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The effect of curricular sequencing of human patient simulation learning experiences on students' self-perceptions of clinical reasoning abilities

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THE EFFECT OF CURRICULAR SEQUENCING OF HUMAN PATIENT SIMULATION LEARNING EXPERIENCES ON STUDENTS' SELF-PERCEPTIONS OF CLINICAL REASONING ABILITIES

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ABSTRACT

Rebecca Sue Jensen

THE EFFECT OF CURRICULAR SEQUENCING OF HUMAN PATIENT SIMULATION LEARNING EXPERIENCES ON STUDENTS' SELF-PERCEPTIONS OF CLINICAL REASONING ABILITIES

It is unknown whether timing of human patient simulation (HPS) in a semester, demographic (age, gender, and ethnicity), and situational (type of program and previous baccalaureate degree and experience in healthcare) variables affects students' perceptions of their clinical reasoning abilities. Nursing students were divided into two groups, mid and end of semester HPS experiences. Students' perceptions of clinical reasoning abilities were measured at Baseline (beginning of semester) and Time 2 (end of semester), along with demographic and situational variables. Dependent variable was Difference scores where Baseline scores were subtracted from Time 2 scores to reveal changes in students' perceptions of clinical reasoning. Students who were older and had previous healthcare experience had higher scores, as well as students in the AS program, indicating larger changes in students' perceptions of clinical reasoning abilities from Baseline to Time 2. Timing of HPS, mid or end of semester, had no effect on Difference scores, and thus students' perceptions of clinical reasoning abilities.

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CHAPTER ONE – INTRODUCTION

Nurses in a variety of settings must be watchful in order to detect errors and prevent adverse events.

> If a patient's status begins to decline, the decline will be detectable though [sic] the nurse's observation of changes in the patient's physical or cognitive status. Performance of this patient monitoring requires great attention, knowledge, and responsiveness on the part of the nurse. (Institute of Medicine [IOM], 2004, p. 32)

Nurses must graduate from programs ready to enact the kind of surveillance necessary to keep patients safe throughout their stays in potentially dangerous healthcare environments (Benner, Sutphen, Leonard, & Day, 2010; IOM, 2004). However, studies indicate that new nurses often lack knowledge and experience to appropriately respond to patient status changes and to maintain a high level of safe patient care in complex healthcare environments (Benner et al.; Ebright, Patterson, Chalko, & Render, 2003; Ebright, Urden, Patterson, & Chalko, 2004; Myers, Reidy, French, McHale, Chisholm, & Griffin, 2010; Tanner, 2007). Unpredictable patient care situations are common and the healthcare environment is dynamic, which leaves little time within which to make decisions that may affect patient morbidity and mortality (Benner et al.). Appropriate responses to patient crises demand healthcare providers who are able to critically think through situations (clinical reasoning), quickly decide which actions to take (clinical judgment), and perform tasks skillfully (Hovanscek, 2007). However, the training needed to produce safe, competent healthcare providers, particularly in nursing, has rapidly expanded in breadth and complexity (Candela, Dalley, & Benzel-Lindley, 2006; Ironside, 2004). A widespread nursing faculty shortage, limited clinical sites, and increasing enrollments in schools of nursing have created barriers for nursing faculty in providing

nursing students with clinical experiences which prepare them for such unpredictable work environments (Schoening, Sittner, & Todd, 2006; Tanner, 2006a).

One essential skill that students must learn in their initial nursing programs is the ability to clinically reason about what assessments need to be completed, what the information obtained means, and what actions to take for optimal patient care (Tanner, 2007). The profession of nursing has yet to agree on standard definitions of clinical reasoning, clinical decision-making and clinical judgment (Kuiper & Pesut, 2004; Rane-Szostak & Robertson, 1996; Simmons, 2010; Tanner).

Nurse educators are seeking strategies and methodologies to overcome the difficulties encountered in developing a high level of clinical reasoning and judgment in nursing students, thus better preparing them to produce safe patient outcomes (Benner et al., 2010). Simulating patient care experiences is one strategy used to reduce barriers in order to providing meaningful patient care experiences and increase students' abilities to clinically reason through complex patient care situations (Benner et al.; Nehring, Lashley, & Ellis, 2002) and improve students' perceptions of their clinical reasoning abilities (Lasater, 2005). Theoretically, such simulated learning experiences help students master the cognitive and metacognitive skills that support the development of clinical reasoning, clinical decision-making, and clinical judgment skills.

Human patient simulation (HPS) offers nursing students a unique opportunity to use clinical reasoning skills to a greater degree than what would likely be possible in actual patient care, where students are restricted from taking a lead role in managing patient crises (Macedonia, Gherman, & Satin, 2003). HPS experiences enhance student nurses' thinking, which, in turn, enhances the ability of student nurses to clinically

reason, make clinical judgments in response to patient care concerns, and perform safe patient care (Bradley, 2006; Rauen, 2001). Several factors can potentially influence how and to what extent students perceive the development of clinical reasoning skills. First, the sequence within which simulation is placed in a semester may affect development of clinical reasoning skills.

Curricular sequencing is an imperfect and somewhat controversial issue in education in general (Iwasiw, Goldenberg, & Andrusyszyn, 2009; McGaghie, Miller, Sajid, & Telder, 1978; Tyler, 1949; Webber, 2002). Nursing programs have borrowed ideas about sequencing from education (Chappy & Stewart, 2004; Webber). A common philosophy in curricular sequencing is that courses should be offered and sequenced in such a way that one level of knowledge is achieved with the next course or experience building on the previous theoretical and experiential content. In theory, as students are exposed to new experiences and knowledge, they are expected to build on previous knowledge and experiences (Chappy & Stewart; McGaghie et al.). Thus, curricular timing and sequencing of a simulated student learning experience within a curriculum may well affect the knowledge, skills, and abilities that students bring to the simulation experience. Students' perceptions of the mastery of their own clinical reasoning skills may depend on where and when in the curriculum they have experienced the simulation. Mid semester placement of HPS potentially provides students with ideas about how nurses must use clinical reasoning skills to identify problems and act appropriately during patient care. By occurring after some patient contact, but before the end of the semester, mid semester HPS may allow students an opportunity to build on knowledge, skills, experiences, and clinical reasoning processes that they have learned in previous clinical

placements and in didactic-theory courses. On the other hand, end of semester timing of HPS might provide an opportunity for students to use the entire course content and patient care skills learned over the semester to deal with patients in crises and reason more effectively and efficiently. There is no evidence in the nursing literature about curricular sequencing of HPS within a semester and its effects on student self-perception of clinical reasoning skill acquisition.

Other factors that may affect the development of clinical reasoning in nursing students include demographic differences, such as age, gender, and ethnicity, and situational differences, such as previous experience in healthcare, previous baccalaureate degrees, and type of nursing program, among students. The effect of such factors has not been evaluated in much of the published nursing education research on learning during HPS and developing clinical reasoning skills (Lasater, 2005; Parr & Sweeney, 2006). While experience is seen as a prerequisite for developing clinical reasoning skills (Tanner, 2006b), the interaction of experience, HPS, and clinical reasoning has not been evaluated (Lasater; Parr & Sweeney).

Literature suggests that HPS is a valuable addition to nursing program curricula, and HPS is being integrated into nursing curricula in many ways and using various models (Hayden, 2010; Nehring & Lashley, 2004). As faculty struggles with where to place other nursing program content and skills in the curricula (Aronson, Rebeschi, & Killion, 2007; Hodson-Carlton, 2009), faculty have little evidence upon which to base curricular placement of HPS. Researchers have not been documenting effects, if any, of HPS placement in the curricula and whether or not placement during a semester's learning influences students' clinical reasoning development.

Measurement of student' clinical reasoning development is a challenge due to the lack of a well established instrument. Students' perceptions of their clinical reasoning abilities is a more direct measure of students' clinical reasoning than observation of students and inferring their clinical reasoning from actions. This study was used to identify changes in students' perceptions of clinical reasoning skills at the beginning (Baseline) and end (Time 2) of a semester. An investigation into the timing of HPS within a semester identified possible relationships between HPS placement in nursing program curricula and students' self-perceptions of their clinical reasoning skills in nursing students.

Significance

Nursing students' personal experiences in clinical practica and HPS are important for developing clinical reasoning skills (Tanner, 2006b). Caring for patients and learning the art of nursing in a dynamic clinical environment is the best setting for students to practice new clinical reasoning skills (Benner et al., 2010; Rauen, 2001). Appropriately, students often are asked to step aside when emergent issues requiring clinical reasoning occur in actual patient care environments (Macedonia et al., 2003). However, by not participating in crucial clinical reasoning during crises, students have fewer opportunities to build experiences that are critical to clinical reasoning skill development. HPS can be used to enhance students' patient care experiences and to provide students with uninterrupted experiences wherein students are asked to reason through clinical situations and make clinical judgments as represented in the simulations. Further, the post simulation debriefing, or processing of the events of the simulation scenario, can help clarify clinical reasoning used during patient care in the simulation. Nursing educators,

who facilitate debriefings, can also help students make connections between clinical reasoning in the particular HPS scenario and the widespread application of clinical reasoning in patient care (Tanner, 2007). Thus, students safely gain experiences on which clinical reasoning skills are built, preparing them for the multifaceted, chaotic work environments in which they will be employed (Benner et al.). Evaluating the influence of age, gender, ethnicity, previous experience in healthcare, previous baccalaureate degree completion, and type of nursing program on students' perceptions of clinical reasoning skills development provides important information for nurse educators to plan educational experiences, including HPS, that are more meaningful for student learners.

Background

Nursing programs are having difficulties providing clinical education experiences that encourage students to develop clinical reasoning skills (Benner et al., 2010; McNelis & Ironside, 2009; Tanner 2006b). The risk to patients from novice nursing students has long been a concern in nursing education (Ebright et al., 2004). However, in the current healthcare system, fears about patient safety have placed student clinical experiences under greater scrutiny due in part to the IOM (2000) revealing extensive threats to patient safety through healthcare providers' errors, including nursing errors. New nurse graduates must be equipped with skills, including the IOM competencies, to safely care for patients. However, adequately providing students with IOM-designated and other clinical competencies, especially clinical reasoning skills, is challenging for the following reasons: 1) higher patient acuity in acute care settings; 2) a demand for increased nursing program enrollments in the midst of increasing faculty shortages; 3) reduced availability of clinical placement sites; and 4) confusion and a lack of clarity in the nursing literature

and among nursing educators on how best to define and measure the concepts of clinical reasoning, clinical decision-making, and clinical judgment.

First, nurse educators are challenged to safely educate students in clinical practica caring for a population of patients who are both older and sicker than at any point previously in the healthcare industry (Jennings, 2008). Higher acuity patients often are cared for using advanced technology, adding complexity to patient care that can be more frightening to novice nursing students and a barrier to optimizing clinical experiences (McNelis & Ironside, 2009). Additionally, significant patient safety issues arise when students are assigned to care for critically ill and medically complicated patients (Stokes & Kost, 2009). The dynamic patient care environment is fraught with potential near-miss and adverse events, particularly as related to novice nurses (Ebright et al., 2003; Myers et al., 2010).

Novice nurses have difficulty identifying and, once identified, sifting through the multitude of cues in patient care situations to make accurate inferences about patients' conditions and to take appropriate actions based on the inferences. Novices tend to see each cue as equally important and spend an inordinate amount of time organizing and prioritizing cues in an effort to identify immediate patient needs from later needs (Benner, 2001). The critical conditions of patients and complexity of healthcare environments do not allow nursing students the time necessary to complete sorting cues into meaningful systems. Students may be assigned to relatively "safe" patients with uncomplicated conditions, reducing opportunities for students to use clinical reasoning skills necessary for the care of patients with complicated conditions (Nehring, 2010b). Students are unable to make the connections among patient conditions, actions to take,

and methods to complete patient care (Cormier, Pickett-Hauber, & Whyte, 2010). Such an environment does not lend itself to developing clinical reasoning skills, which may lead to errors in subsequent clinical judgments.

Second, nurse educators are challenged to adequately educate nursing students in the midst of higher nursing school enrollments and faculty shortages. The projected supply of nursing faculty will be outstripped by demands for faculty in less than 10 years (Cleary, Bevill, Lacey, & Nooney, 2007). Nearly 43,000 qualified applicants were not accepted in baccalaureate nursing programs in the 2009 – 2010 academic year, even though enrollment increased by 9.8% from 2008 enrollment levels (American Association of the Colleges of Nursing [AACN], 2010). The majority of nursing schools cited faculty shortages and lack of clinical sites as limiting factors when determining how many students to accept (AACN). Overwhelmingly (90.6%), vacant nursing faculty positions required or preferred a doctoral degree as a terminal degree for hire into the positions (Fang & Tracy, 2009).

HPS is not a panacea for faculty shortages. A high learning curve associated with preliminary use of HPS has been widely documented (Hovancsek, 2007; Nehring, 2010b; Seropian, Brown, Gavilanes, & Driggers, 2004), resulting in initial, intense demands on faculty time. The extra faculty time is generally associated with the initial set-up of HPS within a nursing program (Hovancsek; Rauen, 2001). The ongoing use of HPS within nursing programs and its effects on faculty time and numbers has not been evaluated; however, part-time or adjunct nursing faculty members could help augment current faculty and be involved in HPS (Foster, Sheriff, & Cheney, 2008; Nehring). Once the scenarios are developed, the simulations can be used repeatedly without extensive,

additional development. Faculty and students spend higher quality time on task during HPS compared to clinical environments (Hovancsek; Nehring), thus reducing the amount of time needed in this experience as opposed to clinical time. Using HPS may not reduce faculty needs to a great extent, but simulation experiences focus on students' use of knowledge, skills, and abilities in order to develop clinical reasoning skills through particular patient situations to a much greater extent than what may be possible in actual patient care experiences.

Within HPS, faculty can identify deficiencies in students' clinical reasoning and judgments as they tackle critical patient care situations in which they would otherwise be relegated to a helping role in actual patient care environments. Structured with careful forethought, HPS sessions for clinical groups can involve up to five students through observer and family member roles. Students observing the simulation may be engaged further with the use of observation forms in which the students document other nursing students' actions during the simulation. The use of video streaming allows HPS to be viewed in a separate room where additional students may discuss actions taken during the simulation, greatly increasing the impact of single simulations for greater numbers of students with little increase in faculty numbers (Kalmakis, Cunningham, Lamoureux, & Ahmed, 2010; Seropian, 2003).

Third, there is a shortage of adequate clinical sites at which students may gain patient care experiences crucial to perceptions of clinical reasoning skill development. Clinical placement sites have become a premium commodity in nursing education. The registered nurse (RN) shortage impacts nursing student clinical placements. The AACN (2010) report on the status of RN education in the United States do not identify specific

reasons for inadequate clinical sites; however, nursing programs are being developed in institutions not previously involved in nursing education, e.g. Brown Mackie College and ITT Technical Institute, increasing competition for clinical sites. RN programs, associate degree, diploma, and baccalaureate degree, compete with licensed practical nursing and other health profession programs for time on patient care units (Schoening et al., 2006). The competition reduces the time within and availability of clinical sites, leading to fewer patient care experiences upon which nursing students can build perceptions of clinical reasoning skills.

Fourth, nursing literature that describes aspects of clinical reasoning, such as critical thinking and clinical judgment, uses the terms interchangeably, creating confusion and contributing to a lack of clarity for nurse educators. Little evidence is available upon which to base nursing education practices, especially related to clinical reasoning skill development (Ferguson & Day, 2005; Patterson, 2009; Tanner, 2001, 2007). Nursing education research literature tends to describe quantitative studies of single courses or programs using fewer than 100 subjects (Yonge et al., 2005). Nursing faculty find little evidence in the literature about methods to instruct students about clinical reasoning, critical thinking, and clinical judgment and then to assess clinical reasoning skills (Simmons, 2010). Many descriptions of instructional techniques to improve these skills associated with clinical reasoning are found in nursing literature without evaluation or comparison with traditional techniques (Tanner, 2007; Benner et al., 2010). Research is specifically lacking in instruments that measure changes in clinical reasoning, how demographic variables impact clinical reasoning development, and if clinical reasoning differs in various situations (Simmons).

The challenges nursing educators face in providing experiences to students that promote students' perceptions of clinical reasoning skill development must be addressed in some way. Nursing students need to learn complex content related to disease process and nursing interventions. Additionally, nursing students need to know how to investigate problems in a vibrant healthcare environment and need to apply knowledge quickly and critically in real-time patient care situations (Benner et al., 2010; Hovanscek, 2007). Student nurses can best learn these skills in clinical arenas where they can practice clinical reasoning and make clinical judgments in an environment that is dynamic, emphasizing how various items are interrelated in patient care (Benner et al., Rauen, 2001). Appropriately, students are often asked to step aside when emergent issues occur in patient care units (Macedonia et al., 2003). Clinical reasoning and judgment skills are refined through experience (Tanner, 2006b), so nurse educators must be able to provide additional experiences to enhance students' perceptions of developing clinical reasoning skills. HPS can help bridge experiential gaps and refine clinical reasoning skills that are difficult to obtain in clinical placements.

Aims

The aim of this research was to identify best practice for the curricular sequencing of HPS learning experiences in order to improve nursing students' perceptions of clinical reasoning abilities. Specifically, contrasts and evaluations were made with HPS sequencing at mid-semester versus end of the semester experiences and the effects of sequencing on the self-perceived development of clinical reasoning skills among nursing students. Specific aims and associated hypotheses are described.

Specific Aim 1: Evaluate the effect of curricular sequencing of HPS experiences on changes in nursing students' perceptions of clinical reasoning development over the semester in which students have their first hospital-based clinical experiences.

Hypothesis 1a: Regardless of curricular sequencing of HPS, students will experience a statistically significant increase ($p < .05$) in their perceptions of clinical reasoning skills (LCJPS) from beginning (Baseline) to end (Time 2) of the semester in which students have their first hospital-based clinical experiences.

Hypothesis 1b: Students who experience HPS mid semester will have statistically significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) than those students experiencing HPS at the end of the semester.

Specific Aim 2: Determine the effect of demographic and situational variables on changes in nursing students' perceived clinical reasoning abilities as measured by the LCJPS.

Hypothesis 2a: Changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester will be statistically significantly different ($p < .05$) between gender and between Caucasian and non-Caucasian ethnic categories.

Hypothesis 2b: Students' ages will positively and significantly correlate ($r =/ > .50$, $p < .05$) with nursing students' perceptions of changes in clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.

Hypothesis 2c: Students who have had previous healthcare experience of direct patient care prior to entering the nursing program will have statistically significantly

larger ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than students who did not have previous healthcare experiences in direct patient care.

Hypothesis 2d: Students who have previous baccalaureate degrees outside the discipline of nursing will have significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those who did not have previous baccalaureate degrees.

Hypothesis 2e: Comparisons of students enrolled in AS or BS degree nursing programs of study will not demonstrate significantly different ($p > .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from the beginning to end of the semester in which students have their first hospital-based clinical experiences.

Hypothesis 2f: Demographic (age, gender, and ethnicity) and situational variables (nursing students' previous experience in healthcare, timing of simulation experience in the semester, previous baccalaureate degree, and type of nursing program) will significantly predict ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.

Conceptual and Operational Definitions

Simulation

Conceptual Definition: Simulation is a representation of reality. The fidelity ranges from low, task trainers, to high, human patient simulation. Simulation takes into account the mannequin, equipment, and the environment.

Human Patient Simulation

Conceptual Definition: Human patient simulation (HPS) is simulation with the use of computerized, high fidelity mannequins that respond to nursing actions. The mannequin was technologically advanced but continued to lack the ability to express changes in facial expressions, mimic limb movement, and change skin color or turgor.

Operational Definition: HPS was conducted with SimMan® (Laerdal) in a dedicated classroom. The researcher and laboratory personnel trained in the use of SimMan and familiar with running HPS scenarios operated the simulators and simulations. The simulation lasted 20 minutes with 3 – 4 students in randomly picked roles of primary nurse, secondary nurse, family member, and nursing assistant. The clinical instructor observed the simulations and contributed to the debriefings, along with the researcher.

Clinical Reasoning

Conceptual Definition: Clinical reasoning refers to the "processes by which nurses and other clinicians make their judgments… includes both the deliberate process of generating alternatives, weighing them against the evidence, and choosing the most appropriate, and these patterns that might be characterized as engaged, practical reasoning" (Tanner, 2006b, p. 204-205). Clinical reasoning and clinical problem solving are synonyms.

Operational Definition: Clinical reasoning was measured with students' ratings of statements in the LCJPS combining 30 individual statement scores into a total score for the survey. The difference in LCJPS total scores from Baseline (beginning) to Time 2

(end of the semester) indicated the changes in students' perceptions of their clinical reasoning abilities.

Demographic and Situational Characteristics

Conceptual Definitions: Demographic characteristics included age, gender, and ethnicity, and situational characteristics included previous experience in direct patient care, previous baccalaureate degree, and type of nursing program. All of the demographic and situational characteristics had the potential to affect students' perceptions of their clinical reasoning abilities.

Operational Definitions: Specific characteristics related to students' demographic and situational characteristics were operationalized through the use of a demographic survey that requested answers about: 1) students' ages (in years), 2) gender (male or female), 3) ethnicity (Caucasian, African-American, Asian, Hispanic, and other), 4) previous experience in healthcare (patient education, direct care, support services), and 5) previous baccalaureate degree (yes or no). Clinical group membership determined timing of the HPS experience within the semester—mid or end. The researcher had access to a student advising information database that provided data regarding the type of program for each survey respondent.

Assumptions

1. Nursing students' clinical reasoning abilities can be measured by students' perceptions of their clinical reasoning abilities with a self-rating scale.
2. Students are able to accurately assess their own clinical reasoning in practice characteristics.

3. Differences in students' self-perceived ratings of clinical reasoning in practice will provide important information about the effects of simulation sequencing within a nursing curriculum.
4. The acquisition of new knowledge, skills, and abilities within a single semester allows for significant differences in students' self-perceptions of their clinical reasoning abilities during patient care from beginning to end of a semester as measured by the LCJPS.

Limitations

1. Clinical faculty varies from semester-to-semester and among clinical groups with differing styles of clinical teaching and coaching. To reduce variation in approaches to simulation, the primary investigator was present at all HPS and simulation debriefings during the study semesters to help guide student experiences during the simulations and debriefing.
2. Patient simulation scenarios varied within and among student clinical groups within the study simulations due to the lack of sufficient simulation facilities to separate students who were engaged in simulations and those who were not, i.e., all students were housed in the same classroom for simulations as each HPS occurred.

Conclusion

Barriers exist when nurse educators try to provide quality clinical experiences for nursing students. A shortage of clinical faculty and clinical sites coupled with sicker patients who require more advanced medical technology in their care and monitoring reduce opportunities for novice nursing students to comfortably manage patient care

(Tanner, 2006a). Opportunities to observe students in clinical practica are limited as a single clinical faculty member may be responsible for up to 10 students. Providing HPS experiences for emergent conditions may help students bridge the clinical practice deficiencies and provide faculty with an opportunity to evaluate communication and psychomotor skills, as well as students' abilities to reason through a change in a patient's condition. The placement or sequencing of HPS in a semester has not been well evaluated or published in the nursing education literature. A major proposition of this study was that the placement of HPS in a semester was a critical variable that was likely to have an effect on students' self-perceptions of their clinical reasoning abilities. In this dissertation study, the effect of HPS placement within a semester on students' self-perceptions of their clinical reasoning abilities during patient care was evaluated using the Lasater Clinical Judgment in Practice Survey. Chapter Two summarizes the nursing literature and describes and discusses the current state of the science in regard to the use of simulation in nursing education programs and some of the debate in the profession between and among the concepts and measures of clinical reasoning. Chapter Three describes more explicitly the design and instruments that will be used in this study. The findings of the data analyses and description of the sample for the study are described in Chapter Four. Chapter Five discusses the meaning of the results of data analyses in light of current nursing literature, as well as implications for the future use of simulations to improve clinical reasoning and suggestions for future research regarding simulations and clinical reasoning skill promotion.

CHAPTER TWO – REVIEW OF LITERATURE

New nursing graduates must use clinical reasoning skills to create safe passage for patients in technologically complex healthcare environments (Benner, Sutphen, Leonard, & Day, 2010; Ebright, Patterson, Chalko, & Render, 2003; Ebright, Urden, Patterson, & Chalko, 2004; Miller & Malcolm, 1990; Simmons, Lanuza, Fonteyn, Hicks, & Holm, 2003; Tanner, 2006a). While nursing programs in the United States are generally efficient when exposing nursing students to important learning experiences during clinical practica, the programs are less efficient at providing students with the nursing science upon which to base critical clinical reasoning as a means to make decisions that provide good patient outcomes. Integration of clinical and classroom teaching weaves the science of nursing into the practice or art of nursing, including the ability to clinically reason during patient care (Benner et al.). Because clinical reasoning skills are critical to competent patient care, nursing students require exposure to situations in which they can use and develop clinical reasoning and clinical judgment skills (Benner et al.; Tanner).

Although clinical experiences with actual patients are the preferred methods for developing clinical reasoning skills (Rauen, 2004; Tanner, 1998), several barriers impede clinical reasoning skill development in nursing students. Barriers exist in both the education system and in the healthcare environment. In the healthcare environment barriers include the complexity of care required for sick, frail patients, competition for clinical sites, and advanced technology used in patient care. Student nurses may be prevented from giving care to complex patients or using advanced technologies in real patient care situations because of potential liability (Nehring, 2010b). In the nursing education system, barriers include increased competition for clinical sites and shortages

of nursing faculty, including clinical instructors (Benner et al., 2010; Schoening, Sittner, & Todd, 2006). One methodology that can be used by nursing faculty and students to practice nascent clinical reasoning skills without harming patients is human patient simulation (HPS) (Macedeonia, Gherman, & Satin, 2003). The use of HPS ameliorates the risk of harm for patients, can be located conveniently within schools of nursing, and provides some relief related to competition for clinical sites.

Although HPS provides a safe environment for students to practice nursing skills, including clinical reasoning, HPS is not a "natural" environment for students. Students may respond differently to actual and simulated patient care experiences for a variety of reasons. Therefore, when investigating HPS as a way for students to develop clinical reasoning skills, researchers must consider the influence of multiple factors in the students' self-perceptions of their development of clinical reasoning skills. Several factors may affect students' perceptions of their developing clinical reasoning skills in response to HPS as a method to develop clinical reasoning, including the students' ages, genders, ethnicities, previous college degrees, and previous work experiences in healthcare (Johnson & Webber, 2010; Lasater, 2005; Parr & Sweeney, 2006). Another factor that may influence students' self-perceptions of clinical reasoning abilities during HPS is sequencing of the HPS within a course. To comprehensively develop an understanding of HPS, its ability to influence students' self-perceptions of development of clinical reasoning skills, and variables that may contribute to variations in students' self-perceptions of clinical reasoning development, more research must be conducted with attention to specific details. To date, research has not adequately addressed such variables.

