STUDENT AND FACULTY PERCEPTION OF HIGH FIDELITY HUMAN PATIENT SIMULATORS

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ABSTRACT

RESEARCH SUBJECT: Student and Faculty Perception of High Fidelity Human Patient Simulators

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Different teaching methods need to be addressed and evaluated. Using simulations to recreate clinical experiences that are as realistic as possible is one teaching method that may facilitate learning (Feingold, Calaluce, & Kallen, 2004). This study is a partial replication of the Feingold et al. (2004) study. The purpose of this study is to evaluate perceptions of the students and faculty of the value, realism, and knowledge transfer of the use of high fidelity human patient simulators. The theoretical framework for the study is Knowles’ Cognitive Learning Theory (1984). The study sample will consist of 50 nursing students in the Adult Health II course at Indiana Wesleyan University. The Nursing Simulation Lab is the setting. Permission will be obtained from Ball State University and the participating institution. A 4-point Likert scale satisfaction survey developed by Feingold et al. (2004), is used to obtain student and faculty perceptions of a simulation using a high-fidelity human patient simulator. The study is voluntary and data will remain anonymous. There are no identified risks to any individual or institution involved in the study. The significance of the study is to determine the value
of high-fidelity simulation as an educational methodology. Nursing research in simulation must be continued to support the teaching methodology and provide direction for evidence-based practice.
Chapter I

Introduction

Introduction

Simulation as an instructional methodology has become a predominant topic and an integral component in nursing education. The use of simulation to teach psychomotor skills by nursing educators has been used for decades. However, there has been a dramatic increase in the use of simulation in recent years. It has evolved to now include clinical experiences which has been made possible with the introduction of high-fidelity human patient simulators that closely resemble real patients. Students are able to learn not only psychomotor skills, but also decision making and critical thinking (Decker, Sportsman, Puetz, & Billings, 2008; Feingold, Calaluce, & Kallen, 2004; Jeffries, 2007; Nehring, 2008). Simulations can be used for learning experiences such as physical assessments, procedure competency validations, as well as continuing education purposes. Simulation can be implemented with computer programs, standardized patients (human actors), static manikins, and high-fidelity human patient simulators (Decker et al., 2008). Besides technical and critical thinking skills, self-efficacy and self-confidence are gained when patient care can be practiced in a non-threatening environment where patients cannot be harmed by a novice practitioner (Decker et al., 2008; Feingold et al., 2004; Jeffries, 2007; Ravert, 2004).
Nursing education is facing a paradigm shift. Many circumstances common to nursing education in the past have changed in recent years and educators are challenged to use new teaching strategies that promote clinical competency (Decker et al., 2008; Nehring, 2008). Factors that have contributed to this phenomenon are the nursing faculty shortage (American Association of Colleges of Nursing, 2005; Nehring, 2008; Ravert, 2004), decreased patient hospital admissions, increased patient acuity, and complex technological interventions with more schools vying for clinical sites (Feingold et al., 2004; Nehring, 2008; Waldner & Olson, 2007). Simultaneously, there is a greater public and institutional demand for safe patient care (Decker et al., 2008; Jeffries, 2008; Medley & Horne, 2005; Waldner et al., 2007) while technological advancements have improved the level of simulation realism and increased the affordability and availability of simulators (Eaves & Flagg, 2001; Feingold, et al., 2004). Furthermore, nursing organizations such as the American Association of Colleges of Nursing and the National Council of the State Boards of Nursing have called for the use of simulation in nursing curriculum (AACN, 2005; NCSBN, 2005; Nehring, 2008).

Nursing researchers worldwide have proposed there are numerous benefits of clinical simulation with high-fidelity simulators. Researchers state that student learning time can be maximized and learning variables can be controlled, experimentation and failure can be allowed without risk to the patient, and ethical concerns are therefore minimized (Halpern & Hakel, 2003; Henneman & Cunningham, 2005; Jeffries, 2007; Rauen, 2004). It has been found that self-evaluation is promoted by students, and immediate feedback can be elicited from faculty after a simulation (Bremner, Adudde...
Communication, team building, and delegation can be learned, practiced, and honed during these experiences (Henneman & Cunningham, 2005; Medley & Horne, 2005; Rauen, 2004). Other positive outcomes include that students report increased self-confidence (Bremner, Aduddell, & Amason, 2008; Feingold et al., 2005; Kiat, Mei, Nagammal, & Jonnie 2007; Rauen, 2004), increased aptitude for critical thinking and decision making (Henneman & Cunningham, 2005; Jeffries, 2008; Kiat et al., 2007; Rauen, 2004; Schoening, Sittner & Todd, 2006), and that simulation is an enjoyable learning approach (Kiat et al., 2007). Moreover, simulation helps to standardize learning experiences (Jeffries, 2008) and provide less-common patient care experiences (Bearnson & Wiker, 2005; Alinier, Hunt, Gordon, & Harwood, 2006). Results have shown to bridge the gap between didactic theory and real patient care (Kiat et al., 2007; Feingold et al., 2004; Jeffries, 2007; Decker et al., 2008; Rauen, 2004; Waldner & Olson, 2007; Halpern & Hakel, 2003).

**Background and Significance**

High-fidelity simulation in professional education began in the aviation industry in response to public demand for safer airline travel (Gaba, 2004). Simulation also become an accepted mode of instruction for a variety of other professional situations such as nuclear power plants, the military, medicine, and nursing (Issenberg, McGaghie, Petrusa, Gordon, & Scalese, 2005). In the late 1950s, a life-size static human manikin named Mrs. Chase was developed that allowed nursing students to practice nursing procedures learned in the classroom. A few years later, in 1974, a partial-body manikin,
Harvey, was introduced which had heart and lung sounds that enhanced students’ assessment and psychomotor skills (Nehring, Lashley, & Ellis, 2002). With technological advancement in the 1980s, computerized high-fidelity manikins were first developed for schools of anesthesiology. Since that time, the high-fidelity human patient simulators evolved into more realistic models and were used in baccalaureate and graduate nursing programs. One such simulator is SimMan®, by the Laerdal company. Today’s manikins have the capability to simulate specific health conditions where students can perform assessments and interventions and the simulator can respond to these interventions in real time (Nehring, 2008). All methods of simulation require substantial time, effort, and resources for faculty to develop and implement. However, the effort proves to be an invaluable methodology of teaching and learning. (Feingold et al., 2004; Jeffries, 2007, 2008).

Nehring (2008) and Jeffries (2008) identify several changes that have occurred in recent years that have affected nursing education. One change is the technological advancements that have permitted realistic computer aided programs and human patient simulators. A second factor is the technologically literate students who have grown up on fast paced computer games that demand more active learning techniques. Therefore, there is a dramatic increase of nursing programs using high-fidelity human patient simulators. Because of this new teaching methodology, the nursing community needs to research its effectiveness and standardize its use in nursing education. Just as anesthesiologists have developed curriculum for anesthesiologists, nursing faculty should develop curriculum suitable to nursing. A number of nursing educators are presently conducting research and
developing frameworks for simulation curriculum. For example, Jeffries and colleagues (Jeffries, 2005, 2007) conducted a three year, multi-site study that included the development of a curriculum framework for the use of simulation in nursing education.

**Statement of the Problem**

Faculty are finding it increasingly difficult to find clinical sites in acute care facilities for nursing students. Different teaching methods need to be addressed and evaluated. Using simulations to recreate clinical experiences that are as realistic as possible is one teaching method that may facilitate learning (Feingold et al., 2004).

**Purpose of the Study**

The purpose of this study is to evaluate perceptions of students and faculty about the realism of the simulation experience, to determine if lab simulations increase knowledge for nursing students, and to determine the value of the learning experience. This is a partial replication study done by Feingold et al. (2004).

**Research Questions**

1. What are the students’ and faculty members’ perceptions of simulation patient and scenario realism?
2. Can students transfer knowledge from lab scenarios to real clinical experience?
3. What is the value of the learning experience?

**Conceptual Theoretical Framework**

Cognitive learning theory is a goal-directed approach that helps students bridge the gap between theory and practice and to build meaning into knowledge (McKeachie & Svinicki, 2006). This study uses the Knowles’ Cognitive Learning Theory that is focused
on adult learning styles. Knowles’ theory is based on five underlying assumptions: (a) adults need to know the why or benefits of learning about a topic, (b) adult learners typically are self-directing, (c) adult student’s life experiences are rich resources for learning, (d) adults’ readiness to learn stems from a need to know standpoint, (e) learners prefer to learn through pertinent, problem centered situations, and (f) motivation for the adult learner is derived from internal incentives (Knowles, Holton & Swanson, 2005).

The reason this theory is appropriate for this study is because students are actively involved in the simulation which is the mode of the learning process. Simulation scenarios should strive to be realistic thus hopefully allowing the student to contextualize and then apply what was learned to the real setting. During simulation, students have the opportunity to apply prior knowledge learned in the classroom setting (Feingold et al., 2004).

Definition of Terms

Patient and Scenario Realism

Conceptual: the ability to simulate a clinical environment in the most realistic manner (Feingold et al., 2004).

Operational: Feingold et al. (2004) designed a 4-item Realism sub scale within the 20-item satisfaction survey to determine the students’ perception of the realism of the simulation. A 4-point Likert-type scale was used with 1 being “Strongly Disagree” and 4 being “Strongly Agree”.

