is very beneficial. [19.7]

Finally, *being in a safe environment* and *being able to make mistakes* were unique in that

participants could again experience things in simulation that they could not experience in

clinical rotations. A participant stated:

> Because in clinical I know I am taking care of real live patients and what I do is extremely important so I don't hurt anyone, but in simulation I know if I make a mistake it's a learning experience and I have another chance to get it right. We are just one set pace and we don't have to worry about the consequences of our actions. [6.10]

Not worrying about the consequences of your actions as a student, may not be an ideal component of simulation learning, which identifies the importance of participants *Being in Clinical* to expand experiences. During clinical students may not be put in a situations that allows them make mistakes because of safety and quality concerns.

Being in Clinical

Being In Clinical emerged as a category from the data, as things that students only experience in clinical. *Being in clinical* emerged with the three properties, which are: *experiencing it for real, only observing, and not doing.*

Experiencing it for real emerged as participants engaged in genuine patient care where they "actually talk to a patient" [24.12], and "see how that impacted them"[19.2]. Clinical experiences provided participants with patient care experiences that were real and helped them gain an understanding of unique patient care situations. Participants experienced authentic patient care which provided learning experiences for participants, that were reinforced by their simulation experiences. A participant described the value of clinical rotations and that simulation learning was a nice way to put things together:

> Honestly, I think so I think one simulation per clinical is perfect. I really do most of my learning in clinical because I learn something new every single time I go, and simulation is a nice way to put together everything what I know, I do what I need to work on. Basically having more than one simulation would not be as helpful as using those days to be in the hospital. [8.8]

This participant determined that clinical learning was very beneficial and most of their

learning was in clinical. Another participant asserted they could not really understand an

emotional event unless they were there in clinical:

> My first med-surg clinical I had a dying patient so, you know we do end of life
> care in class. We did a simulation on that. So, even so you can't understand end of
> life until you see it. You know until you see the doctors tell the family, your aunt
> is gonna die. I was in the room when they told them, the patient didn't die on my
> shift; she started to have the rasping and everything. She was an older person.
> I was just; it was really a real important experience for me just being with the
> family and understanding what they go through. We talk about it in class, but you
> don't get a sense of that heart break until you are there. [21.2–21.3]

This participant described the importance of being there for certain emotional events that

were unique to clinical. Another participant asserted that clinical has more depth and it is

a real person where simulation you are allowed to make mistakes:

> The experience you get in clinical is certainly; it has more depth, you know, it is
> the real person, the real setting, you have to better coordinate your actions, your
> time. If you forget to do something in your assessment you can go back in, also
> this where, as in clinical, and whatever we still have to get it done; sim prepares to
> give you more safe care.[23.9]

Learning from staff nurses was an advantage of clinical rotations and was described as:

> I feel like I learned something every week. Little things from the nurses and I
> think it's worth it, but it is not the same as being thrown into a sim situation,
> actually doing it yourself. [25.8]

This participant asserted that experiencing the emotions of a pediatric patient during a

clinical rotation was something that is situation specific and it helped to *experience it for*

real. This participant compared clinical learning to simulation, although certain clinical

circumstances were more salient:

> … But they are both like the clinical and simulation are like the same type of
> experience because it is a hands on type of thing, you can't just read about heart
> failure, because the patient needs to do this in real life people are always different.

It is like the patient needs to stop drinking soda pop or having sodium in the diet. You actually talk to the patient, they live home alone and they can't eat anything besides lean cuisines so you have to work about more and as a nurse, you can't do the five exact steps the book said…[24.12]

Only observing emerged as a property as participants only watching during their clinical experiences. Participants would just "stand back and watch" [20.2]. Participants expressed that they were frequently only observing in clinical, although some participants considered only observing as a positive experience and stated: "sometimes I learn things by just observing" [17.3] and "observation days; but those experiences I learned so much more" [17.10]. These participants indicated that sometimes observing was a beneficial experience and contributed to them gaining a perspective about various clinical environments and the specialty areas nurses work. *Only observing* did not allow participants to engage in, and take responsibility for, patient care when on various clinical rotations, although the participants could observe nursing interventions and the impact those had on the patient.

A participant explained most clinical was just observing:

> I started, my first clinical was OB clinical, which ends up being mostly observation and alot of my clinical rotations worked out that way; we were just following around nurses and watching what's going, or which is a great way to learn but also as a first clinical. We got to medical-surgical I in the spring of that year, last year, we were sort of clueless. [22.1]

This participant determined that during part of some clinicals it was expected to be *only observing* and at times they were not aware of what was happening. A participant described observation as beneficial in certain situations:

> You get about 14 clinicals and some of that time is taken because like one of them you get a break, one of them you are off in other experiences, and one of them you are in simulation. Some of the experiences are very helpful because

sometimes I learn things by just observing. It has been really bad to have my simulation a bit later in the semester. [17.5]

This participant learned by observing things and thought observation was helpful.

Another participant described the disadvantage of being in certain clinical experiences as not having beneficial experiences:

What I have learned in clinical has just been observing; it seems like especially in medical-surgical when we participate in nursing care we scan the patient, scan the meds, give the patient like oral meds … I know it is a big part of the job, but there is alot of stuff you don't get to see all the time. So, I don't have alot of standout experiences from clinical. [22.5]

A participant explained during an ICU rotation that they were not skilled or experienced enough to provide patient care:

We will need the patient care and to learn how to deal with those difficult patients and things like that … we are in the ICU … we just watch in clinical there are alot of things we don't get the opportunity to do. [25.2]

Not doing emerged as a property from the data as not engaging in any nursing care or procedures when on certain clinical rotations with participants "not doing anything." [19.2] *Not doing* was the predominant feeling of participants on some clinical rotations. The ability to do things in clinical would help participants develop the cognitive and psychomotor skills essential to provide safe and quality patient care. Simulation then becomes critical to participants for the development of various skills. A participant described wanting to learn certain skills, but not getting the opportunity to do things:

That is one thing that I wish I could do more of it in clinical. It honestly seems like it just does not happen. Like the skills that I want to do most. I don't get the opportunity to. Like this location and med-surg II. We are not allowed to give … just like alot of skills, we are not allowed to practice … I wish I could do more. [3.7-3.8]

Another participant stated that during certain rotations they are *not doing* because of the

unique qualities of a rotation, although the experiences was still interesting:

> Yea, um I know my pediatrics clinical I have been a little disappointed with it because I really enjoy pediatrics, um, but we really don't get the chance to do very much and I know it is because we are on the pediatric oncology/hematology unit so I mean it is very interesting to see all those situations occurring. [19.2]

Another participant determined that certain procedures would be difficult to experience

because of hospital IV teams being present to start venous access:

> Oh I was gonna say, um some, alot of hospitals that we have clinical at they have an IV team. So I mean, I feel like we don't have that much of an opportunity to start IVs. [1.19]

Another participant echoed a similar sentiment that you have to expect certain

circumstances without any recourse:

> Um, I think sometimes if you are at a different site they will allow you to do more. It is challenging to them, I have talked to different people that have done IVs, I will probably never get to do IVs which is kind of tough and it is certainly something that we can't change or have control over because there are so many of us and they are fighting for sites for us; so it tough when you are on the side were you don't get to do procedures and there is nothing you can do about it. [10.10]

> Simulation provided a method of deliberate practice for participants to

compensate for *only observing* and *not doing* in some clinical rotations. The next

category is *Being Able to Practice* which was a significant experience for participants

when engaging in simulation learning.

Being Able to Practice

Being Able to Practice emerged from the data as being allowed to engage in a

deliberate, repetitive behavior using simulation, prior to or after clinical rotations.

Participants were able to practice and engaged in various experiences. Going through

deliberate practice with simulation learning experiences was essential for participants to

learn the necessary qualities that a nurse needs to provide safe and quality patient care.

Also, the ability to engage in deliberate practice allowed participants to rehearse the

necessary knowledge and skills essential for competent clinical care. Participants were

able to practice various clinical scenarios with simulation. It also helped participants

develop the knowledge and skills that may not be encountered in clinical rotations.

A participant felt *being able to practice* using simulation was ideal because the patient

was not real and they have didn't to hold back:

> Um, sometimes I mean, I'm just feel nervous going in sometimes. But I feel like I
> was more nervous than what I would feel if I was going to a simulation with a real
> patient. So because I knew that, it wasn't a real patient I felt like I had more of an
> opportunity to practice it. And I didn't feel like scared or hold back. [1.18]

Another participant described the necessity to practice procedural skills:

> Yes, it is helpful practicing skills that we don't get to practice in clinical. and
> myself I have not inserted an IV or done a blood draw or there is alot of things I
> haven't done it and I will be graduating next semester and I have not done that on
> a patient and I would like to practice those. [19.4]

Participants seemed to focus on IV insertion as a procedure. It is suspected that it

is a concrete and basic nursing skill which they felt the need to master prior to

graduation.

Being Able to Practice was a significant process in participants using simulation

learning as a modality to gain experiences that are important to clinical practice. A

participant stated simply that: "simulation gives us alot of more experience to do hands

on with the patient" [1.4].

Another participant explained that deliberate practice with simulation was beneficial:

It was not like we only learn it once. Not all, but all of it, we practice it several

times, so when we had simulation this was like the second time now you should
be able to do this. [3.2]

This statement was evidence of *being able to practice* because the participant may have

physical assessment in the skills lab which was reinforced by practicing with simulation.

The same participant described the necessity of *being able to practice* as:

They prepare us for hemorrhage situations. I feel that is helpful because you will
not encounter that on an average day in clinical. We see a need to put into practice
assessment and teaching everyday, but post-partum hemorrhage you need to be
prepared for that. It is not the type of preparation you can get in practice
without simulation. [3.3]

Being able to practice allowed participants to reinforce classroom learning and practice

"exactly what to do [3.4]" when confronted with a clinical scenario. The ability to

prepare and get guidance from simulation instructors and the opportunity to engage in

deliberate practice reinforced important clinical content. Also, this participant explained

that simulation prepared her for clinical because of the ability to keep practicing with

simulation learning:

Um, in sim you are alot more prepared and get more guidance. I think alot of
times in clinical you just get thrown into it you know, your nurse asks you to hold
down the hand of the kid and they are screaming; you just have to go with it; and
it's alot of time how you will learn in nursing. I like the structure of sim; if I
don't understand something I can come back and do it again, um, if I didn't feel…
If I don't feel that comfortable in clinical you just have to go with it. They can't
breathe and you have to suction them. In sim we get to work that. [23.8]

Another participant echoed the same sentiment:

Well the simulation definitely helps us; it gives us a chance to practice; at
least med-surg I before we had patients to take care of in the hospital I thought
that was beneficial I think the other simulation for OB (obstetrical) and MH
(mental health) it's just a good way to get feedback from professors about what
you need to work on and just to get practice your technique, but those were a

while when we were doing the clinical. [7.2]

Another participant explained that therapeutic communication was enhanced by

simulation:

> Then for mental health the thing I found most helpful was they had us listen to
> someone's thoughts if they were schizophrenic, so that was really helpful to put
> yourself, in the patients shoes because mental health is so hard to wrap your mind
> around it if you have never experienced it. So it gave us, um, an opportunity to
> practice more therapeutic communication than we would be allowed to do in
> clinical. [17.2]

When participants are *Able to Practice, Getting Feedback* emerged as an essential

component of learning.

Getting Feedback

Getting Feedback emerged from the data as the input and constructive criticism

that participants received when engaged in simulation activities. Clinical instructors may

not consistently witness participants engaged in nursing activities in clinical, but

simulation allows participants to be observed and receive feedback. Participants received

more feedback in simulation versus clinical experiences. Feedback was more constructive

and positive in simulation compared to clinical. Participants stated "you get more detailed

feedback during simulation" [23.9]. Feedback emerged from the data as overwhelmingly

positive, although participants wanted specific and constructive feedback to enhance their

learning.