The remainder of Chapter Two will include four major topics. First, clinical reasoning in nurses and nursing students will be explored. Second, instruments in the nursing literature purported to measure students' perceptions of clinical reasoning will be analyzed. Third, the nursing literature will be reviewed for the use of HPS as a pedagogical method designed to promote and evaluate perceptions of clinical reasoning within nursing students. Fourth, the curricular placement of HPS, as reported in the literature, will be summarized.

Clinical Reasoning and Related Concepts

Within nursing literature, there are a myriad of terms that describe how nurses think and solve problems when caring for patients. Terms such as clinical judgment, critical thinking, clinical decision making, problem solving, nursing process, and clinical reasoning lack clarity in the literature and are often used interchangeably (Simmons, 2010; Turner, 2005). The lack of adequate definitions for such terms creates problems for nurse educators trying to teach, evaluate, or measure students' thoughts and decision making processes, which are so crucial to safe patient passage. Of these terms, authors most often refer to critical thinking, clinical reasoning, and clinical judgment. A brief review of the literature helps clarify ways in which these specific terms have been used in nursing education research.

Critical Thinking

Critical thinking is a covert cognitive process that has demonstrated a stubborn resistance to satisfactory description and measurement (Hicks, 2001; May, Edell, Butell, Doughty & Langford, 1999; McCarthy, Schuster, Zehr, & McDougal, 1999; Tanner, 2007). Two Delphi method studies were undertaken to identify critical thinking attributes

and definitions. The American Philosophical Association (Facione, 1990) involved 46 scholars in their research and proposed a list of critical thinking dispositions and cognitive skills, as well as recommendations for teaching and evaluating critical thinking in the classroom. The scholars determined that:

> The ideal thinker is habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and circumstances of inquiry permit. (Facione, 1990, p. 3)

Similar habits of the mind and cognitive skills were determined with the second Delphi study conducted by Scheffer and Rubenfeld (2000) with nurse scholars from eight different countries and the United States. A comprehensive, consensus definition of critical thinking was developed:

> Critical thinking in nursing is an essential component of professional accountability and quality nursing care. Critical thinkers in nursing exhibit these habits of the mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness, intellectual integrity, intuition, open-mindedness, perseverance, and reflection. Critical thinkers in nursing practice the cognitive skills of analyzing, applying standards, discriminating, information seeking, logical reasoning, predicting and transforming knowledge. (Scheffer & Rubenfeld, 2000, p. 357)

Several definitions of critical thinking, as well as other terms used to describe clinical thinking in nursing, have been proposed. A table listing several definitions of critical thinking, clinical judgment, clinical reasoning, clinical decision-making, problem solving, and metacognition are provided in Table 1.

Table 1. Definitions of Terms

Author (date)	Definition
Critical Thinking	
Ennis (1985)	Reasonable reflective thinking that is focused on deciding what to believe or do (p. 45)
Facione (1990)	The process of purposeful, self-regulatory judgment. This process gives reasoned consideration to evidence, contexts, conceptualizations, methods, and criteria (p. 3) Also cited in: Cise, Wilson, & Thie (2004); Facione & Facione (1996); Kawashima & Petrini (2004); Kuiper & Pesut (2004); May et al. (1999); McMullen & McMullen (2009); Redding (2001); Vacek (2009)
Facione (1990)	Critical thinker—habitually inquisitive, well-informed, trustful of reason, open-minded, flexible, fair-minded in evaluation, honest in facing personal biases, prudent in making judgments, willing to reconsider, clear about issues, orderly in complex matters, diligent in seeking relevant information, reasonable in the selection of criteria, focused in inquiry, and persistent in seeking results which are as precise as the subject and the circumstances of inquiry permit (p. 3) Facione, Facione, & Sanchez (1994): feel this definition describes clinical judgment attributes in nurses
Miller & Malcolm (1990)	A combination of an attitude of inquiry, supported by a knowledge base and enhanced by skill in application (p.73)
Facione, Facione, & Sanchez (1994)	Critical thinking cognitive skills: interpretation, analysis, inference, evaluation, and explanation. Also cited in Pesut & Herman (1999)
Kataoka-Yahiro & Saylor (1994)	The critical thinking process is reflective and reasonable thinking about nursing problems without a single solution and is focused on deciding what to believe and do (p. 352)
Alexander & Giguere (1996)	An analytic process addressing not only problem solving but also the ability to raise pertinent questions and critique solutions (p. 16)
Perciful & Nester (1996)	A process wherein an interaction occurs between individuals and interpretations of knowledge which they create (p. 24)
Bethune & Jackling (1997)	Both an attitude and a reasoning process involving a number of intellectual skills—a purposeful activity in which ideas are produced and evaluated and judgments made (p. 1007)
Brookfield (1997)	Critical thinking involves adults in recognizing and researching the assumptions that undergird their thoughts and actions (p. 17)
Oermann (1997)	Thought process underlying decisions and judgments made about clients under the nurse's care and other clinical decisions (Reilly & Oermann, 1992) (para. 1)
Scheffer & Rubenfeld (2000)	Critical thinking in nursing is an essential component of professional accountability and quality nursing care. Critical thinkers in nursing exhibit these habits of the mind: confidence, contextual perspective, creativity, flexibility, inquisitiveness,

Author (date)	Definition
	intellectual integrity, intuition, open-mindedness, perseverance, and reflection. Critical thinkers in nursing practice the cognitive skills of analyzing, applying standards, discriminating information-seeking, logical reasoning, predicting and transforming knowledge (p. 357) Also cited in: Cruz, Pimenta, & Lunney, 2009; Dickieson, Carter, & Walsh (2008); Di Vito-Thomas, 2005; Duchscher, 1999
Rapps, Riegel, & Glaser (2001)	A unique kind of purposeful thinking about any subject, content, or problem in which the thinker improves the quality of the thought process by systematically and habitually reflecting on the criteria employed during the reasoning process (p. 611)
Paul & Elder (2002)	Critical thinking is that mode of thinking-about any subject, content, or problem-in which the thinker improves the quality of his or her thinking by skillfully taking charge of the structures inherent in thinking and imposing intellectual standards upon them (p. 15)
Forneris (2004)	A process of thinking involves being proactive, collaborative, and quality oriented, while incorporating shared viewpoints and decision making, and global systems thinking (p. 1)
Paul & Elder (2008)	The art of thinking in such a way as to: 1) identify its strengths and weaknesses, and 2) recast it in improved form (where necessary) (p. 20)
Paul & Elder (2009)	The art of analyzing and evaluating thinking with a view to improving it (p. 2)
Alfaro-LeFevre (2009):	Critical thinking and clinical judgment in nursing is purposeful, informed, outcome-focused (results-oriented) thinking that: • Is guided by professional standards, ethics codes, and laws (Individual state practice acts) • Carefully identifies the key problems, issues, and risks involved • Is based on principles of nursing process, problem solving, and the scientific method (requires forming opinions and making decisions based on evidence). • Applies logic, intuition, and creativity and is grounded in specific knowledge, skills, and experience. • Is driven by patient, family, and community needs, as well as nurses' needs to give competent, efficient care. • Calls for strategies that make the most of human potential and compensates for problems created by human nature. Requires constantly reevaluating, self-correcting, and striving to improve (p. 7)
Simmons (2010)	Broader concept than clinical reasoning; involves particular dispositions, skills, and mental habits (p. 1154)

Author (date)	Definition
Clinical Judgment	
Itano (1989)	The process of determining the patient's health needs. Judgment involves a careful evaluation and assertion of an opinion based on specialized knowledge (p. 120)
Benner, Tanner, & Chesla (1996)	The ways in which nurses come to understand the problems, issues, or concerns of clients/patients, to attend to salient information, and to respond in concerned and involved ways (p. 2) Cited in: Lasater, 2007; Thomas & Fothergill-Bourbonnais (2005)
Tanner (1998)	An interpretation or conclusion about a patients' needs, concerns or health problems and/or the decision to take action (or not), and to use or modify standard approaches, or to improvise new ones as deemed appropriate by the patient's response (p. 19-20)
Daly (2001)	4 fundamental constituents of critical thinking in the form of a prerequisite knowledge base, a series of intellectual skills, a tendency or disposition to use both knowledge and skills in scrutinizing and evaluating information, and a series of intellectual standards to which such thinking should conform (p. 121)
Pesut (2001)	Clinical judgments require 4 types of logic. First, there is the logic of discerning patient care problems, issues, or nursing diagnoses. Second, there is logic required to contemplate care and make decisions that effect a positive change in a patient's state. Third, there is the logic of judgment in which one gives meaning and makes sense of evidence derived from a change in a patient's state. Finally, there is the logic associated with the conscious reflection and self-management of professional actions (p. 215)
Tanner (2006b)	Interpretation or conclusion about a patient's needs, concerns or health problems, and/or the decision to take action (or not) as deemed appropriate by the patient's response (p. 204) Cited in: McNiesh (2007); Samuels & Fetzer (2009)
Alfaro-LeFevre (2009)	Nursing opinions made about a person's, family's, or group's health at a certain point in time. Nursing decisions made about things like what to assess, what to do first, and who should do it (p. 288)
Clinical Reasoning	
Elstein & Bordage (1988/1999)	Physicians engaged in diagnostic clinical reasoning commonly employ the strategy of generating and testing hypothetical solutions to the problem (p. 111)
Tanner (1998)	Processes by which nurses and other clinicians make their judgments, and includes both the deliberate process of generating alternatives, weighing them against the evidence and choosing the most appropriate, as well as those patterns which might be characterized as engaged, practical reasoning (p. 20)
Pesut & Herman (1999)	Reflective, concurrent, creative, and critical thinking processes embedded in practice used to frame, juxtapose, and test the match between a patient's present state and desired outcome state

Author (date)	Definition
Wong & Chung (2002)	Diagnostic reasoning is a component of clinical decision-making and involves the recognition of cues and analysis of data in clinical situations
McCarthy (2003)	The types of decisions encompassed in the clinical reasoning process include a) those that focus on the nature of observations, b) decisions or inferences about the meaning of observations, and c) management decisions concerning the choice of subsequent actions (p. 90)
Simmons et al. (2003)	Recursive cognitive process that uses both inductive and deductive cognitive skills to simultaneously gather and evaluate assessment data (p. 701)
Leighton (2004)	Reasoning – process of drawing conclusions; conclusions inform problem-solving and decision-making endeavors because human beings are goal driven; reasoning works behind the scenes, coordinating ideas, premises, or beliefs in the pursuit of conclusions (pp. 3 – 4)
Murphy (2004)	The practitioner's ability to assess patient problems or needs and analyze data to accurately identify and frame problems within the context of the individual patient's environment (p. 227)
Kautz, Kuiper, Pesut, Knight-Brown, & Daneker (2005)	Reflective, creative and critical systems thinking processes nurses use to frame the meaning and facts associated with a client story, juxtapose and test the differences between the patient's present story and a desired specified outcome state; and make judgments about outcome achievements derived from reflection and self-regulation of thinking (p. 1.)
Tanner (2006)	Processes by which nurses and other clinicians make their judgments, and includes both the deliberate process of generating alternatives, weighing them against the evidence, and choosing the most appropriate, and those patterns that might be characterized as engaged, practical reasoning (p. 205)
Baldwin (2007)	The strategies used to understand the significance of data, identify potential client problems, and make clinical decisions to resolve problems and achieve outcomes (p. 24)
Banning (2008)	Reasoning is a process that pertains to the thought processes, organization of ideas and exploration of experiences to reach conclusions (p. 178)
Alfaro-LeFevre (2009)	The process used to make a clinical judgment (p. 288)
Johansson, Pilhammar, & Willman (2009)	The cognitive processes and strategies that nurses use to understand the significance of patient data, to identify and diagnose actual or potential patient problems, to make clinical decisions to assist in problem resolution and to achieve positive patient outcomes (p. 3367)

Author (date)	Definition
Simmons, (2010)	Complex cognitive process that uses formal and informal thinking strategies to gather and analyze patient information, evaluate the significance of this information and weigh alternative actions (p. 1155)
Johnson & Webber, 2010	Intentional, goal-directed, multistep process that involves 1) making observations about phenomena in clinical situations, 2) identifying relationships between and among concepts/variables, 3) understanding the significance of those relationships to the health and well-being of the patient, 4) using that understanding to explain the significance of the situation and possible outcomes to the patient and others, and 5) influencing or controlling one or more concepts or variables in attempt to bring about a desired outcome (p. 49)
Clinical Decision Making	
del Bueno (1983)	Making a decision almost always involves a complex process including, but not limited to, the following: Cue sensing, or knowing what to look at and what to look for, and recognizing the cue when you fall over it; cue interpretation, or translation of the concrete perception into words; inference drawing, or coming to a conclusion about the implications of the inference; deliberation on available options, or thinking about what could or should be done; and finally selection among option or between alternatives (p. 7)
Pesut & Herman (1999)	The selection of interventions and actions that move clients from a presenting state to a specified or desired outcome state (p. 41)
Lauri et al. (2001)	2 main phases of clinical decisions—a diagnostic phase in which observation of a patient situation, data collection, and data processing lead to identification of problems or decisions about diagnosis, and a management phase in which plans of action and treatment options lead to nursing interventions (para. 1)
Croskerry (2002)	Strategies in decision making—pattern recognition; rule out worst-case scenarios; exhaustive method; hypothetico-deductive method; heuristics; cognitive disposition to respond (p. 1185)
Roche (2002)	Complex process in which nurses combine theoretical knowledge with practical experience to make judgments regarding client care (p. 365)
Wong & Chung (2002)	Hammond (1964) defined clinical decision-making as the process of identifying the unobservable 'state of the patient' from observable data (p. 66)
White (2003)	Clinical function that differentiates nursing professional staff from technical ancillary staff. Professional nurses gather and process critical patient information to implement nursing actions and report findings to physicians and other health care professionals (p. 113)
Manias, Aitken, Dunning (2004)	3 decision-making models—1) hypothetico-deductive reasoning involves testing hypotheses and then modifying them as a result of an outcome of the situation being tested; 2) pattern recognition

Author (date)	Definition
	involves the process of making a judgment on the basis of a few critical pieces of information; and 3) intuition occurs at an unconscious level and involves nurses' use of tacit knowledge to justify their options (p. 271)
Baxter & Rideout (2006)	Clinical decisions made by nurses are the means by which nurses' contributions to the production of health will be judged (p. 121)
Metacognition	
Flavell (1979)	Cognition about cognitive phenomena; monitor own memory, comprehension, and other cognitive enterprises Cited in Croskerry, 2003
Fonteyn & Cahill (1998)	That body of knowledge and understanding that reflects on cognition itself. That mental activity for which other mental states or processes become the object of reflection
Efklides (2008)	Cognition of cognition that serves two basic functions: the monitoring and control of cognition
Muis & Franco (2010)	Knowledge of one's own cognitive process, that is, knowledge of how one monitors cognitive processes and how one regulates those processes (p. 21)
Problem-Solving Process	
Kuiper (2002)	Self-communication about task demands and cognitive strategies a person engages in before, during, and after performing a task (Beitz, 1996) (para 2)
Pretz, Naples, & Sternberg (2003)	Cycle of the following stages in which the problem solver must: 1) recognize or identify the problem; 2) define and represent the problem mentally; 3) develop a solution strategy; 4) organize his or her knowledge about the problem; 5) allocate mental and physical resources for solving the problem; 6) monitor his or her progress toward the goal; and 7) evaluate the solution for accuracy (pp. 3 – 4)

The definitions of critical thinking are wide ranging and include the rather expansive lists provided by the Delphi studies (Facione, 1990; Scheffer & Rubenfeld, 2000) and less extensive lists from authors such as Alfaro-LeFevre (2009), Daly (2001), and Pesut (2001). Other authors offer more concise definitions of critical thinking, such as Ennis (1985), Brookfield (1997), and Paul and Elder (2009). Many definitions discuss critical thinking as reflective, a process in which problems are solved, and involving analysis. Some critical thinking definitions (Paul & Elder; Rapps et al., 2001) are similar

to those provided for metacognition, which is commonly described as thinking about one's thinking. While critical thinking abilities are deemed a necessary component of clinical reasoning and judgment (Hoffman & Elwin, 2004; Martin, 2002; Simmons, 2010), it is also described as a concept that is broader than clinical reasoning due to its use in thinking outside of clinical situations (Alfaro-LeFevre; Simmons).

Critical thinking has been identified as an essential skill for nurses by the AACN in *The Essentials of Baccalaureate Education for Professional Nursing Practice* (2008) and other nursing program accrediting bodies, such as The National Organization of Nurse Practitioner Faculties (2008). The lack of a clear consensus on exactly what critical thinking involves leads to secondary difficulties related to accurate measurement of critical thinking (Staib, 2003). The emphasis on critical thinking in nursing literature interferes with much needed investigation and dialogue about how to help nursing students learn to think like nurses in order to solve clinical problems (Tanner, 2007). As a subliminal cognitive process, critical thinking may never be fully defined nor be amenable to objective measurement. Instead, nursing educators need to consider how students make decisions about patient care, which is known as clinical reasoning.

Clinical Reasoning

Nursing literature has suggested that experience, knowledge, and critical thinking inform clinical reasoning (Hoffman & Elwin, 2004; Johnson & Webber, 2010; Martin, 2002; Simmons, 2010). Clinical reasoning, the process by which decisions about patient care are made, requires extensive knowledge of the scientific bases for diseases and nursing interventions, as well as the particulars of patient situations (Tanner, 2007). Johnson and Webber (2010) describe influences of effective clinical reasoning as

"personal and professional knowledge, skills, values, meanings, and experiences" and the students' "ability to integrate all of these with the knowledge, skills, values, meanings, and experiences of patients, families, peers, and other healthcare providers" (p. 49). Nurses make decisions by "recognizing, interpreting, and integrating new information" (Martin, 2002, p. 243) to determine appropriate courses of nursing actions. Clinical judgments are the decisions made as to which actions to take to solve patient problems and are dependent upon nurses' abilities to use critical thinking and clinical reasoning (Tanner, 2006b). Current psychological theories related to human reasoning support a dual-process theory in which two different types of decision making occur.

James (1890/1952) first suggested that "Empirical Thought simply associates phenomena in their entirety, Reasoned Thought couples them by the conscious use of this extract" (p. 674). The extract was determining various aspects of phenomena under consideration during reasoning. More recent terminology describing the two types of thinking are System 1, for which people use a variety of heuristics or memory short-cuts, and System 2, which involves a deliberate, reflective, and rule-based thinking. System 1 tends to be used in familiar situations, and System 2 is more useful in novel situations (Facione, 2010). This dialectic manner of thinking may provide some insight into the phenomena of intuition that expert nurses use to determine rapid courses of actions when patients present a set of cues with which the nurse is familiar and yet requires expert nurses in unique situations to reason more deliberatively to determine an appropriate action. Exposure to different types of patient situations can help novice nurses and nursing students to build a memory bank of cues and responses that support positive

patient outcomes. The cues and responses banked into memory through patient care experiences are the building blocks of clinical reasoning (Tanner, 2006b).

While experiences with actual patient care expand clinical reasoning abilities, the opportunity to care for emergent patient conditions is often, appropriately, missing from clinical experiences (Macedonia et al., 2003; Nehring, 2010b). The complex healthcare environment cannot supply students with identical clinical experiences. In addition to providing consistent experiences, the use of HPS can increase students' exposures to dealing with emergent conditions, thus expanding more fully their clinical reasoning abilities. Tanner (2006b) suggested a "Clinical Judgment Model" (Figure 1), which has embedded within it the process of clinical reasoning leading to a judgment. The model does not merely depict the final decision or judgment made in clinical situations, indicating that Tanner recognized the complex process of reasoning that leads to clinical judgments, which will be discussed in more depth.

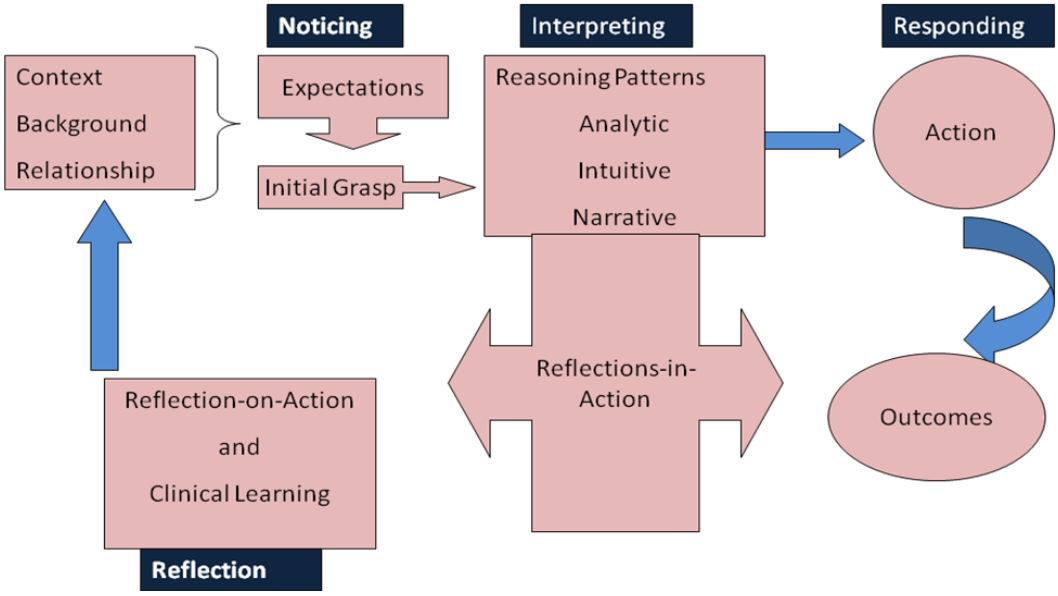

Figure 1. Clinical Judgment Model (Tanner, 2006b; Permission to use from *Journal of Nursing Education*)

Tanner's clinical judgment model (2006b) depicts four main processes within clinical reasoning to a judgment: noticing, interpreting, responding, and reflection. The noticing aspect requires that students perceive patients' concerns (cue recognition) and involves students' knowledge of the context of the situations, personal experiences and backgrounds, and relationships with the patients. With the various aspects of noticing, ideally, students have an expectation of how patients should act or respond. When patients do not respond as predicted, students notice the differences. For interpreting, students use reasoning patterns that involve analysis, intuition, and knowing the patients' stories to determine what the cues indicate in terms of the patient's conditions and what actions may be needed. Responding involves taking some action, which may also include waiting and watching for further developments. For reflection, outcomes of the actions are evaluated during (reflection-in-action) and after (reflection-on-action) the actual

situation. Students learn from the experience during reflection, developing more clinical reasoning skills as patients' responses to nursing actions are evaluated. Reflection is best accomplished in a safe, non-threatening environment (Tanner). Efforts and methods to evaluate various aspects of clinical reasoning, as outlined in Tanner's model, have been documented in the nursing literature and are discussed in the next section.

Evaluating Clinical Reasoning

Successive literature reviews have shown a continued concern about the research methods associated with studies investigating clinical reasoning (Simmons, 2010; Tanner, 1990, 1998, 2007). Methods for measuring the change in student nurses' thinking about decisions made during patient care, clinical reasoning to a clinical judgment, and the students' perceptions of these abilities have not been well established (Rane-Szostak & Robertson, 1996; Tanner 1990, 1998, 2006b, 2007). Studies relating clinical reasoning during patient care and patient outcomes are missing in the nursing literature, also (Fesler-Birch, 2005)

Nurses' clinical reasoning techniques tend not to conform to statistical decision-making models (Kelly, 1966) and tend to involve a mix of techniques within an individual (Aitken, 2003). Reasoning techniques vary according with nurses' expertise (Burger, Parker, Cason, Hauck, Kaetzel, O'Nan, & White, 2010). Heuristics and short cuts also typify nurses' clinical reasoning, depending on nurses' experience and knowledge of similar situations (Simmons et al., 2003; Tanner, 2007). Hurst, Dean, and Trickey (1991) discovered that many nurses failed to include planning and evaluation aspects of reasoning when describing clinical reasoning during patient care. Instead, the nurses discussed cue collection and interventions. Because the ways that nurses clinically

reason are considerable in quantity and quality, being able to accurately research and delimit what contributes to this kind of thinking complicates measurement.

To understand how nurses reason through clinical situations, researchers have used a variety of naturalistic techniques. Participant observation with "think aloud" explanations of actions in retrospect (Hoffman, Aitken, & Duffield, 2009; Lopez, 2009) and case study reviews (Hammond, Kelly, Schneider, & Vancini, 1966; McNett, 2009; Paterson, Dowding, Harries, Cassells, Morrison, & Niven, 2008) have been used to determine cue use and hypotheses generation. Each technique has its benefits and disadvantages.

Retrospective and simultaneous think aloud sessions may reflect a social desirability response bias in which the participant provides what the researcher might want to hear or what "good" nursing practice may involve (Gillis & Jackson, 2002; Polit & Beck, 2010). Retrospective recall has its own host of concerns about memory details, particularly the effect of the interviewer and structure of the interview. Misinformation was more likely with structured interviewing techniques when compared to cognitive interviewing techniques. The cognitive interview included the addition of mnemonics that encouraged participants to consider the context of the memories, to report everything, and to change perspective of the remembered situation (Centofanti & Reece, 2006).

The use of case studies, paper and pencil, computer enhanced, or enacted through HPS, differs remarkably from actual practice for expert nurses, who are often called upon to provide information in clinical reasoning studies. Case studies and actual patient care differ in that variations in real patient presentations allow expert nurses to identify subtle

changes in mood or patient presentation (Benner, 2001). Similarly, HPS and actual patient care situations provide different cuing for expert nurses, reducing the applicability of simulation for evaluation of expert nursing care (Waldner & Olson, 2007). An example of a study detailing a comparison of clinical reasoning between experienced and novice nurses (Tabak, Bar-Tal, & Cohen-Mansfield, 1996) demonstrated that case studies may not provide the depth and breadth of cues that experienced or expert nurses might detect in actual versus paper-based case patient scenarios. In the study, participants were provided case studies with inconsistent and consistent information for a particular diagnosis. Expert nurses felt that the inconsistent scenario was much more difficult to use in order to determine a diagnosis. While the authors did not discuss the possibility, one possible answer to this mystery may be that experienced, expert nurses tend to see their patients as patterns of information, gather cues accordingly, and respond to the situation in a seamless integration of nursing practice (Benner, 2004). Thus, the inconsistent case studies were perceived as more difficult by expert nurses and less problematic by novice nurses, who hold each cue as equally important whether it supports or negates a proposed diagnosis.