Transfer of Knowledge to the Real Setting

Conceptual: transferability of cognitive, affective, and psychomotor skill competency to a real clinical setting (Feingold et al., 2004).

Operational: Feingold et al. (2004) designed a 3-item Transfer sub-scale within the 20-item survey to determine students’ perception of being able to transfer skills to the real setting. A 4-point Likert-type scale with 1 being “Strongly Disagree” and 4 being “Strongly Agree” was used to gather the data.

Value of the Learning Experience

Conceptual: value of the simulation related to testing of clinical skills, decision making, and reinforcement of course objectives, and effectiveness of the teaching tool (Feingold et al., 2004).

Operational: Feingold et al. (2004) designed a 6-item Value sub-scale within the 20-item survey to determine student and faculty perception of the overall value of the experience. A 4-point Likert-type scale with 1 being “Strongly disagree” and 4 being “Strongly agree” was used.

Limitations

Limitations of this study may include the small sample size of the students surveyed from only one college of nursing. This reduced the generalizability of the findings to other institutions and populations. The satisfaction survey used was researcher-developed and lacked reliability and validity. Feingold et al. (2004) identified limitations of not including comparison of grades on simulated and actual clinical
experiences and that the planned qualitative student interview was not done due to lack of participation by the students.

**Assumptions**

Assumptions of this study included variables in the satisfaction survey developed by Feingold et al. (2004) accurately measured the concepts in the study such as realism, transferability of knowledge, and value of the simulation conducted at this school of nursing with this particular population.

**Summary**

Simulation as a teaching-learning methodology is a significant topic in nursing education. Due to the recent introduction of high-fidelity simulation, few studies have addressed its role. Therefore quantitative evidence-based nursing research is lacking (Jeffries, 2007; Feingold et al., 2004). This chapter introduced the purpose of this study that will investigate student and faculty perception of realism, transfer of knowledge, and the value of simulation activities done in the nursing simulation lab. Knowles’ Cognitive Learning Theory will be used as the framework of the research project. Furthermore, the results of this study will add to the body of knowledge in nursing education regarding the significance of simulation as an educational methodology.
Chapter II

Literature Review

Simulated clinical experiences with high-fidelity human patient simulators in the laboratory setting have increased significantly in recent years. According to Feingold, Calaluce, & Kallen (2004) some of the reasons for this occurrence include the nursing faculty shortage, increased patient acuity and technological interventions in acute care settings, decreased patient hospital admissions, more schools vying for clinical sites, the requirement of better prepared graduate nurses, and finally, the recent availability and affordability of more realistic simulators. Although simulation is not new in nursing education, the increased use of clinical simulation is being used to teach not only psychomotor skills, but also critical thinking skills to nursing students. The purpose of this study is to evaluate perceptions of the students and faculty about the realism of the simulation experience, to determine if lab simulations increase knowledge for nursing students, and to determine the value of the learning experience. This is a partial replication study done by Feingold et al. (2004).

Theoretical Framework

This study uses the Knowles’ Cognitive Learning Theory which is based on internal change in perception or information processing that allows the individual to receive information in numerous ways from the environment (Creasia & Parker, 2001).
Some basic propositions of the Cognitive Learning Theory are that (a) instruction must be structured so it can be easily understood, (b) individuals are actively involved, (c) instruction must be contextualized for applicability, and (d) it builds on prior knowledge (Billings & Halstead, 2005). Cognitive learning is a goal-directed approach that helps students to bridge the gap between what they already know and what they are trying to learn. The goal of this strategy is to build meaning into knowledge so that it becomes part of an organized knowledge base. The student can then access that information in the future for application or problem solving. The teaching-learning strategies in this model include review or repetition, modeling, practice, and reflection (McKeachie & Svinicki, 2006).

Knowles’ Cognitive Learning Theory focuses on the adult learning style called andragogy which is comprised of a core set of adult learning principles. Knowles presents five underlying assumptions of this model: (a) adults need to know the why or benefits of learning about a topic, (b) adult learners typically are self-directing, (c) adult student’s life experiences are rich resources for learning, (d) adults’ readiness to learn stems from a need to know standpoint, (e) learners prefer to learn through pertinent, problem centered situations, and (f) motivation for the adult learner is derived from internal incentives (Knowles, Holton, & Swanson, 2005). Other factors that have a direct impact on learning include the individual learner, situational differences, and the learner’s goals and purposes of learning. Knowles & Associates (1984) delineates six additional elements to the andragogical model of education: (a) the climate must be conducive to learning, (b) mutual student-facilitator planning, (c) mutual student-facilitator development of learning
objectives, (d) use of learning contracts and student projects; (e) the use of appropriate and applicable techniques and resources, and (f) evaluation of the learning outcomes, redirecting and implementation of the learning needs of the students.

The reason the cognitive learning theory is appropriate for this study is because students are actively involved in the simulation which is the mode of the learning process. The simulation scenario strives to be realistic thus hopefully allowing the student to contextualize and then apply what was learned to the real setting. During simulation, students have the opportunity to apply prior knowledge learned in the classroom setting (Feingold et al., 2004). According to Knowles et al. (2005), it is important to have a physical learning environment that is conducive to learning, where students reinforce desired behaviors that transfer to an actual setting. Cognitive theorists also stress the psychological environment of orderliness, clearly defined goals and explanations with an open, honest atmosphere for questions and feedback. Learning by experimentation, discovery, and making mistakes is encouraged to help the student retain knowledge. The faculty’s role when using this framework is to maximize the learning experiences by designing learning activities that are as realistic as possible for transfer of knowledge into the real setting. Additionally, faculty should encourage reflection on the experience to be incorporated into future experiences. Cognitive based learning methods enhance retention of concepts and relationships between concepts and promote improved problem solving and critical thinking (Billings & Halstead, 2005).
Statement of Organization of the Literature

The literature review is comprised of qualitative and quantitative research studies regarding the use of high-fidelity simulation in nursing education. The literature review is organized into the following three sections: students’ perceptions of simulation, outcomes of simulation in education, and transfer of simulation knowledge to clinical setting. The chapter concludes with a summary.

Students’ perceptions of simulation

Goldenberg, Andrusyzyn, and Iwasiw (2005) found that patient care simulation using students in role-play case studies had been widely used in education. Through this medium, learners were able to analyze, discuss, critique, and apply classroom theory to actual situations. The purpose of this study was to describe the effect of classroom simulation on students’ self-efficacy in health teaching. Bandura’s Theory of Self-efficacy was used as the conceptual framework for this study.

This exploratory, descriptive design study was conducted at a university in Ontario, Canada. Third-year baccalaureate nursing students participated to evaluate the effect of the simulation on self-confidence. Sixty-six nursing students comprised the population in the final sample. The students were divided into groups of four to five, and each member role-played a character (e.g., patient, nurse, family member, observer, coach) in the simulation case study. After the simulation, the students analyzed the experience. Students shared observations and insights about the experiences and compared them to the theories taught in class (Goldenberg et al., 2005).
A researcher-developed, two-part 63-item, Baccalaureate Nursing Student Teaching-Learning Self-Efficacy Questionnaire was used to gather information concerning: (a) the differences in self-efficacy before and after the case study simulation; (b) the relationships between self-efficacy scores and demographic variables, and (c) the students’ perception of the effectiveness of simulation as a teaching method (Goldenberg et al., 2005).

The content validity was established by three experts in nursing education and face validity was established by a pilot test with fourth year nursing students previously in the course. Cronbach’s alpha reliability coefficient was 0.97. A 4-point Likert scale tool was used to obtain the students’ responses ranging from 4 being “completely lacking confidence” to 1 being “very confident” (Goldenberg et al., 2005).

Findings from the Self-efficacy Subscale for Health Teaching were significantly higher (p=0.001; mean 2.96 before the simulation, and mean 3.55 after the simulation). This indicated an increase in the confidence level of the students. The Demographic Variable Subscale showed no significant relationship between the students’ teaching scores and the selected variables using Pearson’s correlation (r). More than 50% of the students rated the simulations as “effective” and more than one third rated them as “very effective” (Goldenberg et al., 2005).

Goldenberg et al. (2005) concluded that simulation as a teaching method helped to increase nursing students’ confidence in health teaching. This conclusion was made based on the significant increase in the self-efficacy scores after the workshop simulations.
Simulation use in nursing schools in recent years has become an alternative to clinical through the use of high-fidelity human patient simulators. The challenge with lab simulation is to make it as realistic as possible so students feel they are in a real clinical setting. The purpose of this study (Feingold, Calaluce, & Kallen, 2004) was to assess the response to the simulations regarding the following issues: realism, transferability and value of the simulations.

The study was conducted at the University of Arizona, College of Medicine using the high-fidelity manikin, SimMan from the Laerdal company. The participants were baccalaureate-nursing students who were taking the Advanced Acute Care of the Adult course. Ninety-seven students were involved in the simulations with 67% of the students completing the survey. Four faculty members who were involved in implementing the scenarios also completed surveys (Feingold et al., 2004).