Simulation and clinical learning provided students the opportunity to *get*

feedback. Simulation feedback was significantly different than the feedback students

received in clinical. One participant stated:

> I just feel like they are really different because I feel you get alot more feedback

in the sim versus clinical. It would be nice if you could get more feedback in clinical but that is not always an option. Sometimes nurses are not excited to have a student, so they won't give alot of feedback at work. At clinical your instructor has seven other students and are not seeing what you are doing; so that is the nice thing about simulation that somebody is always watching what you are doing and you actually get like feedback which is really, really helpful. [17.4]

One participant determined that feedback in clinical was not frequent, although feedback in simulation was frequent and really helpful. *Getting Feedback* in simulation was again described as different from clinical, as a more global view of what was happening, by a participant:

I think you get more detailed feedback during sim, you get to talk about what you saw, what you did right, and what you did wrong, and what your group thinks and what mattered, you get a more rounded picture of what is going on. [23.9]

Getting feedback was experienced differently in clinical. This participant stated:

So in clinical it is hard because you have one clinical instructor and students. Really the only time your instructor is with you are giving medications; you don't get alot of feedback otherwise with your care. [17.8]

The same participant explained the difference in feedback between clinical and simulation as being watched versus feedback from different individuals in clinical:

No we are mainly independent. It's not like I make a ton of mistakes. But like in simulation they might have told me. But in clinical they are not watching me closely, so they don't give me much feedback. They only time, they, I with me is when I am giving medications or doing a procedure like putting in a foley. So my instructor is not with me. So the feedback I get is gonna be from the patients and sometimes the nurse I am working with and the patients family; that is where I get my feedback. [17.8]

A participant discovered that in simulation you could receive feedback from your peers as well and get a different point of view on your performance:

What is cool about simulation also is that you get feedback from your peers as well. It is actually really helpful because they may see things differently than the instructors do; so you get alot of different viewpoints of what you could have

done better. [17.9]

One participant provided an example of a clinical instructor using a clever method to

elicit feedback from multiple sources:

> The nurse, the patient, the family, the clinical instructor I know my clinical instructor asks every patient at the end, oh, how did that student nurse do? I know my clinical instructor is different from the other ones. It just depends. She will asks the nurse how she worked with you. [24.10]

> *Getting Feedback* contributes to participants *Making Sense of My Learning* which

is the next category in the basic social process.

Making Sense of My Learning

Making Sense of My Learning emerged from the data as things becoming salient

as the result of participants engaging in simulation activities. Participants became

knowledgeable about certain clinical activities after engaging in simulation. If

participants did clinical learning before simulation, the clinical activities may be

replicated or reinforced in simulation. Deliberate practice allowed participants to gain

clarity and *make sense* of things. Participants may not be able to make sense of

significant clinical events without simulation learning making things more salient. This

allowed participants *to make sense of their learning*.

A participant asserted that, because of simulation learning, she could function in a

code situation, *make sense* of what was happening, and engage in emergent patient care

activities:

> Yea that made sense in sim, if I had to do it in real life if I was the only one in the room I would start massage and call for help. I would have known what they would have done before they got in the room. [4.7]

For this participant things came together and they discovered what and how to do things

in simulation, and modify future actions based on their outcomes:

> I didn't think I would know what to do and all of this and it all came together in the end and all the feedback helped you go over everything that you did wrong and what needs to be changed and why it needs to be done a certain way. [12.7]

A participant learned from debriefing and was able to get involved and *make sense* of

things:

> There was a little more in terms of using your imagination and alot of times when you're in the sim room you could say BP is this, and they might not hear you so you need to repeat yourself, but something that I do enjoy is the remediation afterwards and that sort of brings us onto the table. You know in our first code simulation they kind of go in, do the code, remediate and do it again. Then we had to do it again the proper way. I thought I really learned alot from 10 minutes of talking about it. [17.2]

Learning to step back and think was described by a participant as beneficial to *making*

sense of clinical situations:

> That again helps in the clinical setting and you know what to expect. They were preparing us for situations and the things that they could cover. You have to step back and think a little bit. That has definitely helped you think about it. [18.2]

A participant learned to process things and learn from their mistakes. Things would then

make sense in the future because a participant sorted through the process, which helped

reinforce clinical events as:

> I expected myself to do good on the first time. It's beneficial to me that I see a mistake and fix it myself that way in the future I know what I did instead of what somebody told me I did. [21.7]

Making Sense of My Learning was evident when participants engaged in simulation

learning, which led to the next stage of *Fitting Together*.

Fitting Together

> *Fitting Together* emerged from the data as participants making associations

between classroom, simulation, and clinical activities. Simulation fit together and was

evident from the data when participants engaged in the senior level mock code scenarios:

"simulation brought together all the pieces that we have been learning" [14.1].

Participants described high fidelity simulation as a beneficial learning modality that

helped them gain a conceptual understanding of complex patient care events. Simulation

and clinical learning experiences complemented each other and allowed participants to

make connections between simulation and clinical. Fitting together using simulation and

clinical events resulted in certain circumstances "matching up with something" [12.3],

which may allow the ideal circumstance of simulation learning transferring to the clinical

environment. The ability of participants to relate circumstances in simulation to clinical

learning experiences provided evidence that simulation was a beneficial educational

modality.

A participant asserted that simulation and clinical *fit together* well and were very specific

to various clinical experiences:

> Yes, they fit together pretty well. There were specific interventions that we were
> supposed to encounter in simulation that we would encounter in the clinical
> experience, but overall it fit well. That was about alcohol withdrawal. That was
> the mental health one. [3.5]

A participant explained things *fitting* well *together*, but determined that things *fit together*

better in medical-surgical versus mental health. In contrast, simulation was consistently

beneficial:

> Yeah, I think I does fit together really well but I mean sometimes they don't really
> fit together well, it's still good experience to see what a different part it is like for
> mental health. Med-Surg that's they fit really well together and are really helpful.
> [1.9]

A participant described things *fitting together* better in OB versus mental health and

preferred simulation prior to clinical experiences:

> I think normally it fit in well with the material and exactly what we were doing; it
> was kind of, it did match what I thought in clinical but sometimes I think with the
> community one it would be much more useful in the beginning because by
> then I felt like I mastered the interviewing and things like that. The most helpful
> simulation is the one that I had OB. [2.3]

> Simulation provided advanced organizers and deliberate practice for participants

prior to or after clinical. Participants also stated that simulation and clinical activities

seemed to *fit together*: "yea, even different concepts; they fit together nicely" [9.10].

Another participant described things fitting together: "I think they complement each other

because what we are learning in simulation is completely relevant, you know" [8.9].

A participant asserted that classroom content goes together well, although simulation is a

significant contrast compared to clinical. In simulation you do complex and challenging

scenarios which contrasted with "walking around" in clinical:

> I see them fitting together because content always goes together well, they do a
> really good job of that I feel like. What we are learning in class you may get a
> little taste of in clinical. In simulation they take it to the highest degree and
> give you something complicated to figure out. That is where I see it not going
> together. It is completely different. A day of med-surg clinical could be a day of
> walking around and doing real basic assessments and giving oral meds and you
> go to sim and it is like patients are really sick and you have do all this stuff for
> them. [22.6]

A participant explained how simulation and clinical complement each other:

> I think they complement each other because what we are learning in simulation is
> completely relevant, you know, I am not exactly sure where I am going with this.
> In simulation they are trying to give us things that we wouldn't necessarily see in
> clinical and I find that helpful to an extent. [21.6]

Applying My Learning

Applying My Learning emerged from the data as applying previous experience

and knowledge to clinical experiences. Participants were able to apply classroom and

simulation activities to clinical experiences. *Applying My Learning* is also knowledge and

skill that was gained through previous academic experiences, before engaging in

simulation and clinical. Participants, from engaging in simulation and clinical learning

experiences, were able to *apply* their *learning* to patient care situations. Cognitive and

psychomotor knowledge and skills acquired by participants allowed the application of

these abilities to clinical problems.

A participant described simulation learning as an opportunity to use cognitive and

psychomotor skills to then assume the role of the nurse:

> I like, like you said to be able to think for myself. Because you can think you
> know it, I would have done that. Can I take the information out of my brain and
> apply it. I do like the practice. Any practice I will take it. And I just like that I get
> to do more and I don't have to ask my nurse, oh, can I do this. I am the nurse so I
> can give the med. [4.13]

A participant then realized the clinical faculty's commitment to learning, and what the

application of knowledge and skills entails. They also recognized that there is more to it

than just performing in simulation:

> Yes, I really have, and I think to it obvious that the faculty in the simulation lab
> are all very committed and it is not just about you performing something in
> simulation or something; it's about you understanding and being able to apply
> what you learned, they want to help you understand it and apply it. [3.8]

Applying that *knowledge* in clinical was explained by this participant as directly relating

to clinical experiences and being relevant:

> Just being able to apply that knowledge in clinical and I think they do a good job

> with a clinical scenario and that directly relates to your clinical experiences in the hospital. They do a good job at applying scenarios to what you are learning because the highest benefit is the choice of scenarios. [11.9]

Simulation learning was very realistic and allowed transfer and application of knowledge and skills to patients on clinical rotations:

> What we are doing right now and it is very realistic and I was able to say this is what I am doing for my patient and this is what I will do for you. I am able to transfer over this to what I am doing in the simulation and this is what I am doing for my patient. That boosts my confidence even more. [16.8]

Transfer of learning was evident in the situation described by this participant as a phenomenon that is directly related to engagement in simulation learning. Being able to *apply learning* leads to participants *gaining confidence* in their ability to perform patient care.

Gaining Confidence

Gaining Confidence emerged from the data as participants gaining self- assurance when engaged in simulation and clinical activities. Participants were likely to gain confidence as they continued to engage in simulation and clinical experiences throughout the semester. Participants were initially less confident in simulation because performance expectations were consistently greater compared to clinical rotations, although over time participants were generally more confident in simulation. Confidence increased when participants were consistently challenged in simulation to perform at a level that demonstrated competence in various simulated experiences and were challenged to Act Like A Nurse.

A participant commented that their confidence was evolving so they could function in an emergency situation and do things that were helpful until more assistance arrived:

> I feel more confident now, so if a code would happen with my patient I would push the code button, I would not freeze, now I know you press the code button …I am confident I would know what to do in the beginning until everybody else gets there. [4.10-4.11]

This participant obviously *gained confidence* from being involved in various simulation emergency scenarios.

Simulation deliberate practice allowed participants to develop increased confidence whether they were able to successfully complete the various simulation scenarios or not.

The positive and nonjudgmental experiences in the simulation environment allowed participants to *gain confidence*:

> I think one of the main thing it helps is just with confidence because you can think you are really good or really bad at something and you go into sim feeling better about pretty much everything you go over. [12.7]

Another participant credited simulation with an increase in their confidence over the duration of the semester and the development of confidence to perform in simulation:

> I would say, let's see; it just helped me become more confident in my skills. The relationship I built with them and then showing me trust and the confidence I need to do those things. I have the confidence to be confident enough to perform. [18-7-18.9]

Another participant echoed that simulation was a significant factor in *gaining confidence* because of the ability to practice in simulation and it helping develop their cognitive and psychomotor skills with a significant amount of realism:

> … other students in my group and having us split up and now we know more and are confident in clinical because I know I can do that in sim … I don't think I would be as confident as I am today without having the small sim experience to advance; it does help with the confidence part knowing that I can do these skills … they try to make it a realistic as possible and that is very helpful in boosting my confidence. [19.8]

A participant believed simulation fostered confidence because it was a safe environment

where participants could make mistakes and learn to make decisions without harming a

patient:

> I think in simulation it is alot easier to be confident because there is no way I may
> harm someone. I guess some people in simulation would be less confident
> because you are around your peers and your sim might not be up to par. I feel alot
> more confident in sim because, um, I can make my own decisions and I can make
> mistakes. [25.9]

The same participant developed confidence as the semester progressed and clinical

experiences increased, although the participant anticipated that she still needed to learn

much more:

> You are even scared to even walk in the door or; now I feel confident doing my
> IVs, I don't start IVs, but like I feel confident priming IVs, and hanging them and
> giving medications I feel alot more confident in my assessments, so it is different
> confidences, based on what I am doing I guess. I feel confident in both after going
> through so much experience, but if you ask me this a year from now I wouldn't
> say like the same thing. [25.9]

Gaining confidence allowed participants to *Become More Comfortable* which is the next

stage of the basic social process.

Becoming More Comfortable

Becoming More Comfortable emerged from the data as participants gaining a

certain amount of ease and comfort when engaged in simulation and clinical learning

activities. Participants eventually gain some comfort during their undergraduate nursing

education when engaged in simulation and patient care activities. Confidence precedes

comfort for participants, and may not emerge until participants acquire the ability to

perform in a variety of patient care situations. Participants could *gain comfort* to

complete even complex patient care scenarios with the diverse experiences acquired

through simulation learning.