Potentially, a multitude of attributes, which are not currently measurable nor amenable to re-creation through simulation, could be affecting expert nurses' clinical reasoning, such as scents or sounds of which people are not consciously sensing. Taking reasoning evaluation to an artificial setting, such as simulation or case studies, changes the ambiance and the entire process of clinical reasoning for expert nurses (Waldner & Olson, 2007).

The cues that experts use to clinically reason are subtle in nature. Novice nurses and nursing students, who see each cue as equally important and who do not have the experience to notice less obvious patient changes, lack the ability to identify minute, subtle cues that indicate patient conditions are changing (Benner, 2001). In HPS, the simulators are not advanced sufficiently in design to imitate the subtle changes that expert nurses rely on to identify a change in patients' conditions. However, the simulators do provide more obvious indications of condition changes, such as changes in respiratory and heart rates, blood pressure, and crude skin color changes to mimic cyanosis, which nursing students and novice nurses can identify as needing intervention. Because students lack exposure to the same situations and experiences as expert nurses, HPS with simulators that provide obvious condition change parameters is an appropriate environment for nursing students to build skills and perception of skills for clinical reasoning. Nursing students are engaging in clinical reasoning when they identify a condition change, determine that interventions are needed, and act to correct the problems (Tanner, 2007). Nursing education literature addresses measurement of clinical reasoning with the development of a variety of instruments, which will be discussed.

*Instruments for Evaluation of Clinical Reasonin*g

Research studies evaluating instruments developed to assess clinical reasoning have been published in the nursing literature. Five instruments were evaluated for use in the current study. The original studies describing the instruments are detailed in Table 2.

Table 2. Clinical Reasoning Instruments from Nursing Education Literature

Name of Scale Author(s) Method of scale development	Theoretical Underpinning Number of Items Sample	Analyses Results	Critique
Clinical Decision-Making Questionnaire (CDMQ) Bakalis & Watson (2005) • Designed to determine how nurses use decision-making while performing direct patient care, dealing with supervisory and management decisions, and making decisions about nurses' extended roles, e.g. emergent situations • Statements developed by researchers using nursing texts • 2 nurse educators provided analysis of structure and themes	• Atheoretical • 15 items • 4-point response scale: regularly, often, sometimes, and not at all • 60 nurses in 3 different patient care arenas: medical, surgical and critical care	• Cronbach's alpha was .83 • Critical care nurses diagnosed patient conditions and managed the work environment more than medical /surgical nurses • Critical care nurses acted in emergent situations more often • Medical nurses informed patients about their prognosis more often • Age correlated negatively with frequency of making decisions	• Not based on a theory or framework • Not used with students • Scale measured type of decisions rather than the decision making process • Very little psychometric testing
Simulation Evaluation Instrument (SEI) Todd, Manz, Hawkins, Parsons, & Hercinger (2008) • 5 faculty members developed tool based on literature review for critical components: AACN core competencies • Study designed to	• Atheoretical • Content: assessment (4 items), communication (5), critical thinking (8), & technical skills (5) • Checklist with 0 – does not demonstrate	• Interrater agreement between 75 – 100% for categories • Scores of students not provided in article	• Students' perceptions of their skills were not captured • No theoretical framework • Minimal reliability and validity evaluation

Name of Scale Author(s) Method of scale development	Theoretical Underpinning Number of Items Sample	Analyses Results	Critique
assess AACN core competencies for BS nursing students in a pilot study of the use of HPS as an evaluation method	competency and 1- demonstrates competency scoring • Passing score was 75% of total 22 score • 72 Senior level nursing students		
Clinical Decision Making in Nursing Scale (CDMNS) Jenkins (1985, 2001) • Study designed to identify differences in CDM between different program levels of nursing students • Used 4 categories of decision making, which became subscales in the instrument: 1) search for alternatives or options, 2) canvassing of objectives and values, 3) evaluation and reevaluation of consequences, and 4) search for information and unbiased assimilation of new information • Panel of BSN educators had 77% agreement on good validity of items • Students interviewed post survey to	• Based on 7 criteria for optimizing the decision making process proposed by Janis and Mann (1977) • Collapsed into 4 categories • 40 items • Response scale: Never (1) to Always (5) • Pilot tested with 32 senior BSN students	• On subscale A, search for alternatives, juniors and seniors had significantly different mean scores. Otherwise, no significant differences in scores. • Lowest scores for junior level, next were sophomores, and then senior students scored highest	• 4 subscales devised by the author a priori were not evident when factor analysis of scores revealed 9 factors • Sophomores' scored higher in clinical reasoning than juniors' scores • Unable to significantly differentiate education levels of students

Name of Scale Author(s) Method of scale development	Theoretical Underpinning Number of Items Sample	Analyses Results	Critique
identify perceived problems with survey			
Lasater Clinical Judgment Rubric (LCJR) Lasater (2005) • Study designed to develop an instrument with which faculty could evaluate students' clinical reasoning and judgment activities during HPS • Discussion with experts in rubric development; initial observations and scoring of students performing simulations and participating in debriefings • Final discussion with Tanner	• Tanner's CJ Model (Messecar & Tanner, 2004) • Content validity and internal consistency with expert opinion (Tanner) • Student focus group (n = 8) • 11 items with a 4-point response scale: Beginning, Developing, Competent, Exemplary	• 26 junior-level BSN students with 2 scorings each a week apart with different simulations had a mean score of 22.98	• No Cronbach alpha reported • Faculty perceptions, not student self-assessment
Lasater Clinical Judgment in Practice Survey (LCJPS) Lasater (2005) • Study designed to identify students' perceptions of clinical reasoning abilities within the confidence portion of the author's model of CJ • Scheffer and Rubenfeld's (2000) Delphi project on critical thinking	• Lasater's Interactive Model of CJ Development – confidence dimension • 30 items • Sample 1 – N = 59 • Sample 2 – junior and senior BSN students N = 246 • Paired samples of 39 junior and	• 10 items added after discussion with Scheffer and Rubenfeld • Cronbach's alpha for 30 – item survey was .62 (N = 246) • Detected differences in class levels & between beginning and end of semester for students'	• Cronbach's alpha with 21 statements was .65 (N = 59) • No increase in Cronbach alpha with 30 statements and 246 surveys • Lasater termed the instrument as measuring clinical judgment, when in essence it rated students' perceptions of

Name of Scale Author(s) Method of scale development	Theoretical Underpinning Number of Items Sample	Analyses Results	Critique
habits of the minds and skills used to developing items • Conversation with Scheffer and Rubenfeld	44 senior students • Focus group of 5 BSN students to explore the survey for clarity, readability, & relationship to the Tanner Model of CJ (2006)	perceptions of clinical reasoning skills • Correlation with CCTDI, r = .62, p< .001	various aspects of clinical reasoning to judgments as well

Key: CCTDI = California Critical Thinking Dimensions Inventory; CDM = clinical decision making; CJ = clinical judgment

Bakalis and Watson (2005) consulted nursing texts to develop the Clinical Decision Making Questionnaire (CDMQ). The CDMQ was designed to determine nurses' decision making in the areas of direct patient care, supervision and management, and expanded roles in emergencies. Thus, the scale was less about the ways nurses reason to a decision, clinical reasoning, and more indicative of what types of decisions nurses make. The scale was not tested or used with nursing students. The interest of the current study is to determine if HPS influences growth of nursing students' perceptions of clinical reasoning skills, so this instrument was not considered as an adequate or reliable measure for this dissertation research.

The Simulation Evaluation Instrument (SEI) was developed to assess AACN core competencies for BS nursing students in a pilot study of the use of HPS as an evaluation method (Todd, Manz, Hawkins, Parson, & Hercinger, 2008). Core competencies evaluated by the instrument consisted of elements necessary for clinical reasoning:

assessment, communication, critical thinking, and technical skills. Although the authors did not identify their subscales as representing any aspects of clinical reasoning, several competencies are necessary for adequate clinical reasoning. The SEI included mutually exclusive categories of meets and does not meet competencies for 22 items for possible scores of 0 – 22 with passing identified as 75% of the total possible score. The scale had an interrater agreement between 75 – 100% for the 4 categories. Todd and colleagues suggested that the published pilot study should be repeated prior to widespread use of the instrument. The instrument used faculty ratings of student actions and was not considered a valid measure for the current study, because it did not include students' perceptions of their clinical reasoning abilities.

Jenkins (1985, 2001) used criteria proposed by Janis and Mann (1977) to determine how nursing students perceive their behaviors in the area of clinical decision making, also known as clinical reasoning to develop the Clinical Decision Making in Nursing Scale (CDMNS). The CDMNS had 40-items with a 5-level response scale of never to always for statements based on 4 categories of clinical decision making: search for alternatives or options, canvassing of objectives and values, evaluation and reevaluation of consequences, and search for information and unbiased assimilation of new information. Post data collection factor analysis did not support the four subscales devised by the author. A Cronbach alpha of .83 for 111 students completing the CDMNS was achieved. Three levels of students participated in the study with juniors scoring lowest and seniors scoring highest; the sophomores' mean score was between the junior and senior mean scores. None of the scores were significantly different across program levels.

The CDMNS was evaluated in two additional published studies. Theile, Holloway, Murphy, Pendarvis, and Stucky (1991) evaluated 83 junior BSN students with resultant Cronbach alpha scores ranging from .80 – .93 for the scale. The students demonstrated moderate to low scores on the CDMNS. In the second published study, Bowles (2000) evaluated two groups of senior BSN students (N = 65) using the CDMNS and the California Critical Thinking Skills Test (CCTST). While the relationship between the two tests was significantly positive, the CDMNS accounted for only 4% of the variance in the CCTST. Because the CDMNS measured sophomores as having higher clinical reasoning skills than junior nursing students, accounted for so little of the variance in a standardized critical thinking test, CCTST, and did not involve HPS, the instrument was not considered to have enough documented validity for this dissertation study.

Lasater (2005) developed two instruments, the Lasater Clinical Judgment Rubric (LCJR) and the Lasater Clinical Judgment in Practice Survey (LCJPS), dealing with clinical reasoning, which Lasater labeled as clinical judgment. The theoretical basis of both instruments was a model developed by Lasater: Interactive Model of Clinical Judgment Development (Figure 2). The model has four dimensions: 1) *confidence* in applying clinical judgment to nursing practice, 2) *aptitude* toward critical thinking, 3) *skill* in the use of clinical reasoning, and 4) *experience* in using clinical reasoning during simulated patient care. Lasater also used Tanner's Clinical Judgment Model as a basis for the study, indicating that the Lasater Interactive Model of Clinical Judgment Development represented what nursing students bring to patient care experiences.

Figure 2. Lasater Interactive Model of Clinical Judgment Development (Permission to use from K. Lasater, EdD.)

Lasater's Clinical Judgment Rubric (LCJR) (2005) was developed using the four main dimensions of Tanner's Clinical Judgment Model (2006b) (Figure 1). The rubric represented the skill construct in Lasater's Interactive Model of Clinical Judgment Development. Each component of Tanner's Clinical Judgment Model was used as a dimension and subscale in the LCJR and described student actions during simulated patient care: noticing, interpreting, responding, and reflecting. The four subscales were divided into dimensions within each subscale for a total of 11 dimensions:

- Noticing—focused observation, recognizing deviations from normal patterns, information seeking;
- Interpreting—prioritizing data, making sense of data;
- Responding—calm and confident manner, clear communication, well-planned intervention/flexibility, being skillful;
- Reflecting—evaluation/self-analysis, commitment to improvement.

Four levels were scored as beginning 1), developing 2), accomplishing 3), and exemplary 4) skills in each dimension. The scale had potential scores of 11 – 44. Lasater's study revealed a mean score of 22.98 for 26 junior-level BS nursing students. There were no differences in LCJR scores when differences in the day of the week, time of the day, order of simulation scenarios, small group membership during scenarios, and size of groups were considered (Lasater, 2005).

Gubrud-Howe (2008) used the LCJR to investigate the use of a trademarked learning framework, How People Learn® and to identify quantitative differences in control (N = 19) and experimental (N = 17) groups. The experimental group had experiences that were driven by the learning framework while the control group received typical nursing program instruction for the study institution. All students participated in simulation and were evaluated using the LCJR. Significant differences of pre-treatment scores between control and experimental groups were obtained for 3 of the 11 performance indicators: Noticing—recognizing deviations from expectations, focused observation; and Responding—calm, confident manner. Both groups had significantly different LCJR mean scores at beginning and end of semester. The LCJR determined that students' clinical reasoning actions increased over the semester. The instrument was also used specifically within the HPS environments. The faculty used the instrument to evaluate students' actions and reasoning, but students' perceptions of their clinical reasoning abilities were not identified.

Blum, Borglund, and Parcells (2010) examined clinical competence and self-confidence in 53 BS nursing students using the LCJR totals. The authors chose four specific ratings within the LCJR for student rating of their self-confidence and four

additional ratings for faculty evaluation of students' clinical competence. The self-confidence subscale consisted of calm/confident manner, well-planned intervention/flexibility, evaluation/self-analysis, and commitment to improvement. Students' subscale responses resulted in a Cronbach alpha of .81. The midterm-to-final ratings were positively correlated and significantly different. The clinical competence subscale included LCJR items of recognizing deviations from expected patterns, information seeking, prioritizing data, and clear communication. The Cronbach alpha for the competency subscale using faculty responses was .88. The subscale demonstrated a positive relationship and significant differences from midterm to final measures. The 53 students were divided into traditional laboratory experiences and simulation experiences. From midterm to final measures, neither subscale was significantly different between groups, but both subscale totals increased significantly for both groups. Simulation was not superior to traditional laboratory experiences for student development of self-confidence and clinical competence as depicted by the subscales devised by the researcher. The LCJR does not provide insight into students' perceptions of their clinical reasoning abilities and was not considered appropriate for this study.

For the other instrument created by Lasater (2005), the Lasater Clinical Judgment in Practice Survey (LCJPS), development began with Lasater's Interactive Model of Clinical Judgment Development (Figure 3) and the instrument represented the confidence construct in the model. Further, LCJPS development was augmented with information from Scheffer and Rubenfeld's (2000) Delphi study, which identified consensus on critical thinking descriptors related to habits of the mind and skills. The final version of the instrument had 30-items and a 4-level response scale of strongly disagree, disagree,

agree, and strongly agree, resulting in potential scores of 30 – 120. Lasater worded 10 items negatively, requiring reverse scoring with data entry. The LCJPS had a relatively low Cronbach alpha of .62 (N = 246) in Lasater's original study. Unpublished results of the use of the LCJPS demonstrated higher Cronbach alpha levels of .72 – .82 (Jensen, 2008). Initial use of the scale found that differences between beginning to end of semester LCJPS scores were significant for junior and senior students (Lasater). Relationships at the beginning and end of the semester for junior and senior student LCJPS scores had moderate to strong correlations of .55 and .81, respectively. The instrument was used in connection with HPS in addition to usual clinical experiences as a way to develop clinical reasoning. Students provided a perception of their clinical reasoning abilities with the LCJPS. While the initial reliability measures were low, further data collected with the instrument revealed higher reliability.

The review and critique of instruments designed to measure clinical reasoning revealed two out of five reviewed instruments as potentially suitable for use as measurements in this dissertation study as a formative evaluation, the CDMNS and the LCJPS. While faculty evaluation of students' clinical reasoning skills is not the purpose of the current study, the LCJR and SEI would be useful for faculty evaluation of students' performances in simulation. The CDMNS provides an evaluation of clinical reasoning skills from the students' perspectives; however, previous use has failed to adequately identify increases in clinical reasoning skills over time as nursing students advance through the program. Given the evidence available for clinical reasoning instruments, the LCJPS provides an instrument that identifies students' perceptions of their clinical reasoning skills over time and was used to evaluate changes in reasoning skills,

comparing usual and simulated clinical experiences over a single semester. The LCJPS reliability measures were somewhat below acceptable standards of a Cronbach alpha coefficient at or above .70 (Polit & Beck, 2010). The instrument's use in the current study resulted in much higher Cronbach alpha coefficient results: .79 for the Baseline LCJPS and .78 for the Time 2 LCJPS. The instrument is appropriate for measuring students' perceptions of clinical reasoning abilities.

Summary of Clinical Reasoning Concerns

Overall, the literature indicated three major considerations related to clinical reasoning for this dissertation study. First, the terms used to describe clinical reasoning, clinical judgment, and critical thinking lack clarity, making a search for nursing education literature related to clinical reasoning skill development difficult. Second, research done thus far to clarify how clinical reasoning develops is not complete and may be skewed because experienced nurses are often used as samples, which does not indicate how student nurses develop clinical reasoning. Third, while several instruments purport to measure clinical reasoning, there are concerns with the instruments ranging from use in settings other than HPS to requiring faculty to label student actions as clinical reasoning rather than obtaining students' perceptions of their clinical reasoning abilities. Despite such ambiguity, clinical reasoning development is desired in nursing students and there are expectations that clinical reasoning will improve as students advance through nursing programs. In the next section the use of HPS as a newer pedagogical method to help develop perceptions of clinical reasoning skills in nursing students will be discussed.

Clinical Reasoning Development in Nursing Students Using HPS

One method employed by nurse educators to influence nursing students' development of clinical reasoning skills, and their perceptions of the same, is HPS. This section will describe 1) HPS, 2) a framework for simulation use in nursing education, 3) literature that reviews the use of HPS in nursing programs, and 4) how HPS may be used to promote nursing students' perceptions of development of their clinical reasoning.

Simulation Defined

Gaba (2004) defined simulation as an "artificial replication of sufficient elements of a real-world domain to achieve a stated goal" (p. 7). Rauen (2004) defined simulation as: "an event or situation made to resemble clinical practices as closely as possible" (p. 46). HPS involves a realistic and intricate simulator with multiple human-like physiological features, which permits "a high level of interactivity and realism for the learner" (Hovancsek, 2007, p. 3).

Human Patient Simulation (HPS)

The addition of HPS to nursing education pedagogies provides ways to promote confidence in patient care skills and allows students to use clinical reasoning skills (Jeffries, 2005; Nehring 2010a; Nehring & Lashley, 2004). Within simulated patient care environments, nursing students decide what additional information to gather through physical assessment of the simulator, determine which information is pertinent to the situation, and make a decision on what nursing interventions to take. The clinical reasoning actions during HPS are necessary to reach a clinical judgment (Tanner, 2006b). During the simulation, students are also asked to "act like a nurse" in dealing with the patient, family members, healthcare team members at the bedside, and potentially

healthcare providers available by phone (Rystedt & Lindstrom, 2001). As with content and skills (Hodson-Carlton, 2009), the nursing education literature does not provide a consensus as to where to place simulation within a course or nursing program (Hayden, 2010; Nehring, 2007). The nursing education literature related to HPS has not addressed the number of experiences, length of simulations, or placement within courses or programs. For each study reviewed, the type and amount of simulation, as well as purposes and outcomes of the research, were diverse and not amenable to systematic analysis (Nehring, 2010a). Thus, the dose of HPS experiences is unknown in relation to developing students' perceptions of clinical reasoning abilities, as well as other simulation outcomes.

Theoretical Model for Simulation

Jeffries (2005) proposed a theoretical framework that can be used for initial design, ongoing implementation, and assessment of simulations and proposed a model to illustrate the framework (Figure 3). Three major portions of the model are the educational environment, including the instructor, student, and pedagogical practices; the design and implementation of the simulation; and the expected outcomes of simulation. The framework provides a method for nursing faculty to identify important aspects of HPS scenario development, use with students, and evaluative components that may be salient to the development of students into nurses.

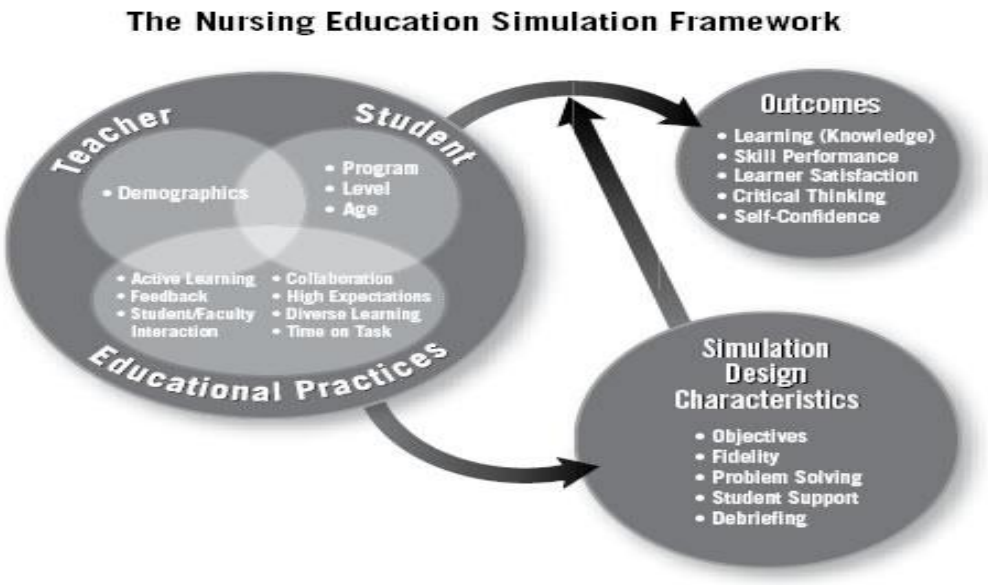

Figure 3. Nursing Education Simulation Framework (Jeffries, 2005, permission to use from National League for Nursing [NLN])

Educational Environment

Within the educational environment of nursing education simulation, the teacher and student interact in a variety of ways. The educational philosophy of the instructor, in part, drives the methods used for simulation (Jeffries, 2005). Nurse educators, however, must invest some time and energy in order to fully, expertly implement HPS. For busy nursing faculty, learning new ways of delivering nursing education may be restrained by time, knowledge of computer-based programs, and money to invest in new equipment and training (Hovancsek, 2007). Simulation technicians can help reduce nursing faculty time requirements by preparing the simulator and environment, managing simulator responses during the scenario, and devising manikin programming based on faculty input. Simulation can help provide student-centered learning, but students need direction prior to the simulated activity and need to be aware of their roles in the scenario.

Simulation Design Characteristics

Several aspects of the simulation design are of particular importance when developing and conducting simulations, including 1) learning objectives related to the HPS, 2) fidelity of the simulation, 3) problem solving, 4) student support, and 5) the debriefing process. First, learning objectives for the simulation should be related in part to the course objectives within which the simulation experience occurs. An important aspect of using simulations is leveling or scaffolding learning objectives appropriate for the students' educational level—simple to complex and sophomore to senior (Jeffries & Rogers, 2007). Progressively building more advanced patient care skills into HPS scenarios as students advance through the program is an important method for developing students' confidence and abilities to use clinical reasoning (Larew, Lessens, Spunt, Foster, & Covington, 2007). This dissertation study will use simulation scenarios more complex than those used in the fundamentals course in the students' previous semesters, but less complicated than the medical surgical course subsequent to the course in the study (Jeffries & Rogers). However, the simulations will be similar for the mid and end of semester groups.

Second, fidelity in simulation must be considered. Fidelity is the degree to which the simulation or simulator mimics actual patients and patient care situations and involves the mannequin, the equipment used in the simulation, the environment, and the ability of participants to role play (Jeffries, 2005; Seropian et al., 2004). Rules regarding behavior in the simulation environment, such as confidentiality and student uniform requirements, can encourage expectations of treating the HPS experience as reality (McCauseland, Curran, & Cataldi, 2004). Because fidelity involves so many aspects of the simulation,

many features of HPS can be quite low in fidelity quality, yet result in very high level learning (Seropian et al., 2004; Waldner & Olson, 2007). By explaining the less real aspects of the simulation to participants, simulation facilitators help participants anticipate potential differences in the simulated environment from what might be expected in actual patient care situations (Hotchhkiss, Biddle, & Fallacaro, 2002).

Third, HPS encourages students to solve problems by using knowledge from didactic portions of course work to clinically reason as simulations proceed (Schoening et al., 2006). Adjusting cues within the HPS can encourage students to solve patient care problems by providing increasingly specific information to prompt appropriate patient care for the simulation experience. In this dissertation study, students will be asked to solve similar patient problems at both simulation sessions, mid and end of semester. Each simulation scenario will involve a patient who is initially stable, but has a variety of comorbidities that are potential problems. As each simulation progresses, the student will be asked to conclude what is causing a change in the patient's situation, gather information concerning the change, and either treat it or contact a healthcare provider for further orders. Because simulations that are too complex may overwhelm participating nursing students and inhibit patient care skill development (Jeffries & Rogers, 2007), the patient in the scenarios used for this dissertation study will be similar to those encountered in their clinical experiences.

Fourth, student support during simulation can take many forms, but primarily involves cueing during the simulation. Further, expanding student support to include information provided prior to simulation and introducing the simulator and its functioning to students is essential (Ravert, 2010). Fifth, student support continues as

faculty facilitate debriefing post simulation. All simulation requires debriefing, regardless of the type of simulation. Often, the most important learning occurs in the debriefing, where learners reflect on what transpired during the simulation. Debriefing involves participants and instructor/operators reviewing various aspects of a simulation experience (Johnson-Russell & Bailey, 2010).

Overall, HPS is a safe, realistic environment in which students can be encouraged to flex new clinical reasoning skills. With faculty support, students can make poor clinical judgments, see the effects, and repeat the scenario to move beyond poor clinical decisions, clinically reasoning more appropriate patient care decisions and realizing positive patient outcomes (Medley & Horne, 2005). The design characteristics, educational environment, and curricular placement of the HPS may affect student nurses' outcomes.

Outcomes of Simulation

A variety of outcomes are possible when using HPS. The outcome components of Jeffries' framework (2005) include knowledge of pathophysiology and nursing interventions, skill performance (Jeffries), critical thinking (Jeffries; Ravert, 2008), and self-confidence and satisfaction of learners (Smith & Roehrs, 2009). Radhakrishnan and colleagues (2007) found that students who experienced patient care scenarios with HPS had significantly better scores in the areas of patient identification (safety) and assessing vital signs when caring for patients in clinical arenas. Further, the skills developed in the simulated environment were transferred to actual patient care. Learning outcomes of HPS identified through a descriptive study included improved knowledge of medication side effects, better understanding of patients' individual differences, medication

administration skills, and confidence related to medication administration (Bearnson & Wiker, 2005).