A 20-question survey was used to gather the information about the reality of the simulations, the pace and flow of the clinical simulation, the ability to transfer skills learned to actual clinical settings and the value of the simulated clinical experiences. Three survey subscales included Realism, Transfer and Value. A 4-point Likert scale tool was used to obtain the student’s responses ranging from 4 being “Strongly Agree” to 1 being “Strongly Disagree”. The reliability measurement was not stated. The tool was revised from a previously developed satisfaction survey (Feingold et al., 2004).

Findings from the Value subscale were that 76.2% of the students were in agreement that the scenario had value to education or practice. Findings from the Realism subscale showed that the majority of the students, 86%, found the simulation to be
realistic indicating that the setting, pace, and flow of the scenarios was like a real clinical setting, including the patient, SimMan (Feingold et al., 2004).

The results of the Transfer subscale were that 80% of the students stated that the experience was an adequate test of skills and decision-making abilities. Yet, only 46% of the students thought the simulation increased confidence, improved clinical competence, or prepared them to function in an actual setting. On the other hand, the faculty survey showed 100% agreement on all three subscales. Feingold et al., (2004) concluded that the students valued the learning experience and the faculty believed the simulation was realistic, tested clinical skills and decision making, reinforced clinical objectives and prepared students for real clinical experience.

Nursing professors at Creighton University have used high-fidelity simulators to teach nursing students clinical skills. Faculty at the institution had discovered the use of simulation with high-fidelity technology had been an effective teaching method. The purpose of this quantitative study was to examine students’ perceptions of a preterm labor simulation as a method of instruction. Fifty-seven baccalaureate-nursing students taking the obstetrical course completed the 10-question survey (Schoening, Sittner, & Todd, 2006).

The 10-question survey was used to garner the information about meeting the simulation objectives and the students’ perceptions of confidence enhancement, knowledge gained, and satisfaction of the simulation. Two survey subscales included Objectives and Student perceptions. A 4-point Likert scale tool was used to obtain the students’ responses ranging from 4 being “strongly agree” to 1 being “strongly disagree.”
The reliability measurement was not stated. The tool was devised by the faculty authors. Data were also collected from narrative responses on the evaluation tool and journal entries that the students wrote during the semester (Schoening et al., 2006).

Findings from the Simulation Objective subscale showed that the mean score was 3.64 on a 4 point scale for meeting the objectives. Results from the Student Perception subscale showed the mean score to be 3.75 on a 4 point scale for increasing confidence, improving skills and increasing knowledge of pre-term labor, indicating the students strongly agreed. Subject categories were formed from analysis of the narrative entries which included (a) Skills, Hands-on Learning, Practice; (b) Confidence, Self-efficacy, and Non-threatening Environment; (c) Critical Thinking, Realism, Knowledge, Review and Decision Making; (d) Value, Transferability, and Satisfaction; and (e)Teamwork, Communication, and Preparedness (Schoening et al., 2006).

Schoening et al. (2006) concluded that the students met the course objectives and gained confidence in patient care from the simulation. Students indicated the confidence was a result of hands on simulation practice in a nonthreatening laboratory environment. Finally, the students valued the simulation and perceived what they learned would transfer to the real patient care.

Bremner, Aduddell, Bennett, & VanGeest, (2006) studied the implications of using high-fidelity simulators in nursing education for the purpose of identifying best practices for using this teaching methodology. These researchers concurred with other previously cited nursing education challenges noted in the literature: fewer clinical sites and nursing faculty for increasing nursing student numbers; increased patient acuity with
a shorter length of patient stay in the hospital; and the need for better-prepared graduate
nurses. Understanding how the high-fidelity human patient simulators (HPS) applies to
the acquisition of clinical skills for the novice nursing student was cited as an important
area of research. The review of the literature stressed that nursing educators need to look
at using quality simulation in lab settings to prepare students for acquiring technical
skills, communication skills, and critical thinking and decision making skills.

This study evaluated students’ responses to the use of the HPS in simulated
clinical scenarios. The purpose of this study was to determine the value of using HPS
technology as an educational methodology from the perspective of novice nursing
students. The study addressed the issues of teaching/learning, utility, realism of the HPS,
limitations to the HPS methodology, and the student’s confidence and comfort with the
use of the HPS in teaching assessment skills during clinical scenarios. Fifty-six novice
nursing students in a baccalaureate program were involved in the study. Students did a
head-to-toe assessment of a patient using the HPS under faculty instruction. Upon
completion of the activity, 41 students completed a 2-part questionnaire (Bremner et al.,
2006).

The 2-part questionnaire was used to measure the students’ perceptions. Section 1
was a survey using a Likert rating scale. The questionnaire identified the following: (a)
students’ overall perceptions of experience with the HPS, (b) students’ opinion if
experience should be mandatory or voluntary, (c) students’ perception of gained
confidence in physical assessment skills, and (d) students’ perception of stress and
anxiety relief on the first clinical day at the hospital. The second section of the survey
was open-ended. This section of the survey elicited comments in writing about students’ perceptions of the simulation experience (Bremner et al., 2006).

Quantitative analysis resulted in 95% of the students rating the session from good to excellent. Sixty-eight percent of the students indicated the simulation should be mandatory in the course. Sixty-one percent believed the simulation gave them confidence with assessment skills. Whereas 42% of the students stated this teaching strategy relieved stress associated with the first day of clinical for them as novice students (Bremner et al., 2006).

Qualitative analysis was done of open-ended questions through the review of the students’ comments for general themes. The four themes identified were (a) Teaching/Learning Utility, (b) Realism, (c) Limitations, and (d) Confidence/Comfort. Sixty-seven percent of the students commented on the topic of teaching/learning utility; and 26% noted the simulation was realistic. Twenty-two percent cited limitations to the simulation stating there was not enough time with the use of the simulator, students did not like working in a group, and the simulator was scary. Four percent indicated a gain in confidence and comfort with patient care because of the simulation. One student stated, “It made me feel more comfortable touching the patient my first day of clinical” (Bremner et al., 2006).

Bremner et al. (2006) concluded that findings of the study documented the value of HPS in the areas of teaching/learning-utility, realism, and confidence/comfort. Findings also revealed the limitation of the lack of enough student time with the simulator. The researchers felt the study results revealed the beginning formation of best
practices related to using patient simulation in baccalaureate nursing education, specifically with novice students. According to the researchers, the recommended best practices using the HPS include, well-articulated learner outcomes, clear course/clinical objectives, ongoing training and supervision of faculty, staff, and participants, and collaboration with student and faculty in planning, implementation, evaluation, and debriefing of each session.

Outcomes of Simulations in Education

A review of the literature revealed that computer-assisted simulation programs have provided patient care scenarios that allow students to assess and treat patients along with immediate feedback. Goolsby (2001) conducted a study to understand the role of computer-assisted simulations with nurse practitioner students. The purpose of this phenomenological study was to describe the nurse practitioner students’ observations during computer-assisted sessions to understand the role of computer-assisted simulations in the educational setting. This study was conducted at a Midwest university with eight nurse practitioner students who had completed 1 year and were enrolled in a clinical elective course. Most of the students were in the mid 30 age range. The university’s computer laboratory was used for the study.

Observation and interview methods were used to gather data. The interviewer observed the students working through the simulations and recorded notes about their behavior. The students worked in pairs to complete the patient assessment simulations. After the simulations were completed, the students were interviewed to ascertain perspectives on the simulation program and scenarios. The observations were recorded,
refined, coded, and quantified based on the theoretical framework of ecological psychology (Goolsby, 2001).

The majority of the results of the study were positive in nature. Findings for the first research question, "What role does computer-aided scenarios play in nurse practitioner education?" revealed that the simulations were a good teaching tool because it allowed time for the novice to think about the patient’s problems. All of the nurses appreciated the feedback received from the program after completing each scenario and everyone thought the information would be transferable to the real setting. All of the participants stated the scenarios were realistic and that the program assisted them in learning medical terminology. Study findings for the second research question, "How do NP students solve computer-assisted scenarios?" were that even though the students worked in pairs, each pair worked in a different manner. Some students worked symbiotically, others worked individually, taking turns doing the scenarios. Some students used text books for reference, and others did not (Goolsby, 2001).

Goolsby (2001) concluded that computer-assisted scenarios (CAS) were beneficial in the education of nurse practitioners. The nurse practitioner students gained knowledge that would be transferable to the real setting. It enhanced students’ knowledge of terminology, physical examination sequencing, diagnosing, decision making and clinical confidence. Immediate feedback was another strength of the CAS.

Dobbs, Sweitzer, & Jeffries (2006) point out that the nurse educator shortage, fewer clinical sites, and the increasing complexity in the healthcare environment are challenges in preparing nurses for safe and efficient practice. The purpose of this study
was to test (a) the simulation design features in the Simulation Model by Jeffries et al. (2005), (b) the knowledge, problem-solving skills, and self-confidence outcomes when caring for a diabetic, insulin-managed patient, and (c) students’ satisfaction with the simulation.