Simulation provided participants the ability to become more self-assured, with a participant describing deliberate practice with simulation as providing the targeted learning activities to gain comfort when confronted with an emergency situation. If some emergency event did happen, the participant believed she/he could perform instead of running around not knowing what to do and feeling uncomfortable:

> … I definitely think it helps make me more comfortable with a particular patient if I had that situation would ever come up. The code simulation is something I really enjoyed it helped so far, as if something could happen. I didn't feel like I would be running around like a chicken with my head cut off. [18.1-18.2]

A participant explained about comfort evolving over time in clinical and then realizing the semester was completed:

> In clinical I think the confidence is definitely built; so starting out I remember being so nervous because I never really have dealt much with patients in a clinical setting before. Yea, it definitely grows throughout the semester as you get more comfortable and it stinks because by the time your super comfortable your clinical is over. I think that stinks a little bit. [17.9]

Simulation offered participants the ability to be *comfortable* doing things. Simulation allowed participants to feel comfortable engaging in deliberate practice that is unencumbered; then participating in a debriefing session to get valuable and constructive criticism:

> Yeah, I think so, I mean like it helps with feeling more comfortable doing it because I mean in the beginning I find myself kind of guessing myself because I always confirm with the nurse and my instructor. In simulation we are just doing what we are doing and then post conference when we do that is when they tell us like the things we did right and wrong. [1.15]

Becoming More Comfortable allows participants to continue to increase the probability that they will acquire the ability to *Know What To Do,* which is the next stage in the basic

social process.

Knowing What To Do

Knowing What To Do emerged from the data as participants being able to perform in various situations, as a result of simulation and clinical learning. Participants learned what to do in simulation by being presented the theoretical knowledge in the classroom and practicing various simulation scenarios. Participants also described the necessity of being prepared if something happens, and having the knowledge to care for patients in the clinical environment. The ability of participants to acquire the knowledge and skills necessary to progress to *Knowing What To Do,* from simulation learning, provides participants the ability to apply this knowledge and skill in clinical practice. Participants also described the necessity of being prepared if something happens and having the knowledge to care for patients in the clinical environment when things happen. A participant explained that being independent and *knowing what to do* was a positive feeling, and that they now had the confidence to advance their learning:

> I am like it is great because now I really know I can be independent and that I can know how much I know and I know I can do this myself and I do know the fundamentals of this area, but I should look back into what I should research further or something else. [16.2]

The same participant felt prepared while in pediatric and community clinicals and felt confident about the ability to function in a competent manner. The participant also explained that they could successfully handle a clinical situation from beginning to end:

> I would say from a scale of one to ten as a nursing student that my competence is like eight or nine for both of those so because I know what I am doing, where I am going, and how I will handle the situation. [16.8]

A participant explained the value of *knowing what to do* because of simulation learning.

When dealing with a pediatric patient, a participant realized that respiratory distress was a

precursor to cardiac arrest. This participant also realized that acquiring this knowledge

and assessment skill was important to learn in simulation. This participant then felt

prepared to care for a pediatric patient, as a consequence of simulation learning:

> Having the knowledge now I need to look for respiratory distress before a cardiac arrest and you think it would happen more often because we have only taken adult patients until now; so it's the opposite having that simulation experience really helped because we talked it over with our instructor. She described to us what is the most important thing for a pediatric patient and that she was very helpful to have gained that knowledge from sim because I would not have had the knowledge until I had clinical. [19.6]

A participant asserted that simulation provided the knowledge and skill to perform in

clinical. This participant gained the ability to *know what to do* over the semester and

progressed from not really understanding things to gaining confidence in their ability to

function as a nurse:

> In our first clinical we weren't good at it and we were really awkward with it. I goes both ways and it's like simulation has helped me do better in actual clinical. Now that we have sim labs were the last one and alot more confident and know what to do. [8.1]

The same participant explained that simulation was important to *knowing what to do*:

> Yes, it was a very textbook example of what would happen in a … if somebody was having a postpartum hemorrhage; so we all knew what to do; like we studied exactly what to do. [8.2]

Classroom learning provided the theoretical knowledge of what would happen in

an obstetrical emergency. Simulation learning allowed this participant to study exactly

what to do when confronted with a complex clinical problem.

Another participant determined that complex simulation experiences enhanced

their ability to function in clinical emergencies, like during a code blue. The participant

acquired the ability to deal with a patient in significant distress; this was evident because of extensive simulation experiences.

The ability to process and communicate a complex situation was evident as explained by this participant:

> I had a rapid response once that it helped knowing the code blue from simulation and everyone that comes in, someone has to be the one that is charting it and everything that is happening and somebody has to be the nurse, who explains to the nurse, that comes in, what has been happening. [24.4]

The results from this study defined the process by which simulation learning transfers to the clinical environment in undergraduate nursing students; also the results validate the value of simulation. The next section will describe the necessity of rigor in qualitative research.

Assessing Rigor of the Study

The classical grounded theory method was utilized to allow the generation of a theory that has grab and is interesting (Glaser, 1978). Glaser and Strauss (1967) emphasized the theory must satisfy four criteria: fit, workability, relevance, and modifiability. A new theory will become evident because the data will generate categories that lead to an understanding and discovery of a particular phenomenon. The criteria are addressed in this section along with the grounded theory study components to confirm rigor of the study.

Rigor is defined as a structured analytic process to gain an understanding of what the data convey (Glaser & Strauss, 1967). Rigor in qualitative research is associated with methodological commitment to the process and consideration of the emerging data (Glaser & Strauss).

Glaser and Strauss (1967) also defined rigor as *credibility, plausibility,* and *trustworthiness. Credibility* is accuracy in fit and relevance. *Plausibility* is detailed elements of the actual strategy for data collection. *Trustworthiness* is when a conceptual framework forms a systematic theory. Glaser and Strauss (1967) further concluded that rigor is evident because qualitative data often result in a *de facto* (p. 235) conclusive analysis rather than a preliminary one. Guba (1981), defined the processes that contribute to rigor: credibility, dependability, conformability, and transferability.

Similarly, Lincoln and Guba (1985) defined the components of rigor that are aligned with Glaser and Strauss (1967). The components of rigor to establish trustworthiness are: (a) *credibility* is prolonged engagement, persistent observation, triangulation, peer debriefing, negative case analysis, referential adequacy, and member checks, (b) *transferability* is thick description of data and specification of minimum elements, (c) *dependability* is inquiry and, fiscal audit, accuracy of records, and data support of conclusions, and (d) *confirmability* is audit, reflexive journal, findings grounded in data, clarity, explanatory power, and utility of category structure.

Using the classical grounded theory approach (Glaser & Strauss, 1967) the researcher used the constant comparative method to generate a substantive theory. *Credibility* was established when the data that emerged from analysis fit the BSP. Data then generated a theory that was relevant and a reflection of the data generated from participant interviews. *Plausability* was demonstrated when the researcher adhered to the four stages utilized in the constant comparative method (Glaser & Strauss, 1967) which are: (a) comparing incidents applicable to each category, (b) integrating categories and

their properties, (c) delimiting the theory, and (d) writing the theory.

The researcher using the Lincoln and Guba (1985) criteria established *credibility* when the data emerged through member checks and referential adequacy. *Transferability* was confirmed when the data provided a thick description and specification of minimum elements. *Dependability* was evident when the study data supported the conclusions. *Confirmability* was evident because the theory generated had explanatory power, was grounded in the data, and provided clarity.

Table 1 compares trustworthiness criteria of Glaser and Strauss (1967) and Lincoln and Guba (1985).

Glaser and Strauss (1967)	Lincoln and Gaba (1985)	Evidence
credibility	credibility	Data fit the basic social process and generated a theory. Salience, scope, and depth of categories emerged
plausibility	dependability	Incident applicable to each category, accuracy of records, verification of bottom line, data supported conclusion, delimiting the theory
trustworthiness	transferability	Data forms a systematic theory, provides thick description, specification of minimum elements
trustworthiness	confirmability	Substantive theory emerged that adhered to rigor, audit trail was evident, findings grounded in the data, clarity, and explanatory power were confirmed

The theory generated through data analysis, revealed the categories and properties of each category that made logical sense and fit together. The data analysis did not conclude until it was determined the theory generated was a reflection of the data. The quotes cited were used for illustration, with the data being grounded in the events. Furthermore, trustworthiness became evident because the data in the study formed a systematic theory about the process by which simulation learning transfers to the clinical environment in undergraduate nursing students.

The findings represent the participants' perspective. Fit became apparent as the theory emerged from the data. Relevance also became apparent because the conceptualization generated a significant phenomenon that became evident as participants engaged in simulation learning. The theory that emerged in this study also demonstrated dependability. For example, if a nursing student engages in simulation learning, her/his ability to practice will result in significant feedback, which will foster the process of things making sense, fitting together and being able to apply learning. This results in students gaining confidence; becoming more comfortable, with the outcome of knowing what to do. This process and outcome were supported by emergent categories and confirmed by an expert in ground theory methodology, with consideration of alternative explanations.

The data generated resulted in the emergence of abstract concepts that resulted in discovery of a theory that is significant and will enhance nursing educators' teaching strategies. The theory generated is relevant to other specialties within the healthcare environment.

The theory generated may be relevant to other disciplines in health care because the data revealed that simulation was a significant opportunity for students to engage in learning experiences that may transfer to the clinical environment. Clinical experiences enhanced, and reinforced, simulation learning. Participants in this study, over time, were exposed to a variety of simulation practice scenarios, assumed responsibility for patient care, and eventually knew what to do.

Finally, the ability to gain experience in a simulation learning environment encouraged deliberate practice, in a safe and realistic environment, that allowed participants to learn from their mistakes which resulted in participants gaining confidence. Participants were then comfortable enough to function in the clinical environment with the ability to know what to do when confronted with a clinical problem.

Chapter Summary

This chapter defined the process by which simulation learning transfers to the clinical environment in undergraduate nursing students. The core category, Acting Like A Nurse, and the ten categories and their properties were presented. The participant interviews provided confirmation of the process by which simulation learning transfers to the clinical environment. The components of a grounded theory study were then described as essential to the generation of a relevant theoretical model to support simulation and transfer. In the subsequent chapter, previous literature will be discussed as it relates to the findings, how the findings contribute to nursing knowledge, and implications for nursing education, research, administration, and clinical practice.

CHAPTER FIVE

DISCUSSION

The purpose of this chapter is to discuss the key findings of the grounded theory study of the process by which simulation learning transfers to the clinical environment in undergraduate nursing students, and how these findings relate to previous findings in the theoretical and empirical literature. The model and core category are discussed, then the ten categories are discussed along with previous literature findings and unique discoveries from this research study. In conclusion, the chapter will discuss limitations and strengths of the study and implications for nursing practice, education, administration, and future research. The model from chapter four is reproduced below.