Several aspects of HPS require planning to successfully conduct simulation with nursing students. Regardless of the type of simulated patient care, learning during simulation is enhanced and supported by clear discussions of salient aspects of the scenario during debriefing (Johnson-Russell & Bailey, 2010). Planning in relation to HPS also involves placement of the simulation experience within the curriculum, which may influence nursing student learning from HPS.

Curricular Placement of HPS

Anecdotal discussions of how HPS is implemented in various nursing programs are common in the nursing literature (Dearman, Lazenby, Faulk, & Coker, 2001; Herm, Scott, & Copley, 2007; Horan, 2009; Kardong-Edgren, Starkweather, & Ward, 2008; Leigh & Hurst, 2008; Mauro, 2009; McCausland et al., 2004; Medley & Horne, 2005; Murray, Grant, Howarth, & Leigh, 2008; Nehring & Lashley, 2004; Peteani, 2004; Rauen, 2001; Waxman, 2010). However, in a search of medical and nursing databases, few research studies were found related to curricular placement of simulation experiences. Nehring and Lashley (2004) conducted a survey across national and international nursing programs to determine, among other things, the curricular content, number, and type of nursing courses that use HPS. The majority of colleges and universities used simulation in less than 5% of the curricula. Commonly, universities and colleges used HPS in undergraduate courses for basic nursing skills, physical assessment, and beginning and advanced medical-surgical nursing concepts. The most common use of HPS (57.1%) was as part of clinical hours. However, Nehring and Lashley did not report

information about timing of HPS within the curricula as a whole nor in individual courses or semesters.

Authors seem to be in agreement that HPS can be integrated into clinical, didactic, physical assessment, and psychomotor skills courses (Dubose, Sellinger-Karmel, & Scoloveno, 2010; Harder, 2010; Wilford & Doyle, 2006). However, the optimum dose (number and length) of HPS experiences has not been addressed in published research studies (Cant & Cooper, 2009). Data involving curricular order of courses, in general, indicated that three specific stages are often found: basic sciences, then preclinical sciences, then clinical disciplines. Within each stage, multiple combinations of courses are common (McGaghie et al., 1978). Decisions about curricular planning were related to philosophical foundations and expected competencies associated with nursing programs (Chappy & Stewart, 2004; Iwasiw et al., 2009). Thus, there is little in the way of evidence on which to base curricular placement of HPS in nursing education. This dissertation study will contribute some evidence toward whether or not placement of HPS within a semester influences student nurses' perceptions of their clinical reasoning and judgment development. The next section will discuss nursing literature related to HPS use for student nurses' perceptions of clinical reasoning development.

HPS and Developing Students' Nurses Perceptions of Clinical Reasoning

Rourke, Schmidt, and Garga (2009) demonstrated through a review of current HPS literature between 1989 and 2009 that very few (10%) studies made adequate use of theory, i.e., linking theory with research outcomes. Much of the nursing education literature related to HPS provided anecdotal information about:

- *how to develop simulation scenarios* (Horan, 2009; Kuiper, Henrich, Matthias, Graham, & Bell-Kotwall, 2008; Rauen, 2001; Waxman, 2010),
- *how to perform HPS with nursing students* (Dearman et al., 2001; Herm et al., 2007; Horan, 2009; Kardong-Edgren et al., 2008; Leigh & Hurst, 2008; McCausland et al., 2004; Medley & Horne, 2005; Murray et al., 2008; Nehring & Lashley, 2004; Peteani, 2004; Rauen, 2001; Waxman, 2010),
- *how to increase faculty involvement in simulation* (Dillard, Sideras, Ryan, Hodson Carlton, Lasater, & Siktberg, 2009; King, Mosely, Hindenlang, & Kuritz, 2008),
- *how to promote knowledge acquisition by students* (Hoffman, O'Donnell, & Kim, 2007; Schaliret & Pollock, 2010),
- *how students' evaluated their experiences with HPS* (Abdo & Ravert, 2006; Aronson, Rosa, Anfinson, & Light, 1997; Cato, Lasater, & Peeples, 2009; Gore, Hunt, & Raines, 2008; Kardong-Edgren et al., 2008; Lambton, O'Neill, & Dudum, 2008; Mole & McLafferty, 2004; Moule, Wilford, Sales, & Lockyer, 2008; Parr & Sweeney, 2006; Reilly & Spratt, 2007; Rhodes & Curran, 2005; Robertson, 2006; Traynor, Gallagher, Martin, & Smyth, 2010; Wotton, Davis, Button, & Kelton, 2010).

To be included in the review of literature related to students' perceptions of their clinical reasoning development using HPS, articles had to be research-based, include an instrument that evaluated students' perceptions of their clinical reasoning abilities in patient care, and include reports of reliability and validity of instruments, if a quantitative

study. Articles that were excluded were anecdotal (Dillard et al., 2009) or did not demonstrate reliable and valid instruments, if a quantitative study (Parr & Sweeny, 2006; Rhodes & Curran, 2005; Robertson, 2006). With inclusion and exclusion criteria considered, only one quantitative study (Lasater, 2005) remained.

Of the quantitative studies reviewed from nursing literature, only one met the inclusion criteria and included a tool specifically devised to evaluate students' perceived use of clinical reasoning skills in conjunction with participation in HPS. Lasater (2005) investigated the effects of HPS on students' perception of clinical reasoning skill development in 39 junior and 44 senior level nursing students at the beginning and end of the semester. Both groups had significant increases in confidence related to students' perceptions of clinical reasoning skills, as measured by the LCJPS and compared to control groups who did not experience HPS. HPS supported students' perceptions of clinical reasoning skill development. Other nurse researchers have called for further research to understand the influence on demographic variables on clinical reasoning and the use of HPS (Parr & Sweeney, 2006; Robertson, 2006) Demographic variables of age, gender, and ethnicity were not significantly related to students' LCJPS scores (Lasater 2005).

Additional characteristics that may influence students' perceptions and changes in perceptions of clinical reasoning abilities are experience in the healthcare field prior to entering the program, attaining a previous baccalaureate degree, the type of nursing program into which the student self-selected through application to a particular program, and, in this study, the intervention variable of timing of simulation within the semester. Skills acquired from working in the healthcare field prior to entering the nursing program

or the skills needed to attain a previous baccalaureate degree could provide nursing students with reasoning advantages that students without either history might not have. Reasoning skills in work, life, and education may transfer to clinical reasoning in nursing. The type of nursing program may influence students' perceptions of clinical reasoning abilities because historically students in AS nursing programs have higher mean ages. Age has been shown to be positively related to reasoning abilities (Alfaro-Lefevre, 2009). An examination of how the demographic and situational variables influence students' perceptions of clinical reasoning abilities in the current study may help provide more information about the relationships involved.

Conclusion

The review of literature provided insight and considerations for this dissertation study in relation to student nurses, clinical reasoning, and HPS. Considerations included: 1) ambiguity of terminology surrounding clinical reasoning; 2) barriers that impede nursing faculty from providing adequate clinical experiences upon which nursing students can build clinical reasoning skills; and 3) the use of HPS as an adjunct to clinical experiences to provide a safe environment for nursing students to practice clinical reasoning skills.

First, the nursing literature is uncertain about the meaning of, educational methods for, and evaluation of clinical reasoning. Despite the uncertainty related to clinical reasoning, a few commonalities can be derived from the nursing education literature. Nursing students are expected to learn how to clinically reason and progress in their clinical reasoning skills over time in nursing programs. Benner (2001) generally placed graduate nurses at the advanced beginner stage of the Novice to Expert

framework. Thus, nursing students must graduate with abilities to grasp pertinent aspects of a situation. Advanced beginners, nursing students at graduation, need to understand that they remain nurse-centered in their approach to patient care and must rely on others for help in difficult situations. Nursing faculty are tasked to provide experiences in which nursing students can advance from novice to advanced beginner abilities to ensure successful integration of nursing graduates into dynamic, chaotic, and potentially dangerous healthcare environments.

Another commonality related to clinical reasoning in the nursing education literature is that defining and assessing clinical reasoning is a morass of information. Much of the research related to clinical reasoning and its alternative designations, clinical judgment and clinical decision making, has used methodologies, such as case studies and structured interviews that may lead to biased findings. Assessing clinical reasoning in nursing students has been undertaken using a broad range of methods (Tanner, 2007), limiting the ability to synthesize research findings. Many studies relied on faculty rating of students' clinical reasoning skills (Lasater, 2005; Todd et al., 2008); less frequently, students were asked to rate their perceptions of clinical reasoning (Bowles, 2000; Jenkins, 1985, 2001; Lasater, 2005; Thiele et al., 1991). Of the few studies in which students completed self-rating, only one instrument, the LCJPS, stands out as a reliable and valid measure of students' perceptions of their clinical reasoning abilities. Despite low initial reliability measures, the LCJPS differentiated significant differences from beginning to end of semester and between class levels for students' perceptions of clinical reasoning abilities.

Second, nursing programs are currently under more pressure to graduate larger numbers of nursing students to meet predicted shortfalls of nurses while dealing with aging faculty and a lack of doctorally prepared and clinical faculty (AACN, 2010). Clinically, patients are sicker with higher levels of technology at the bedside and competition for clinical placement sites is high (Schoening et al., 2006). Within this milieu, nursing faculty must provide experiences for nursing students in which patients are not harmed and simultaneously develop clinical reasoning skills in students for patient care (Macedonia et al., 2003; Rauen, 2004).

Third, HPS is one method in which development of student nurses' clinical reasoning skills can be accomplished with the nursing education research literature beginning to bear this out through anecdotal and experimental reports. Unfortunately, very few nursing studies, 10% (2 out of 20 reviewed studies) in a literature review, used adequate theoretical basis for research designs involving HPS (Rourke et al., 2010). With Jeffries' (2005) simulation framework and other nursing education models, nurse educators can plan, develop, and conduct nursing simulations, using evidence-based pedagogical practice. Further research will help determine more best practices in terms of various student characteristics, such as learning styles, class level, demographic variables, etc., as well as placement and dose (number and length) of simulation experiences within courses and curricula.

Chapter Two has provided a review of literature related to clinical reasoning and HPS, as well as how nurse researchers have evaluated both terms and their effects on each other. The proposed methods for further evaluation of students' perceptions of their clinical reasoning abilities, using HPS as an intervention, are explained in Chapter Three.

CHAPTER THREE – METHODOLOGY

Student nurses must learn and exhibit the use of clinical reasoning skills prior to graduation and entry into complex healthcare environments in order to provide safe patient care. Several barriers within nursing education and the clinical arena may impede the acquisition of clinical reasoning skills and students' perceptions of their clinical reasoning skill development (Benner et al., 2010). This dissertation study will evaluate whether the timing of human patient simulation (HPS) experiences within a semester impacts students' perceptions of clinical reasoning abilities. Proposed methods for the study will be described in this chapter.

Design

This dissertation study was a quasi-experimental, repeated-measures design, using convenience samples of nursing students and clinical reasoning perception scores obtained at different times in the semester. The dependent variable was changes in students' perceptions of clinical reasoning abilities as measured by the Lasater Clinical Judgment in Practice Survey (LCJPS) (2005). Independent variables include: demographic variables of age, gender, and ethnicity; and situational variables of previous experiences in healthcare, previous baccalaureate degree, and type of nursing program. Timing of HPS within the semester is an independent variable manipulated by the researcher: mid or end of semester. Two types of statistical comparisons will be used in this study. First, a nonequivalent, before and after comparison will be used with students acting as their own controls. Second, the same group of students will be analyzed as independent groups of students, who will receive the intervention (HPS) at different times in the semester. Group 1 will experience HPS mid semester, and Group 2 will

receive HPS at the end of the semester. Students enrolled in NUR 202 Adult Medical-Surgical Nursing II, the first hospital-based clinical course in an undergraduate nursing program, can participate in the study.

Sample

The convenience sample was nursing students enrolled in the first hospital-based clinical course (NUR 202 Medical-Surgical Nursing of Adults II) in Associate of Science (AS) and Bachelor of Science (BS) nursing programs at a Midwestern university. This particular course was chosen, because in either the BS or AS programs, students complete this course and all previous nursing courses using the same clinical and didactic requirements. All students are required to participate in simulations as part of course work, regardless of whether or not they choose to participate in research studies such as this one.

Inclusion/Exclusion Criteria

Inclusion criteria were: 1) students in NUR 202 Medical-Surgical Nursing of Adults II at the Midwestern university and 2) 18 years of age or older. Exclusion criteria were: 1) students not enrolled in the medical-surgical course and 2) students under the age of 18.

Power Analysis

Cohen (1988) offered a method for determining sample size prior to data analysis based on a researcher's proposed effect size, power, and alpha levels. For a t-test where the effect size is a modest .50 with a two-tailed alpha of .05 and power of .80, Cohen's tables demonstrate that 64 subjects in each group will be required to achieve such power. However, the tables also provided various sample sizes for differing effect sizes at a

power of .80. A meta analysis of attrition rates in randomized control trials in education research literature revealed attrition rates of 0 – 30% (Valentine & McHugh, 2007). In a given academic semester, approximately 60 students enter NUR 202 Medical-Surgical Nursing of Adults II. Therefore, given attrition rates, data from three semesters were needed for the study to achieve a sample size of 64 students per group. Groups were developed by assigning clinical groups within the course (8 – 9 clinical groups per semester) to a mix of mid and end of semester simulation experiences. Within the mid and end of semester groups, day and evening clinical groups were distributed as evenly as possible for each semester.

Setting and Time Frame

The study took place in a classroom at a Midwestern university. Based on the sample size needed to achieve a power of .80, data were collected over three academic semesters. Figure 4 depicts measurement and intervention timings for HPS for this dissertation study. The demographic and LCJPS surveys were administered at the beginning of the semester. At the end of the semester, the LCJPS was administered. The beginning (Baseline) and end (Time 2) of semester were chosen as measurement intervals in order to allow for simulation experiences to occur in the middle and end of the semester and to provide for less complicated distribution and collection of instruments. Further, the course instructor did not attend the skill review where the Baseline survey was distributed, reducing the risk of influencing course grades due to instrument completion or non-completion. One group (Group 1) of students received the intervention (HPS) mid semester and the other group (Group 2) nearer to the end of the semester.

Week 2	Weeks 6 – 8	Weeks 14 – 15	Week 15
O (Demographic survey & LCJPS)	X (Group 1)	X (Group 2)	O (LCJPS)

Key: O = Observation; X = Intervention (HPS)

Figure 4. Measurement and Intervention Timings

Human Subjects Approval

Human Subjects Protection

Institutional Review Board (IRB) approval was obtained from Indiana University-Purdue University Fort Wayne (Purdue University IRB) and Indiana University-Purdue University Indianapolis to conduct the research (Appendix D). The study packet included a letter of invitation to request students to participate in the study. The invitation letter indicated that participation was voluntary, students' course grades were not affected by participation in the study, their instructors did not have access to any surveys, and respondents were 18 years of age or older (Appendix A). Further, the researcher was not responsible for coursework evaluation of the study participants nor assigned grades for students in the course. Participation in the HPS was part of coursework and mandatory for students; however, research participation was voluntary.

Risks, Benefits, and Precautions

Risks, benefits, and precautions planned during the study were identified. Students were assigned an identification number by the investigator based on their enrollment in NUR 202 Medical-Surgical Nursing of Adults II to track changes in students' perceptions of clinical judgment from beginning to end of semester. The list of names and study identification numbers were available only to the researcher, who kept the list locked in a file cabinet, separated from the completed surveys.

Risks associated with this study were believed to be minimal or relatively minor; therefore, it was reasonable to ask persons to participate in the study. Risks may have included slight emotional or psychological issues associated with answering survey items and the self-assessment that may have occurred from considering the items therein. Precautions to reduce such risks included verbally assuring students that 1) participation was voluntary, 2) they could return the survey unanswered, and 3) answers to survey items were kept confidential and had no influence on their course grade. There were minimal risks that an individual could breach security measures taken to keep the identification number and student name list confidential. Precautions to prevent such a breach included separating the name and identification number list in a different cabinet from the surveys, which also remained locked. Participants could potentially be identified from demographic information on the survey. To prevent such an identification, the surveys remained locked in a cabinet. Data were entered by the researcher into a computer file that was password protected. Aggregated data were reported and used for statistical analysis. For any variable in which numbers of respondents were less than five in a category, the category was dropped from analysis. For example, typical student demographics at the Midwestern university tended to be primarily female and Caucasian. Thus, any ethnicity group with less than five students was changed to an "other" category. This precaution was taken as at least one ethnicity group had a single student respondent. Therefore, ethnicity was changed to Caucasian and non-Caucasian categories.

Potential benefits to participants included a self assessment of their perceptions of clinical reasoning abilities during patient care activities and recognition of areas which

needed improvement or had improved in their clinical practice. Additionally, information from the study could benefit future nursing students by identifying any benefits that HPS experience timing had related to nursing students' perceptions of their clinical reasoning abilities.

Recruitment Procedures

Participants were invited to participate by completing surveys at the beginning and end of the semester. The researcher approached students at the beginning of the semester during a skill review occurring in Week 2 of the semester. Students gathered as clinical groups in the nursing skills lab to review several skills during Week 2 of the semester. Survey packets were distributed by the researcher as students entered the lab before and at the beginning of the lab session. All students registered for this course received a packet and the opportunity to participate in the research. Students completed the survey in a classroom in which the skill review took place. Students were seated at tables. As students entered the room, the packets were presented to each student by the researcher and they were asked to complete the surveys after reading the invitation letter. The researcher waited in the room until all packets were returned.

For the initial study semester, the demographic survey contained an area for students to write in the last five digits of their student identification numbers, as survey packets were distributed without names or assigned study identification numbers. Many students supplied the last five digits of their social security numbers or left the section blank, resulting in a 34% response rate at the beginning of the semester. At the end of the first semester, the area that requested the last five digits of the student identification number was highlighted and the researcher called attention to it when handing out the

survey, resulting in a higher 78% response rate. After the initial semester, students' names were placed on the outer envelope for distribution and study identification codes were placed on the surveys to track responses from beginning to end of the semester. Response rates in subsequent semesters ranged from 81 % to 94%. Students' program information, AS or BS, was obtained from the faculty advisor database to which the researcher had access.

The survey packet contained a letter from the researcher explaining the research (Appendix A), a demographic survey (Appendix B) and the Lasater Clinical Judgment in Practice Survey (Appendix C). For all semesters, research participants returned the surveys to the researcher in the manila envelope, which concealed whether or not the participant completed the survey. The researcher, who attended each clinical group meeting in the nursing lab in Week 2 of the semester, remained in the lab until all envelopes were returned.

The second survey packet distribution at the end of the semester occurred in two ways. Students in Group 2, who experienced HPS at the end of the semester, received the second survey packet at the end of the nursing lab session where they experienced HPS in Week 14 or 15. The researcher distributed the envelopes to Group 2 students and waited for return of same. Students in Group 1, who experienced HPS in the middle of the semester, received survey packets at the end of the course lectures in Week 15 of the research semester. Packets were distributed after the faculty of record for NUR 202 Medical-Surgical Nursing of Adults II had left the room. The setting was a lecture hall with stadium seating and individual folding arm desks. The researcher distributed the

surveys in a manila envelope and remained in attendance while students completed the survey.

Measurements, Descriptive Data, Reliability, and Validity

Demographic Variables

Many studies involving HPS lacked information on sociodemographic variables that may influence learning from HPS (Lasater, 2005; Parr & Sweeney, 2006). The packets (Appendices A – C) included a study number assigned to the students based on enrollment in NUR 202 Medical-Surgical Nursing of Adults II. For the demographic survey (Appendix B), study participants supplied their age, gender, ethnicity, and if they had any healthcare experience in the form of direct care, support services, or health education, which were defined on the form, prior to beginning the nursing program. Students indicated if they had obtained a previous baccalaureate degree. The researcher had access to a computer-based, faculty advising database that provided the type of program for each student, which was used to identify types of programs, AS or BS, for all students in the study.

Instruments

The review of literature indicated that initial reliability and validity of the LCJPS was established with a single published study. What is currently known about the LCJPS from Lasater's (2005) research will be reviewed.

Scale Development

Lasater (2005) developed the Lasater Clinical Judgment in Practice Survey (LCJPS) for two purposes to accurately assess students' self-report of their confidence in applying clinical judgment, which for this study will be considered to be clinical

reasoning, to patient care. An important aspect of scale development included aligning statements in the LCJPS with the critical thinking habits of the mind and skills, which were formulated in Scheffer and Rubenfeld's (2000) Delphi Study. Initially, Lasater constructed 21 statements related to students' confidence in applying clinical reasoning to their practices. After removing three questions, the initial use of the survey demonstrated a Cronbach alpha of .65 (N = 59). Lasater then contacted Scheffer and Rubenfeld and, after discussions, added 10 additional items to better evaluate application of dimensions of critical thinking. Table 3 provides the relationship between critical thinking dimensions and LCJPS items, as determined by Lasater.

Table 3. Relationship between Dimensions of Critical Thinking and Statements in the Lasater Clinical Judgment in Practice Survey

Dimension	Related Survey Questions
Habits of the Mind	
Confidence	6, 27, 30
Contextual perspective	13, 24, 27, 28
Creativity	4, 19, 26
Flexibility	8, 10, 19
Inquisitiveness	1, 11, 15, 19
Intellectual integrity	8, 11, 20
Intuition	21, 29
Open-mindedness	19, 20, 22, 23
Perseverance	11, 14, 17
Reflection	2, 12, 24, 25
Skills	
Analyzing	5, 12, 24
Applying standards	9, 12, 14
Discriminating	7, 9, 11
Information seeking	1, 15, 22
Logical reasoning	7, 16, 20
Predicting	6, 28, 30
Transforming knowledge	3, 18, 25, 29

Further testing of the instrument was completed in two ways. Fellow faculty members were asked to evaluate the survey for construct validity and found it to represent the construct of students' confidence in clinical reasoning skills for patient care. And, a focus group of five BS nursing students in their last semester of school prior to graduation (Lasater, 2005) completed the survey and was asked to evaluate the survey for clarity, readability, and relationship of the survey to the Tanner Clinical Judgment Model (2006b). Students provided suggestions on minor statement wording changes to improve clarity and readability. No changes in the LCJPS statements were made related to content as it was deemed to reflect activities suggested for clinical reasoning by the Tanner Clinical Judgment Model.

The LCJPS was administered to junior and senior BS nursing students at the beginning and end of a semester. During the semester, one subset of the junior students experienced weekly HPS, while other junior and senior students had little or no HPS experiences. The junior students, who did not experience weekly HPS, and all of the senior students were considered to be a comparison, control group because of the lack of weekly exposure to HPS experiences. The instrument differentiated students' perceived clinical reasoning abilities as significantly different between control and experimental groups and from beginning to end of the semester (Lasater, 2005).

Lasater (2005) analyzed LCJPS scores with several known groups: traditional versus nontraditional students, previous healthcare related experiences, and course enrollment. No significant difference in LCJPS scores were found between nontraditional and traditional students or students with and without previous healthcare related experience. Within known groups, the differences in simulation participation based on

course enrollment (regular simulation versus no or limited simulation experiences) was statistically significant with students who participated in HPS (N = 23) demonstrating mean LCJPS scores of 101.65 (SD = 5.1) compared to students not participating in HPS (N = 16) with mean scores of 97.25 (SD = 5.2). The same difference was not observed in senior students of which 38 had occasional HPS experiences (M = 100.54, SD = 7.6) and 32 students in 2 different courses who had no HPS experiences (M = 103.67, SD = 6.7 and M = 99.62, SD = 9.0).

Reliability of the LCJPS was conducted with 246 surveys with paired (beginning and end of semester) survey completion by 39 junior and 44 senior students. Lasater (2005) obtained a Cronbach coefficient of .62 for the combined junior and senior students, beginning and end of semester administration of the LCJPS survey (N = 246). A paired *t*-test indicated that both junior (N = 39) and senior (N = 44) students demonstrated a statistically significant increase in LCJPS scores from beginning to end of the semester. The junior and senior student scores revealed moderate (r = .55) and strong (r = .81) positive relationships, respectively, between beginning and end of summer survey scores.

Lasater (2005) suggested the LCJPS could be used in any nursing education setting. Further recommendations from Lasater vis-à-vis additional refinement of the LCJPS were larger, multi-site studies, verification of survey reliability and construct validity, and exploring LCJPS score variances with student attributes, such as age, gender, ethnicity, previous college degree, and previous healthcare related experience. Lasater identified a limitation that was particularly important for LCJPS, which involved the unknown influence of clinical and other experiences on the students' perceptions of

the development of their clinical reasoning skills. Students in Lasater's study who did not experience HPS and participated in usual clinical practica experienced increases in LCJPS scores from beginning to end of semester (1.59 points). However, students experiencing HPS had larger increases in LCJPS scores (3.81 points). Increases in LCJPS scores from beginning to end of semester were statistically significant.

Statistical Analysis

Data Cleaning

The investigator entered the data into PASW (Predictive Analytic Soft Ware) 18 (2009). After data entry, the researcher printed off the database information and compared the printout with all surveys to check accuracy of all data elements. Errors were corrected. Items from the LCJPS (Lasater, 2005) that were negatively worded were transformed by the program after all data were entered and examined for accuracy. Table 4 provides statements in the LCJPS and indicates which have negative wording. Further, frequency tables were examined for errors in data entry. While the survey item responses are ordinal in nature, it is common to change the data to an interval level measurement to calculate a total survey score and use statistical analyses appropriate for interval level data (DeVellis, 2003).