This study was conducted at Indiana University School of Nursing in the nursing skills lab using static manikins. The participants consisted of all 60 baccalaureate nursing students enrolled in a medical/surgical course. A 62-question survey was used to obtain the information about the design and students’ perceptions about the simulation. A 5-point Likert scale tool was used to measure the students’ responses ranging from 5 being “strongly agree” to 1 being “strongly disagree.” Five survey subscales included Simulation Design (by the NLN/Laerdal project group, Cronbach alpha = 0.92), Satisfaction, Self-confidence (Cronbach’s alpha = 0.94), Cognitive Gains (instructor developed pre-post test, no reliability measurement stated), and Self-perceived judgment performance (Cronbach’s alpha = 0.92).

Instruments for this study included the following:

1. Simulation Design Scale: A 20 item tool developed by the NLN/Laerdal research project group with a Cronbach’s alpha of 0.92 for this study.

2. Satisfaction with the teaching methodology: A five-item subscale using a 5-point Likert scale ranging from 5 being “strongly agree” to 1 being “strongly disagree”. The Conbach’s alpha was 0.94.

3. Self-confidence: An 8-item subscale (5 being “strongly agree” and 1 being “strongly disagree”) was used to measure self-confidence in learning.
4. Cognitive gains: An identical, instructor developed, 12-item pre-post test tool was used to compare cognitive gains. No reliability measurement was stated.

5. Self-perceived judgment performance: A 17-item Likert Scale was used to measure the students’ self-perceived judgment performance. The Cronbach’s alpha was 0.92 for this study (Dobbs et al., 2006).

Findings for the Simulation Design Scale showed a grand mean of 4.2 indicating faculty feedback was the most important feature. Overall, the students reported being very satisfied with the instructional method. The Self-confidence subscale resulted in a mean of -4.3 indicating the students were confident in care for an insulin managed patient. (There was no confidence pre-test prior to the simulation to compare.) The Cognitive Gains subscale revealed no significant differences in knowledge gains from pre-tests and post-tests (no mean numbers were given). Finally, findings from The Self-perceived Judgment Performance subscale showed a mean of -3.7 indicating the students were confident in diabetic assessment skills (Dobbs et al., 2006).

Dobbs et al. (2006) concluded that simulation in the teaching-learning process enhanced instructional outcomes. The simulation design feature deemed most important by students was debriefing indicating it is an integral part of the learning process and should be included after every simulation experience. Cognitive gain did not occur possibly because the tests did not measure knowledge application and synthesis during the simulation experience. Students were satisfied with the simulation experience and confident in caring for a diabetic client.
Although simulation technology has gained popularity for the training of healthcare professionals in recent years, Alinier, Hunt, Gordon, & Harwood (2006) discovered there was a lack of scientific evidence proving the effectiveness of this methodology in undergraduate nursing education. This study was conducted to determine the effect of scenario-based simulation training on nursing students’ clinical skills and competence. Additionally, students were queried about perceptions of confidence and stress while working in a technological environment. The purpose was to determine if the experimental group would perform better in a post-test OSCE (Objective Structured Clinical Examination) than the control group.

This study was conducted in a diploma nursing program in the United Kingdom and used the human patient simulator, SimMan, by the Laerdal company. Ninety-nine second year, volunteer nursing students participated in two, fifteen-station Objective Structured Clinical Examinations (OSCE). The students were randomly divided into two groups where all participated in the first OSCE. Five weeks before the second OSCE, the experimental group was exposed to scenario-based simulation training; whereas, the control group was not. However, both groups participated in actual adult health patient care clinical experiences (Alinier et al., 2006).

Six months after the first OSCE, both groups were reassessed in a second OSCE. Students also completed a 2 question, researcher-developed, 5-point Likert scale questionnaire examining the students’ perception of confidence (1 = very confident to 5 not confident) and stress (1 = not stressful to 5 = very stressful) when working in a technological environment. To ensure validity & reliability of the OSCE, a panel of
educators paid detailed attention to designing the OSCE instructions for content and accuracy. Demographic data of the students was obtained at this time for group comparison (Alinier et al., 2006).

Statistical significance of the difference in the OSCE results was evaluated using $t$-tests. The control group average performance for the first OSCE was 48.18% (95% CI 46, 31-50.06) and the experimental group was 47.54%. Scores on the second OSCE were 56.00% for the control group and 61.71% for the experimental group. A comparison of the results of the two groups proved significant. The improvement in the performance was 7.18% for the control group and 12.18% for the experimental group. 7.0 percentage points between the means proved highly statistically significant (independent sample $t$-test $\text{d.f.} = 97$, $P < 0.001$; test for equality of variance $F = 0.623$, $P = 0.432$) (Alinier et al., 2006).

Questionnaire findings showed the two groups differed only slightly with respect to perceptions of stress and confidence. A Mann-Whitney $U$-test was used to analyze the difference between students’ perceptions of stress and confidence. The questionnaire measured 2.9 and 3.5 respectively for the control group and 3.0 and 3.4 for the experimental group, indicating simulation based training did not have a statistically significant effect on their perceptions of this issue. In addition, results showed the students reporting lack of confidence also admitted to being stressed when exposed to working in a technological environment ($P = 0.002$, chi-square, $\text{d.f.} = 2$, $n = 99$) (Alinier et al., 2006).
Alinier et al. (2006) concluded this study provided quantitative evidence that high-fidelity simulation was beneficial for educating undergraduate nursing students. Because of the improved scores and positive feedback from the participants, the authors believed simulation will be incorporated into future nursing curricula. One student reported she applied knowledge learned in the simulation to a real cardiac arrest. The authors suggested patient care simulation has the potential for being counted as clinical practice hours because it is a safe learning environment and it exposes learners to a wide range of cases in a short period of time.

Unfortunately, most nursing students do not have the opportunity to see various ways patients may respond when given a particular medication. In 2002, the students at Brigham Young University had to miss clinical days due to the Winter Olympics that were being held in Salt Lake City, Utah. Therefore, the faculty implemented the use of a high-fidelity Human Patient Simulator (HPS) to make up the clinical days. They took the opportunity to demonstrate three different possible patient reactions to the same medication. The purpose of this study was to explore the benefits and limitations of using a HPS, and also to evaluate students’ knowledge, psychomotor skills, and confidence during a medication administration simulation. This exploratory descriptive study consisted of two groups of students and their instructors. The two student groups of junior nursing students in their first clinical rotation on a surgical unit had recently completed 5 weeks of a 6-week clinical rotation in a local hospital. The University’s nursing simulation lab provided the setting for the missed clinical days and for this study (Bearnson & Wiker, 2005).
A researcher-developed, 4 point Likert scale-type survey was used to gather data (4 = strongly agree to 1 = strongly disagree). The reliability or validity of the survey was not mentioned. Students responded to the following statements: (a) Working with the HPS increased my knowledge of medication side effects; (b) Working with the HPS increased my knowledge of differences in patients’ responses; (c) Working with the HPS increased my ability to administer medications safely; and (d) Working with the HPS increased my confidence in my medication administration skills. The survey also had three open-ended questions asking what the students had learned, what would improve the simulation session, and if they would recommend doing it again (Bearnson & Wiker, 2005).

The mean scores of the survey items are as follows:

(a) 3.13 for the increased knowledge of medication side effects question.

(b) 3.31 for the increased knowledge of differences in patients’ responses question.

(c) 3.06 for the increased ability to administer medications safely question.

(d) 3.00 for the increased confidence in my medication administration question.

Student responses to the open-ended questions were also positive in nature. Students stated they learned the importance of performing a thorough assessment, recognizing abnormal findings, and using critical thinking to plan care based on the assessments. They appreciated hearing and recognizing abnormal physical assessment findings not always heard on real patients. The students felt the simulation was valuable and should be used in addition to, not instead of, a clinical day with real patients. Some
students stated they valued working together as a team during the simulations to assimilate information for patient care (Bearnson & Wiker, 2005).

Bearnson & Wiker (2005) concluded the objective of the simulation was met in that the simulation provided a safe and effective hands-on learning experience that justified continued use of the HPS. The experience increased students’ knowledge, competence and confidence in medication administration. Finally, students valued the experience and recommended its use in the future to supplement clinical experiences. Limitations included that only a few students can participate in the simulation at a time and only two intravenous medication choices were available on the HPS for demonstration.

Bremner, Aduddell, & Amason (2008) noted that high-fidelity Human Patient Simulators (HPS) had been used by many nursing programs for educational purposes. Because this technology is new in nursing education, the authors advocated that evidence-based practices must be established regarding its use. The purpose of this study at Kennesaw State University was to investigate first year nursing student’s perceptions of confidence and comfort levels as evidenced by their anxiety level. The objectives of this study were to: (a) examine demographic information of the first year nursing students participating in the study, (b) examine the effects of a HPS simulation on students’ level of anxiety on their first clinical day, and (c) explore the relationship of learning styles, coping styles, and anxiety levels of students using simulation.

An experimental design study with 149 sophomore students was conducted over the period of 2 consecutive semesters. The students were divided into 2 randomized
groups. Group 1 (N = 71) participated in a hands-on HPS session where they were instructed to communicate with and assess the simulator as they would a real patient. Group 2 (N = 78) received the usual skills lab practice session about communication and assessments without the use of the HPS one week prior to their first clinical experience (Bremner et al., 2008).