Acting Like A Nurse

Getting feedback

which led to

Being in simulation ⟷ Being able to practice ⟶ Making sense of my learning ⟶ Gaining confidence

Fitting together

Being in clinical

Applying my learning

Becoming more comfortable
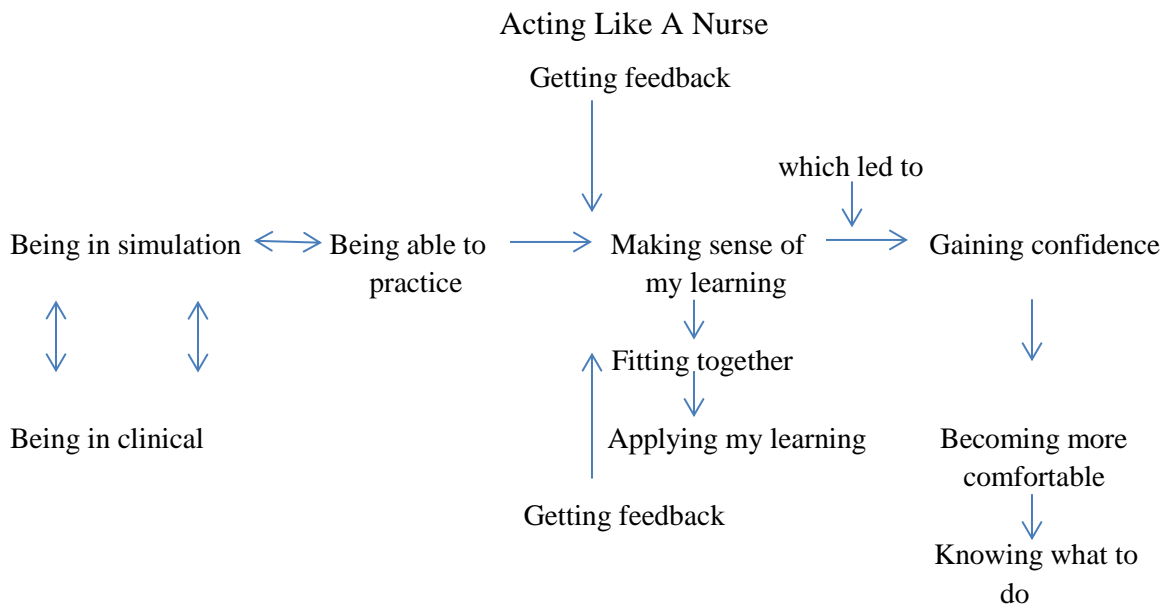
Getting feedback

Knowing what to do

Figure 1. Model of the process by which simulation learning transfers to the clinical

environment in undergraduate nursing students (From Chapter 4).

   Being in Simulation allowed participants to apply information and learn how to handle clinical situations, where they are required to Act Like A Nurse. *Being in* Clinical allowed participants to *experience it for real* although clinical experiences may be *only observing* and *not doing.* When participants engaged in simulation learning, it allowed them to acquire deliberate practice. *Being Able to Practice* was the process by which participants learned by doing things, rather than observing, and were able to practice several times rather than only once. *Getting Feedback* emerged from simulation and clinical experiences as beneficial, with both positive and negative components. Participants wanted to be told, how to improve their performance, rather than always receiving positive feedback. *Getting Feedback* set conditions for participants as they were *Making Sense of My Learning* which emerged from the data as things becoming salient and participants thinking that things were coming together in the end.

   Participants described things as *Making Sense* with the learning experiences they encountered in simulation and clinical. If participants were not able to practice and get feedback, they were not as able to make sense of their learning. Participants were then able to experience *Fitting Together,* which emerged as things matching up and complementing each other. Participants fit together classroom and skills lab activities with simulation learning, that then matched up things with clinical experiences. Simulation learning reinforced theoretical knowledge and participants were connecting content to experience with events they may be exposed to or experience in clinical. The ability to fit things together provided participants the ability to transfer simulation

learning to the clinical environment. *Fitting Together* was a significant cognitive process in the basic social process of Acting Like A Nurse. Participants were then able to *Apply My Learning* to clinical events. *Apply My Learning* was using cognitive skills in the application to clinical problems. Participants were able to transfer over things to patient care. Understanding and application emerged from this category. This resulted in participants *Gaining Confidence* in their ability to complete patient care activities with a feeling they would be competent to perform in a safe and effective manner. Over time participants move toward *Becoming More Comfortable* that they are not going to make mistakes or harm patients. The final stage in the basic social process was *Knowing What To Do.* Participants had the knowledge and skill to deal with a clinical situation and feel comfortable and prepared to respond in emergent and routine patient care.

Core Category

Acting Like A Nurse emerged from the data as the core category in the process by which simulation learning transfers to the clinical environment in undergraduate nursing students. Participants used the phrase "being in charge" and "be on your own" to refer to the feeling of assuming the role of the nurse when engaged in simulation learning. Acting Like A Nurse reflects the importance that simulation learning provides to participants when they learn to take responsibility for their actions and are called on to do exactly what a nurse would do when providing patient care. This contributes to participants' ability to transfer simulation learning to the clinical environment. The opportunity to "be the nurse" exposed participants to the necessary knowledge and skill required to function as a competent nurse and prepares them for their eventual practice.

The basic social process that emerged from the study provides a conceptual understanding and insights into the actual process by which simulation learning transfers to the clinical environment in undergraduate nursing students. To date, most simulation studies in nursing and other disciplines have been quantitative studies with still emerging evidence of validity. Also, various qualitative studies have lacked sound methodology, although the value of simulation learning was evident.

Expectations by various stakeholders suggested a change in nursing education was needed to optimize transfer of learning and was critical to safe and quality nursing care. The AACN (2008; 2009) determined simulation was a significant way to improve student communication, assessment abilities and was identified as a way to actively engage students in their learning. Acting Like A Nurse, with simulation learning, enhanced participant learning and is aligned with the AACN recommendations.

Acting Like a Nurse in simulation may help the formation of clinical judgment in a realistic environment. The participants experience in the clinical environment is variable and participants were often in the position of *only observing* and *not doing*. When the participant could be Acting Like A Nurse in simulation, participants take on the role of the nurse, think on their own, and it becomes their responsibility to respond to various simulation learning situations; that is most importantly the opportunity to be the nurse. Further, the opportunity to Act Like A Nurse will foster the transfer of simulation learning to the clinical environment and preparation for eventual practice.

The core category Acting Like A Nurse reflects the basic social process by which simulation learning transfers to the clinical environment in undergraduate nursing

students and encompasses the ten categories: *Being in Simulation, Being in Clinical, Being Able to Practice, Getting Feedback, Making Sense of My Learning, Fitting Together, Applying My Learning, Gaining Confidence, Becoming More Comfortable, and Knowing What To Do.* These ten categories and their properties are discussed in the next section with how these relate to the previous literature.

Categories

Being in Simulation

In the beginning stage of Acting Like A Nurse, the participants are being *able to experience things,* and *being able to make mistakes* while *being in a safe environment.* The category *Being in Simulation* indicated that participants' are engaging in simulation learning activities that helped them develop cognitive and psychomotor skills.

Being in Simulation was identified as an essential learning modality to address competencies in undergraduate nursing students. Cronenwett et al. (2007), with support from the Robert Wood Johnson Foundation, proposed Quality and Safety Education for Nurses (QSEN) to address the necessary educational components to develop competence in pre-licensure nursing students. Experiences of nursing students should be improved to be enhance the quality and safety in the health care environment. After developing QSEN, nursing faculty members determined that the competencies for nursing students should be aligned with the 2003 IOM report, which were; patient centered care, teamwork and collaboration, evidence-based practice, quality improvement, safety, and informatics. The addition of safety to nursing competencies, by the QSEN faculty members, was a significant addition to the essential features of competent nursing

practice. The QSEN faculty proposed in 2007 that a statement of knowledge, skills, knowledge, skills, and attitude (KSAs) should be educational goals for undergraduate nursing education.

This category had the additional properties of *being able to experience things* which emerged as students getting the opportunities to experience relevant clinical situations that they may or may not encounter in clinical rotations. *Being able to make mistakes* is participants' not worrying about the consequences of their actions and knowing if they mess up they can learn from that. The third property of *Being in Simulation* is *being in safe environment* where the students know they may not harm someone.

Researchers have used simulation to advance nurses' knowledge and skill. Farnsworth et al. (2000) used HPS to teach nurses analgesic sedation skills. This was a nontraditional method that demonstrated the transfer of knowledge and skill using simulation. Similarly, simulation was used as a method of deliberate practice when Howard (2007) used an interactive case study compared to HPS when teaching nursing students; this supported simulation as a more targeted strategy for increasing students knowledge of medical-surgical nursing. This also validated simulation as a positive teaching strategy that could lead to the transfer of knowledge to the clinical environment.

After decades of simulation usage, it was discovered that the acquisition of the theory and knowledge relevant to simulation learning experiences should precede the simulation scenarios. Rogers (2004) used simulation to help medical students learn to manage and assess life threatening illness more effectively. Rogers determined medical

education has been authoritarian and non-interactive which doesn't contribute to critical thinking. Simulation allowed students to experience things in a realistic environment.

Furthermore, previous theoretical literature supported the premise that being in simulation was beneficial to student learning. The qualitative studies of Johnson et al. (1999), Bremner et al. (2006), Schoening et al. (2006), and Lasater (2007) concluded that simulation learning helped students experience essential clinical experiences, develop problem solving and critical thinking skills, and allowed the practice of psychomotor skills. The quantitative studies of Alinier et al. (2006) and Brannan et al. (2008) compared simulation learning to a traditional curriculum in undergraduate nursing students with statistical differences being evident to support simulation learning.

Field (2004) determined the value of learning from clinical experience alone may be inadequate and that simulation could provide mentor support, rich dialogue, and adequate time for reflection. Larew et al. (2006) also utilized a simulation format that incorporated a simulated patient with several cues pointing to an actual problem; which allowed nursing students to develop their critical thinking skills.

Jeffries (2007) asserted that simulation learning supplements clinical learning and sets the stage for students to work with authentic problems, synthesize data, make good clinical decisions and reflect on their practice. Benner et al. (2010) also concluded that simulation can contribute to learning in context that requires the student to respond to the simulated patient; which can help students develop patient care skills and foster an understanding of significant clinical issues.

Being able to experience things allowed participants to experience things that they

had not experienced in clinical and may not be exposed without simulation. These experiences are unique to simulation and allowed participants the ability to acquire the knowledge and skill that is relevant to clinical practice. Active learning is encouraged by simulation activities and supports the constructivist position in student learning. *Experiencing things* in simulation has the advantage of being an active approach to learning which is an interactive process that allows active engagement of students, necessitates problem solving, and fosters discussions (Rogers, 2004).

Being able to make mistakes emerged as a property where participants were not worried about the consequences of their actions, and if they "messed up" they would learn from that. Simulation learning provided an educational modality where students could make mistakes on the manikin without harming a real patient. Participants felt free to make mistakes and if they made a mistake they would not forget it, although participants acknowledged the need to prepare for simulation similarly to clinical. Making mistakes in simulation allowed for really specific feedback to foster improvement. Another property of *Being in Simulation* that emerged from the data is *being in a safe environment.*

Being is a safe environment emerged as practicing without there being any consequences; with a chance to learn. Participants determined that they would not harm or endanger a patient because it was a simulation learning environment. Participants determined that simulation was an optimal learning environment because you can just work out things with the opportunity to practice; with support from the simulation staff.

The NCSBN study of Hayden et al. (2014) and NLN sponsored study of Jeffries

and Rizzolo (2006) are often cited studies that support simulation learning. Nursing students engagement in simulation was thought to be equivalent to clinical rotations and beneficial to the process of learning, although the findings of this study supports the value of clinical rotations. Simulation learning emerged from the data as a necessary component of nursing education that provides a learning environment that relates theoretical knowledge to a clinical problem. *Being in Simulation* emerged from the data as an educational modality that fosters transfer of learning to relevant clinical problems, provides a context of recall to facilitate transfer, allowed the participant to discriminate relevant from nonrelevant knowledge, and provides a mental set useful in solving clinical issues.

Transfer of learning assumes the learners will apply knowledge and skills to the clinical setting. Application of one set of knowledge and skills to a similar or different setting is also a premise of transfer of learning (Thomas, 2007). Transfer of learning requires the application of initial and past learning (Haskell, 2001). Further, transfer of learning is at the foundation of learning, thinking, and problem solving and is a core concept in learning that involves both process and outcome (Leberman et al., 2006). The components of *experiencing it for real, only observing,* and *not doing* were evident in the next stage: *Being in Clinical.*

Being in Clinical

Being in Clinical is another stage in the basic social process. *Being in Clinical* emerged from the data as only things that participants experience in clinical. As an example, participants were exposed to real patients that they were able to converse with.

Three properties of *being in clinical* emerged as *experiencing it for real, only observing,* and *not doing.*

In *experiencing it for real* the participants were exposed to learning experiences that were authentic and not simulated. Benner (1984) asserted that nurse educators need to place a greater emphasis on clinical experiences. Benner et al. (2010) also adopted simulation as a high stakes learning environment that was similar to experiential learning that would help students develop the complex skill and knowledge required to react to the variability encountered in clinical situations. The authors also concluded that simulation could provide clinical referents, help make connections, and expand theoretical knowledge in nursing students.