Table 4. Statements from LCJPS with Negatively Worded Items Indicated

Statement	Negative Wording
When I find an inconsistency between patient care and my knowledge, I take the time to get the answer.	
Reflection has very little to do with critical thinking.	Negative
Even if I have complete assessment information, I find it difficult to choose an appropriate intervention.	Negative
I pride myself in thinking "outside the box" in the clinical setting.	
When something negative happens in the clinical area, I try to forget about it.	Negative

Statement	Negative Wording
I am confident about my rationale for my choice of nursing interventions when caring for patients.	
If I have adequate patient assessment information, I can choose an appropriate nursing intervention.	
When I know I'm right about a patient issue, I don't care what other team members think.	Negative
When I get new information, I carefully evaluate the reliability of the source.	
I don't have trouble prioritizing the needs of my patients.	
If a nurse with more experience says I should do something, I do it, even if I'm not sure why.	Negative
I know the strengths and limitations of my clinical practice.	
The only thing I focus on in the clinical area is the patient's physical condition.	Negative
I don't mind putting extra effort to be sure I'm giving safe care.	
I routinely look for new information that I can use in the clinical setting.	
It's important to me to support my conclusions about patients with data.	
I set goals to address my areas for improvement in the clinical setting.	
When I learn something new, I share it with the team members and peers.	
I like to consider alternative solutions to difficult patient problems.	
I am willing to change my viewpoint, if there is evidence to support a different one.	
I frequently get a gut feeling about my patients.	
I use both subjective and objective information to make judgments about patients care.	
I would rather learn about the care of patients on my own than from other nurses.	Negative
For each complex patient situation, there is a right and wrong way to deal with it.	Negative
When I make a mistake in the clinical area, I find it helpful to talk it over with someone who has more nursing experience and that I trust.	
When something goes wrong with my patient, my first intervention is to call the physician.	Negative
As long as I am working with other team members, I feel quite confident in my ability to care for my patients.	
I can set priorities in the midst of a patient crisis.	
My past life experiences help me to provide good patient care.	
As a new graduate nurse, I expect to function independently in patient care.	Negative

Procedure/Intervention

Students enrolled in NUR 202 Medical-Surgical Nursing of Adults II participated in HPS experiences as part of their clinical experiences during the semester. Students were placed into groups of 2 – 3 students as a team during the HPS. They were provided with information prior to the simulation experience, which included: diagnoses, ages, gender, and medications ordered in the various HPS scenarios chosen for the clinical group. When in the simulation lab, students were introduced to the simulator and what it did and did not do in terms of simulating an actual patient. The students had previous exposure to the simulator in a skill review lab that occurred during in Week 2 of the semester. During the simulation experience, students were provided with student copies of the simulation scenario information, physician orders, and medication administration records. The learning objectives were supplied as part of the students' scenario information.

Objectives for each simulation were similar and shared with the students prior to the HPS, allowing students to fully understand the goals of each situation. Primarily, the goals were:

1. Demonstrates assessment skills appropriate and essential for the client: vital signs, mental status, medications, cardiorespiratory status.
2. Demonstrates appropriate nurse-client communication and communication of essential information with healthcare providers and community resources.
3. Identify patient safety needs.
4. Demonstrate decision making in unpredictable framework, drawing on knowledge from previous courses.

The manikin (SimMan®) was a medium fidelity simulator (Seropian et al., 2004). Thus, there were aspects of such a simulator that required students to suspend disbelief in order to picture skin color changes, grip strength, limb movement, etc., as directed by the manikin operator. The abilities of students to suspend disbelief may have affected their ability to use the simulation as substitutes for actual patient care. The environment involved a hospital bed with a curtain, bedside table, patient monitor, oxygen therapies, and other patient care accouterments depending on the simulation scenario, e.g., bandages, urinary catheters, and wound drains. Despite every attempt to make the environment as realistic as possible, space considerations required the use of the classroom within which the simulator resides to house all of the students present for the simulation experience while individual simulations were taking place. Such an environment may have influenced students' abilities to concentrate on the simulation scenario.

Simulations were similar to patient situations students encountered in their clinical experiences that took place on medical units, orthopedic units, and perioperative areas. All of the simulations provided an opportunity for nursing students to clinically reason through emergent patient situations in relation to patients typically seen in clinical practica; situations in which they would be asked to step aside in actual patient care environments (Macedonia et al., 2003). An example of an emergent condition was respiratory depression after administration of morphine. Regardless of how slow the student injected the morphine, the patient exhibited respiratory depression. The students generally participate actively in one or two HPS scenarios. Further, students may observe two or three other HPS scenarios. For students in NUR 202 Medical-Surgical Nursing of

Adults II, the following patient situations were available for use during the simulation experiences:

- A 35 year-old male with Type I diabetes mellitus admitted for pancreatitis and hyperglycemia
- A 78 year-old female with a history of chronic obstructive lung disease, rheumatoid arthritis, and hypertension admitted for a urinary tract infection
- A 75 year-old male with diabetes, hypertension, coronary artery disease and post fractured hip repair admitted from an extended care facility to an acute care hospital for hyperglycemia
- A 76 year-old female with a history of coronary artery disease and hypertension admitted for congestive heart failure
- A 50 year-old male five hours post laparoscopic cholecystectomy who develops atrial fibrillation
- A 26 year-old female admitted for ectopic pregnancy; post salpingo-oophorectomy with vaginal bleeding
- A 79 year-old male post hip fracture repair, complaining of pain, who develops respiratory depression post morphine administration

Debriefing occurred immediately after the simulation finished with the instructor and researcher leading the discussion. First, students were asked to review what went well, followed by what could be improved if the HPS was repeated. Other discussion included explaining their thoughts during the simulation, correcting any misinformation, and offering open discussion of any other topics the students preferred.

The simulation experience was supported by laboratory personnel preparing the simulator, providing copies of the student information, and running the simulator while clinical faculty focused on supporting, evaluating, and debriefing the students. Because clinical faculty to a small extent and students to a larger extent changed the simulation by their actions within it, the simulations were not exactly the same for all persons. By participating in the simulation and observing others performing in other simulations, students were exposed to a variety of opportunities to use clinical reasoning skills (Hovancsek, 2007).

The didactic and clinical experiences of the two groups in this dissertation study differed slightly, as one group experienced the simulation mid semester and one at the end of the semester. Within the clinical experience, students returned to the nursing skills lab in Week 2 of the semester for evaluation of patient care skills prior to caring for patients in the hospital and participated in observational experiences in perioperative areas for one clinical experience during the semester. Week 1 of the semester involved orientation to the unit, clinical expectations, and clinical paperwork, but no direct patient care.

Generally, within the first half of a semester, students received didactic content related to critical thinking and nursing decision making, intravenous therapy, total parenteral nutrition, blood transfusions, fluid and electrolytes, and perioperative client care. In the second half of the semester, subjects covered in lecture included: endocrine, orthopedic client, immunology and sexuality in the client, chronic pain, organ transplantation, and care of the oncologic client. Clinically, the students spent time on medical-surgical and orthopedic patient care units. Students started on one type of unit

and switched to the other midway through the semester. In this way, two clinical groups shared the two units at the same clinical time and day.

Variable Selection

Variables were selected in accordance with the research questions, based on a review of the available nursing education literature. Independent variables included demographic variables of age, gender, and ethnicity and situational variables of previous experience in healthcare, previous baccalaureate degree, and type of nursing program. The independent variable, differences in the timing of the simulation experience within the semester, was manipulated. Dependent variables included the difference in LCJPS scores from Baseline to Time 2, representing the change in students' perceptions of clinical reasoning abilities from beginning to end of the semester. Differences in students' perceptions of clinical reasoning scores from the LCJPS were calculated within the data analysis program as a separate dependent variable.

Data Analysis and Research Questions

Statistical analyses conducted to determine differences and relationships among data are displayed in Table 5. The majority of the demographic variables revealed a very homogenous student population. Primarily, nursing students at the study nursing program were Caucasian (85%) and female (91%). Ethnicity was reduced to a dichotomous variable of Caucasian and non-Caucasian because at least two non-Caucasian ethnicity categories had less than five respondents. Further, previous experience in healthcare in this sample was considered dichotomous categories of experience and no experience. Relationships between LCJPS scores at the beginning and end of semester and age were analyzed for significant relationships. The effects of differences between and among

categories of independent variables on LCJPS Difference scores were analyzed with appropriate parametric statistical tests.

Table 5. Aims, Hypotheses, Associated Instruments, and Statistical Analyses

Specific Aim 1: Evaluate the effect of curricular sequencing of HPS experiences on changes in nursing students' perceptions of clinical reasoning development over the semester in which students have their first hospital-based clinical experiences.		
Hypotheses	*Instruments*	*Statistical Analyses*
Hypothesis 1a: Regardless of curricular sequencing of HPS, students will experience a statistically significant increase ($p < .05$) in their perceptions of clinical reasoning skills (LCJPS) from beginning (Baseline) to end (Time 2) of the semester in which students have their first hospital-based clinical experiences.	Beginning and end of semester LCJPS scores	Paired t-test
Hypothesis 1b: Students who experience HPS mid semester will have statistically significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those students experiencing HPS at the end of the semester.	Beginning of semester LCJPS scores subtracted from end of semester LCJPS scores creating Difference scores	Independent groups t-test
Specific Aim 2: Determine the effect of demographic and situational variables on changes in nursing students' perceived clinical reasoning abilities as measured by the LCJPS.		
Hypotheses	*Instruments*	*Statistical Analyses*
Hypothesis 2a: Changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester will be statistically significantly different ($p < .05$) between gender and between Caucasian and non-Caucasian ethnic categories.	LCJPS Difference scores Demographic Survey	Independent groups t-test
Hypothesis 2b: Students' ages will positively and significantly correlate ($r =/ > .50$, $p < .05$) with nursing students' perceptions of changes in clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.	LCJPS Difference scores Demographic Survey	Pearson r
Hypothesis 2c: Students who have had previous healthcare experience of direct patient care prior to entering the nursing program will have statistically significantly larger ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills	LCJPS Difference scores Demographic survey	Independent groups t-test

(LCJPS Difference scores) from beginning to end of a semester than students who did not have previous healthcare experiences in direct patient care.		
Hypothesis 2d: Students who have previous baccalaureate degrees outside the discipline of nursing will have significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those who did not have previous baccalaureate degrees.	LCJPS Difference scores Demographic survey	Independent groups t-test
Hypothesis 2e: Comparisons of students enrolled in AS or BS degree nursing programs of study will not demonstrate significantly different ($p > .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from the beginning to end of the semester in which students have their first hospital-based clinical experiences.	LCJPS Difference scores	Independent groups t-test
Hypothesis 2f: Demographic (age, gender, and ethnicity) and situational variables (nursing students' previous experience in healthcare, timing of simulation experience in the semester, previous baccalaureate degree, and type of nursing program) will significantly predict ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.	LCJPS Difference scores Demographic survey	Factorial ANOVA

Conclusion

Methodological considerations for the dissertation study were discussed in this chapter. The timing of HPS experiences in a semester and its effects on changes in students' perceptions of their clinical reasoning development from beginning to end of a semester were examined in the current study. Additionally, the effect, if any, of demographic and situational variables on LCJPS scores were evaluated to determine if nursing faculty need to be aware of such variables when using HPS and supporting perceptions of clinical reasoning development in nursing students.

CHAPTER FOUR – DATA ANALYSIS

Identifying the change in nursing students' perceptions of clinical reasoning abilities may help faculty understand if clinical reasoning may be related to the timing of simulation experiences within a semester. This chapter reports the results of data collection over three semesters. The results were evaluated by: 1) cleaning the data, 2) screening the data, 3) depicting the sample, 4) describing the variables and 5) illustrating data analysis for specific aims of the study. Each step in the data evaluation will be elaborated on in the following sections. Predictive Analytic SoftWare (PASW) Version 18 (2009) was used to analyze all data.

Data Cleaning

Demographic and clinical reasoning (LCJPS) surveys were administered at the beginning (Baseline) and end (Time 2) of the semester. At the time of the survey, students were enrolled in NUR 202 Adult Medical Surgical Nursing, which is the first hospital-based clinical course with different students enrolled each semester. Surveys were administered over three academic semesters, Spring and Fall 2008 and Fall 2009. Data from the surveys were entered into the PASW 18 database by the investigator. Tabachnick and Fidell (2007) suggested that accuracy of data entry should be examined by inspecting the original surveys against the database file. After all data were entered, the data were printed out and a manual check of the data against the original surveys was completed for each survey. Errors in data entry were corrected. Once data entered into SPSS were correct, negatively worded items on the LCJPS were reverse coded (Tabachnick & Fidell), using the PASW program. Ten items were negatively worded: statements numbered 2, 3, 5, 8, 11, 13, 23, 24, 26, and 30. Responses were scored from

one to four: 1 = strongly disagree, 2 = somewhat disagree, 3 = somewhat agree, and 4 = strongly agree. Total survey scores were generated by adding all responses, after recoding negatively worded items. As designed by Lasater (2005), there were no subscales. The demographic survey and LCJPS are available in Appendices B and C, respectively.

The number of LCJPS and demographic surveys collected across semesters varied (Table 6). Respondents who completed Baseline and Time 2 surveys represented 31% of students enrolled in the first semester of the study, Spring 2008. In subsequent semesters (Fall 2008 and Spring 2009), 72% and 82% of student participated in the study. The overall average response rate for all semesters was 61%.

Table 6. Data Collection across Semesters

	Baseline Surveys		Time 2 Surveys		Both Surveys	
	(Surveys returned) divided by (Number of students in course)*	Response Rate	(Surveys returned) divided by (Number of students in course)*	Response Rate	(Both surveys returned) divided by (Number of students in course)	Response Rate
Spring 2008	26/77	33.8%	55/71	77.5%	22/71	31.0%
Fall 2008	69/76	90.8%	60/74	81.1%	53/74	71.6%
Spring 2009	63/67	94.0%	51/61	83.6%	50/61	82.0%
Totals	158/220	71.8%	166/206	80.6%	125/206	60.7%

* Beginning, end, and total number of students for each semester are listed due to attrition of students from the course over the semester.

New students were enrolled in NUR 202 each semester, except for those who failed the course previously or withdrew during the semester. Students returning to the course after withdrawing from or failing the course were able to participate again in the

study. If students withdrew from the course, their Baseline survey would not be paired with a Time 2 survey and would not be included in the study.

Data Screening

After data cleaning, data screening was undertaken, which involved analysis of missing data. Tabachnick and Fidell (2007) suggested that variables with five percent or less of missing data did not need missing data analysis. None of the demographic variables had more than five percent missing data. Some LCJPS scores were missing in greater than five percent occurrences due to a lack of complete survey item responses and a missing Baseline or Time 2 survey for the same student (Table 7).

Table 7. Frequencies for Survey Collection among Semesters

	Baseline		Time 2		Both Scores	
Semester	N	% of Total	N	% of Total	N	% of Total
Spring 2008	26	16.7%	55	33.1%	22	17.7%
Fall 2008	69	44.2%	60	36.1%	53	42.7%
Spring 2009	63	39.1%	51	30.7%	50	39.5%
Totals	158		166		125	

Further investigation was completed in the cases where one of either the beginning or end of semester clinical reasoning surveys was missing (Table 8). Statistical analyses were completed to assess differences in demographic and situational variables, as well as timing of simulation experiences, between students who returned one survey and students who returned both surveys. No significant differences were found between variables or simulation timing for the two groups.

Table 8. Comparison of Respondents with One and Both Survey Scores

Characteristic of Interest		Respondents with 1 Survey Score (N = 78)	Respondents with 2 Survey Scores (N = 125)
Age	Mean(SD)	27.2 (8.2)	26.7 (8.3)
	Range	19 – 52	19 – 53
Semester	Spring 2008	13 (17%)	22 (18%)
	Fall 2008	30 (39%)	53 (42%)
	Spring 2009	35 (44%)	50 (40%)
Gender	Male	8 (10%)	11 (9%)
	Female	70 (90%)	114 (91%)
Ethnicity	Caucasian	68 (87%)	106 (85%)
	Non Caucasian	10 (13%)	19 (15%)
Type of Program	AS	41 (53%)	58 (46%)
	BS	37 (48%)	67 (54%)
Previous Experience in Healthcare	None	32 (41%)	62 (50%)
	Some	46 (59%)	63 (50%)
Previous Baccalaureate Degree	Yes	19 (24%)	25 (20%)
	No	59 (76%)	100 (80%)
Simulation Timing	Mid	44 (56%)	63 (50%)
	End	34 (44%)	62 (50%)

Key: AS = Associate of Science Degree Program; BS = Baccalaureate of Science Degree Program; N = number; SD = Standard Deviation

Study Sample Characteristics

The sample consisted of 125 respondents who returned both Baseline and Time 2 surveys, because data analyses were completed using the difference in scores between Baseline and Time 2. Most surveys were collected in the Fall 2008 (42%) and Spring 2009 (40%) semesters with the remaining 18% from Spring 2008 semester. Table 9 provides a summary of sample characteristics data. And, Table 10 details the independent variables across the three semesters in which the study took place.

Table 9. Summary of Sample Characteristics

Sample Characteristics		N* (%)
Semester	Spring 2008	22 (18%)
	Fall 2008	53 (42%)
	Spring 2009	50 (40%)
Gender Total N = 123	Female	114 (91%)
	Male	11 (9%)
Ethnicity	Caucasian	106 (85%)
	Hispanic	5 (4%)
	African American	5 (4%)
	Native American	1 (1%)
	Pacific Islander	2 (2%)
	Asian	3 (2%)
	Other	3 (2%)
Ethnicity/ Dichotomous	Caucasian	106 (85%)
	Non-Caucasian	19 (15%)
Experience in Healthcare	None	62 (50%)
	< 1 yr	19 (15%)
	1 – 3 yrs	24 (19%)
	4 – 6 yrs	9 (7%)
	> 6 yrs	11 (9%)
Experience/ Dichotomous	None	60 (49%)
	Some	63 (51%)
Type of Healthcare Experience	None	62 (50%)
	Direct care	48 (39%)
	Other	11 (11%)
Previous Degree	Yes	25 (19%)
	No	100 (80%)
Program	AS	58 (46%)
	BS	67 (54%)
Simulation Timing	Mid Semester	63 (50%)
	End of Semester	62 (50%)

* Total N = 125

Table 10. Sample Characteristics within Each of Three Study Semesters

Sample Characteristics	Semester	N (%) Group	N (%) Group
		19 – 22	23 – 53
Age	Spring 2008	9 (14.3%)	13 (17.6%)
	Fall 2008	30 (47.6%)	23 (42.4%)
	Spring 2009	24 (38.1%)	26 (41/9%)
	Total N (%)	63 (50.4%)	62 (49.6%)
		Male	Female
Gender	Spring 2008	1 (9.1%)	21 (18.4%)
	Fall 2008	5 (45.5%)	48 (42/1%)
	Spring 2009	5 (45.5%)	45 (39.5%)
	Total N (%)	11 (8.8%)	114 (91.2%)
		Caucasian	Non Caucasian
Ethnicity	Spring 2008	20 (18.9%)	2 (10.5%)
	Fall 2008	42 (39.6%)	11 (57.9%)
	Spring 2009	44 (41.5%)	6 (31.6%)
	Total N (%)	106 (84.8%)	19 (15.2%)
		None	Some
Previous Experience in Healthcare	Spring 2008	11 (17.7%)	11 (17.5%)
	Fall 2008	26 (41.9%)	27 (42.9%)
	Spring 2009	25 (40.3%)	25 (39.7%)
	Total N (%)	62 (49.6%)	63 (50.4%)
		Yes	No
Previous Baccalaureate Degree	Spring 2008	15 (15%)	7 (28%)
	Fall 2008	43 (43%)	10 (40%)
	Spring 2009	42 (42%)	8 (32%)
	Total N (%)	100 (80%)	25 (20%)
		AS	BS
Type of Program	Spring 2008	12 (20.7%)	10 (14.9%)
	Fall 2008	27 (46.6%)	26 (38.8%)
	Spring 2009	19 (32.8%)	31 (46.3%)
	Total N (%)	58 (46.4%)	67 (53.6%)

Age

Respondents' ages (N = 125) ranged from 19 – 53 with a mean of 26.73 (SD = 8.23). The mode for respondents' ages was 20, and the median was 22. The distribution was strongly positively skewed. Attempts to transform the distribution to a more normal distribution were unsuccessful, and transformations were not recommended for all skewed data (Tabachnick & Fidell, 2007). Therefore, age as a continuous variable was transformed into a dichotomous variable with a median split (Pallant, 2007) for statistical analyses, except relationship analyses, when a nonparametric Spearman rho was used. The median split provided two equal groups. Table 11 provides an overview of age means and standard deviations across semesters. Category one included ages 19 – 22 (N = 63), and category two included ages 23 – 53 (N = 62).

Table 11. Mean Respondents' Ages across Semesters

Semester	N	Mean (SD)	Category	N (%)
Spring 2008	22	29.32 (9.7)	19 – 22	9 (41%)*
			23 – 53	13 (59%)*
Fall 2008	53	24.66 (5.6)	19 – 22	30 (57%)*
			23 – 53	23 (43%)*
Spring 2009	50	27.78 (9.4)	19 – 22	24 (48%)*
			23 – 53	26 (52%)*
Total	125	26.73 (8.2)	19 – 22	63 (50%)
			23 – 53	62 (49%)

*Percent is number of respondents for the semester divided by total respondents in each semester

As a variable, age was examined for significant differences between types of nursing programs (AS/BS), genders (male/female), previous baccalaureate degree (yes/no), previous experience in healthcare (yes/no), ethnicity (Caucasian/non-Caucasian), and timing of simulation experience (mid/end of semester). Significant

differences in ages were found for the following comparisons: type of program – AS students were significantly older than BS students; and previous baccalaureate degree – students with previous baccalaureate degrees were significantly older than those without previous degrees (Table 12).

Table 12. Descriptive Data and Statistical Test Results for Significantly Different Age Comparisons

Descriptive Data				
Source – Respondents Ages		N	M	SD
AS Program		58	30.40	9.35
BS Program		67	23.55	5.44
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	$t = 4.93$ ($p < .0005$)	88.72	6.8	4.07 – 9.62
Descriptive Data				
Source – Respondents Ages		N	M	SD
No previous baccalaureate degree		100	25.01	7.16
Previous baccalaureate degree		25	33.60	8.77
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	$t = -5.123$ ($p < .0005$)	123	-8.59	-11.91 – -5.27

Ages within the sample were also compared using data from national surveys of student ages (National League for Nursing [NLN], 2010). Table 13 details percentages across four age ranges for the current sample and information from NLN from 2008 – 2009 nursing student enrollment data. There were no significant differences in ages between the institution within which the dissertation data were collected and national ages reported for the 2008 – 2009 academic year (NLN, 2010), using Chi square analyses (AS: $\chi^2_{(3)} = 5.55$, $p = .14$; BS: $\chi^2_{(3)} = 5.42$, $p = .14$).

Table 13. Comparison of Ages in Sample to Population Using NLN Data 2008-2009

Age Ranges	BS		AS	
	NLN Data*	Current Sample	NLN Data*	Current Sample
up to 25 years	70%	69%	26%	40%
26 – 30 years	16%	15%	25%	17%
31 – 40 years	10%	16%	29%	29%
41 and older	4%	--	20%	14%

* Data from NLN Surveys (2010)

Gender and Ethnicity

The sample included 114 females (91%) and 11 males (9%). Nationally, in 2008 – 2009, men comprised 13.8% of baccalaureate nursing students (Kaufman, nd). Thus, the sample of males for this dissertation had nearly 4% fewer men than the population of nursing students in regards to proportion of male students in undergraduate programs. Caucasians comprised 85% (N = 106) of the sample. At least one ethnicity category had a total of one respondent. To ensure that identification of the respondent was not possible, non-Caucasian respondents were grouped into a single category and comprised 15% (N = 19) of the sample. Ethnicity was depicted in two categories. Of the non-Caucasian ethnicities, African American and Hispanic students were the most numerous with five respondents in each category (four percent of total respondents for each category). In 2008 – 2009, 28% of nursing students enrolled in United States baccalaureate programs were minorities (Kaufman). The study nursing program was more homogenous than the population of nursing students in all nursing programs across the nation. Table 14 provides details related to respondents' gender and ethnicity totals for each semester in the study.

Table 14. Respondents' Gender and Ethnicity Distribution across Semesters

Semester	Gender	N (%)	Ethnicity	N (%)
Spring 2008	Male	1 (4.5%)*	Caucasian	20 (91%)*
	Female	21 (95.5%)*	Non-Caucasian	2 (9%)*
Fall 2008	Male	5 (9%)*	Caucasian	42 (79%)*
	Female	48 (91%)*	Non-Caucasian	11 (21%)*
Spring 2009	Male	5 (10%)*	Caucasian	44 (88%)*
	Female	45 (90%)*	Non-Caucasian	6 (12%)*
Total	Male	11 (8.8%)	Caucasian	19 (15.2%)
	Female	114 (91.2%)	Non-Caucasian	106 (84.8%)

*Percent is number of respondents for the semester divided by total respondents in each semester

Previous Experience in Healthcare

Respondents' experience in healthcare prior to entering the nursing program was gathered as the type of experience, as well as the amount of experience. Equal percentages of respondents had some (N = 63; 50%) and no (N = 62; 50%) previous experience in healthcare. For those respondents who had previous experience in healthcare prior to beginning the program (N = 63), most had experience with direct patient care (N = 48; 77%). Due to the low number of respondents with similar types of experiences, for most data analyses, the categories were collapsed into a dichotomous variable of experience in healthcare and no experience in healthcare prior to entering the program (Table 15).

Table 15. Previous Experience in Healthcare of Respondents across Semesters

Semester	Experience	N (%)*
Spring 2008	None	11 (50%)*
	Some	11 (50%)*
Fall 2008	None	26 (49%)*
	Some	27 (51%)*
Spring 2009	None	25 (50%)*
	Some	25 (50%)*
Total	None	62 (49.6%)
	Some	63 (50.4%)

*Percent is number of respondents for the semester divided by total respondents in each semester

Previous Baccalaureate Degree

The majority of respondents had no previous baccalaureate degree (N = 100, 80%) prior to beginning the nursing program. Eight (11.9%) of the BS students had a previous baccalaureate degree and 17 (29.3%) of the AS program students indicated they had obtained a previous baccalaureate degree (Table 16).

Table 16. Previous Baccalaureate Degree of Respondents across Semesters

Semester	Previous Degree	N (%)
Spring 2008	Yes	7 (5.6%)
	No	15 (12%)
Fall 2008	Yes	10 (8%)
	No	43 (34.4%)
Spring 2009	Yes	8 (6.4%)
	No	42 (33.6%)
Total	Yes	100 (80%)
	No	25 (20%)

Type of Nursing Program

Type of nursing program was nearly equally distributed among respondents (AS = 58, 46%; BS = 67, 54%). Table 17 displays the number of respondents who were in each program in total and across the three semesters in which the study took place.

Table 17. Type of Nursing Program of Respondents across Semesters

Semester	Nursing Program	N (%)
Spring 2008	AS	12 (54.5%)
	BS	10 (45.5%)
Fall 2008	AS	27 (51%)
	BS	26 (49%)
Spring 2009	AS	19 (38%)
	BS	31 (62%)
Total	AS	58 (46.4%)
	BS	67 (53.6%)

*Percent is number of respondents for the semester divided by total respondents in each semester

Dependent Variable Description

Baseline Survey – Beginning of Semester LCJPS

All items in the LCJPS were summed for total LCJPS scores. Baseline survey total scores for the 125 complete surveys ranged from 70 – 110 with a mean of 93.89 (SD = 6.2; 95% Confidence Interval [CI] 92.57 – 95.21). The mode was 98, and the median was 94. Skewness (Kolmogorov Smirnov = -.05, p = 0.20) and kurtosis (Shapiro-Wilk = -.07, p = 0.37) were near zero, indicating a nearly normal distribution. A single outlier of 70 points (z = -3.85) was noted in the distribution. Analysis of the outlier included examination of the 5% trimmed mean, which is calculated after removing the highest and lowest 5% of the distribution (Pallant, 2007). Because the 5% trimmed mean (93.57) was within 0.32 points of the actual mean and not considered problematic in this distribution

(Pallant), the outlier survey score of 70 was retained for statistical analysis. Baseline survey scores compared across the three study semesters were not significantly different (Tables 18 and 19). Table 20 displays descriptive information for each survey measurement time, Baseline and Time 2, and Difference scores, which are Baseline survey scores subtracted from Time 2 survey scores.