The first of three instruments used was a researcher-designed questionnaire to collect demographic and simulation content evaluation information. A twenty item pre- and post-test questionnaire was used to determine the value of the simulation methodology. No reliability or validity was stated. The second instrument, The Self Assessment Inventory, from the Assessment Technologies Institute was a 45 question, Likert-type assessment to determine students’ learning and coping styles. This inventory was reviewed by content experts and found to be valid and reliable. Reliability of the inventory was .9144 using coefficient alpha. The third tool used was the 40-statement State-Trait Anxiety Inventory that measured students’ anxiety. Each scale allows a minimum score of 20 and a maximum score of 80. The validity and reliability has been documented in previous literature. A score of 39-40 is considered to show clinically significant anxiety symptoms (Bremner et al., 2008).

The findings of the study revealed no significant difference between the experimental and control groups in terms of age, gender, education, and employment status. No significance was noted in the students’ learning styles; furthermore the majority preferred visual, tactile, and group learning. These findings support the use of
experiential, hands-on learning with HPS as an appropriate and applicable educational strategy (Bremner et al., 2008).

Summary results from Self-Design Questionnaire for Group 1 who used the HPS are as follows: (a) 84% rated the overall experience with HPS as excellent to very good, (b) 97% stated HPS should be a component of the nursing curriculum, (c) 71% said the experience gave them confidence with physical assessment skills, (d) 65% strongly agreed or agreed that the experience with the HPS relieved their stress on the first day of clinical, and (e) 42% reported that they were less anxious about the first day of clinical. Students perceived an advantage of the HPS experience was that it gave them the opportunity to build confidence with assessment skills because the experience was realistic, and they could start over if necessary. Disadvantages identified by the faculty were increased time and effort to work the computer. Disadvantages identified by the students included the inability to communicate with a “real” patient, lack of realism with the manikin, and lack of time to work with the simulator (Bremner et al., 2008).

Brenmer et al. (2008) concluded patient care simulations with HPS decreased student stress levels related to first-time clinical experiences. Predominant learning styles for these students were visual and tactile; and they preferred group learning. The authors also concluded specific criteria was needed for simulations including well-articulated learner outcomes, student involvement, and a time for reflection and debriefing after each session. Finally, the authors felt this study assists in establishing evidence-base educational practice in using high-fidelity human patient simulators to help students decrease anxiety levels prior to their clinical experience.
It is impossible for nursing students to encounter every kind of patient care experience prior to graduation. Nevertheless, schools of nursing have been challenged to prepare graduate nurses who are confident and safe practitioners in a shorter time frame. Therefore, faculty guided simulations in the lab setting may be the answer that will expose learners to realistic clinical experiences. Uncommon patient conditions and situations can be simulated to let the learner gain valuable experiences before graduation. The purpose of this study by Kiat, Mei, Nagammal, & Jonnie (2007) was to assess the effectiveness of simulation with nursing students at the Institute of Technical Education in Singapore. It was also to evaluate the students’ learning experience so as to enhance the design and conduct of the simulation based training. This survey was conducted in 2005 with nursing students in partnership with The Medical Education Technologies, Inc. (METI). The 260 students had completed 1 year of their 2 year degree and had no simulation experience.

The researchers developed three instruments for this study: The Perceived Benefits of Simulation based Training as a Learning Approach, The Preference for Simulation based Training as a Learning Approach, and The Factors Influencing the Effectiveness of Simulation Based Training. These instruments, totaling 30 items, used a 4-point Likert scale (1= strongly disagree and 5= strongly agree). The validity and reliability of the instruments was not stated. A drafted version was first piloted with 10 students that were not part of the study. These students identified words and sentences they did not understand and then minor changes were made accordingly by the researchers (Kiat et al., 2007).
An overwhelming majority of the students stated that simulation as a learning approach was beneficial. Findings from the Perceived Benefits Scale revealed that (a) it was an enjoyable way to learn (94%); (b) it allowed students to analyze the patient’s condition and think on their feet (95%); (c) it helped students to realize areas for improvement (97%); (d) it increased confidence (95%); and (e) it allowed students to make mistakes without causing harm to real patients (96%). However, a significant portion of the students disagreed that simulation as a learning approach would improve social and communication skills (12%) nor create a realistic experience (12%). The authors suggested this might be due to student discomfort of talking with simulators and the gigantic size of the simulators (Kiat et al., 2007). Findings from the Benefits of Students’ Actual Experience with Simulation Based Training were virtually identical results as the previous subscale. In the section, Factors Influencing the Effectiveness of Simulation Based Training, 94% of the students reported that the outcomes of simulation based training are determined by the following factors: the quality of the scenario, the degree of realism of the simulators, availability of equipment, students’ preparedness before sessions, facilitators’ interest in the lesson, and student familiarity with the technical equipment (Kiat et al., 2007).

Kiat et al. (2007) concluded that students perceived that patient care simulations had value and benefits such as increased confidence and critical thinking skills. Through realistic clinical scenarios, simulation based training stimulates students to develop higher order cognitive skills. It also showed that simulation provided opportunities to acquire and refine technical, clinical, and social skills in real-life situations without risk.
to real patients. Students conveyed that simulation was an enjoyable learning approach that bridges theory to nursing practice.

**Transfer of Simulation Knowledge to Clinical Experience**

Scherer, Bruce, & Viliporn (2007) noted in their article that the learning experiences of advanced practice nurses differ greatly in crisis care management, and the majority of APN students have not participated in a real crisis situation. Additionally, very few studies with APN students using HPS have been reported in the literature. The purpose of this study was to evaluate the knowledge and confidence of Adult and Acute Care APN students in managing a cardiac event. High-fidelity human patient simulators (HPS) were used to evaluate the students’ patient care abilities. The authors hypothesized that simulations would allow the APN to apply knowledge learned, sharpen critical thinking, and improve psychomotor skills in a safe, structured environment.

This quasi experimental design study was conducted at the University of Buffalo School of Nursing using the HPS, Med Sim-Eagle. Two groups, one experimental and one control, were used to test the following hypotheses: (a) students who participate in the simulation experience will score higher on a knowledge test than subjects in the control group; and (b) students who participate in the simulation experience will have higher confidence scores in managing a cardiac event than subjects in the control group (Scherer et al., 2007).

Twenty-three acute care and adult nurse practitioner students enrolled in an acute care clinical practicum course participated in the study. The students were randomly assigned into either the experimental group (n=13) or the control group (n = 10),
instructed on the clinical management of atrial arrhythmias, and given the knowledge pre-test and confidence survey to complete. The experimental group then participated in the atrial fibrillation case scenario simulation. The control group participated in a faculty-run seminar using the same case scenario. Post-testing for both groups occurred one week and one month following the completion of the exercises (Scherer et al., 2007).

Several tools were used for this study. The Demographic Data Sheet elicited information about the APN’s nursing experience. The Knowledge Quiz, a researcher developed tool, evaluated simulation and visual learning. The open-ended questions included questions about assessments, differential diagnoses, management, and medications. The 10-item, Likert-type Confidence Scale (0 = not at all confident, 4= very confident; Max Score = 40) measured students’ confidence when managing a patient in a cardiac event. This researcher-developed scale was reviewed by cardiology ACNP experts and was based on Bandura’s Self-efficacy Theory (1989). No reliability or validity measurements were identified. Finally, the 6 item, Evaluation Instrument, (Likert Scale, 0 = not at all to 3 = very much so) plus 4 open-ended questions rated the students’ perceptions of the overall experience (Scherer et al., 2007).

Findings from the Demographic Data Sheet revealed no significant differences in the variables between the two groups. Findings from the Knowledge Quiz and the Evaluation Instrument also showed no significant differences for either group and students rated the experience highly. However, the mean scores of the Confidence Scale demonstrated a significant difference between the groups. The control group scored 31.30 on the post-test and the experimental group scored 25.64, (p = .040). The experimental
group valued the simulation experience, indicating that simulation let them problem solve in a critical event without the added stress of a real patient. Additionally, they gained insight into themselves and how to deal with real life and death issues, and appreciated the controlled and realistic environment. Some students stated the simulation was stressful; however, others wanted more and longer simulations to increase their critical thinking and decision making capabilities (Scherer et al., 2007).

Scherer et al. (2007) concluded that the post-test knowledge scores improved only slightly after the educational interventions; however, post-test confidence scores improved significantly in both groups. All of the participants gave high ratings to each overall experience. The opportunity to apply knowledge previously learned and the opportunity to problem-solve in a low risk environment were two benefits identified by both groups. The authors concluded that although the study showed both simulation and a case study seminar had similar outcomes; additional research on simulation should be done with a larger sample and a third group that received no intervention.

Radhakrishnan, Roche, & Cunningham (2007) found a lack of nursing research to validate the influence of intentional, regular simulation practice with human patient simulators (HPS) on the clinical performance of nursing students. Their pilot study at the University of Massachusetts was conducted to identify 7 nursing clinical practice parameters potentially influenced by human patient simulation in the lab setting. The researchers hypothesized that students who practice patient care with a HPS would perform better in every aspect of clinical performance. This quasi-experimental study was designed to evaluate the effects of simulation practice using the HPS, SimMan, on
student clinical performance. A convenience sample of 12 senior BSN students completing a second degree program participated. Students were randomly assigned to either the intervention group (n=6) or the control group (n=6). The intervention group participated in the simulation practice with a complex two-patient assignment in addition to clinical requirements. The control group completed clinical requirements, but had no simulated practice in the lab. Both groups participated in the study at the completion of their semester. The nursing care categories that were evaluated in the study included: safety, basic assessments skills, prioritization of care, problem-focused assessment, interventions, delegation, and communication.