Clinical rotations for participants provide varied experiences and helped participants put things together. Emotional experiences, such as a person dying were more impactful in the clinical environment. A participant described a young cancer patients positive reaction to a professional baseball player as something that you couldn't get in simulation. *Experiencing it for real* was in significant contrast to the next property of *Being in Clinical* which was *only observing.*

Only observing emerged as participants only watching during their clinical experience. Some participants perceived *only observing* as a positive experience because they were engaged in passive learning. Participants were observing the various roles of the nurse and gaining a perspective of various clinical environments throughout the hospital. The potential to learn and apply knowledge was less likely because participants were relegated to a passive role, which is not the optimal learning situation. Participants

described that following around nurses left them clueless, although certain rotations, such as ICU, participants anticipated they would only observe. The next property of *Being in Clinical* emerged as *not doing* which refers to not engaging in procedural experiences in clinical.

Not doing emerged as not engaging in any nursing care or procedures when on certain clinical rotations. Participants *not doing* things on various clinical rotations accentuates the importance of simulation learning for participants' development of the knowledge and skill to function in the clinical environment. Hayden et al. (2014) concluded that simulation may be equivalent to clinical rotations in knowledge and skill acquisition, readiness for practice, and NCLEX pass rates. *Being in Clinical* experiences were variable and inconsistent, which illuminates the importance of *Being in Simulation.* *Only observing* and *not doing* in clinical demonstrates the importance of participants *Being Able to Practice* with simulation.

Being Able to Practice

Being Able to Practice emerged from the data as a deliberate, repetitive behavior, using simulation. Participants described simulation as a chance to practice and experience things. Practice in simulation allowed the reinforcement of theoretical information and the development of cognitive, affective, and psychomotor skills.

The acquisition of skill, knowledge, and clinical judgment using simulation is supported by Benner's (2004) and Ericsson's (2004) positions of deliberate practice: connecting theoretical knowledge to clinical practice. The theoretical framework of nursing practice developed by Benner (1984) used the Dreyfus and Dreyfus (1986) model

to describe the progression from novice to expert practice. Benner (1982) defined the progression across the levels of skilled performance as reliance on abstract principles with the eventual use of concrete experiences to enhance understanding. Initially everything seems important, although eventually only certain parts are relevant. Benner's theoretical framework also asserted that undergraduate nursing education should place a greater emphasis on clinical experiences rather than lectures, although data that emerged from this study indicated that clinical experiences for participants did not provide the necessary practice that participants needed to gain significant clinical skill and knowledge. However, Benner's work was at a time when simulation use was not widespread and the two primary and available modes of instruction in nursing education were classroom and clinical learning.

Multiple studies support simulation as a method of deliberate practice. Barsuk et al. (2009) used simulated based education to improve procedural competence in CVC insertion in second and third year-medical residents over a 32 month period. CRBI decreased to .50 infections per 1000 catheter days from 5.03 infections per 1000 catheter days. Procedural skills and knowledge were enhanced using simulation in medicine.

Fraser et al. (2011) explored whether training on a CPR simulator improved diagnostic performance in 86 first-year medical students. Auscultation and diagnoses of cardiac abnormalities were enhanced through simulation learning. The authors concluded that to maximize learning gains and transfer to the clinical setting, the principles of metacognition and situated learning should be applied to simulator training; which then influences positive outcomes. Simulation was used as a method of deliberate practice in

medical students to enhance their diagnostic skills and knowledge.

Skills and knowledge in cardiovascular assessment were explored (Jeffries et al., 2011) in APN students. Using simulation, APN students exposure to simulated CPR skills resulted in a 22% gain in knowledge. Overall deliberate practice with simulation helped APN students improve their cardiovascular knowledge through deliberate practice.

In another study with nursing students, Oermann et al. (2011) examined the effects of deliberate practice on CPR skills in a multi-centered trial with 666 nursing students using a voice activated manikin (VAM). The authors concluded that deliberate practice with simulation fostered learning and transfer of skills to clinical practice.

Further, these four studies confirmed that simulation was an effective method to advance the knowledge and performance of nursing students: Barsuk et al., 2009; Fraser et al., 2011; Jeffries et al., 2011; Oermann et al., 2011 concluded that simulation based training is helpful in training nurses and physicians, application of situated learning and metacognition is beneficial in simulator training, and deliberate practice with a simulator helps students improve their knowledge and skill. The goal of simulation based deliberate practice is to encourage learning and transfer to the clinical environment. These studies support simulation as an important modality in *being able to practice* for nursing and medicine, including students physicians.

In another discipline, Ivancic and Hesketh (2000) used simulation to teach young drivers their driving skills. The realism of simulation decreased anxiety and improved performance of inexperienced drivers. In medicine, Hammond et al. (2002) asserted high

risk areas such as ER and surgery, which were difficult to gain deliberate practice

because of the variables of pressure, time, and stress were a poor context for novice

learners because of complex problems, variable patient acuity, and a large amount of

uncertainty. This assertion supports simulation as a valuable method of deliberate

practice. Also, in medicine, Seymour et al. (2002) used virtual reality to enhance surgical

residents operating skills. This provided an avenue for deliberate practice of surgical

skills for surgical residents. Residents that engage in simulation had a significant increase

in operative skills.

Similarly, in veterinary medicine training, Zemljic (2004) used simulation with

veterinary students as deliberate practice to refine their skills. Animal models were not

readily available to practice surgical skills and presented ethical issues. Euliano (2000)

also determined that HPS simulation has become essential with the discontinuation of

animal laboratories and identified the necessity to develop HFS, with simulation being an

adjunct to experiential learning. Simulation allowed students the experience of *Being

Able to Practice.*

Simulation usage is as a method of deliberate practice to enhance quality and

safety in health care. Educators should teach what is applicable over time and contexts,

not just to a similar or immediate context. Ziv et al. (2003) concluded that simulation use

in medicine will increase due to the potential for rehearsal and skill evaluation, the ability

to decrease the risk to real patients, and the necessity to practice a wider range of skills.

In another discipline, Smith et al. (2012) used simulation to teach physical therapy

students electrocardiographic recognition. Physical therapy students determined this

simulated practice was beneficial and enhanced their knowledge of electrocardiogram interpretation.

When participants were able to practice they were prepared for various clinical scenarios and it may be the only time they would have the opportunity to "experience things" in a realistic environment. Benner et al. (2010) determined that deliberate practice was essential for students to be prepared for a particular task and capable of functioning in a role, gain a sense of salience (what is notable and significant), and have the ability to apply things to their patients, which results in them setting priorities and understanding clinical events. The structure and uniformity of simulation learning provided participants the ability to receive input which leads to the next stage in the learning process, which is *Getting Feedback.*

Getting Feedback

Following the beginning stage, the middle stage of simulation learning and transfer reflects the participants receiving input and constructive criticism when engaged in simulation. *Getting Feedback* emerged as participants acquiring insight into their progress and interacting with faculty. Simulation feedback was more constructive and positive according to the participants. *Getting Feedback* included constructive criticism and information about the progress, or lack of progress, participants were making when engaged in simulation and clinical learning. Participants believed that simulation feedback was overwhelmingly positive, although participants preferred negative feedback with a more explicit explanation of what could be done better next time.

The debriefing aspect of simulation was described as more detailed and

instructive about what participants did right and wrong. In clinical rotations, feedback

was difficult to obtain from clinical instructors, because faculty have a large number of

students to evaluate, so it is difficult for clinical instructors to provide constructive

feedback about participants performance. Some clinical instructors used a creative

approach of asking the nurse who the student is working with in clinical, the patient, and

the patient's family how the student performed at the end of the day, so they could gain a

perspective how the student was progressing. Feedback in clinical was variable and not

detailed like simulation feedback. Participants described simulation feedback as a more

accurate picture of a students progress. Simulation offered participants feedback from

their peers and resulted in varied viewpoints.

The essentials of debriefing in simulation learning were explored by Dreifuerst,

(2009). Debriefing is when students and faculty examine simulation or clinical

encounters and it fosters the development of reasoning and judgment skills through

reflection (Dreifuerst, 2009). The author further stated:

> With limited clinical time, inconsistent exposure to different types of
> patient situations, and little time available to interact with faculty,
> students may have few opportunities to link classroom content to
> clinical practice through experiential learning. By providing opportunities
> to review events and make visible their meaning, debriefing offers a way
> to draw out student thinking and help students develop their complex
> decision-making skills. While reflecting is thought to be an innate learning
> experience, not all learners do it consistently or thoughtfully enough for
> it to be a significant learning event. (p. 110)

Multiple authors have supported simulation as way to *get feedback* (Henneman &

Cunningham, 2006; Jeffries, 2005; Jeffries & Rogers, 2007; Rudolf, Simon, Rivard

Dufresne, & Raemer, 2007; Seropian, Brown, Gavilanes, & Driggers, 2004).

Dreifurst (2009) further asserted that students should be coached to accept feedback, using a non-threatening manner, to enhance affective and behavioral learning. Debriefing is constructive, focused, and remains positive for undergraduate nursing student when engaging in simulation learning. Jeffries and Rizzolo (2006) determined that the best education practices (Chickering & Gamson, 1987) of collaboration, fidelity, and feedback were an essential component of simulation learning. Feedback in simulation allowed participants to engage in a process of self-evaluation and reflects on the simulation scenarios completed. Feedback was determined to be very helpful by multiple participants and enhanced the participants ability to assess their knowledge and skills. When participants were *Getting Feedback,* things became apparent so participants could *Make Sense* of their *Learning.*

Making Sense of My Learning

Making Sense of My Learning emerged from the data as things becoming salient as a result of simulation learning, and things making sense in simulation. Participants gain clarity about various clinical situations after engaging in simulation learning. *Making Sense of My Learning* was critical to gaining a perspective about significant clinical events. In high risk clinical events, such as a cardiac arrest, things came together in the end and participants discovered why things need to be done in a certain way and what to do. Deliberate practice in simulation learning allowed participants to engage quick thinking and use cognitive skills to sort through a simulated clinical problem.

Simulation experiences allowed a participant to learn the actual scenario forced participants to be responsible, which again helped participants gain clarity. The

preparation for situations allowed participants to know what to expect, and allowed them to step back and think a little bit. This reflection and acquisition of new knowledge was not supported by Jeffries and Rizzolo (2006) position that simulation was designed to give students an opportunity to acquire knowledge, although this position is aligned with making sense because simulation learning and may be directed toward synthesis and application of current knowledge, rather than the acquisition of new knowledge (Jeffries & Rizzolo). The results from this study support that participants do *make sense* of their *learning* and may be able to apply this learning to clinical problems.

Making Sense of My Learning may have allowed the potential for skills transfer and gave participants the knowledge and the ability to augment transfer. Using health care professionals, Wilson et al. (2009) asserted simulation provided insight into the patients experience of neurodisability to health care providers. Simulation encouraged empathy and personal reflection. It also increased health care providers awareness, and encouraged empathy, following the simulation intervention. Students were able to make sense of their learning by engaging in simulation learning, which provided realistic experiences for students. Schoening et al. (2006) used simulation to allow nursing students to experience the high risk condition of preterm labor. The authors concluded that simulation provided realistic practice that allowed students to make sense of their learning and was an effective and innovative strategy for nursing students.

The ability to sort things out and fix things in simulation further allowed participants to gain an understanding, through simulation, about significant nursing care issues. The NLN position in 2003 supported the notion that nursing education needs to

facilitate an environment that fosters reflection, critical thinking, and the use of

technology to educate nursing students. Simulation has the potential to engage nursing

students, which resulted in participants *making sense* of their *learning.*

The AACN (2008) also recommended simulation as a way to actively engage

nursing students in their learning. Active learning, specifically constructivism supports

the learners knowledge and structure as a way to interpret, reflect, and evaluate

meaningful experiences. Macaulay and Cree (1999) determined that schema is

knowledge stored in memory, in the form of mental models, and is an essential data

structure necessary for representing concepts. *Making Sense of My Learning* is essential

to the development of mental models that guide performance. The ability to *make sense*

of things occurs over time, requires reflection, and knowledge acquisition. When *making*

sense of their *learning,* participants were able to progress to *Fitting Together* things.

Fitting Together

Making associations between simulation and clinical activities emerged from the

data as *Fitting Together.* Participants explained that simulation and clinical learning fit

together and were a perfect match that allowed things to come together. *Fitting Together*

of various simulation and clinical experiences can foster the transfer of learning of skills

and knowledge to similar, and different, circumstances. A significant issue in nursing and

other disciplines is students taking responsibility for their learning through active

learning (Stevenson & Gordon, 2014). Simulation activities encourage active learning

and support student learning. Simulation also allows the application of initial and past

learning (Haskell, 2001). *Fitting Together* may foster transfer of learning, which is an

essential component of learning and involves process and outcome (Leberman et al., 2006).