Table 18. Clinical Reasoning Surveys Means and Difference Scores across Semesters

Semester	N	Baseline M (SD)	Time 2 M (SD)	Difference Scores M (SD)
Spring 2008	22	97.05 (6.7)	99.50 (7.9)	2.45 (7.1)
Fall 2008	53	93.30 (6.8)	94.36 (6.6)	1.06 (5.7)
Spring 2009	50	93.12 (8.2)	96.69 (7.0)	3.57 (6.2)
Total	125	93.89 (6.2)	96.20 (7.0)	2.31 (6.2)

Table 19. Descriptive Data and ANOVA Table for Baseline Surveys over Three Study Semesters

ANOVA Table					
Source	Sum of Squares	df	Mean Squares	*F*	*p*
Between Groups	267.03	2	133.51	2.46	.090
Within Groups	6625.90	122	54.31		
Total	6892.93	124			

Descriptive Data			
Semester	N	Mean	Standard Deviation
Spring 2008	22	97.05	6.7
Fall 2008	53	93.30	6.8
Spring 2009	50	93.12	8.2

Table 20. Descriptive Information for Baseline, Time 2, and Difference Survey Scores

	Baseline Survey	Time 2 Survey	Difference Scores
Mean (SD)	93.888 (7.46)	96.196 (7.00)	2.308 (6.23)
5% Trimmed Mean	93.847	96.184	2.272
Median	94.0	96.0	0.3
Mode	98.0	93.0	0.4
Range	70 – 112	79 – 114	-14 – 21
95% CI	92.57 – 95.21	94.96 – 97.44	1.21 – 3.41
Skewness	-0.049	0.007	0.057
Kurtosis	-0.070	-0.320	0.179

Time 2 Survey – End of Semester LCJPS

Time 2 survey total scores for the 125 respondents ranged from 79 – 114 with a mean of 96.2 (SD = 7.0; 95% CI 94.96 – 97.44). The mode was 93 and median was 96. Skewness (Kolmogorov Smirnov = 0.05, p = 0.20) was near zero, indicating a nearly symmetrical distribution. Kurtosis (Shapiro-Wilk = 0.99, p = 0.83) was slightly higher, indicating a flatter distribution. However, the kurtosis value is not significant and does not indicate severe concerns about the Time 2 scores distribution (Pallant, 2007). No outliers beyond three standard deviations were found. Table 18 details Time 2 survey means across semesters. Table 20 displays descriptive information about Time 2 Surveys. When examining Time 2 survey scores across semesters, an ANOVA demonstrated a significant difference in average survey scores. Post hoc testing revealed that the Fall 2008 Time 2 survey scores were significantly lower than Spring 2008 Time 2 scores (Table 21).

Table 21. Descriptive Data and ANOVA Table for Time 2 Survey Scores over Three Semesters

ANOVA Table					
Source	Sum of Squares	df	Mean Squares	*F*	*p*
Between Groups	267.03	2	133.51	2.46	.011
Within Groups	6625.90	122	54.31		
Total	6892.93	124			

Descriptive Data			
Semester	N	Mean	Standard Deviation
Spring 2008	22	99.50	7.9
Fall 2008	53	94.36	6.6
Spring 2009	50	96.69	7.0

Baseline survey and LCJPS Difference scores were not significantly different among semesters. Difference scores took into account Baseline and Time 2 survey scores and each respondent acted as his or her own control. Overall, Baseline and Time 2 survey scores demonstrated strong positive correlation. Therefore, lower Time 2 survey scores would correspond to lower Baseline survey scores for Fall 2008 semester. Scores for Baseline, Time 2, and Difference scores were lower in Fall 2008 than in other semesters.

LCJPS Difference Scores – Time 2 Scores minus Baseline Scores

LCJPS Difference scores were obtained by subtracting the beginning of semester LCJPS scores from the end of semester LCJPS scores for the 125 respondents with both scores in the database. The average Difference score was 2.31 (SD = 6.2, 95% CI = 1.22 – 3.38), with a median of 3 and a mode of 4. Difference scores ranged from -14 to 21. Exploration of normalcy for the LCJPS Difference scores revealed normal skewness and kurtosis, using Kolmogorov-Smirnov and Shapiro-Wilk analyses. A single outlier of 21 (z = 3.01) was identified. The 5% trimmed mean of 2.27 is within .04 points of the

average (2.31) Difference score. The outlier was retained in the distribution because the difference in the means was minute (Pallant, 2007). Some students experienced a decrease (N = 38, 30%) in LCJPS scores or had the same score (N = 9, 7%) from Baseline to Time 2 measurements. The majority of students (N = 78, 62%) experienced increases in LCJPS scores from Baseline to Time 2. Table 18 (above) provides average beginning and end of semester LCJPS scores and Difference scores across semesters and as totals in the study. Table 20 (above) displays descriptive information about the LCJPS Difference scores.

LCJPS Difference scores were examined with an ANOVA for differences across semesters and LCJPS Difference scores were similar among semesters. Difference scores were smallest in Fall 2008 semester and highest in Spring 2009, but not significantly different (Table 22). Respondents from Spring 2008 fell in the middle for average Difference scores. Because LCJPS Difference scores were similar among the three study semesters, all data were considered to be from the same population and combined for data analysis.

Table 22. Descriptive Data and ANOVA for Difference Scores over Three Semesters

	ANOVA Table				
Source	Sum of Squares	df	Mean Squares	*F*	*p*
Between Groups	163.10	2	81.55	2.14	.122
Within Groups	4642.79	122	38.06		
Total	4805.89	124			

Descriptive Data			
Semester	N	Mean	Standard Deviation
Spring 2008	22	2.45	7.1
Fall 2008	53	1.06	5.7
Spring 2009	50	3.57	6.2

Correlation Matrix for Continuous Variables

Continuous variables, age, Baseline and Time 2 survey scores, and Difference scores were entered into a correlation matrix to identify any relationships among continuous variables (Table 23). Moderate to large positive correlations were found between total scores for Baseline and Time 2 surveys and between Difference scores and Time 2 survey scores. A negative, moderate relationship was found between Difference scores and Baseline survey scores. Finally, a small, positive correlation was found between age and Time 2 survey scores.

Table 23. Correlation Matrix for Continuous Study Variables

	Baseline Survey Scores	Time 2 Survey Scores	Difference Scores	Age
Baseline Survey Scores	1			
Time 2 Survey Scores	.631**	1		
Difference Scores	-.489**	.369**	1	
Age	.134	.218*	.085	1

** = p < .001; * = p < .05

Data Analyses for Specific Aims of the Study

Specific Aim 1: Evaluate the effect of curricular sequencing of HPS experiences on changes in nursing students' perceptions of clinical reasoning development over the semester in which students have their first hospital-based clinical experiences.

Hypothesis 1a: Regardless of curricular sequencing of HPS, students will experience a statistically significant increase ($p < .05$) in their perceptions of clinical reasoning skills (LCJPS) from beginning (Baseline) to end (Time 2) of the semester in which students have their first hospital-based clinical experiences.

Data analysis: The difference in mean scores from Baseline and Time 2 surveys was significant (Table 24). Effect size was large (d = .75) (Cohen, 1988). Students perceived an increase in clinical reasoning skills from Baseline to Time 2.

Table 24. Descriptive Data and Statistical Analyses for Hypothesis 1a

Descriptive Data				
Source		N	M	SD
Baseline LCJPS Scores		125	93.97	7.4
Time 2 LCJPS Scores		125	96.07	7.1
Difference Scores		125	2.31	6.2
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Paired *t*-test	$t = 4.15$ ($p < .001$)	124	2.31	1.2 – 3.4

Hypothesis 1b: Students who experience HPS mid semester will have statistically significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) than those students experiencing HPS at the end of the semester.

Data analysis: Timing of the simulation experience within the semester had no effect on LCJPS Difference scores (Table 25). Average Difference scores for students experiencing simulation mid semester were very similar to students experiencing simulation at the end of the semester. The hypothesis was not supported. The results and implications for nursing education for Specific Aim 1 will be discussed in Chapter Five.

Table 25. Descriptive Data and Statistical Analyses for Hypothesis 1b

Descriptive Data				
Source – LCJPS Scores		N	M	SD
HPS mid semester		125	3.03	6.2
HPS end of semester		125	1.57	6.2
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	$t = 1.31$ ($p = .19$)	123	0.19	-0.74 – 3.66

Specific Aim 2: Determine the effect of demographic and situational variables on changes in nursing students' perceived clinical reasoning abilities as measured by the LCJPS.

Hypothesis 2a: Changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester will be statistically significantly different ($p < .05$) between gender and between Caucasian and non-Caucasian ethnic categories.

Data analysis: LCJPS Difference scores were similar for between ethnic and gender groups (Table 26). The hypothesis was not supported.

Table 26. Descriptive Data and Statistical Analysis for Hypothesis 2a

Descriptive Data – Ethnicity				
Source of Difference Scores		N	M	SD
Caucasian		106	2.3	6.12
Non-Caucasian		19	2.5	7.00
Statistical Test Results – Ethnicity				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	t = -0.13 (p = .90)	123	0.20	-2.9 – 3.3
Descriptive Data – Gender				
Source of Difference Scores		N	M	SD
Female		114	2.3	6.4
Male		11	2.2	3.9
Statistical Test Results – Gender				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	t = -0.07 (p = .944)	123	-0.14	-4.0 – 3.8

Hypothesis 2b: Students' ages will positively and significantly correlate (r =/ > .50, $p < .05$) with nursing students' perceptions of changes in clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.

Data analysis: Respondents' ages were strongly and positively skewed, requiring a nonparametric Spearman rho correlation analysis between age and LCJPS Difference scores. A small, positive correlation was found between Difference scores and respondents' ages ($rho_{(123)} = .209$, $p = .019$). Students who were older experienced greater gains in perceived clinical reasoning over the semester. The hypothesis was supported, but the relationship was not at the 0.50 level of correlation as predicted.

Hypothesis 2c: Students who have had previous healthcare experience of direct patient care prior to entering the nursing program will have statistically significantly larger ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills

(LCJPS Difference scores) than students who did not have previous healthcare experiences in direct patient care.

Data analysis: Students with previous experience in healthcare before entering the nursing program had significantly higher average Difference scores than students without previous experience in healthcare (Table 27). A medium effect size (d = .50) was found (Cohen, 1988). Students who had previous direct patient care healthcare experience prior to entering the nursing program had significantly larger gains in perceived clinical reasoning skills over the semester than students without previous experience in healthcare. The hypothesis was supported.

Table 27. Descriptive Data and Statistical Analysis for Hypothesis 2c

Descriptive Data				
Source – Difference Scores		N	M	SD
Previous experience in healthcare		63	3.8	6.2
No previous experience in healthcare		62	0.8	5.9
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	$t = 2.75$ ($p = .007$)	123	2.98	0.83 – 5.13

Hypothesis 2d: Students who have previous baccalaureate degrees outside the discipline of nursing will have significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those who did not have previous baccalaureate degrees.

Data analysis: LCJPS Difference scores were similar on average for students who had and did not have previous baccalaureate degrees (Table 28). Student with previous

baccalaureate degrees had larger increases in LCJPS Difference scores but not significantly larger. The hypothesis was not supported.

Table 28. Descriptive Data and Statistical Analysis for Hypothesis 2d

Descriptive Data				
Source – Difference Scores		N	M	SD
Students with previous baccalaureate degrees		25	3.5	4.8
Students without previous baccalaureate degrees		100	2.0	6.5
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	$t = 1.04$ ($p = .30$)	123	1.44	-1.3 – 4.2

Hypothesis 2e: Comparisons of students enrolled in AS or BS degree nursing programs of study will not demonstrate significantly different ($p > .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from the beginning to end of the semester in which students have their first hospital-based clinical experiences.

Data analysis: Respondents enrolled in the AS program had significantly larger positive changes in LCJPS scores from beginning to end of the semester than students enrolled in the BS nursing program (Table 29). A small to medium effect size ($d = .41$) was found (Cohen, 1988). AS students made greater gains in perceived clinical reasoning skills over the semester compared to BS students. The hypothesis was not supported.

Table 29. Descriptive Data and Statistical Analysis for Hypothesis 2e

Descriptive Data				
Source – Difference Scores		N	M	SD
AS Students		58	3.64	5.4
BS Students		67	1.16	6.7
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	$t = 2.26$ ($p = .026$)	123	2.48	0.31 – 4.66

Hypothesis 2f: Demographic (age, gender, and ethnicity) and situational variables (nursing students' previous experience in healthcare, timing of simulation experience in the semester, previous baccalaureate degree, and type of nursing program) will significantly predict ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.

Data analysis: Because the difference in LCJPS scores from beginning to end of the semester takes into account each respondents' baseline perception of clinical reasoning skills (Rogosa, 1995), as well as the gains or losses in perceived clinical reasoning skills over the semester, LCJPS Difference scores were used as a dependent variable. Univariate analyses revealed that three variables resulted in significant LJCPS Difference scores: previous experience in healthcare, type of program, and older students (23 – 52 years). Thus, a three-way between groups ANOVA was conducted to explore the impact of previous experience in healthcare (none or direct care), type of program (AS or BS), and age in a median split (19 – 22 and 23 – 53) on changes in students' perceptions of clinical reasoning abilities over a semester, as measured by LCJPS Difference scores. None of the interaction effects between all possible combinations of

the three variables in the analysis were statistically significant. There was a statistically significant main effect for previous experience in healthcare (Tables 30 and 31). Students with previous experience in healthcare had significantly higher LCJPS Difference scores in the ANOVA model. The three variables in the model, previous experience in healthcare, age, and type of program accounted for 13.3% of variance in LCJPS Difference scores (R^2 = .133).

Table 30. Descriptive Data for 2f

Previous Experience	Age ranges	AS		BS		Total	
		N	M (SD)	N	M (SD)	N	M (SD)
None	19 – 22	11	1.72 (5.2)	23	-1.39 (6.7)	34	-0.38 (6.3)
	23 – 53	19	2.21 (5.7)	9	2.33 (4.0)	28	2.25 (5.1)
Some	19 – 22	7	6.29 (5.4)	22	1.70 (6.1)	29	2.93 (6.2)
	23 – 53	21	4.88 (4.8)	13	3.92 (8.2)	34	4.51 (6.2)
Total	19 – 22	18	3.69 (5.7)	45	0.12 (6.5)	63	1.14 (6.5)
	23 – 53	40	3.61 (5.3)	22	3.27 (6.7)	62	3.49 (5.8)

Table 31. Statistical Analysis for 2f

ANOVA Table					
Source	Sum of Squares	df	Mean Squares	*F*	*p*
Between Groups – previous experience	252.25	1	252.25	7.08	.009
Between Groups – age	33.46	1	33.46	.94	.334
Between Groups – type of program	133.60	1	133.60	3.75	.055
Error	4165.95	117	35.61		
Total	5471.75	125			

Post Hoc Data Analysis

Relationship of Baseline and Time 2 LCJPS Scores

A correlation of Baseline and Time 2 LCJPS scores revealed a moderate to strong positive relationship ($r_{(123)} = 0.63$, $p < .0005$). LCJPS respondents who scored higher Baseline surveys tended to score higher on Time 2 surveys.

Difference Scores and Previous Healthcare Experience

Further analyses of the data were suggested by results related to types of previous healthcare experiences and LCJPS Difference scores, which demonstrated higher Difference scores for those with previous healthcare experiences prior to entering the nursing program. Initial categories of capacity of healthcare experiences in the demographic survey were direct patient care, support services, and patient education. Interests for the current study were to identify how experiences in direct patient care affected clinical reasoning perceptions of students. Therefore, three categories of types of previous healthcare experiences were developed: none, direct care, and support services, which included patient education and support services, unit clerk, clerical duties in a patient care setting, and dietary services.

When the type of previous healthcare experience (none, direct care, and support services) was analyzed with ANOVA, a significant difference in LCJPS Difference scores was found. The effect size was moderate (eta squared = .06) (Pallant, 2007). Further analysis using least squares differences demonstrated that LCJPS respondents who had direct care experiences had significantly larger LCJPS Difference scores than those who had none. Students who had experience in other types of support services had LCJPS Differences scores slightly less, but not significantly less, than students with

direct care experience (Table 32). Further, if respondents with healthcare experience participated in the simulation mid semester, they made greater, but not significantly greater, gains in perceived clinical reasoning skills than students who experienced simulation at the end of the semester (Table 33).

Table 32. Descriptive Data and ANOVA Table for Differences Scores and Type of Previous Healthcare Experience

ANOVA Table					
Source	Sum of Squares	df	Mean Squares	*F*	*p*
Between Groups	286.62	2	143.31	3.84	.024
Within Groups	4513.90	121	37.31		
Total	4800.52	123			

Descriptive Data			
Type of Previous Healthcare Experience	N	Mean	Standard Deviation
None	62	0.81	5.9
Direct Care	48	3.86	6.0
Other Services	14	3.79	7.4

Table 33. LCJPS Difference Scores for Previous Healthcare Experience and Simulation Timing

Experience	Simulation Timing	N	Mean	Standard Deviation
None	Mid	32	1.41	5.9
	End	30	.17	
Some	Mid	31	4.71	6.2
	End	32	2.89	

Difference Scores and Age

Another post hoc analysis of data regarding respondents' ages and Difference scores was deemed necessary to determine the influence of age on Difference scores. In further analysis, an independent *t*-test using median split for age as the grouping variable was completed to determine if a distinction between younger and older students' LCJPS

Difference scores was present (Table 34). Older students, 23 – 53 years old, had significantly higher LCJPS Difference scores than younger students, 19 – 22-years old. A small to medium in effect size (d = .39) was realized (Cohen, 1988). Students in the 23 – 53 year old group perceived greater gains in clinical reasoning skills over the semester.

Table 34. Statistical Data for Difference Scores and Age

Descriptive Data				
Source – Difference Scores		N	M	SD
Students age 19 – 22		63	1.14	6.5
Students age 23 – 53		62	3.5	5.8
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
Independent *t*-test	t = 2.14 (p = .034)	123	-2.34	-4.5 – -0.2

Difference Scores, Age, and Previous Baccalaureate Degree

Further analysis of potentially significant variation in age and LCJPS Difference scores were evaluated using type of program as the independent variable in a multivariate analysis of variance (MANOVA). There was a statistically significant difference between students who had a previous baccalaureate degree on combined variation in age and Difference scores ($F_{(2,122)}$ = 13.32, p < .0005, Wilk's Lambda = .09, partial eta squared = .179). When results for age and Difference scores were considered separately, the only difference to reach statistical significance, using a Bonferroni adjusted alpha level of .025, was age ($F_{(1,123)}$ =.821 , p < .0005, partial eta squared = .176). Mean ages demonstrated that students with previous baccalaureate degrees were older (M = 33.6, SD = 8.8) than students without baccalaureate degrees (M = 25.01, SD = 7.2).

Difference Scores, Age, and Previous Experience in Healthcare

Further analysis of potentially significant variation in age and LCJPS Difference scores were evaluated using experience in healthcare as the independent variable in a MANOVA. There was a statistically significant difference between students who had and did not have previous experience in healthcare on combined variables of age and Difference scores ($F_{(2,122)} = 4.0$, $p = .021$, Wilk's Lambda = .94; partial eta squared = .061). When results for age and Difference scores were considered separately, the only dissimilarity, using a Bonferroni adjusted alpha level of .025, was Difference scores ($F_{(1,123)} = 7.53$, $p = .007$, partial eta squared = .058). Mean scores demonstrated that students with previous experience in healthcare had higher Difference scores (M = 3.79, SD = .76) than students without previous experience in healthcare (M = .81, SD = .77).

Difference Scores, Age, and Type of Program

Further analysis of a potentially significant effect of age and type of program on LCJPS Difference scores was evaluated in a two-way ANOVA. Age was entered as a dichotomous variable using a median split and type of program was AS or BS. No main or interactive effects were observed in the model.

Age as a Covariate and Significant Variables for Difference Scores

Because age appears to be a concern for the analysis of the dissimilarities in LCJPS Difference scores, a two-way analysis of covariance were completed for independent variables of previous healthcare experience and type of program using age as a covariate. A two by two between-groups analysis of covariance was conducted to assess the dissimilarities in LCJPS Difference scores between students with and without previous experience and between students in AS or BS programs. The independent

variables were previous experience in healthcare, some or none, and type of program, AS or BS. The dependent variable consisted of changes in scores on the LCJPS from Baseline to Time 2, or Difference scores. Participants' ages were used as the covariate in this analysis.

Preliminary checks were conducted to ensure there was no violation of the assumptions of normality, linearity, homogeneity of variance, homogeneity of regression slopes and reliable measurement of the covariate. After adjusting for age, there was not a significant interaction effect of previous experience in healthcare and type of program ($F_{(1, 120)} = .045$, $p = .83$). The main effects for both previous experience in healthcare ($F_{(1,120)} = 8.3$, $p = .005$, partial eta squared = .065) and type of program ($F_{(1,120)} = 4.66$, $p = .033$, partial eta squared = .037) were statistically significant. Participants with previous healthcare experience and students in the AS program had significantly higher LCJPS Difference scores than participants without previous healthcare experience and students in the BS program regardless of the effects of age.

Summary of Findings

The findings overall were mixed with many non-significant statistical results. Three variables found to have significant effects on LCJPS Difference scores in univariate analyses were age, type of program, and previous experience in healthcare. The three variables accounted for 13.3% of the variance in LCJPS Difference scores. Analysis of variance and regression revealed that only previous experience in healthcare impacted LCJPS Difference scores.

Analysis of individual variables in difference tests demonstrated a few significant results comparing LCJPS Baseline and Time 2 measurements as Difference scores: 1) on

average, students in the AS program experienced greater gains in perceived clinical reasoning skills than students in the BS program; 2) students, on average, made significant gains in their perceptions of clinical reasoning skills over the semester; 3) older students and students with previous experience in healthcare made significantly greater gains in perceived clinical reasoning abilities over the semester, and 4) within the group of students who had previous healthcare experiences, those who experienced HPS mid semester made greater gains, but not significantly greater, in Difference scores than those experiencing HPS at the end of semester. While students in the AS program tend to be older, there were no interaction effects between age and type of program. Age and difference scores were correlated significantly with older students perceiving higher gains in clinical reasoning over the semester.

Post hoc analysis demonstrated that students with previous baccalaureate degrees were older than those who did not have previous baccalaureate degrees. Older students, 23 – 53 years, had survey Difference scores higher than younger students, 19 – 22 years. Another post hoc analysis using MANOVA supported independent t-test findings that students with experience in healthcare had higher survey Difference scores than students without experience in healthcare. Further, age as a covariate did not alter the significant distinctions in LCJPS Difference scores between students with and without previous healthcare experience and students in AS and BS programs.

Conclusion

The timing of simulation within a semester has the potential to affect students' perceived clinical reasoning abilities and changes in their perceptions from beginning to end of a semester. Findings from the study revealed a mix of information regarding the

influence of demographic (age, gender, ethnicity) and situational (type of program, previous experience in healthcare, and previous baccalaureate degree) factors on student perceptions of clinical reasoning skills during patient care. The intervention of simulation timing did not affect students' perceptions of clinical reasoning abilities nor affect gains in perceptions of clinical reasoning abilities over the semester. Variables that influenced differences in the gain of students' perceptions of clinical reasoning abilities over a semester were previous experience in healthcare, older students – 23 years and older, and type of nursing program. Chapter Five will discuss the study findings in light of current nursing education literature, as well as limitations of the study, implications for nursing education, and directions for future research involving simulation placement within the curricula and students' perceptions of clinical reasoning abilities.

CHAPTER FIVE – DISCUSSION

Clinical reasoning by nurses, and student nurses, is vital for safe patient care (Banning, 2008). Reviews of current nursing education strategies reveal that clinical reasoning by nursing students is difficult to teach and evaluate (Benner et al., 2010; Schweitzer, 2008; Simmons, 2010; Tanner, 2007) and clinical experiences may not fully support development of clinical reasoning skills (Benner et al.). The use of human patient simulation (HPS) has been proposed as a method of furthering nursing students' clinical reasoning abilities and their perceptions of the same (Brannan, White, & Bezanson, 2008; Jeffries, 2005; Kuiper et al., 2008; Lasater, 2005; McNelis, Jeffries, Hensel, & Anderson, 2009; Tanner, 2006). Investigation into the effect of the timing of simulation experiences in the curriculum may provide information about the use of HPS to improve students' perceptions of their abilities to clinically reason. This chapter includes a discussion of the study findings related to what is known about clinical reasoning and HPS. Specifically, the following will be discussed: 1) a brief review of the overall study, 2) validity and reliability of the study instrument (LCJPS), 3) discussion of findings related to the specific aims and hypotheses of the study, 4) implications for nursing research and nursing education, and 5) limitations of the study.

Brief Review of the Study

In this study, students were placed into one of two intervention groups comprised of simulation experiences which occurred in the middle or end of a semester. Measures of students' perceptions of clinical reasoning related to patient care were completed at the beginning (Baseline) and end (Time 2) of a semester, using the LCJPS (2005). The difference in the scores was used as the dependent variable. Further, a variety of

potentially influential independent variables were examined for their effects on the difference scores.

Independent variables considered for their influence on changes in students' perceptions of clinical reasoning scores from beginning to end of a semester included demographic and situational factors. Demographic factors were considered to be the students' ages, genders, and ethnicities. Situational factors included the students' previous experience in healthcare, type of program, and previous baccalaureate degree. The independent variables were gathered from participants through the use of a demographic survey and accessing university databases. The single independent variable controlled during the study was timing of the HPS experience, either mid or end of the semester. Students' perceptions of their clinical reasoning skills for patient care were measured with the LCJPS (Lasater, 2005).

Reliability and Validity of LCJPS

Lasater (2005) developed the Lasater Clinical Judgment in Practice Survey (LCJPS) to accurately assess students' self-report of their confidence in applying clinical judgment to patient care. Many aspects of validity were examined related to the clinical reasoning survey. The LCJPS has been examined for face and content validity, construct validity, and criterion-related validity.