All of the students were evaluated using the faculty-developed tool called The Clinical Simulation Evaluation Tool (CSET). This tool was comprised of a measurable objective list with a numeric scale indicating performance of the listed behaviors. Points were awarded for every observed student behavior during the patient care simulation (62 points possible). Validity or reliability measurements were not given. However, the authors stated objectivity of the testing was enhanced by using the detailed evaluation tool and clinically experienced faculty. Chi-square test was used to compare the two groups (Radhakrishnan et al., 2007).

The students in the intervention group achieved significantly higher scores in the categories of safety and basic assessment skills than the students in the control group. Scores for the safety category were 45 for the intervention group and 34 for the control group. Scores for the Basic Assessment category were 43 for the intervention group and 33 for the control group. There were no significant performance differences in the other
clinical parameters. Students in the intervention group scored 20 total points in the Patient Identification Subcategory (Safety category) whereas the control group scored a total of 9 points ($X^2 = 10.81, p \leq 0.001$). In the Assessing Vital Signs Subcategory (in the Basic Assessment Skills category; $X^2 = 6.762, p = 0.009$), the intervention group received a significantly higher total score, 17 points, than the control group who scored a total of only 8 points (Radhakrishnan et al., 2007).

Radhakrishnan et al. (2007) concluded this study revealed that simulated patient care practice improved nursing students’ patient identification and vital sign assessment in a complex two-patient simulation. Although the authors hypothesized students engaging simulation practice would score higher in all 7 categories, the findings were important since patient safety and basic assessments are critical. This study revealed that simulation reinforced important safety practices with the students.

Summary

These literature reviews have revealed the importance simulation as a teaching-learning methodology in nursing education. Feingold et al., (2004) believed that high-fidelity simulations in a baccalaureate nursing program had value for learners and educators. They believed simulations prepared students for actual patient care by increasing students’ competence and confidence. Realism of the simulator and simulation environment was crucial to the educational experience and this influenced the students’ perceptions of how knowledge learned in a simulation would transfer into a real clinical setting. Realism of the simulation and transfer of knowledge were two other aspects that
Feingold et al. (2004) believed to be important. Numerous studies have revealed these same findings in addition to other findings that formed several dominant themes.

Many of the studies in the literature review evaluated students’ confidence levels after a patient care simulation. Students in Feingold et al.’s (2004) study noted that the simulation increased their confidence in real patient care. Scherer et al. (2007) obtained the same results with advanced practice nursing students in a crisis management situation. Dobbs et al. (2006) and Bremner et al. (2008) reported students gained confidence in physical assessment skills; whereas, Bearnson & Wiker (2005) and Goldenberg et al. (2005) demonstrated that students were more confident with patient teaching after a simulation. Similarly, Bremner et al. (2006) reported that the anxiety levels of first year nursing students preparing for a first time clinical decreased after a patient care simulation.

The cost- benefit ratio regarding the high cost of simulation in nursing education is often questioned; therefore, nurse educators must provide evidenced based research that supports its use and its added expense. Knowledge gained in simulations that cannot be gained in the classroom needs be demonstrated. A few of the studies in the literature review discovered there was not a significant difference in pre-and post-test knowledge scores when comparing students who had a simulation intervention and those who did not (Dobbs et al., 2007; Scherer et al., 2007; Radhakrishnan et al., 2007; Bremner et al., 2007). However, other studies found simulation experiences to improve students’ psychomotor skills, patient safety measures, and knowledge about the patient’s condition and treatment presented in the simulation. The studies by Bremner et al. (2006) and
Goolsby (2001) demonstrated that students improved physical assessment skills because of practice on the high-fidelity manikins and computer assisted programs, respectively. Increased ability with procedure performance was noted by Beranson et al. (2005), Alinier et al. (2006), and Radhakrishnan et al. (2007). Knowledge gains were reported by Dobbs et al. (2007) about insulin management; Bearson et al. (2005) about medication administration, Feingold, et al. (2004) about patients with COPD, and Schoening et al. (2007) about pre-term labor.

Educators routinely evaluate teaching strategies used in the curriculum. The desired outcome for any teaching method is the transfer of knowledge to the real setting. Research denotes that for transfer of knowledge to occur, the simulation must be as realistic as possible. The studies conducted by Goolsby (2001), Feingold et al. (2004), and Kiat et al. (2007) concluded that students perceived the knowledge learned in the simulation would transfer to the real setting. Accordingly, the nursing students in these same studies reported that the simulations had a high degree of realism that set the stage for knowledge transfer to take place. Testing of the simulation design features and student satisfaction with the instructional method was deemed important and evaluated in several studies. Dobbs et al. (2007), Goolsby (2001), Bremner et al. (2006), Goldenberg et al (2005), and Kiat et al. (2007) all reported that students thought the simulations were well presented, beneficial, and realistic. The students were highly satisfied with simulation as a teaching methodology and that is was an enjoyable way to learn.

In conclusion, this review of literature indicates that simulation is a valuable teaching-learning technique in baccalaureate and graduate nursing education. Many
benefits are derived from its use such as increased student knowledge, increased psychomotor, assessment, and procedural skills, along with critical thinking abilities. Since patient safety is demanded by the public, high-fidelity simulations in nursing education may be able to better prepare new graduates for the workforce (Feingold et al., 2004). However, additional research needs to be conducted to validate the effectiveness of this methodology in nursing education (Scherer et al., 2007).
**RES 697 Literature Review Table**

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<th>Source</th>
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</table>
| Goldenberg, Andrusyszy & Iwasiw (2005) | **Problem**: Health teaching is a integral part of nursing practice  
**Purpose**: Describe the effect of classroom simulation on students’ self-efficacy in health teaching.  
**Questions**: 1. What are the differences in self-efficacy scores before and after a health teaching simulation? 2. What are the relationships between self- | Bandura’s Self-efficacy Conceptual Framework | a non-probability, convenienc sample of 66 BSN students | Exploratory, descriptive design study | A researcher-developed, two-part, 63-item, Baccalaureate Nursing Student Teaching-Learning Self-Efficacy Questionnaire | Self-efficacy Subscale for Health Teaching were significantly higher. The Demographic Variable Subscale showed no significant relationship between the students’ teaching scores and the selected variables using Pearson’s correlation (r). More than 50% of the students rated the simulations as “effective” and more than one third rated them as “very effective” |
efficacy scores and selected demographics? 3. What ratings do students’ ascribe the effectiveness of simulation as a teaching method?

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<td>Feingold, Calaluce, &amp; Kallen, (2004)</td>
<td><strong>Problem:</strong> Decreased availability of clinical sites in acute care facilities. <strong>Purpose:</strong> To evaluate student and faculty perceptions to simulations regarding the following issues: realism, transferability knowledge to the clinical site and</td>
<td>Knowles Cognitive Learning Theory</td>
<td>97 baccalaureate nursing students taking Advanced Acute Care of the Adult; 4 nursing faculty</td>
<td>Descriptive Design Method</td>
<td>A researcher developed 20-question, 4-point Likert scale tool satisfaction survey with subscales: Realism, Transfer and Value</td>
<td>Value subscale: 76.2% agreed that the scenario had value to education or practice. Realism subscale: 86%, found the simulation to be realistic indicating that the setting, pace and flow of the scenarios was like a real clinical setting, including the patient, SimMan. Transfer subscale: 80% stated the experience was an adequate test of</td>
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Questions: 1. What are the students’ and faculty members perceptions of patient and scenario realism? 2. Can students transfer knowledge from lab scenarios to real clinical experience? 3. What is the value of the learning experience?

46% of the students thought the simulation increased confidence, improved clinical competence, or prepared them to function in an actual setting.

Faculty survey showed 100% agreement on all three subscales.

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<td>Schoening, Sittner, &amp; Todd, (2006)</td>
<td>Problem: For nurse educators to overcome problems such as increasing student enrollment, faculty shortages and increased demand for safe</td>
<td>None indicated</td>
<td>57 junior baccalaureate nursing students taking an obstetrical course at Creighton</td>
<td>Non-Experimental pilot evaluation, Exploratory Descriptive Study</td>
<td>A Researcher developed 10 item, 4-point Likert -scale tool with Two subscales: (a) Objectives and (b)Student</td>
<td>Objective subscale showed that the mean score was 3.64 for meeting the objectives. Results from the Student Perception subscale showed the mean score to be 3.75 for increasing skills and decision-making abilities.</td>
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Examine students’ perceptions of a preterm labor simulation as a method of instruction for patient care from new graduates.

**Purpose:**

Examine students’ perceptions of a preterm labor simulation as a method of instruction.

University perceptions.

Data were also collected from narrative responses on the evaluation tool and journal entries.