Simulation is a tool that connects theory to practice and positively affects nursing student outcomes which supports constructivism as the learner's knowledge structure as a way to interpret, reflect, and evaluate meaningful experiences. Kaakinen and Arwood (2009) suggested that educators should design learning opportunities for nursing students that focus on knowledge and skill acquisition. Furthermore, performance is enhanced with learning for understanding and information will be more useful if it is presented in the context of problem solving (Bransford & Stein, 1993; Brown & Kane, 1988).

Fitting Together fosters the transfer of information and skills in one setting to a different or similar setting (Thomas, 2007). Transfer is the ability to learn a behavior that will be replicated in a new situation. Detterman (1993) determined transfer can be distinguished in two important ways: (a) near transfer; which is transfer to an identical or similar situation compared to the original learning and new situation, and (b) far transfer, the transfer of a learning activity to a dissimilar or new situation. Detterman further defined transfer as specific and nonspecific. Specific transfer occurs when content learning is transferred to a new situation. Nonspecific transfer occurs when strategies or principles transfer to a new situation which also could be called general transfer (Detterman).Viewing transfer on a continuum of situations progressively more different from original learning is helpful in thinking about near and far transfer (Detterman). The participants engaged in simulation and clinical experiences, where transfer was likely to occur, clearly described things *Fitting Together*.

Fitting Together for participants also supports the notion of far transfer. Far transfer supports transfer through principles that create variety and an understanding of the underlying principles of a particular behavior. Content and instruction design are important and necessary components supporting near and far transfer with *Fitting Together* being a critical component of transfer of learning. The stage that follows *Fitting Together* is *Applying My Learning*.

Applying My Learning

The application of previous knowledge and experience from simulation learning to clinical circumstances emerged from the data as *Applying My Learning*. Participants were able to apply previous simulation experiences, and apply skill, and knowledge to clinical events. This application of learning with transfer to similar or dissimilar circumstances may be possible using simulation activities.

Johnson et al. (1999) determined the purpose of clinical simulation was to allow students to synthesize and apply knowledge across a variety of settings. Students response to simulation was positive. Weller (2004) determined simulation was beneficial because it allowed the application of theoretical knowledge to patient management scenarios. Also, knowledge application in a realistic and safe environment may lead to the development of a systematic approaches to problem solving (Weller).

In medicine, Scalese and Issenberg (2005) also described the use of simulation to help veterinary medicine students acquire and refine clinical skills. Animal models were humane to use compared to students applying their learning to live animals.

Bensfield et al. (2012) asserted that a consistent, high quality education

experience was necessary to produce professional, safe, and competent nurses. The authors further determined simulation was a way to decrease the variability prevalent in nursing education. HFS was used for a summative evaluation in 100 baccalaureate undergraduate nursing students at a large Midwestern University. This study asserted that simulation was a way for students to apply their learning and allowed educators the ability to evaluate students through simulation learning. The authors similarly concluded that it was necessary to determine whether students could apply their learning.

Applying My Learning is congruent with the ability to transfer. The ability to transfer is based on memory and the application of previously acquired knowledge (Cormeir & Hagman, 1987). The ability to transfer was described by Cormier and Hagman as: (a) the structure of the learned task and its relationship to the transfer task, (b) using generalization and discrimination to represent the training task and determining whether the encoding conditions foster learning, (c) conditions at retrieval that influence access to and application of appropriate knowledge, and (d) background knowledge helps the subject, which may result in the successful application of knowledge and transfer.

Cognitive processes drive the transfer of learning, which are a complex and dynamic phenomenon. Applying learning is dependent on thinking and problem solving (Singley & Anderson, 1989). Individuals must learn to apply learning in a task specific situation. Thorndike (1924) previously described adaption and transformation, which further allowed students to apply their learning.

Applying is a property of *Applying My Learning,* referring to participants taking information from simulation, and applying it to clinical care. In this study, participants

engaged in clinical, simulation, and skills lab activities which allowed the application of important conceptual and contextual information to patient care. Participants were able to apply their learning which was similar to the conclusions that the simulation studies of Jeffries et al., (2011) and Hayden et al., (2014) demonstrated. Similarly, the conclusions of various qualitative studies reported that students could apply their learning (Bremner et al., 2006; Johnson et al., 1999; Lasater, 2007). When participants were able to apply their learning it contributed to participants *Gaining Confidence*.

Gaining Confidence

In the later stage of the basic social process, participants *Gain Confidence* when engaged in simulation and clinical activities. Confidence is acquired when participants experience deliberate practice in simulation and apply those abilities to clinical care. Advanced simulation scenarios, such as the mock code, that participants experience as a senior student, provided the knowledge and skill required to function in a crisis situation. This confidence acquired through simulation and clinical exposure, further advanced the participants' understanding of the complexities of patient care in the clinical environment.

The theoretical and empirical evidence supported participants g*aining confidence* after engaging in deliberate practice activities in simulation, which was supported by numerous simulation studies (Blum, Borglund, & Parcells, 2010; Jeffries & Rizzolo, 2006; McCaughey & Traynor, 2010; Mould, White, & Gallagher, 2011; Sinclair & Ferguson, 2009; Wagner, Bear, & Sander, 2009). Confidence of participants increased as more exposure to relevant simulation knowledge and skill was acquired throughout the

semester. *Gaining Confidence* occurs over time and is dependent on the quality and frequency of simulation learning. Realism may be a factor in increasing participants confidence; the more fidelity provided by simulation learning, may make it more likely for participants to gain confidence.

Some literature did not provide evidence to support simulation learning as a way for students to gain confidence. Brannan et al. (2008) concluded that the confidence level among nursing students that participated in simulation learning experience was not significantly different from those students who received a traditional lecture teaching approach.

Gaining Confidence produces the outcome of participants *Becoming More Comfortable.* The potential to be *become more comfortable* is more likely to occur if participants are allowed to experience simulation learning and its beneficial components.

Becoming More Comfortable

The category of *Becoming More Comfortable* emerged from that data as feeling assurance when engaged in simulation and clinical activities. Participants have the confidence and comfort to a complete a task. Comfort was acquired when participants became more self- assured. *Becoming More Comfortable* was a unique finding of this study and allowed participants to enhance their cognitive, affective, and psychomotor skills.

Simulation provides students exposure to clinical events prior to caring for real life patients in clinical. As a result of these dynamics simulation learning experiences, students become comfortable when engaged in patient care. Schoening et al. (2006)

discovered that simulation learning helped students gain a sense of effectiveness in a nonthreatening environment. The authors also determined that students would become more comfortable with tasks because simulation allowed significant deliberate practice. Similarly, simulation help students feel more comfortable with knowing when to call the physician and when to initiate other nursing interventions.

Participants discovered they were learning to know what to do as exposure and increased experience in the simulation allowed participants to react in a competent manner when clinical events arose. *Becoming More Comfortable* led participants to realize that they had the ability to *know what to do*. When participants became *more comfortable,* it allowed them to progress to *Knowing What to Do.*

Knowing What To Do

The final stage in the basic social process was *Knowing What To Do* which emerged from the data as being able to perform in various simulation learning and patient care situations. Participants were able to function in a competent manner when confronted with a clinical issue and were prepared to act with the skill and knowledge to care for patients. *Knowing What to Do* allowed participants to gain a sense of independence that they could do things for themselves and function in a patient care situation. Beginning competence was expressed by participants being prepared if something happens and *knowing what to do.*

Ruggenberg (2008) determined that simulation learning experiences had a positive effect on knowledge acquisition and transfer of learning. Simulation also offered the significant advantage of effective learning practice which would allow nursing

students the potential to acquire the ability to know what to do when confronted with clinical problems.

The IOM (2000) determined that medical educators need to focus on educational efforts to prevent the 46,000-98,000 patient deaths that occur each year due to the lack of experience of medical personnel. This report identified the importance of nursing students experiencing the training to know what to do. Simulation is a learning modality that has the potential to help students gain a greater understanding about the importance of, for example, medication administration which could prevent medication errors and improve patient safety.

This simulation learning study concluded that simulation learning may transfer to the clinical environment using participants in the study sample. As previously explained, Cronenwett et al. (2007) developed an expected guide for knowledge, skills, and attitudes (KSAs) that nursing students should acquire in their undergraduate nursing education. *Knowing What to Do* is a component in the development of competence. The essential elements of competence are aligned with the learning outcomes targeted in nursing programs throughout the country. The discovery that nursing students learn to know what to do and develop further competence, as a result of simulation learning, is a very significant finding. This finding also identified significant skill and knowledge acquisition, from engaging in simulation learning, in undergraduate nursing students.

Hanson and Bratt (2015), in a concept analysis of competence, determined the components of competence acquisition were: (a) the ability to complete a task, (b) the knowledge to use critical thinking, cognitive, and psychomotor skills, (c) the skill to

complete a task, and (d) the application of decision making, knowledge, and skills. The conclusions of the authors, in the concept analysis, were that competence and safety in practice may be a significant area of concern for nursing students and faculty.

Benner at al. (2010) thought that nurse educators should help students gain a sense of salience, specifically what is notable and significant. Also *knowing what to do*, through simulation learning was asserted that students need to have the capability to experience the thought processes in decision making, know how things apply to their patients, recognize the salience of a situation, with simulation being an innovation that can improve situated thinking and communication.

Simulation learning as an educational modality contributed to students knowing what to do and was explored by Hayden et al., (2014). It was discovered that substituting clinical hours with simulation learning for 20% to 50% of clinical time resulted in no differences among groups for NCLEX pass rates, end of program nursing knowledge, clinical competency, and overall readiness for practice. These findings demonstrated that *knowing what to do* could be acquired with simulation as a significant component of a students educational experiences and demonstrated the value of simulation in nursing education. These conclusions also support the premise that simulation learning may be equivalent to clinical time, although simulation is very expensive and time consuming.

The empirical evidence generated from this study also supports the extensive use of educational resources dedicated to simulation learning in nursing education and presents data that support simulation learning as a beneficial and necessary component of undergraduate nursing education.

Unique Findings

This study had unique findings that emerged. Acting Like A Nurse was a significant finding that was unique to this simulation study. Participants frequently were not able to Act Like A Nurse except when engaged in simulation learning. The finding that students develop the mindset for actions of acting like a nurse is unique, in part, because the student adopts a level of confidence and competence expected to produce safe, quality nursing care. The core category Acting Like A Nurse evolved to participants learning how to handle clinical situations, doing everything the nurse would do, and taking complete responsibility when confronted with a simulation scenario. The goal of nursing education programs is preparation for practice where the student will assume the role of the nurse in a professional, safe, and competent manner. Simulation learning, where students Act Like a Nurse may bridge the gap between theory and practice. It has been reported (del Bueno, 2005) that 65 percent of new graduate nurses were not ready for clinical practice upon graduation from various nursing programs, regardless of educational background.

The AACN (2008) in *The Essentials of Baccalaureate Education for Professional Nursing Practice* described that baccalaureate generalist practice should prepare the baccalaureate graduate nurse to practice with patients and various groups across the lifespan and healthcare continuum (AACN). The baccalaureate graduate should understand and respect varied care, complexities, and use of healthcare resources as a part of patient care (AACN).

The AACN (2008) clearly defined the value of varied learning opportunities and

simulation:

> Learning opportunities, including direct clinical experiences, must be sufficient in breadth and depth to ensure the baccalaureate graduate attains these practice focused outcomes and integrates the delineated knowledge and skills into the graduate's professional nursing practice. Clinical learning is focused on developing and refining the knowledge and skills necessary to manage care as part of an interprofessional team. Simulation experiences augment clinical learning and are complementary to direct care opportunities essential to assuming the role of the professional nurse. A clinical immersion experience provides opportunities for building clinical reasoning, management, and evaluation skills. (p. 4)

This study confirmed that Acting Like A Nurse, through simulation learning, was aligned with the outcomes described by AACN (2008). In summary, the basic social process of Acting Like A Nurse allowed simulation learning to transfer to the clinical environment. This unique finding validates simulation as an essential and relevant component of undergraduate nursing education. Nursing educators have an obligation to prepare nursing students to be competent upon the completion of their nursing program.