Validity

In Lasater's (2005) original study, the survey was validated by establishing face and content validity from experts, such as Drs. Tanner, Scheffer, and Rubenfeld, using a focus group of nursing students, and requesting expert opinions of Lasater's fellow nursing faculty at the research facility.

Construct validity was evaluated using known-group methods. Lasater (2005) analyzed LCJPS scores with several known groups: traditional versus nontraditional students, previous healthcare related experiences versus no experience, and course enrollment with limited, regular, or no simulation. No significant difference in LCJPS scores were found between nontraditional and traditional students or students with and without previous healthcare related experience. However, the differences in course enrollment (regular simulation versus no or limited simulation experiences) was statistically significant for students who participated regularly in HPS (N = 23) demonstrating mean LCJPS scores of 101.65 versus students not participating in HPS (N = 16) with mean scores of 97.25. There was not a significant difference in senior students (N = 18) who had occasional HPS experiences (M = 100.54) and seniors (N = 26) who had none (2 groups of students: M = 103.67 and M = 99.62).

Another validity criterion used to evaluate the survey was criterion-related validity. Lasater (2005) conducted a correlation analysis of the LCJPS and the California Critical Thinking Dispositions Inventory taken at the end of the nursing program and observed a moderate, positive relationship ($r = .62$, $p < .001$).

During this dissertation study, construct validity with known groups was conducted at the institution where the current dissertation research took place. The LCJPS was administered to beginning students in the BS program and those near graduation in three different programs: AS, BS, and RN – BS. Students at the end of their programs perceived higher clinical reasoning skills than students beginning their programs (Table 35). A moderate effect size was realized, Cohen's $d = .44$.

Table 35. Descriptive and Statistical Test Results Comparing Nursing Students' Clinical Reasoning Survey Scores from Beginning to End of Program

Descriptive Data				
Source – LCJPS Scores		N	M	SD
Students beginning the nursing program		75	95.85	6.4
Students at the end of their nursing programs		102	98.44	6.4
Statistical Test Results				
Statistical Analysis	Test statistic (p value)	df	Mean difference	95% CI of Mean Difference
t-test	$t = -2.66$ ($p = .009$)	175	-2.58	-4.5 – -.66

Further known group comparisons were completed outside the current study, but at the same institution. The LCJPS was able to differentiate between students' perceptions of clinical reasoning abilities in three different programs, when measured at the end of the respective nursing programs. Significant differences were found among program types for end of program LCJPS scores, AS, BS, and RN – BS (Table 36). BS nursing students' perceptions of their clinical reasoning abilities were significantly lower than students who were already working as RNs (RN – BS program) and students in the AS program. The LCJPS was able to differentiate between beginning and near graduation students' perceptions of their clinical reasoning abilities as well as differentiating amongst types of program. Examination of survey reliability was undertaken by Lasater in the initial development of the survey and reliability was again examined in the current study.

Table 36. Descriptive Data and ANOVA Table for LCJPS Scores Compared Among 3 Nursing Programs

	ANOVA Table				
Source	Sum of Squares	df	Mean Squares	*F*	*p*
Between Groups	576.87	2	288.44	7.35	.001
Within Groups	6868.44	175	39.25		
Total	7445.31	177			

Descriptive Data			
LCJPS Scores	N	Mean	Standard Deviation
AS Students	57	99.27	6.1
BS Students	111	96.00	6.4
RN – BS Students	10	101.40	6.5

Reliability

Initially, reliability testing of the LCJPS was conducted with 246 surveys with paired (beginning and end of semester) survey completion (Lasater, 2005). Lasater obtained an alpha Cronbach coefficient of .62 for the combined junior and senior students (N = 246). The junior and senior student scores revealed moderate (r = .55) and strong (r = .81) positive relationships, respectively, between beginning and end of semester survey scores.

Cronbach alpha reliability coefficients for the current study sample were higher and varied slightly from Baseline to Time 2 measures of students' perceptions of clinical reasoning. LCJPS reliability coefficients were .79 at the beginning and .78 at the end of semester. Polit and Beck (2010) suggest that Cronbach alpha coefficients between .80 and .90 are desired, but that coefficient levels of .70 – .80 are sufficient reliability measures for the use of scales.

Initial reliability and validity assessments of the LCJPS were adequate for further testing and review in the current dissertation study. Assessments in the current study reaffirmed scale reliability and validity.

Discussion of Findings

This section will review statistical analysis findings associated with specific aims and hypotheses with discussion of findings related to current literature. Table 37 details specific aims and associated hypotheses for the current study, statistical analyses associated with individual hypotheses, results of the analyses, and what the results mean in terms of study variables. Post hoc analyses to further explicate significant statistical findings are included with each hypothesis as appropriate.

Table 37. Statistical Analysis Findings Related to Study Aims and Hypotheses

Specific Aims Hypotheses Statistical Analyses & Results	Findings
Specific Aim 1: Evaluate the effect of curricular sequencing of HPS experiences on changes in nursing students' perceptions of clinical reasoning development over the semester in which students have their first hospital-based clinical experiences.	
Hypothesis 1a: Regardless of curricular sequencing of HPS, students will experience a statistically significant increase ($p < .05$) in their perceptions of clinical reasoning skills (LCJPS) from beginning (Baseline) to end (Time 2) of the semester in which students have their first hospital-based clinical experiences. <u>SUPPORTED</u>	
Paired *t* test of beginning and end of semester LCJPS scores: • $t_{(124)} = 4.15$, $p = .0005$ • Effect size (ES): $d = .75$ • LCJPS scores beginning M = 93.97, SD = 7.4 • LCJPS scores end M = 96.07, SD 7.1	Students had a significant gain in LCJPS scores on average from beginning to end of semester.

Specific Aims Hypotheses Statistical Analyses & Results	Findings
Post hoc analysis: Correlation of beginning and end of semester LCJPS scores: • $r_{(125)} = .63$, $p < .0005$	Students who scored higher on the beginning of semester LCJPS tended to score higher on the end of semester LCJPS.
Hypothesis 1b: Students who experience HPS mid semester will have statistically significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those students experiencing HPS at the end of the semester. <u>NOT SUPPORTED</u>	
Independent *t* test: • $t_{(123)} = 1.31$, $p = .19$ • Mid semester HPS: LCJPS scores M = 96.29, SD = 6.7 • End of the semester HPS: LCJPS scores M = 96.10, SD = 7.3 •	Students experiencing HPS mid semester had no difference in LCJPS Difference scores compared to those experiencing HPS at the end of the semester.
Specific Aim 2: Determine the effect of demographic and situational variables on changes in nursing students' perceived clinical reasoning abilities as measured by the LCJPS.	
Hypothesis 2a: Changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester will be statistically significantly different ($p < .05$) from beginning to end of a semester between gender and between Caucasian and non-Caucasian ethnic categories. <u>NOT SUPPORTED</u>	
Independent *t* test: <u>Gender:</u> • $t_{(123)} = -0.07$, $p = .944$ • Females N = 114, M = 2.3, SD = 6.4 • Males N = 11, M = 2.2, SD = 3.9	Difference in gender of respondents did not result in significantly different perceptions of gains in clinical reasoning over the semester.
<u>Ethnicity:</u> • $t_{(123)} = -0.13$ ($p = .90$) • Caucasian N = 106, M = 2.3, SD 6.12 Non-Caucasian N = 19, M = 2.5, SD = 7.00	Differences in ethnicity did not result in different gains in perceptions of clinical reasoning over the semester.

<table>
<tr><td colspan="2">Hypothesis 2b: Students' ages will positively and significantly correlate (r =/ > .50, p < .05) with nursing students' perceptions of changes in clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.
<u>PARTIALLY SUPPORTED</u>: significant correlation realized, but the relationship did not reach a .50 level</td></tr>
<tr><td>Correlation coefficient:
$rho_{(125)} = .209$, $p = .019$</td><td>As students' ages increased, perceptions of clinical reasoning abilities increased.</td></tr>
<tr><td>Post hoc analysis:
Independent t test:
$t_{(123)} = 2.14$, $p = .034$
ES: $d = .39$
Older respondents, 23-53 years, N = 62, M = 3.5, SD = 5.8
Younger respondents, 19 – 22-years N = 63, M = 1.14, SD = 6.5</td><td>Students who were 23 years and older perceived greater gains in clinical reasoning skills over the semester.</td></tr>
<tr><td colspan="2">Hypothesis 2c: Students who have had previous healthcare experience of direct patient care prior to entering the nursing program will have statistically significantly larger (p < .05) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than students who did not have previous healthcare experiences in direct patient care.
<u>SUPPORTED</u></td></tr>
<tr><td>Independent t test:
$t_{(123)} = 2.75$, $p = .007$
ES: $d = .50$
previous experience in healthcare N = 63, M = 3.8, SD = 6.2
no previous experience in healthcare N = 62, M = 0.8, SD = 5.9</td><td>Students who had previous healthcare experience in direct patient care prior to entering the nursing program had larger gains in perceived clinical reasoning skills over the semester than students who had no patient care experiences prior to the nursing program</td></tr>
<tr><td>Post hoc analysis:
ANOVA and least squares differences post hoc tests:
$F_{(2.121)} = 3.84$, $p = .024$
ES: eta squared = .06
direct care experiences M = 3.86, SD = 6.0
other services M = 3.8, SD = 7.4
no direct care experience M = 0.8, SD = 5.9</td><td>Students who had no direct patient care experiences had significantly lower changes in perceptions of clinical reasoning skills from Baseline to Time 2 than students who had direct care or other service experience in healthcare prior to entering the nursing program.</td></tr>
</table>

Hypothesis 2d: Students who have previous baccalaureate degrees outside the discipline of nursing will have significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those who did not have previous baccalaureate degrees. NOT SUPPORTED	
Independent *t* test: • $t_{(123)} = 1.04$, $p = .30$ • previous baccalaureate degrees N = 25, M = 3.5, SD = 4.8 • no previous degree N = 100, M = 2.0, SD = 6.5	Students with and without previous baccalaureate degrees realized similar increases in perceived clinical reasoning skills over the semester.
Hypothesis 2e: Comparisons of students enrolled in AS or BS degree nursing programs of study will not demonstrate significantly different ($p > .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from the beginning to end of the semester in which students have their first hospital-based clinical experiences. NOT SUPPORTED	
Independent *t* test: • $t_{(123)} = 2.26$, $p = .026$ • ES: $d = .41$ • AS program N = 58, M = 3.64, SD = 5.4 • BS nursing program N = 67, M = 1.16, SD = 6.7	AS students made greater gains in perceived clinical reasoning skills over the semester compared to BS students.
Post hoc analysis: 2-way ANOVA age as a dichotomous variable and type of program as independent variables and LCJPS Difference scores as the dependent variable • Type of program: $F_{(1,121)} = 2.80$, $p = .097$ • Age: $F_{(1,121)} = 1.72$, $p = .192$	A two-way ANOVA comparing LCJPS Difference scores using the dichotomous age variable and type of program was not significant for main or interaction effects.

Hypothesis 2f: Demographic (age, gender, and ethnicity) and situational variables (nursing students' previous experience in healthcare, timing of simulation experience in the semester, previous baccalaureate degree, and type of nursing program) will significantly predict ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester. PARTIALLY SUPPORTED: When variables that were significant in univariate analysis were entered into a three-way ANOVA, previous experience in healthcare was the only independent variable that resulted in a significant variance within LCJPS Difference scores.	
Previous experience in healthcare: $F_{(1,117)} = 7.08$, $p = .009$) Age: $F_{(1,117)} = .94$, $p = .33$ Type of program: $F_{(1,117)} = 3.75$, $p = .055$) No interaction effects between dyads of variables or all three variables in model $R^2 = .133$)	Only previous experience in healthcare was significant for effects on LCJPS Difference scores. The three variables accounted for 13.3% of the variance in Difference scores.

Notes: AS = Associate of Science degree; BS = Bachelor of Science degree; ES = effect size; M = mean; N = number; SD = standard deviation

Specific Aim 1: Evaluate the effect of curricular sequencing of HPS experiences on changes in nursing students' perceptions of clinical reasoning development over the semester in which students have their first hospital-based clinical experiences.

Hypothesis 1a: Regardless of curricular sequencing of HPS, students will experience a statistically significant increase ($p < .05$) in their perceptions of clinical reasoning skills (LCJPS) from beginning (Baseline) to end (Time 2) of the semester in which students have their first hospital-based clinical experience.

The first aim for the study was to determine if timing of the HPS experience had an effect on changes in students' perceptions of clinical reasoning over a semester. The first hypothesis was supported when respondents' survey scores indicated an overall significant increase in perceptions of clinical reasoning abilities from Baseline to Time 2 with an average increase of 2.31 points. The mean increase in points was reduced by a

number of students who experienced decreases or no changes in perceptions of clinical reasoning skills. Nine students (7.2%) had no change in their LCJPS scores. Negative changes in LCJPS scores ranged from -0.1 to -14.0 and represented 38 students (30.4%). The majority of students (N = 78; 64%) experienced an increase in LCJPS scores from beginning to end of the semester. Correlation of beginning and end of semester LCJPS scores was moderately high (Table 37), meaning that students with high LCJPS scores at the beginning of the semester also tended to have high LCJPS scores at the end of the semester.

Lasater (2005) also realized a significant increase in LCJPS scores from beginning to end of a semester, as well as significant, positive correlations of the scores from beginning to end of semester, using HPS experiences to improve students' perceptions of their clinical reasoning abilities. Jenkins (1985) evaluated differences in students' perceptions of decision making abilities amongst different cohorts of nursing students, sophomore, junior, and senior. Jenkins but did not conduct pre-post intervention studies within the cohorts themselves and did not use HPS. Nursing education literature suggests that abilities to critically reason, clinically reason, and make decisions should increase as students progress in their nursing programs (Benner et al., 2010; Johnson & Webber, 2010; Rowles & Russo, 2009). However, little evidence about specific increases in decision-making which occurs within cohorts during a semester or even an academic year has been published.

Hypothesis 1b: Students who experience HPS mid semester will have statistically significantly higher ($p < .05$) changes in nursing students' perceptions of clinical

reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those students experiencing HPS at the end of the semester.

LCJPS Difference scores were similar whether students experienced HPS in the middle or end of the semester (Table 37). While students' perceptions of clinical reasoning ability scores generally increased from beginning to end of the semester, there were no differences based on simulation timing. The single HPS experience may have been inadequate to affect students' perceptions of their clinical reasoning abilities. Clinical reasoning is supported by clinical experiences, classroom lecture, and HPS (Benner et al., 2010; McNelis et al., 2009; Oermann & Gaberson, 2006, Tanner 2006b). The current study had a minimal amount of HPS experiences, but the medical-surgical course also included four hours of classroom lecture and five hours of clinical experience weekly. The "dose," or amount of simulation, experienced by students in HPS research was not a focus in the current study. In many of the studies involving simulation and the effect of HPS on reasoning abilities, the dose was not investigated as a potential influence on clinical reasoning skill development. The dose of simulation ranges greatly in HPS studies: 1-hour single sessions to weekly sessions throughout a semester (Nehring, 2010), but investigation into the importance of different HPS doses are rare (Cant & Cooper, 2009; Nehring, 2010a; Weaver, 2011).

In the current study, the dose of simulation was small: 20 minute participative HPS experiences and up to an additional 60 minutes of observational experiences as other students participated in different simulations. With a single HPS dose, the students' experiences in clinical practica may have provided more experiences upon which to understand the use of clinical reasoning abilities in patient care, making the timing of the

HPS experience irrelevant for overall increases in students perceptions in clinical reasoning abilities. Therefore, other factors and events within the semester that were experienced at much higher frequencies by students, such as classroom lectures and clinical practica, were more likely responsible for the significant increases in LCJPS scores from Baseline to Time 2 (Lasater, 2005; Tanner, 2006b). Further, the impact of simulation experiences on students' perceptions of clinical reasoning abilities is difficult to separate from other competing influences in nursing education, such as classroom lecture and clinical experiences (Lasater, 2005).

Blum, Borglund, and Parcells (2010) compared traditional laboratory experiences to HPS for a course in patient assessment and skills. Regardless of the type of learning environment, the students' confidence and competence increased from beginning to end of the semester. There were no significant differences between groups despite weekly simulation experiences in the HPS group. The trend was for the simulation group to have higher confidence and competence scores, but not significantly higher, which may have been due to small sample sizes.

Specific Aim 2: Determine the effect of demographic and situational variables on changes in nursing students' perceived clinical reasoning abilities as measured by the LCJPS.

Hypothesis 2a: Changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester will be statistically significantly different ($p < .05$) between gender and between Caucasian and non-Caucasian ethnic categories.

The second aim was to determine the effect of various situational and demographic variables on the changes in LCJPS scores and students' perceptions of clinical reasoning over the semester. The first hypothesis for this aim dealt with gender and ethnicity. LCJPS Difference scores did not vary between males and females nor between Caucasian and non-Caucasian respondents (Table 37). Lasater (2005) found no differences in LCJPS scores based on gender and ethnicity, but had a small sample size that may have prohibited identifying differences in gender and ethnicity. While there have been requests for research on the effects of demographic characteristics on simulation outcomes (Lasater, 2005; Parr & Sweeney, 2006; Robertson, 2006; Simmons, 2010), little is found on this topic in the nursing education literature. Because clinical reasoning is affected by many student factors, such as personal and professional knowledge, skills, values, meanings, and experiences (Alfaro-LeFevre, 2009; Johnson & Webber, 2010), there may be some unknown influences of students' demographic and situational factors on clinical reasoning perceptions. Students may employ such factors in different ways as they clinically reason while caring for patients. Students may not equally apply each factor in their clinical reasoning activities, thus adding complexity in sorting out any effects ethnicity or gender may have on students' perceptions of clinical reasoning changes. A larger sample size may illustrate relationships not apparent with the 125 respondents in the current study.

Hypothesis 2b: Students' ages will positively and significantly correlate (r =/ > .50, $p < .05$) with nursing students' perceptions of changes in clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.

Correlation of ages and LCJPS Difference scores revealed a significant, weak positive relationship. As students' ages increased, LJCPS Difference scores also increased. Using a median split of ages, students who were 23 – 53 years old had significantly higher LCJPS Difference scores than students who were ages 19 – 22. Positive relationships between age and critical thinking abilities (Alfaro-LeFevre, 2009; Turner, 2005) and clinical judgment skills (Alfaro-LeFevre) are known. The findings of the current study lend further support to the relationships.

Frisch (1987) evaluated junior-level BS nursing students (N = 42) for cognitive development using Perry's positions across a single semester. Most students were operating at Perry position 3, which indicates beginning multiplism of thinking: diverse options are considered but only until the correct answer is discovered. Some students were operating at a Perry position 2, which indicates dualism of thinking: while diverse options are observed, the differences are not considered to be true. Only one student was scored at a Perry position 4, which is the second stage of multiplism: diverse opinions are considered as individuals' rights and solutions can depend on the situation. Nursing students operating at these relatively immature levels of cognitive development will have difficulty determining important aspect of patient care in environments with multiple cues and informational sources. Frisch did not provide mean ages of the sample, so the effect of age on the sample was unknown.

Because ages were significantly different between type of programs, and baccalaureate degree, further analysis of the effect of age on LCJPS Difference scores was warranted. These effects will be discussed with results from Hypotheses 2d and 2e.

Hypothesis 2c: Students who have had previous healthcare experience of direct patient care prior to entering the nursing program will have statistically significantly larger ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than students who did not have previous healthcare experiences in direct patient care.

Data analyses revealed that students with previous healthcare experience perceived significantly larger gains in clinical reasoning abilities than students without healthcare experience (Table 37). For students who had previous healthcare experience, those who participated in simulation mid semester made larger gains in perceived clinical reasoning abilities than students who had simulation at the end of the semester, but not statistically significantly larger. The larger gains in LCJPS Difference scores of students with previous experience in healthcare and participation in mid semester HPS illustrates a trend that may be significant with a larger sample size. Experiences in clinical and classroom arenas have well defined positive relationships with clinical judgment accuracy (Spengler et al., 2010). While Lasater (2005) did not find a difference in LJCPS scores based on whether students had previous experience in healthcare or not, the sample size of the study was small with 83 students divided between junior and senior status. While focusing on nontraditional male students in nursing, Smith (2006) found that nursing program challenges were easier to meet due to students' life experiences and developmental stages.

Some of the differences in perceptions of clinical reasoning abilities in students with previous healthcare experience might be explained by the five-stage adult skill acquisition model. Dreyfus and Dreyfus (1986) developed a five-stage model of adult

skill acquisition, which includes novice, advanced beginner, competence, proficiency, and expertise stages. Dreyfus (2004) described advanced beginners as moving beyond the novice stage of skill acquisition by developing:

> an understanding of the relevant context, he or she begins to note, or an instructor points out, perspicuous examples of meaningful additional aspects of the situation or domain. After seeing a sufficient number of examples, the student learns to recognize these new situational aspects, recognized on the basis of experience, as well as to the objectively defined nonsituational features recognizable by the novice. (p. 177)

In the model, novices see each cue as equally important and are task-oriented. Advanced beginners consider additional factors in the context of patients' care (Benner, 2001). Clinical practice, in simulation or actual patient care, is necessary for students to develop skills related to clinical reasoning in uncertain environments (Oermann, & Gaberson, 2006). Students with previous experience in healthcare may be more comfortable entering the less structured and more context-oriented ways of understanding patient care situations (Cangelosi, 2007) than novice students without previous experience in healthcare. Thus, the HPS environment with its context-driven patient care scenarios may appeal to students with previous healthcare experience, who may be older and have more life experience, also. The experienced nursing learners may be comfortable with less structured HPS environments where connections between nursing knowledge and patient care can be made (Cangelosi).

Nursing students with previous experience in direct patient care enter the nursing program with knowledge, skills, and attitudes that may reduce the stress of caring for patients in clinical practica. Use of the patient care skills has become routine for students with previous healthcare experience and does not require extensive thought or planning,

as it likely does for students without experience with direct patient care. For students without previous healthcare experience, the time and effort required to plan basic patient care may reduce the amount of time and energy that could be spent making critical connections between patient status and potential concerns related to the patient's situation. The lack of time to make connections reduces opportunities to build clinical reasoning abilities and perceptions of the same (Benner et al., 2010).

Hypothesis 2d: Students who have previous baccalaureate degrees outside the discipline of nursing will have significantly higher ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester than those who did not have previous baccalaureate degrees.

Students who had previous baccalaureate degrees had LCJPS Difference scores similar to students without previous baccalaureate degrees (Table 37). Experience is positively related to clinical judgment abilities (Spengler et al., 2009) and students with pervious baccalaureate degrees would have more life experience. Students with previous baccalaureate degrees had an average increase in LCJPS scores of 3.5 points and students without previous baccalaureate degrees had an average increase of 2.0 points from beginning to end of a semester. No interaction effect was found between age and previous degree for LCJPS Difference scores, despite students with previous degrees being significantly older than students without previous degrees.

Much of the nursing education literature comparing students with previous baccalaureate degrees focuses on accelerated BS programs with shorter times from entry to graduation based on previous baccalaureate degree knowledge and experiences. One interesting study evaluated responses to a survey developed from the 1985 version of the

American Nurses Association Code for Nurses and associated values of AS and BS nursing students. Two significant differences have relevance for this dissertation study. AS students had higher scores than BS students for assuming responsibility and accountability for individual nursing judgments and actions and for exercising informed judgments. There were no differences in survey scores based on age; no evaluation of differences in ages between AS and BS groups was reported (Martin, Yarbrough, & Alfred, 2003).

Saunders (1997) investigated differences in clinical judgment and clinical decision making for nursing students in three different programs: generic BS, RN – BS, and accelerated BS for students with previous baccalaureate degrees. Students' perceptions of their clinical decision making skills were evaluated with Jenkin's (1985) CDMNS with no difference among groups on total scores or subscale scores. The students' clinical judgment abilities were evaluated with the Clinical Judgment in Nursing Series: Emergencies in Adult Clinical Care Test. The RN – BS and accelerated BS groups had higher scores than the generic BS groups on the clinical judgment test. Saunders suggested age, work experience, self-directedness, and readiness to learn were important factors influencing higher clinical judgment scores.

Hypothesis 2e: Comparisons of students enrolled in AS or BS degree nursing programs of study will not demonstrate significantly different ($p > .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from the beginning to end of the semester in which students have their first hospital-based clinical experiences.

Students enrolled in the AS program perceived greater gains in perceptions of clinical reasoning abilities from Baseline to Time 2 measurement than students in the BS program (Table 37). Students in the AS program (M 30.4, SD 9.35) were significantly older on average than students in the BS program (M = 23.55, SD = 5.44). Despite significant differences in age for students in AS and BS programs, LCJPS Difference scores were similar when considering age and type of program.

The advantage of life experiences in the generally older AS students in this sample may have accounted for the larger gains in perceptions of clinical reasoning abilities from Baseline to Time 2 measurements for AS students. Life experiences are used when critically thinking and clinically reasoning (Alfaro-LeFevre, 2009; Spengler et al., 2009; Tanner, 2006b). Many interrelated mental processes are used when nurses clinically reason. The mental processes are influenced by the context of the patient care situation and the experiential knowledge of the nurse (Ruth-Sahd & Hendy, 1997).

Shin (1998) assessed differences in clinical decision making skills among senior nursing students enrolled in AS and BS programs in Korea, using the Nursing Performance Simulation Instrument (NPSI). The instrument was part of an unpublished doctoral dissertation (Grover, 1991, as cited in Shin 1998). The paper-based tool has four case scenarios of clinical situations and scores range from 0 – 53. Students' mean ages were similar for both groups in Shin's study: AS = 21.5 and BS = 22.3). BS students demonstrated significantly higher clinical decision making scores.

Another study of Korean nursing students evaluated differences in critical thinking dispositions using the California Critical Thinking Disposition Inventory (CCTDI) and the California Critical Thinking Skills Test (CCTST). Significant

differences for both tools were found between programs: AS, BS, and RN – BS. Total scores on both tests were highest for BS students and lowest for AS students. RN – BS students scored between the other two groups on both tests (Shin, Jung, Shin, & Kim, 2006).

Hypothesis 2f: Demographic (age, gender, and ethnicity) and situational variables (nursing students' previous experience in healthcare, timing of simulation experience in the semester, previous baccalaureate degree, and type of nursing program) will significantly predict ($p < .05$) changes in nursing students' perceptions of clinical reasoning skills (LCJPS Difference scores) from beginning to end of a semester.