Subject categories were formed from analysis of the narrative entries which included (a) Skills, Hands-on Learning, Practice; (b) Confidence, Self-efficacy, and Non-threatening Environment; (c) Critical Thinking, Realism, Knowledge, Review and Decision Making; (d) Value, Transferability, and Satisfaction; and (e) Teamwork, Communication, and Preparedness.
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<td>Bremner, Aduddell, Bennett, &amp; VanGeest, (2006).</td>
<td><strong>Problem</strong>: Lack of (a) Identified best practices for using simulation in nursing education; (b) Understanding how the (HPS) applies to the acquisition of clinical skills for the novice nursing student. <strong>Purpose</strong>: Determine the value of using HPS technology as an educational methodology from the perspective of novice nursing students.</td>
<td>None indicated</td>
<td>56 novice nursing students in a baccalaureate program, 41 students completed the survey</td>
<td>Exploratory Descriptive</td>
<td>2-part questionnaire: Section 1: Likert rating scale identified the following: Students’ overall perceptions … (a) of the HPS, (b) if the experience should be mandatory or voluntary, (c) of gained confidence in physical assessment skills, and (d) if stress and anxiety relief on the first clinical day at the hospital. Second section: open-ended</td>
<td>95% of the students rated the session from good to excellent. 68% said the simulation should be mandatory in the course. 61% percent said the simulation gave confidence with assessment skills. 42% stated this teaching strategy relieved stress associated with the first day of clinical for novice students. The Teaching/Learning Utility subscale: 67% of the students perceived the educational methodology to be beneficial. The Realism subscale: 22% indicated the...</td>
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question elicited comments in writing about students’ perceptions of the simulation experience. 4 sub-scales identified: (a) The Teaching/Learning Utility Subscale, (b) The Realism Subscale, (c) The Limitations Subscale, and the (d) Confidence/Comfort Subscale. Simulation was realistic, and 2% indicating it was not. The Limitation subscale: 22% cited limitations of not enough time with simulator (15%), students did not like working in a group (5%), and the simulator was scary (2%). The Confidence and Comfort subscale indicated 4% had more comfort and confidence with patient care. One student said, “It made me feel more comfortable touching the patient my first day of clinical.”

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| Goolsby (2001) | **Problem**: Non-standardization of nurse practitioner education  
**Purpose**: To develop a better understanding of the computer-assisted simulations’ role as a teaching modality with NP students.  
**Questions**:  
1. What role does computer-aided scenarios play in nurse practitioner education?  
2. "How do NP students solve computer-assisted scenarios?" | **Ecological psychology framework**:  
8 nurse practitioner students who had completed 1 year or study, enrolled in a clinical elective course. Most of the students were in the mid 30 age range. | **Phenomenological study**:  
Observation and interview methods  
After the simulations were completed, the students were interviewed to ascertain perspectives on the simulation program and scenarios. The observations were recorded, refined, coded, and quantified based on the theoretical framework of ecological psychology  
"What role does computer-aided scenarios play in nurse practitioner education?" revealed that the simulations were a good teaching tool because it allowed time for the novice to think about the patient’s problems; All of the nurses appreciated the feedback; Everyone thought the information would be transferable to the real setting; All of the participants stated the scenarios were realistic and that the program assisted them in learning medical terminology. | **Observation and interview methods**:  
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**Problem:** Nurse educator shortage, fewer clinical sites, and the increasing complexity in the healthcare environment are challenges in preparing nurses for safe and efficient practice.

**Purpose:** Test: the simulation design features in the Simulation Model by Jeffries et al. (2005); Knowledge, problem-solving skills, and self-confidence, students’ satisfaction with the simulation.

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<td>Dobbs, Sweitzer &amp; Jeffries, (2006)</td>
<td><strong>Problem:</strong> Nurse educator shortage, fewer clinical sites, and the increasing complexity in the healthcare environment are challenges in preparing nurses for safe and efficient practice. <strong>Purpose:</strong> Test: the simulation design features in the Simulation Model by Jeffries et al. (2005); Knowledge, problem-solving skills, and self-confidence, students’ satisfaction with the simulation.</td>
<td>None indicated</td>
<td>60 baccalaureate nursing students enrolled in a medical-surgical course</td>
<td>Exploratory Descriptive Study</td>
<td>62-question 5-point Likert scale tool -- Five subscales: Simulation Design (by the NLN/Laerdal project group, Cronbach alpha = 0.92); Satisfaction, Self-confidence (Cronbach’s alpha = 0.94), Cognitive Gains (instructor developed pre-post test, no reliability measurement stated); and Self-perceived judgment performance (Cronbach’s)</td>
<td>Simulation Design Scale: grand mean of 4.2 indicating faculty feedback was the most important feature. Students reported being very satisfied with the instructional method. The Self-confidence subscale resulted in a mean of -4.3 indicating the students were confident in care for an insulin managed patient. (There was no confidence pre-test prior to the simulation to compare.) The Cognitive Gains subscale revealed no significant differences in knowledge gains from pre-tests and post-tests (no mean numbers were given).</td>
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<td>Alinier, Hunt, Gordon, &amp; Harwood, (2006)</td>
<td><strong>Problem</strong>: Lack of scientific evidence proving the effectiveness of simulation methodology in undergraduate nursing education. <strong>Purpose</strong>: Determine the</td>
<td>None indicated</td>
<td>9 second year, diploma program nursing students in the United Kingdom</td>
<td>Researcher developed OSCE A 2 question, researcher-developed, 5-point Likert scale questionnaire examining the</td>
<td>The control group average performance for the first OSCE was 48.18% (95% CI 46, 31-50.06) and the experimental group was 47.54%. Scores on the second OSCE were 56.00% for the control group and 61.71% for the experimental group.</td>
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effect of scenario-based simulation training on nursing students’ clinical skills and competence; student perceptions of confidence and stress while working in a technological environment.

**Question**: Would the experimental group perform better in a post-test OSCE than the control group?

Questionnaire findings showed the two groups differed only slightly with respect to perceptions of stress and confidence. The questionnaire measured 2.9 and 3.5 respectively for the control group and 3.0 and 3.4 for the experimental group.

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<td>Bearnson &amp; Wiker, (2005)</td>
<td><strong>Problem</strong>: Nursing students do not have the opportunity to see various ways patients may respond when given a particular</td>
<td>None indicated</td>
<td>Un-identified number of junior nursing students (approximately 16) in</td>
<td>Exploratory descriptive study</td>
<td>Researcher-developed, 4 point Likert scale-type survey, reliability or validity of the survey not</td>
<td>The mean scores of the survey items are as follows: (a) 3.13 for the increased knowledge of medication side effects question. (b) 3.31 for the</td>
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medication. **Purpose**: Explore the benefits and limitations of using a HPS, and also to evaluate students’ knowledge, psychomotor skills, and confidence during their first clinical rotation on a surgical unit mentioned. Students responded to the following statements: (a) Working with the HPS increased my knowledge of medication side effects; (b) Working with the HPS increased my knowledge of differences in patients’ responses; (c) Working with the HPS increased my ability to administer medications safely; and (d) Working with the HPS increased my confidence in my medication administration question. Students stated they learned the importance of performing a thorough assessment, recognizing abnormal findings, and using critical thinking to plan care based on the assessments. They appreciated hearing and recognizing abnormal physical assessment findings not always heard on real patients. The students felt the simulation was valuable and should be used in addition to, not
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<td>Bremner, Aduddell, &amp; Amason, (2008)</td>
<td><strong>Problem:</strong> Simulation is new in nursing education, and evidence-based practices must be established regarding its use. <strong>Purpose:</strong> to investigate first year nursing student’s perceptions of confidence and comfort levels as evidenced by</td>
<td>None identified</td>
<td>Experimental design study</td>
<td>1. Researcher-designed: Demographic questionnaire; Simulation content evaluation; Value of the simulation methodology. Questionnaire No reliability or validity was stated. 2. The Self Assessment Inventory, from</td>
<td>No demographic differences between groups. No significant differences in students’ learning styles. <strong>Self-Design Questionnaire for Group 1:</strong> (a) 84% rated the overall excellent to very good, (b) 97% stated HPS should be a component of the nursing curriculum, (c) 71% said the experience gave them</td>
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their anxiety level and explore the relationship of learning styles, coping styles, and anxiety levels of students using simulation.

3. The third tool used was the 40-statement State-Trait Anxiety Inventory that measured students’ anxiety.

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<td>Kiat, Mei, Nagammal, &amp; Jonnie, (2007)</td>
<td>Problem: Schools of nursing have been challenged to prepare graduate nurses who are confident</td>
<td>None identified</td>
<td>The 260 students had completed 1 year of their 2 year</td>
<td>Exploratory Descriptive</td>
<td>Three Researcher developed instruments: The Perceived Benefits Scale revealed (a) it was an enjoyable way to learn (94%); (b) it allowed students to analyze the patient’s confidence with physical assessment skills, (d) 65% strongly agreed or agreed that the experience with the HPS relieved their stress on the first day of clinical, and (e) 42% reported that they were less anxious about the first day of clinical</td>
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and safe practitioners in a shorter time frame.