Limitations

A limitation of this study is that the purposeful sample was only composed of traditional four-year baccalaureate nursing students and did not consist of accelerated baccalaureate or associate degree nursing students. A more diverse student sample may produce different data compared to the study results. It may be the case that more life experiences translate into better learning outcomes when students are engaged in simulation learning. Also, a more mature purposeful sample, with more advanced interpersonal skills, could enhance expectations and trust from the nursing staff during simulation and various clinical rotations. An additional limitation of this study is that the sample consisted of final year nursing students and did not include junior level traditional

baccalaureate nursing students. A sample that consisted of nursing students that were not exposed to advanced simulation and less clinical learning may not demonstrate the value of simulation learning.

Implications for Nursing Practice

The findings of this study have implications for nursing practice. Simulation learning and Acting Like A Nurse could help bridge the gap between nursing education programs and clinical practice. New graduate nurses that were exposed to targeted simulation learning could transition more smoothly to clinical practice.

Simulation learning, integrated in a nurse residency program, may better prepare graduates for clinical practice. The ability to be in charge and assume complete responsibility for the patient, specifically Acting Like A Nurse, while engaged in clinical practice, may reduce the orientation period for new graduates, enhance confidence and comfort, and provide stability in the clinical setting. Readiness for practice could also be enhanced with simulation learning and contribute to new graduates integrating the nursing process, critical thinking, and developing a mental checklist of significant clinical tasks.

Implications for Nursing Education

The findings of this study have implications for nursing educators. The IOM (2008) report indicated that nursing education should be transformed to meet the demands encountered by nurses in the present day healthcare environment. The emerging theory is useful for nursing educators to understand the process by which simulation learning transfers to the clinical environment. It was discovered that when participants

Act Like A Nurse in simulation, transfer of learning may be likely to occur, although transfer of learning can still occur when students are exposed to various clinical rotations.

Transfer of learning, as supported by the literature, is more likely to occur if you teaching is focused in the information, strategy, and reasoning to apply to the clinical environment. On the basis of this study, the resources for simulation may indeed be justified, if these resources are aids in programs meeting the program goal. The goal of nursing programs throughout the country is to provide students the ability to be ready to Act Like A Nurse upon graduation. Simulation learning allows targeted and goal directed experiences that further develop cognitive, affective, and psychomotor skills. This process is significant in nursing education because there is significant variability in learning experiences for nursing students while on clinical rotations compared to the uniform and consistent content students are exposed to in simulation learning.

As previously discussed, the recent NCSBN study (Hayden et al., 2014) determined that students that substituted 25% to 50% of their clinical hours with simulation over a two year period compared to the 10% simulation control group had no significant differences for end of program nursing knowledge, clinical competency, overall readiness for practice, and NCLEX pass rates. The authors concluded that simulation learning may be equal to clinical rotations in undergraduate nursing students, although simulation is expensive, resource intensive, and a significant investment that may yield equivalent results to clinical rotations. This study demonstrated that clinical rotations have value in *experiencing it for real* and provided an introduction and orientation to various health care environments. This findings may provide nurse

educators the data to support simulation learning as an equivalent method to nursing students clinical rotations in undergraduate nursing programs, but not as a complete substitution.

Clinical rotations still have a significant place in undergraduate nurses education to enhance overall learning. It may be that some vicarious learning occurs as student nurses observe nurses in the clinical setting being nurses. This observation provides a modeling experience that is transferred to being able to Act Like A Nurse in simulation.

Implications for Nursing Administration

Nursing administration in healthcare settings should consider onboarding and nurse residency programs; simulation could enhance and ease the transition of new graduates to clinical practice. This study demonstrated the value of deliberate practice using simulation as modality that provided unique and necessary experiences that allowed students to make sense of their learning, fit things together, and allow application of their learning.

Additionally, the findings of this study have implications for nursing education administration. The ability of Act Like A Nurse in simulation may indicate that nursing programs need to further integrate simulation learning into undergraduate nursing programs throughout the country. As previously described, the opportunity to assume the role of the nurse would enhance the development of cognitive, affective, and psychomotor skills. Targeted educational strategies that were validated by this study would be more likely to produce competent nursing graduates.

Previous quantitative studies (Alinier, 2006; Brannan et al. 2008) comparing

simulation to the traditional curriculum in undergraduate nursing students determined that it may be equivalent, although these results may not be objectively and clinically significant. The discovery that simulation learning encourages the transfer of learning to the clinical environment, in undergraduate traditional nursing students, provides a framework to conduct and effectively utilize simulation as an important learning modality.

Implications for Future Research

The results of this grounded theory study indicated the need to further study simulation learning and the process of transfer in various student groups to confirm or modify the model. It is anticipated that the educational strategy of simulation learning will continue to become an important part of nursing and medical education. The model generated in this study revealed the process by which simulation learning transfers to the clinical environment in undergraduate nursing students.

It is anticipated that medicine and allied health educators could use simulation learning to encourage the transfer process in various student groups. This premise should be studied to determine if simulation learning in various student populations would produce favorable learning outcomes and enhance readiness for practice. Another possible direction for future research includes the development of an empirically derived tool to assess the transfer process. A previous qualitative research study with baccalaureate nursing students concluded that simulation learning experiences have a positive impact in providing realistic learning experiences that are consistent with real life expectations (Panunto, 2009). There is significant future research that could be

conducted from this study, such as: (a) testing student confidence over time, (b) testing the theory itself through structural equation modeling (SEM), (c) further research on acting like a nurse in the student role, and (d) determining the number of simulation experiences that are optimal. Replicating this study with nurses that are six months to one year after graduation could determine if simulation learning facilitates the adjustment to the realities of clinical practice. Finally, a longitudinal study could be conducted that follows nursing students engaged in simulation learning with an early component of the nursing program to being new graduates. It may determine if simulation learning enhances students ability to deal with complex clinical situations. Also, future research is needed in simulation learning to determine the ideal educational strategies and content to foster learning transfer to the clinical environment.

Conclusion

The process of simulation learning and transfer to the clinical environment is an important issue in nursing education. This classical grounded theory study results provide a conceptualization to guide the effective and targeted use of simulation educational resources. The model that emerged from the data identified the process by which simulation learning transfers to the clinical environment in senior undergraduate nursing students. This model demonstrates the value of experiential learning, through simulation, in the transfer of relevant knowledge and skill to challenging clinical problems and developing into the role of the nurse.

This substantive theory provides evidence of the value and importance of simulation learning as an essential part of the curriculum in nursing programs throughout

the country. The ability of students to Act Like A Nurse in simulation allowed students to take on the role of the nurse, be in charge, and realize it is their responsibility to have the knowledge and skill to function as a competent nurse. These study findings were very significant because the ability of students to Act Like A Nurse prior to graduation identified simulation learning as a valuable learning modality that enhanced undergraduate nursing students curriculum. The grounded theory that emerged from the data can help explain the theoretical gaps existing in the simulation and nursing literature. Finally, this study provides a unique contribution to the body of knowledge that presently exists in the simulation literature with a theoretical model that may help prepare competent nursing graduates.

APPENDIX A

LETTERS OF APPROVAL

NOTICE OF FULL APPROVAL OF A RESEARCH PROJECT

Date: 06/05/2014

Investigator: Schmidt, Lee A
LU Number: 206514
TITLE: Simulation Learning and Transfer in Undergraduate Nursing
Students
ITEMS SUBMITTED FOR REVIEW:
● 05/21/2014 Research Protocol
● 05/23/2014 206514.052314
● 06/05/2014 IRB redlined consent
● 06/05/2014 206514.060514

Dear Investigator,

The above-referenced research project was given Full Approval by the
Institutional Review Board on 06/05/2014.
YOUR PROJECT MAY NOW BEGIN.

Results from the Board Review and required conditions applied to the
project
can be accessed through the online Research Portal or by clicking this
link:

http://portal.luhs.org/template/dean/GWJUMPCF201A53EC504A9484B26D711DA0
F7B7.cfm

The following is for your information and will help you meet local and
federal IRB requirements.

1. You must use the final IRB-approved version of the Consent Document.
Spelling and grammatical changes may be made as necessary, but any
other
changes require prior review and approval.

2. You are required to maintain complete records of this project.
Any changes in the protocol and the Consent Document must receive prior
IRB approval.
Use the online Research Portal's Project Amendment form to report
changes.
A change to the protocol necessary for the immediate safety and welfare
of a
research participant may be implemented prior to IRB review and
approval.

3. Federal Regulations require that projects undergo periodic review
of research activity at least once a year. This review must be
substantive.
The frequency of review and next scheduled date of periodic review for
your project

can be found under the "Annual Review" tab in the Research Portal's IRB section.
You will receive notification 4-8 weeks prior to the scheduled date of review.
At that time, you must provide information regarding the status of the project.
If the information is not received, the project will be suspended.
It is important that you not let approval lapse.

4. The IRB must be notified any time that the project temporarily or permanently
stops enrolling participants along with the reason. Use the online Closure form to
submit these notifications.

5. Any notices or advertisements soliciting participation must receive prior IRB approval.
Use the online Amendment reporting form.

6. The IRB must be notified PROMPTLY of all serious and any unanticipated adverse events
associated with the project (or the device or the drug). This includes any notification
received of adverse events occurring at other performance sites. Further guidance on
adverse event reporting may be found at the Office for Human Research Protections web site;
http://www.hhs.gov/ohrp/policy/AdvEvntGuid.htm#Q5

Reportable events include, but are not limited to:
a) a serious adverse event (including events that produce injury or death, an event
   leading to hospitalization or lead to prolongation of a current hospital stay);
b) the enrollment of a patient on a study that is no longer enrolling participants;
c) pregnancy occurring on the study where the study excludes pregnancy;
d) any patient reporting a billing problem as a result of project participation;
e) any participant who has voiced a complaint about some aspect of the project
or the consent document;
f) any unanticipated, untoward, or unexpected adverse event not covered above including
   rare adverse events or adverse events that occur at an unexpected rate
g) protocol deviations
h) investigational drug/device brochures, revisions

Adverse Protocol Events are reported through the online Research Portal.

7. The IRB may suspend the project to new participant enrollment or may suspend the

participation of current subjects if there is a perceived safety and/or regulatory issue.

8. Prospective consent must be obtained from all research participants.

9. The IRB may review your records relating to this project, including signed consent documents.

10. The Institutional Review Board of Loyola University Medical Center is appropriately
constituted and has been granted Federal Wide Assurance Number FWA00009471.

11. If you are unsure of your reporting requirements or of what is expected of you
during the conduct of this research, please call the IRB Office (708-216-4608) or
Dr. Kenneth Micetich (708-327-3144).

12. The Loyola Institutional Review Board is appropriately constituted as stipulated in
45cfr46 and is in compliance with Good Clinical Practice Guidelines insofar as those guidelines
are consistent with the U.S. Food and Drug Administration regulations (21 CFR Parts 50 and 56)
and the Department of Health and Human Services regulations (45 CFR 46) pertaining to the
protection of human subjects in research.

Thank you for your cooperation.

Kenneth Craig Micetich, M.D.
Chairman
Institutional review Board for the
Protection of Human Subjects
Loyola University Health Sciences
Division

LOYOLA UNIVERSITY CHICAGO
Health Sciences Division
Institutional Review Board for the Protection of Human Subjects
2160 South First Avenue
Maywood, IL 60153

09/22/2014

PROJECT AMENDMENT: NOTICE OF FULL APPROVAL

Investigator	**Schmidt, Lee**
LU Number	**206514**
Title	**Simulation Learning and Transfer in Undergraduate Nursing Students**
IRB Number	**206514060514**
AMENDMENT #2 :	**Submitting the revised consent form to reflect the addition of a telephone interview as an option. The consent form was not submitted with the prior amendment.**
Type of Change	**Administrative**
Change in Patient Risk	**No Change**
Change to ICD?	**NO**
Inform Past or Current Patients?	**NO**
Review Date	**09/10/2014**
Review Type	**Expedited**
Action	**Full Approval**
Comments	**Information noted. Use the revised consent document identified as: 206514am2.091014 Version Date: 09/09/2014 (see project summary).**
DATE OF APPROVAL	**09/10/2014**

This Amendment Approval has been granted through an Expedited Review.
The Full Board will review the Amendment and/or changes to the
Informed Consent Document on 09/17/2014.