Univariate analyses of demographic and situational variables revealed three variables with significant differences in LCJPS Difference scores: previous experience in healthcare, type of program, and age. Statistical analysis of the three variables using ANOVA revealed only previous experience in healthcare significantly affected changes in students' perceptions of clinical reasoning abilities from Baseline to Time 2 (Table 37). The relevant research was discussed with Hypothesis 2c.

Theoretical Implications

The results of the current dissertation study support the need for patient care experiences for optimal development of clinical reasoning skills. In Tanner's Clinical Judgment Model (2006b), nursing knowledge and experience are two requisites for clinical reasoning to a clinical judgment. As students make decisions about patient care, they develop new clinical reasoning abilities. Experience with patient care provides knowledge and skills to advance along the adult skill acquisition model and enhances students' perceptions of their clinical reasoning abilities (Benner, 2001). Working in HPS

situations generally increases students' perceptions of the their clinical reasoning abilities (Lasater, 2005; McNelis et al., 2009; Simmons, 2010), which would impact the portion of Tanner's Clinical Judgment Model that describes what the student brings to the clinical reasoning situation, knowledge and experience.

In this dissertation study, students' perceptions of their clinical reasoning abilities, on average, grew from Baseline to Time 2 measurements; however, it is not clear that the single HPS experience was responsible for the significant increase in LCJPS scores. Lasater (2005) suggested that students' experiences outside of HPS were major unknown and unquantifiable influences on students' perceptions of clinical reasoning abilities. Older students with more extensive life experiences made greater gains in perceived clinical reasoning abilities from beginning to end of a semester than younger students. Students with previous healthcare experiences, which contributed to the unknown influence on students' perceptions of clinical reasoning, also had higher perceptions of their clinical reasoning abilities. The common factor seems to be experience, which has been shown to influence thinking and reasoning abilities (Alfaro-LeFevre, 2009; Dreyfus, 2004; Skår, 2009; Spengler et al., 2010). In order to clarify factors that may influence students' perceptions of clinical reasoning, implications for nursing research are provided in the next section.

Implications for Nursing Research

The current study findings provide implications for future research involving the use of HPS for advancing students' perceptions of their clinical reasoning abilities. 1) Further testing of the survey tool, LCJPS, for reliability and validity is suggested. 2) Research methodology needs to include a consistent method for tracking changes in

students' perceptions of their clinical reasoning abilities from pre to post intervention. 3) Distinguishing among situational and demographic factors for influence on students' perceptions of clinical reasoning abilities would help clarify which factors are more important in clinical reasoning development. 4) Investigation of factors that led to reductions in students' perceptions of clinical reasoning abilities from beginning to end of a semester would help nursing faculty more clearly understand the clinical reasoning developmental process in order to maximize scarce nursing education resources, faculty and facilities. 5) The optimum dose of simulation to improve students' perceptions of clinical abilities needs to be identified. 6) Nurse educators need to determine how to leverage students' previous experience in healthcare and life experiences into gains in perceptions of clinical reasoning abilities. 7) Clarification of best practice for simulation timing for those students with previous healthcare experience for optimum development of clinical reasoning abilities is needed. And, 8) research to assess appropriate methods of assisting young students and students without previous experience in healthcare in making critical connections between nursing knowledge and patient care using clinical reasoning skills should be completed. The research implications were derived from various unanswered questions arising from the dissertation study findings.

Implications for Future Nursing Education

Implications for future nursing education can be derived from findings in the current study. No differences in students' perceptions of clinical reasoning were found groups for gains in LCJPS scores from Baseline to Time 2. The time students spent in HPS was small relative to the time spent in clinical environments. Clinical experience was postulated as more influential in developing students' perceptions of clinical

reasoning skills than the HPS for this dissertation study. While one implication for nursing education may be to continue clinical experience to the exclusion of HPS, such a conclusion may be short sighted. Barriers to students' development of clinical reasoning skills currently present in actual patient care environments are unlikely to dissipate and will more likely continue or become worse. HPS as a safe environment for students to practice patient care and clinical reasoning skills can help overcome some of the barriers encountered with actual patient care environments.

Differences in gender and ethnicity were other areas in which similarities in perceptions of gains in clinical reasoning skills were found, as well as for students with and without previous baccalaureate degrees. The lack of significant differences for gender and ethnicities is an important finding that indicates nurse educators are providing what students need in terms of experience and information upon which to develop perceptions of clinical reasoning skills, regardless of demographic differences. The similarity in LCJPS Difference scores for students with and without previous degrees may be due to a small sample size and disparate group sizes (100 versus 25). The finding deserves additional research and attention by nurse educators to assure students are receiving appropriate instruction and experiences to develop clinical reasoning skills.

Other findings, which revealed significant differences, can also inform teaching and learning practices of nurse educators. Students with previous experience in healthcare, older students (23 years old and older), and students in the AS program demonstrated higher perceptions of clinical reasoning abilities over a semester in the current study. Age and experience have positive influences on critical thinking and clinical judgment. Students in the AS program were older on average than students in the

BS program. For nurse educators, identification of those students with previous direct patient care experiences and providing more advanced patient care situations for them in clinical practica may help advance perceptions of clinical reasoning abilities. Conversely, identification of students without previous healthcare experience may be as important. Students without previous healthcare experience may need additional time to become accustomed to the clinical environment before realizing the clinical reasoning connections between patients' conditions and their care. Potentially, the student with previous healthcare experience could be paired with inexperienced students to facilitate learning and perceptions of clinical reasoning abilities. The implicit reasoning within patient situations must be made explicit, and such an approach to teaching clinical reasoning is important to help inexperienced nurses learn how to think like experts (Benner, et al., 2010; Kautz et al., 2005; Kuiper et al., 2008; Kuiper & Pesut, 2004).

Students realized increases in perceptions of clinical reasoning abilities over the semester regardless of the timing of their simulation experiences. Thus, with a single HPS experience, as used in the current study, the influence of weekly clinical experience may be equally or more important to improving perceptions of clinical reasoning abilities as the simulation experience. Nurse educators should use every opportunity to expose students to the connections between patient conditions and nursing interventions and the use of clinical reasoning during patient care (Benner et al., 2010).

Timing of the simulation in the current study did not affect perceptions of clinical reasoning abilities. However, there was some indication that students with experience may benefit from HPS at mid semester or before. Multiple simulations each semester are suggested to provide varied experiences and more exposure to the types of clinical

reasoning necessary in patient care, especially emergent patient care (Benner et al., 2010; McNelis et al., 2009).

Limitations

Research is an imperfect undertaking, especially when dealing with human subjects. Concerns about the current study and improvements for future research are suggested. Considerations for improving and extending the study include: 1) employing larger and more varied sample through the use of multiple research sites, 2) increasing the time span between clinical reasoning perception measures, 3) measuring the dose of simulation with comparison of different doses, and 4) refining methodologies to improve tracking survey responses for pre and post intervention measurements.

As a single site study, generalization of findings is limited to similar institutions with similar nursing programs. The sample at the study institution had proportionally fewer men and minority students than found nationally in nursing programs for the 2008 – 2009 academic year (Kaufman, nd). Students in associate degree programs are older on average than baccalaureate programs. The students in the current sample were proportionally similar in age to students in baccalaureate nursing programs nationally (NLN, 2010). Multisite studies may provide a sample from which results could be more generalizable than in the current, single site study.

The short time span between measurements of students' perceptions of their clinical reasoning abilities may be a limitation. Baseline and Time 2 measurements spanned a single semester. There may have been minimal or no increases in perceptions of clinical reasoning abilities for nearly one-third of the sample because a longer period of time is needed to synthesize learning from simulation, clinical, and classroom

experiences into improved clinical reasoning abilities and students' perceptions of the same (Simmons, 2010; Tanner, 2007). Administering the LCJPS from beginning to the end of an academic year may yield more positive Difference scores and provide better discrimination of students' perceptions of clinical reasoning among independent variables identified in the current study.

The "dose" of simulation, or exposure to the simulation experience, may have been too small. Students' clinical experiences greatly outnumbered the single HPS experience and most likely influenced their perceptions of clinical reasoning abilities to a much greater extent. Regularly scheduled HPS experiences in which students can actively work through clinical reasoning in patient care without harm to actual patients would contribute to students' perceptions of their clinical reasoning abilities. However, separating the effects of HPS and clinical experiences influence on clinical reasoning would be difficult.

Methods employed early in the current study resulted in difficulty matching Baseline and Time 2 surveys for computation of difference scores. When identification numbers were supplied, much higher response rates were realized. Continuing to use surveys on which identification numbers are supplied for respondents should result in better response rates. Despite the limitations found in the current study, important conclusions can be derived from the results and are discussed in the next session.

Conclusion

Several barriers exist for providing optimum clinical experiences for nurse educators and nursing students. Barriers include: technologically rich and complex patient care environments, faculty shortages, competition for clinical sites, and increased

attention to the risks that novice students pose for patients. Further, teaching nursing students about clinical reasoning is difficult because clinical reasoning in healthcare takes place in environments that are complex, unique, and uncertain (Benner et al., 2010). HPS has been proposed as a way for nursing students to respond to emergent situations in a safe environment where mistakes do not result in death of actual patients (McNelis et al., 2009). Responding to emergent conditions helps develop students' understanding of clinical reasoning requirements for patient care (Tanner, 2007).

The current study examined the use of a single HPS experience at mid or end of semester to determine if timing affected students' perceptions of clinical reasoning abilities for patient care. LCJPS Difference scores were used to represent changes in students' perceptions' of their clinical reasoning abilities from beginning to the end of the semester. The simulation timing did not result in different levels of perceptions of clinical reasoning abilities. However, other variables of interest resulted in dissimilarities in LCJPS Difference scores. Older students, students with previous experience in healthcare, and students in the AS program had higher LCJPS Difference scores. Since AS nursing students are generally older than BS students (NLN, 2010), the additional life experience may provide a buffering of the stress of new clinical environments and allow for more advanced thinking regarding clinical reasoning. Previous healthcare experiences may also reduce student stress associated with novel patient care environments and may allow more time and energy for thinking about clinical reasoning for patient care.

Nurse educators may have a more proactive role in assisting students with clinical reasoning skill development by assessing students' prior experiences in healthcare and ages. Students without prior experience need additional help making clinical reasoning

decisions. Regular HPS experiences with patient conditions requiring clinical reasoning may enhance students' perceptions of their clinical reasoning abilities.

APPENDIX A

Invitation to Participate in a Research Study

Dear NUR 202 Student:

You'll be experiencing a simulation of patient care, which will replace a clinical experience, at some time in the semester. In conjunction with that experience, I would like to invite you to participate in a research study.

This is a unique opportunity to help contribute to the body of nursing knowledge and provide valuable information for future students in this and other nursing programs.

If you agree to participate:

- Complete the 3 questionnaires
- Return the packet to the clinical instructor or return it to the nursing department office by January 23.

There will be a second set of questionnaires at the end of the semester. Your answers to the questionnaires will be compared.

Participation in this research is voluntary. Your grade in this course will not be affected by participating or not participating in this research. Your instructor will never have access to the survey. You must be 18 years or older to participate in this research.

If you have any questions, please contact me by phone, 481-5485, or email, jensenr@ipfw.edu

Sincerely,

Rebecca Jensen, MS, RN, CRNI

Assistant Professor, Director of Simulation and Research

APPENDIX B

Research ID number _____

Demographic Questionnaire

Please answer EACH question by circling the ONE most appropriate response for the question or filling in the appropriate information:

1. Gender: Male Female

2. Age (in years) _____

3. How much healthcare-related work/volunteer experience did you have BEFORE you began your nursing education – before you started NUR 115?

None _____

Less than 1 year _____

1 – 3 years _____

4 – 6 years _____

More than 6 years _____

4. In what capacity?

_____Direct care (caring for clients)

_____Health education (teaching clients or groups about healthy living)

_____Support services (unit clerk, clerical duties in a patient care setting, dietary)

Please indicate the capacity you have had most recently if 2 categories are applicable to your situation

5. Have you earned a previous bachelor's degree in another major?

no yes

6. In which racial/ethnic group do you place yourself?

Caucasian Caucasian/Hispanic African/American

Native American Pacific Islander Asian Other_____

APPENDIX C

Lasater Clinical Judgment in Nursing Scale

Please answer the questions as honestly as possible, in a way that shows your current state AT THIS TIME, not how you would like to be, or how you think you should be. The first answer that pops into your head is what is needed.

Using the scale provided, decide how much you either agree or disagree with each statement. Next to each statement, mark an "x" in the box that BEST indicates how you feel.

	Strongly Disagree	**Somewhat Disagree**	**Somewhat Agree**	**Strongly Agree**
1. When I find an inconsistency between patient care and my knowledge, I take the time to get the answer.	□	□	□	□
2. Reflection has very little to do with critical thinking.	□	□	□	□
3. Even if I have complete assessment information, I find it difficult to choose an appropriate intervention.	□	□	□	□
4. I pride myself in thinking "outside the box" in the clinical setting.	□	□	□	□
5. When something negative happens in the clinical area, I try to forget about it.	□	□	□	□
6. I am confident about the rationale for my choice of nursing interventions when caring for patients	□	□	□	□
7. If I have adequate patient assessment information, I can choose an appropriate nursing intervention.	□	□	□	□
8. When I know I'm right about a patient issue, I don't care what other team members think.	□	□	□	□

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
9. When I get new information, I carefully evaluate the reliability of the source.	□	□	□	□
10. I don't have trouble prioritizing the needs of my patients.	□	□	□	□
11. If a nurse with more experience says I should do something, I do it, even if I'm not sure why.	□	□	□	□
12. I know the strengths and limitations of my clinical practice.	□	□	□	□
13. The only thing I focus on in the clinical area is the patient's physical condition.	□	□	□	□
14. I don't mind putting in extra effort to be sure I'm giving safe care.	□	□	□	□
15. I routinely look for new information that I can use in the clinical setting.	□	□	□	□
16. It's important to me to support my conclusions about patients with data.	□	□	□	□
17. I set goals to address my areas for improvement in the clinical setting.	□	□	□	□
18. When I learn something new, I share it with the team members and peers.	□	□	□	□
19. I like to consider alternative solutions to difficult patient problems.	□	□	□	□
20. I am willing to change my viewpoint, if there is evidence to support a different one.	□	□	□	□

	Strongly Disagree	Somewhat Disagree	Somewhat Agree	Strongly Agree
21. I frequently get a gut feeling about my patients.	□	□	□	□
22. I use both subjective and objective information to make judgments about patient care.	□	□	□	□
23. I would rather learn about the care of patients on my own than from other nurses.	□	□	□	□
24. For each complex patient situation, there is a right and wrong way to deal with it.	□	□	□	□
25. When I make a mistake in the clinical area, I find it helpful to talk it over with someone who has more nursing experience and that I trust.	□	□	□	□
26. When something goes wrong with my patient, my first intervention is to call the physician.	□	□	□	□
27. As long as I am working with other team members, I feel quite confident in my ability to care for my patients.	□	□	□	□
28. I can set priorities in the midst of a patient crisis.	□	□	□	□
29. My past life experiences help me to provide good patient care.	□	□	□	□
30. As a new graduate nurse, I expect to function independently in patient care.	□	□	□	□

APPENDIX D

PURDUE
UNIVERSITY

HUMAN RESEARCH PROTECTION PROGRAM
INSTITUTIONAL REVIEW BOARDS

To:	REBECCA JENSEN NF B050P
From:	RICHARD MATTES, Chair Social Science IRB
Date:	08/17/2007
Committee Action:	**Exemption Granted**
IRB Action Date:	08/14/2007
IRB Protocol #:	0708005645
Study Title:	The Effects of Timing of High-Fidelity Patient Simulation on Clinical Judgment and Self-Efficacy of N

The Institutional Review Board (IRB), pursuant to Federal regulations, 45 CFR 46.101(b), has determined that the above-referenced protocol is exempt category (2) .

If you wish to revise or amend the protocol, please submit a new exemption request to the IRB for consideration. Please contact our office if you have any questions.

We wish you good luck with your work. Please retain a copy of this letter for your records.

INDIANA UNIVERSITY

OFFICE OF RESEARCH ADMINISTRATION

Date:	September 12, 2010
To:	Dr. Patricia Ebright Nursing NU 412
From:	Regina Weber Research Compliance Administration, IUPUI UN 618
Subject:	IUPUI/Clarian Institutional Review Committee - Exempt Review of Human Study
Study Number:	EX1009-38B
Study Title:	The Effect of Curricular Sequencing of Human Patient Simulation Learning Experiences on Students' Self-Perceptions of Clinical Reasoning Abilities

Your application for approval of the study named above has been accepted as meeting the criteria of exempt research as described by Federal Regulations [45 CFR 46.101(b), paragraph 2]. A copy of the acceptance is enclosed for your file.

Although a continuing review is not required for an exempt study, prior approval must be obtained before change(s) to the originally approved study can be initiated. When you have completed your study, please inform our office in writing.

If the research is conducted at or funded by the VA, research may not be initiated until approval is received from the VA Research and Development Committee.

Please contact the Office of Health Care Billing and HIPAA Programs at 317-278-4891 for information regarding a Data Use Agreement, if applicable.

Enclosures: ☒ Copy of acceptance

Phone: 317-274-8289 • Fax: 317-274-5932 • Email: irbexp@iupui.edu • Website: http://research.iupui.edu

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Tanner, C. (1990). Teaching clinical judgment. *Annual Review of Nursing Research, 8*, 153-173.

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Tanner, C. (2006a). Changing times, evolving issues: The faculty shortage, accelerated programs, and simulation. *Journal of Nursing Education, 45*(3), 99-100.

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Vacek, J. (2009). Using a conceptual approach with concept mapping to promote critical thinking. *Journal of Nursing Education, 48*(1), 45-48.

Valentine, F., & McHugh, C. (2007). The effects of attrition on baseline comparability in randomized experiments in education: A meta-analysis. *Psychological Methods, 12*(3), 268-282.

Waldner, M., & Olson, J. (2007). Taking the patient to the classroom: Applying theoretical frameworks to simulation in nursing education. *International Journal of Nursing Education Scholarship, 4*(1), Article 18.

Waxman, K. (2010). The development of evidence-based clinical simulation scenarios: Guidelines for nurse educators. *Journal of Nursing Education, 49*(1), 29-35.

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Wilford, A., & Doyle, T. (2006). Integrating simulation training into the nursing curriculum. *British Journal of Nursing, 15*(17), 926-930.

Wong, T., & Chung J. (2002). Diagnostic reasoning processes using patient simulation in different learning environments. *Journal of Clinical Nursing, 11,* 65-72.

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CURRICULUM VITAE

Rebecca Sue Jensen

EDUCATION

Degree Granting Institution & Location	Degree	Date Awarded
Parkview Methodist School of Nursing, Fort Wayne, IN	Diploma	1977 – 1980
Indiana University-Purdue University Fort Wayne, Fort Wayne, IN	BS	1981 – 1992
Indiana University-Purdue University Fort Wayne, Fort Wayne, IN	MS	1995 – 1999
Indiana University- Purdue University Indianapolis, Indianapolis, IN	PhD	2003 – 2011

ACADEMIC APPOINTMENTS

Indiana University-Purdue University Fort Wayne (Department of Nursing)

Continuing Lecturer	2001 – 2005
Assistant Professor	2005 – present
Director of Simulation and Research	2007 – present

LICENSURE

Licensed as a Registered Professional Nurse Indiana, 1980 – 2011

CLINICAL APPOINTMENTS

Facility/Company	Title/Rank	Dates
Parkview Hospital	Staff Nurse	1980 – 2007
Interim (Home health care)	Staff Nurse	1989 – 1990
First Option Health Care (Home health)	Per Diem Nurse	1993 – 1995
Select Specialty Hospital	Lead Nurse	1999 – 2000
Coram Health Care (Home Health)	Per Diem Nurse	2001 – 2005 2006 – 2008

CONSULTATIONS/OTHER PRESENTATIONS

Facility/Company	Topic	Date(s)
Indiana Med. Assoc.	IV Therapy	2003, 2005 & 2007
Surgical Care Center	IV Therapy	2004
Community Home Health Care	IV Therapy	2005
New Haven EMS	"What's My Line" – EMS access of Central Venous Devices for emergency IV access	2006

Facility/Company	Topic	Date(s)
Nursing Faculty Bradley University, Peoria, IL	Human Patient Simulation Facilitates Nursing Education Outcomes	2009
Graduate Nursing Faculty Clayton State University, Morrow, GA	Integrating Simulation into Graduate Education	2010

MEMBERSHIP IN PROFESSIONAL SOCIETIES

Infusion Nurses Society 1992 – 2011
Association of Vascular Access 1995 – 2011
American Nurses Association 1990 – present
    Indiana State Nurses Association
Sigma Theta Tau International 1997 – 2011
    Xi Nu Chapter at Large
        Archive Chairperson – 3 years
        V.P for IPFW – 2005 – 2009
        Counselor IPFW – 2010 – 2012
Society for Simulation in Healthcare 2007 – 2011
International Nursing Association for Clinical Simulation and Learning 2007 – 2011

PAPER PRESENTATIONS

Jensen, R. (2004, November). *Predictors of phlebitis: A research plan*. Paper presented at the meeting of the Fall Research Colloquium Xi Nu at Large Chapter of Sigma Theta Tau, Fort Wayne, IN.

Jensen, R. (2007, August). *Self-efficacy in a hybrid course*. Paper presented at the meeting of the Scholarship of Teaching and Learning in Nursing Conference, Cincinnati, OH.

Jensen, R. (2007, September). *Acquiring IV skills: It's more than just sticks*. Paper presented at the meeting of the Association for Vascular Access: 21st Annual Conference. Phoenix, AZ.

Jensen, R. (2008, July). *High-fidelity patient simulation: A versatile education tool*. Paper presented as part of the symposium: Meeting the challenge: Make technology ubiquitous in nursing education at the 2nd International Nurse Education Conference: Research and Innovation in International Nurse Education, Dublin, Ireland.

Jensen, R. (2009, October). *Writing simulation scenarios: How to save time and aggravation*. Paper presented at the 40th Annual Sigma Theta Tau International Biennial Convention in Indianapolis, IN.

Jensen, R. (2010, October). *Using Cerner's Academic Education Solution (AES) with human patient simulators (HPS) in three key areas: Nursing fundamentals, the evaluation of psychomotor skills, and preparing nursing educators: Integrating human patient simulators (HPS) and EMRs to evaluate competency in psychomotor skills development.* Paper presented at Cerner Healthcare Conference in Kansas City, MO.

Jensen, R. (2010, October). *Assessing clinical reasoning in a capstone clinical course*. Paper presented at the 2010 Assessment Institute in Indianapolis, IN.

POSTER PRESENTATIONS

Bauer, A., & Jensen, R. (2008). *Student satisfaction related to expanded roles of laboratory personnel.* Poster presented at the Scholarship of Teaching and Learning in Nursing Conference, Cincinnati, OH.

Jensen, R. (2007, April). *Assessment of intravenous therapy instruction in an associate degree nursing program*. Poster presented at the Scholarship of Teaching and Learning Community Poster Sessions at Indiana University, Bloomington, IN.

Jensen, R. (2007, August). *IV Therapy: It's more than just sticks*. Poster presented at the Scholarship of Teaching and Learning in Nursing Conference, Cincinnati, OH.

Jensen, R. (2008, July). *An innovative course design for LPN-ADN articulation*. Presented at the Emerging Technologies in Nursing Education Conference, Seattle, WA.

Jensen, R. (2009, October). *Initiating nursing students' PDA use: Lessons learned*. Poster presented at the 40th Annual Sigma Theta Tau International Biennial Convention in Indianapolis, IN.

Jensen, R., & Willock, K. (2008). *Healthy Cities Health Fair*. Poster presented at the 4th Annual IPFW Diversity Showcase in Fort Wayne, IN.

Schulte, S., Jensen, R., & DeKoninck, P. (2008, May). *Assessing the impact of information literacy instruction in a beginning nursing professional seminar course using citation analysis.* Poster presented at Connections: Bridging the Gaps, to Medical Library Association Annual Conference. Chicago, IL.

PUBLICATIONS

Jensen, R. (2008). An innovative course design for Licensed Practical Nurse – Associate Degree nursing articulation. *Teaching and Learning in Nursing, 3*(4), 137-140.

Jensen, R. (2009). Teaching students about IV therapy: Increased competence and confidence. *Journal of Association for Vascular Access, 14*(1), 21-27.

Jensen, R. (In press, 2012). Administering intravenous therapy. In G. Duncan, W. Baumle, & R. Bender (Eds.). *Medical-surgical nursing*. Clifton Park, NY: Delmar Cengage Learning.

Jensen, R. (In press, 2012). Administering parenteral nutrition. In G. Duncan, W. Baumle, & R. Bender (Eds.). *Medical-surgical nursing*. Clifton Park, NY: Delmar Cengage Learning.

Jensen, R. (In press, 2012). Managing blood and blood products. In G. Duncan, W. Baumle, & R. Bender (Eds.). *Medical-surgical nursing*. Clifton Park, NY: Delmar Cengage Learning.

Jensen, R. (In press, 2012). Managing central venous access. In G. Duncan, W. Baumle, & R. Bender (Eds.). *Medical-surgical nursing*. Clifton Park, NY: Delmar Cengage Learning.

Jensen, R. (In press, 2012). Managing peripheral venous access. In G. Duncan, W. Baumle, & R. Bender (Eds.). *Medical-surgical nursing*. Clifton Park, NY: Delmar Cengage Learning.

Jensen, R., Meyer, L., & Sternberger, C. (2009). Three technological enhancements in nursing education: Informatics instruction, personal response systems, and human patient simulation. *Nurse Education in Practice, 9*(2), 86-90.

FELLOWSHIPS/SCHOLARSHIPS

Indiana University-Purdue University Indianapolis University Fellowship – Graduate	2003 – 2004	$15,000
Indiana University-Purdue University Indianapolis	2004 – 2005	$10,000
Indiana University-Purdue University Indianapolis Jesse Cross Scholarship	2005 – 2006	$2,000
Sigma Theta Tau International Xi Nu Chapter at Large Scholarship	2005	$500
Indiana University-Purdue University Indianapolis	2005 – 2006	$1000
Midwest Alliance of Health Education Student Research Fellowship	May, 2008	$2300

TEXTBOOK REVIEW

2011 Reviewed IV therapy content in White, L., Duncan, G., & Baumle, W. (2011). *Foundation of basic nursing*. Clifton Park, NY: Delmar Cengage Learning. Content in Chapter 27 Medication Administration and IV Therapy.

2008 Invited to review textbook by Elsevier: Arnold, E., & Boggs, K. (2007). *Interpersonal relationships: Professional communication skills for nurses* (5th ed.). St. Louis, MO: Saunders.