**Purpose:** Assess the effectiveness of simulation with nursing students at the Institute of Technical Education in Singapore. Evaluate the students’ learning experience so as to enhance the design and conduct of the simulation based training

<p>| Degree and had no simulation experience | Benefits of Simulation based Training as a Learning Approach; The Preference for Simulation based Training as a Learning Approach, and The Factors Influencing the Effectiveness of Simulation Based Training. | Benefits of Students’ Actual Experience with Simulation Based Training: virtually identical results as previous subscale In the section Factors Influencing the Effectiveness of Simulation Based Training, 94% reported that the outcomes of simulation based training are condition and think on their feet (95%), (c) it helped students to realize areas for improvement (97%); (d) it increased confidence (95%); and (e) it allowed students to make mistakes without causing harm to real patients (96%). (12%) disagreed that simulation would improve social and communication skills nor create a realistic experience |</p>
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| Scherer, Bruce, & Viliporn, (2007) | **Problem**: Non-standardized learning experiences of advanced practice nurses in crisis care management; few studies with APN students using HPS have been reported  
**Purpose**: Evaluate knowledge and confidence of APN students in managing a cardiac event. | Bandura’s Self-Efficacy Theory | Twenty-three acute care and adult nurse practitioner students enrolled in an acute care clinical practicum course | Quasi-experimental design | Demographic Data Sheet  
The Knowledge Quiz, a researcher developed tool, No reliability or validity measurements  
Evaluation Instrument  
Confidence Scale Instrument | Demographic Data Sheet revealed no significant differences in the variables between the two groups.  
Knowledge Quiz and the Evaluation Instrument also showed no significant differences for either group and students rated the experience highly.  
Confidence Scale: significant difference: |
**Question:** Would simulations allow the APN to apply knowledge learned, sharpen critical thinking, and improve psychomotor skills in a safe, structured environment?

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<td>Radhakrishnan, Roche, &amp; Cunningham, (2007)</td>
<td><strong>Problem:</strong> A lack of nursing research to validate the influence of simulation practice (HPS) on the clinical performance of nursing students. <strong>Purpose:</strong> To identify 7 nursing clinical practice parameters potentially</td>
<td>None identified</td>
<td>A convenience sample of 12 senior BSN students completing a second degree program</td>
<td>Quasi-experimental study</td>
<td>Faculty-developed tool called The Clinical Simulation Evaluation Tool (CSET). This tool was comprised of a measurable objective list with a numeric scale indicating performance of the listed</td>
<td>control group scored 31.30 on the post-test and the experimental group scored 25.64, (p = .040)</td>
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Scores for the safety category: 45 for the intervention group and 34 for the control group. Scores for the Basic Assessment category: 43 for the intervention group and 33 for the control group. There were no significant performance differences in the other clinical parameters. Students in the
influenced by human patient simulation in the lab setting. **Question:** The researchers hypothesized that students who practice patient care with a HPS would perform better in every aspect of clinical performance.

| behaviors. Validity or reliability measurements were not given. Chi-square test was used to compare the two groups | intervention group scored 20 total points in the Patient Identification Subcategory (Safety category) whereas the control group scored a total of 9 points ($X^2 = 10.81, p \leq 0.001$). In the Assessing Vital Signs Subcategory (in the Basic Assessment Skills category; $x^2 = 6.762, p = 0.009$), the intervention group received a significantly higher total score, 17 points, than the control group who scored a total of only 8 points. |
Chapter III
Methodology and Procedures

Introduction

Simulation in nursing education has been used for many years to teach nursing procedures. However, there is an increased use of clinical simulation to teach not only psychomotor skills, but also critical thinking. One reason for the increased use is the availability and affordability of high-fidelity human patient simulators. With the advent of this new technology in nursing education, evidence based research must be conducted to validate its effectiveness.

Purpose

The purpose of this study is to evaluate perceptions of the students and faculty about the realism of the simulation experience, to determine if lab simulations increase knowledge for nursing students, and to determine the value of the learning experience. This is a partial replication study done by Feingold et al. (2004).

Organization of Chapter

This chapter contains a description of the methods and procedures for the study. The chapter will address the research questions, population, sample, setting, protection on the human subjects, procedures, methods of measurement, research design, and data analysis methods.
Research Questions

1. What are the students’ and faculty members’ perceptions of patient and scenario realism?
2. Can students transfer knowledge from lab scenarios to real clinical experience?
3. What is the value of the learning experience?

Population, Sample, and Setting

This study will take place at Indiana Wesleyan University. The population will consist of third year BSN nursing students enrolled in the Adult Health II/Medical-Surgical course. The anticipated study sample is approximately 50 nursing students, 1 full-time, and 8 part-time Medical-Surgical nursing faculty. This convenience sample will participate in a course required clinical simulation with SimMan®. The surveys will be administered by a faculty member that is not involved in the simulation study. The survey will be completed in a secluded quiet room in the lab after concluding the simulation. No researchers of this study will be present when the surveys are being completed. The surveys will be submitted by the students in an envelope to the faculty proctor. No names will be obtained on the surveys and each returned survey will later be assigned a number for identification. Each participant will receive a letter via email inviting them to participate in the survey after the simulation experience.

The setting will be the Brooks-Fortune Nursing Simulation Skills Lab at Indiana Wesleyan University in Marion, Indiana that has an enrollment of approximately 3,000 students. The School of Nursing has approximately 350 undergraduate students enrolled
as sophomores, juniors, and seniors. The Simulation Skills Lab has 9 exam rooms, 3 four bed wards, 1 eight bed ward, 4 single hospital rooms, and 1 ICU room. State-of-the-art equipment found in the Lab includes: functioning head wall systems, low-fidelity (20), medium-fidelity (8), and high-fidelity (3) manikins, 2 crash carts, 10 computers for bedside charting, and much more that is needed for performing simulated patient care during simulation scenarios. The location of the human patient simulators are the ICU, a single hospital room, and a four bed ward.

Procedures

Permission will be obtained from Ball State University and the participating institution, Indiana Wesleyan University. The study is voluntary and data will remain anonymous. There are no identified risks to any individual or institution involved in the study. Permission to use the questionnaire will be obtained from the author of the questionnaire. Subjects of the proposed research study will complete the instrument voluntarily. Implied consent will be assumed by each returned questionnaire. The significance of the study is to determine the value of high-fidelity simulation as an educational methodology. The surveys will be administered by a faculty member that is not involved in the simulation study. No risks are foreseen for the participants and participation in the survey will in no way have a positive or negative impact on the students’ grade. This method assures anonymity and confidentiality. The human rights of the participants will be protected at all times.
**Instrumentation**

Feingold et al.’s (2004) satisfaction survey will be used to evaluate the perceptions of the students and faculty about the realism of the experience and to determine if lab simulations increase knowledge for nursing students, and to determine the value of the learning experience. Feingold et al. (2004) designed the satisfaction survey based on a previously developed satisfaction survey. The reliability measurement of the Feingold et al. (2004) tool was not stated. The satisfaction survey contains 20 items for the students and 17 items for the faculty. It is based on a 4-point Likert scale with 4 being “Strongly Agree” and 1 being “Strongly Disagree”. The three subscales are: Realism (4 items), Transfer (3 items), and Value (6 items) plus individual items not in a subscale (7). The 17-item faculty survey will also solicit feedback about the need for faculty support and training related to simulations. The instrument measures the participants’ perceptions of the simulation experience regarding realism, transferability of knowledge and value. A demographic survey will be used to gather the following information about the participants: gender, age, self-reported grade point average, and ethnicity.

**Research Design**

This study is a partial replication of the Feingold et al. (2004) study. It involves repeating the original study under similar conditions, following the methods as closely as possible. The intent is to determine whether the findings from the original hold up despite minor changes in the research conditions. The results from both studies are more credible
if they are consistent with each other. This study will use the descriptive study designs method. It will be used to investigate the effect of simulation (Burns & Grove, 2005).

**Method of Data Analysis**

Descriptive statistics, including mean, standard deviation, frequency, and percentage of student responses was used to analyze the survey data and obtain survey subscales. A descriptive design is used to identify information about a phenomenon of interest (Burns & Groves, 2005). Two-tailed, independent-group *t* tests were performed in the Feingold et al. (2004) study to determine statistical significance between the self-reported GPA levels and responses to the three survey subscales and to the individual survey items not included in these subscales. Analysis of variance (ANOVAs) was used to determine statistical significances between or within the age groups, students’ responses to the survey subscales, and the individual items. An alpha level of .05 was used for all statistical tests. Chi-square tests were used to determine differences between respondents and non-respondents for the demographic variables of gender, age, and ethnicity.

**Summary**

Evaluating the effect of simulation as a teaching-learning methodology in nursing education is important. The purpose of this study is to evaluate perceptions of the students and faculty about the realism of the simulation experience, to determine if lab simulations increase knowledge for nursing students, and to determine the value of the learning experience. This is a partial replication study done by Feingold et al. (2004). The study sample will be approximately 50 third year nursing students in the Adult Health II
course at Indiana Wesleyan University and 1 full-time and 8 part-time nursing faculty. IRB approval will be obtained from Ball State University and Indiana Wesleyan University and the students will be informed of the voluntary study. Students’ rights will be protected at all times. The students will be informed that participation is not required, and that confidentiality and anonymity will be maintained. Descriptive statistics will be used to evaluate perceptions of the students and faculty about the realism of the simulation experience, to determine if lab simulations increase knowledge for nursing students, and to determine the value of the learning experience. Two-tailed t tests, ANOVA, and Chi-square tests will be used to examine differences within and between the 2 group’s demographic data.
References


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