If the Board does not reaffirm this expedited decision,
you will be notified by 09/24/2014.

Elaine Fluder
Director
Human Research Protections Program
Loyola University Health Sciences Division

APPENDIX B

INTERVIEW GUIDE

Participants were specifically asked:

1. How old are you?

2. What is your experience?

3. How many years of school have you completed?

4. How many simulation experiences have you participated in?

5. Tell me about your simulation and clinical experiences as a nursing student?

6. How do you see clinical and simulation fitting together or not fitting together?

7. How do you see simulation fitting into your overall program of study?

8. What challenges have you experienced in your simulation experiences?

9. What benefits have you gained from your simulation experiences?

10. Can you tell me anything new about simulation and clinical experiences that we haven't covered?

Participants were specifically asked:

1. Comparing simulation and clinical activities what specifically seemed to help you

    gain more skill and knowledge?

2. How would you compare simulation feedback to clinical feedback?

3. How does simulation make you feel compared to clinical?

4. What have you learned in simulation compared to clinical?

5. Tell me about how you feel when being watched in simulation versus clinical?

6. Tell me about your experience in the ability to do things in simulation compared to

    clinical?

7. What helps you learn how to do things better; clinical or simulation activities?

8. What makes you feel more confident clinical or simulation?

APPENDIX C

RECRUITMENT MATERIALS

Simulation Research Study

David Miles, a PhD in Nursing candidate at Loyola
University Chicago, is conducting a study about simulation
learning and how it relates to clinical learning experiences.

Participation includes: 30 to 45 minute interview either in
person or via phone. As a token of appreciation, a $30 Visa
gift card will be presented at completion of the interview.

For further information
please contact David A. Miles
at (219)-682-4480 or via email
dave_miles@sbcglobal.net

Inclusion Criteria
 Fourth-year nursing
students who have
completed their first
Medical-Surgical
Nursing (MSN 277)
course and clinical
(MSN 277L)

APPENDIX D

CONSENT FORMS

LOYOLA UNIVERSITY CHICAGO
HEALTH SCIENCES DIVISION
MAYWOOD, ILLINOIS
DEPARTMENT OF

INFORMED CONSENT

Participant's Name:

_____

PROJECT TITLE: Simulation Learning and Transfer in Undergraduate Nursing Students

RESEARCHER: David A. Miles CRNA, MSN, PhD in Nursing Candidate

THE APPROVAL FOR THIS PROJECT EXPIRES ON 06/05/2015.

Participant Information

PRINICIPLES CONCERNING RESEARCH: You are being asked to take part in a research project. It is important that you read and understand the principles that apply to all individuals who agree to participate in the research project described below:

1. Taking part in the research is entirely voluntary.

2. We do not know if you will benefit from taking part in the research but the knowledge obtained may help others.

3. You may withdraw from the study at any time without anyone objecting and without penalty or loss of any benefits to which you are otherwise entitled.

4. If during your participation in the research project new information becomes available which would affect your being in the research project (such as better

Document ID#:
Version Date: 9/26/2014

treatments or the side effects of the treatments), your doctor will discuss this new information with you and will help you make a decision about your continuing in the research.

The purpose of the research, how it is to be done, and what your part in the research will be is described below. Also described are the risks, inconveniences, discomforts and other important information which you need to make a decision about whether or not you wish to participate. You are urged to discuss any questions you have about this research with the staff members.

PURPOSE OF RESEARCH: The purpose of this dissertation study is to discover the process by which simulation learning transfer to the clinical environment in undergraduate nursing students. This study is being completed as part of the degree requirements for the Doctor of Philosophy degree at Loyola University Chicago.

Approximately 15 people will participate in this research.

DESCRIPTION AND EXPLANATION OF PROCEDURES: If you agree to participate in this study, you will be asked to participate in an audiotaped in person interview with David Miles, the investigator for this study. You will be asked to answer questions about simulation and clinical experiences as a nursing student and how your simulation experiences apply to your clinical experiences. The interview should last between 30 and 60 minutes and will be conducted at a place convenient for you and the interviewer.

The interview will be tape recorded. You may refuse to answer any question asked, ask to have the tape recorder shut off at any time, take a break during the interview, or end the interview at any time. After the interview is completed, the audiotape will be transcribed verbatim. Any names or identifying information disclosed during the interview will be deleted from the completion of the study. The information obtained during your interview will be combined with information obtained in the other interviews conducted in the course of the study.

RISK/BENEFITS: There are no foreseeable risks to you associated with participation in this study beyond those experienced in daily life. There are no direct benefits to you associated with participation in this study. It is hoped that the information gained from this study will increase our understanding of simulation learning and transfer and fill a significant gap in the nursing literature.

COMPENSATION: You will be given a thirty dollar gift card as a token of appreciation for participation in this study at the completion of the interview.

Document ID#:
Version Date: 9/26/2014

CONFIDENTIALITY: Any identifying information disclosed during the interview will be deleted from the transcribed record of the interview and replaced with general terms to preserve confidentially. The signed consent forms will be stored separately from the audiotapes and transcribed interviews. All consent forms, audiotapes, and transcribed interviews will be kept in locked file cabinets.

Your records from this study will be considered confidential to the extent permitted by law. A number will be assigned to each interview transcript. Authorized Loyola University Chicago employees, the Department of Health and Human Services, or other agencies may review the research records from this study and must follow the same rules of confidentiality. The dissertation advisor may review the audio tapes, will work with the investigator on data analysis, and will have access to the transcripts.

The results of this study will be submitted for publication and may be presented at professional conferences. Quotations from selected interviews may be used as examples in publications or presentations, but no identifying information will be presented with those quotations.

VOLUNTARY PARTICIPATION: Participation in this study is voluntary. If you decide to participate, you can withdraw your participation at any time without penalty, or refuse to answer any question asked during the interview. Your decision of participation has no influence in your status as a student in the undergraduate nursing program in the Marcella Niehoff School of Nursing at Loyola University Chicago.

If you ever questions regarding your participation in this study at any time, you may contact David Miles (dave_miles@sbcglobal.net, or (219) 682-4480 investigator for this study or Dr. Lee Schmidt (lschm3@luc.edu or (773) 508-3466), dissertation chairperson.

If you ever feel that you have been injured by participating in this study or if you have any questions concerning your rights as a research participant, you may contact either Kenneth Micetich, MD, Chair of the Institutional Review Board for the Protection of Human Subjects- Loyola University Chicago Health Sciences Division, at 708-216-2633 or Elaine Fluder, MSN, Director of the Human Research Subjects Protection Program at 708-216-4608.

Although you have the right to revoke this authorization, you accept that such revocation will not apply to any uses and disclosures of your information that are described in the Loyola University Health System Notice of Privacy Practices or otherwise allowable under any Federal or State laws.

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Version Date: 9/26/2014

CONSENT:

You will receive a signed copy of this informed consent document.

You have been fully informed of the above described research program with its possible benefits and risks. Your signature below indicates that you are willing to participate in this research study and agree to the use and disclosure of information about you as described above. You do not give up any legal rights by signing this consent document.

_____ _____

Participant's Signature   **Date**

_____ _____

Witness Signature   **Date**

LOYOLA UNIVERSITY CHICAGO
HEALTH SCIENCES DIVISION
MAYWOOD, ILLINOIS
DEPARTMENT OF

INFORMED CONSENT

Participant's Name:

_____

PROJECT TITLE: Simulation Learning and Transfer in Undergraduate Nursing Students

RESEARCHER: David A. Miles CRNA, MSN, PhD in Nursing Candidate

THE APPROVAL FOR THIS PROJECT EXPIRES ON 04/28/2016.

Participant Information

PRINICIPLES CONCERNING RESEARCH: You are being asked to take part in a research project. It is important that you read and understand the principles that apply to all individuals who agree to participate in the research project described below:

5. Taking part in the research is entirely voluntary.

6. We do not know if you will benefit from taking part in the research but the knowledge obtained may help others.

7. You may withdraw from the study at any time without anyone objecting and without penalty or loss of any benefits to which you are otherwise entitled.

The purpose of the research, how it is to be done, and what your part in the research will be is described below. Also described are the risks, inconveniences, discomforts and other important information which you need to make a decision about whether or not you wish to participate. You are urged to discuss any questions you have about this research with the staff members.

Document ID#:
Version Date: 10/05/2015

PURPOSE OF RESEARCH: The purpose of this dissertation study is to discover the process by which simulation learning transfer to the clinical environment in undergraduate nursing students. This study is being completed as part of the degree requirements for the Doctor of Philosophy degree at Loyola University Chicago.

Approximately 25 people will participate in this research.

DESCRIPTION AND EXPLANATION OF PROCEDURES: If you agree to participate in this study, you will be asked to participate in an audiotaped in person interview with David Miles, the investigator for this study. You will be asked to answer questions about simulation and clinical experiences as a nursing student and how your simulation experiences apply to your clinical experiences. The interview should last between 30 and 60 minutes and will be conducted at a place convenient for you and the interviewer.

The interview will be tape recorded. You may refuse to answer any question asked, ask to have the tape recorder shut off at any time, take a break during the interview, or end the interview at any time. After the interview is completed, the audiotape will be transcribed verbatim. Any names or identifying information disclosed during the interview will be deleted from the completion of the study. The information obtained during your interview will be combined with information obtained in the other interviews conducted in the course of the study.

RISK/BENEFITS: There are no foreseeable risks to you associated with participation in this study beyond those experienced in daily life. There are no direct benefits to you associated with participation in this study. It is hoped that the information gained from this study will increase our understanding of simulation learning and transfer and fill a significant gap in the nursing literature.

COMPENSATION: You will be given a thirty dollar gift card as a token of appreciation for participation in this study at the completion of the interview.

CONFIDENTIALITY: Any identifying information disclosed during the interview will be deleted from the transcribed record of the interview and replaced with general terms to preserve confidentially. The signed consent forms will be stored separately from the audiotapes and transcribed interviews. All consent forms, audiotapes, and transcribed interviews will be kept in locked file cabinets.

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Version Date: 10/05/2015

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The results of this study will be submitted for publication and may be presented at professional conferences. Quotations from selected interviews may be used as examples in publications or presentations, but no identifying information will be presented with those quotations.

VOLUNTARY PARTICIPATION: Participation in this study is voluntary. If you decide to participate, you can withdraw your participation at any time without penalty, or refuse to answer any question asked during the interview. Your decision of participation has no influence in your status as a student in the undergraduate nursing program in the Marcella Niehoff School of Nursing at Loyola University Chicago.

If you ever questions regarding your participation in this study at any time, you may contact David Miles (dave_miles@sbcglobal.net, or (219) 682-4480 investigator for this study or Dr. Lee Schmidt (lschm3@luc.edu or (773) 508-3466), dissertation chairperson.

If you ever feel that you have been injured by participating in this study or if you have any questions concerning your rights as a research participant, you may contact either Kenneth Micetich, MD, Chair of the Institutional Review Board for the Protection of Human Subjects- Loyola University Chicago Health Sciences Division, at 708-216-2633 or Elaine Fluder, MSN, Director of the Human Research Subjects Protection Program at 708-216-4608.

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CONSENT:

You will receive a signed copy of this informed consent document.

You have been fully informed of the above described research program with its possible benefits and risks. Your signature below indicates that you are willing to participate in

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Version Date: 10/05/2015

this research study and agree to the use and disclosure of information about you as described above. You do not give up any legal rights by signing this consent document.

_____ _____

Participant's Signature   **Date**

_____ _____

Witness Signature   **Date**

APPENDIX E

TABLE 1

Table 1. A comparison of the criteria for trustworthiness

Glaser and Strauss (1967)	Lincoln and Guba (1985)	Evidence
credibility	credibility	Data fit the basic social process and generated a theory. Salience, scope, and depth of categories emerged
plausibility	dependability	Incident applicable to each category, accuracy of records, verification of bottom line, data supported conclusion, delimiting the theory
trustworthiness	transferability	Data forms a systematic theory, provides thick description, specification of minimum elements
trustworthiness	confirmability	Substantive theory emerged that adhered to rigor, audit trail was evident, findings grounded in the data, clarity, and explanatory power were confirmed

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VITA

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