USE OF COMPUTERIZED PATIENT SIMULATORS: PERCEPTIONS OF
STUDENTS AND FACULTY
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ABSTRACT

RESEARCH SUBJECT: Use of Computerized Patient Simulators: Perceptions of Students and Faculty

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Today’s complex health care environment demands that nurses are able to make quick assessments and clinical decisions. The use of Human Patient Simulation (HPS) in baccalaureate nursing education may hold value for both students and faculty regarding the acquisition of clinical decision making skills (Feingold, Callaluce, & Kallen, 2004). This study is a partial replication of Feingold et al.’s (2004) study.

The purpose of this study is to examine student and faculty opinions regarding the use of HPS in baccalaureate nursing schools for the acquisition of nursing skills. Knowles (1990) Adult Learning Theory is the framework for this descriptive study. A projected convenience sample of 50 senior baccalaureate students enrolled during fall semester and 50 senior baccalaureate students enrolled during spring semester of an Adult Health 3 course will comprise the student population. Four faculty course facilitators will be surveyed during both courses. The study will take place at a large university in the Midwest. Both groups will complete a pre- and post-simulation experience satisfaction survey. Permission will be obtained from Ball State University. Findings will provide
relevant information regarding the value of HPS use among nursing students as a useful tool in the acquisition of clinical decision making skills.
Chapter I
Introduction

Clinical decision-making judgment has been an important issue in healthcare education for the past four decades. However, the last 20 years of related research have shown an increase in the developmental processes by which educators foster student acquisition of clinical decision-making skills (Shin, Jung, Shin, & Kim, 2006; Bremner, Aduddell, Bennett, & VanGeest, 2006). While the concept of clinical decision-making has not always been labeled as such, it has been a part of nursing’s repertoire for many years (Schefffer & Rubenfeld, 2000). Nurses must possess creativity and critical thinking (CT) skills in order to make sound clinical decisions in nursing practice and, because of this, the necessity of CT skills incorporation into nursing education curriculum was addressed by the National League for Nursing Accreditation (NLNAC) (1999) and the American Association of Colleges of Nursing (AACN) (1998) (Shin et al., 2006).

While the call from the NLNAC (1999) and AACN (1998) for incorporation of critical thinking and clinical decision-making skills enhancement into undergraduate nursing curriculum was sounding, a myriad of changes were taking place throughout our healthcare institutions. Increasing acuity levels of patients, decreasing lengths of hospitalization, institutional cost containment practices, and the explosion of healthcare technology and specialization created an intense need for well-prepared nurses entering the profession (Benner, 1982; Bremner et al., 2006). Public awareness regarding the need
for increased safety was swiftly becoming a forefront issue necessitating major change throughout the healthcare industry (Schoening, Sittner, & Todd, 2006). Graduate nurses, entering the profession at the novice level, were ill prepared for practice in light of a decreasing number of available experienced mentors. These changes began to shape educational curriculum development throughout nursing schools across the nation and simulation exercise was a rapidly growing enterprise to assist in filling the critical thinking gap for nursing educators (Bremner et al., 2006).

Although medical simulation had been in practice for many years, little research regarding the usefulness, value, and design of simulation experience in nursing education had been conducted. In 2003, the NLNAC, in collaboration with Laerdal Medical Corporation, conducted a national 3-year study involving eight schools of nursing that explored the use of human patient simulation (HPS) as a tool to enhance CT and clinical decision-making skills in the classroom, laboratory, and clinical settings (NLNAC, 2007). The study findings indicated that not only were the students able to acquire, apply and practice necessary patient skills in a non-threatening clinical environment, but also provided valuable insight for faculty related to the design and development of simulation scenarios. The findings from this study were vital towards beginning to bridge the gap between healthcare institution and nursing education’s curricular changes (NLNAC, 2007).

In order for HPS implementation to be useful in nursing education, qualitative and quantitative exploration into both student and faculty perceptions regarding the realism, transferability of skills acquired from its use, and value of the experience must be performed (Nehring & Lashley, 2004; Feingold, Calaluce, & Kallen, 2004). It is critical
for nursing education that beliefs and ideas, whether good or bad, surrounding HPS exercise be fully researched and reported at length (Savoldelli, Naik, Hamstra, & Morgan, 2005).

**Background and Significance**

Simulation experiences have been utilized in the professional arena for many years. Role play, case study examination, simulation games, computer assisted instruction, and low- and high-fidelity mannequin use are some of the more commonly known types of simulation in the medical field (Bearnson et al., 2005).

The initiation of mannequin simulation practice in the medical arena can be traced as far back as 1969 when first introduced to anesthesiologist residents for practice in endotracheal intubation skills. It was believed that the simulator produced a more skilled professional. Since that time, the field of anesthesiology has not only used simulation experience for skills practice but for the acquisition of crisis resource management (CRM) skills as well (Rhodes & Curran, 2005). The objectives of CRM relates to the basic principles of team coordination behavior and are very applicable to acute care nursing education simulation exercise (Wallin, Muerling, Hedman, Hedegard, & Fellander-Tsai, 2007).

After its inception in the late 1960’s, mannequin use spread slowly into a wider variety of fields including aviation, the nuclear power industry, medicine, and most recently, nursing and nursing education. Unlike studies performed in the aeronautics and aviation sciences using CRM principles, studies conducted throughout the medical field using simulation were based upon the CRM training principles but were limited in the
reporting of content and description of scenarios that had been developed and used (Wallin et al., 2007).

Of late, simulation experience has exploded onto the nursing education picture. However, simulation use in nursing service has been contained mainly to the critical care area to teach RN’s how to care for acutely ill patients and test advanced cardiac life support skills (Rhodes & Curran, 2005). Most recently, HPS use is being examined in great depth in undergraduate and graduate nursing educational programs as an effective instrument for facilitating student learning outcomes. Not only do students see and act upon a vast array of clinical situations in a safe environment, the entire process assists in promoting the acquisition, initiation, and enhancement of critical thinking and clinical decision-making (Rhodes & Curran, 2005).

HPS use is an effective approach for both teaching and evaluating performance. Educators employ simulation encounters to assist students to develop problem solving and team collaboration skills, assess student performance in relation to the achievement of course objectives, and assist students to obtain a better feel for the patients’ perspective (Bremner et al., 2006).

The number of Human Patient Simulators being used in medical and nursing education is growing rapidly. This growth is due to not only to an increased demand for clinical site availability and healthcare industry related issues, but to the availability of the technology and student and educator needs. Simulation exercises will never replace the real clinical experience but issues akin to cost containment and clinical site availability for students are forcing nursing educators to continue to search for innovative ways to fulfill student learning objectives (Feingold et al., 2004). HPS use provides a low
cost, effective means of equipping novice nurses with the building blocks necessary for survival in an extremely fast paced and evolutionary work environment.

Statement of the Problem

Human patient Simulator (HPS) use is increasing in nursing schools because not only are there not enough clinical experiences available for students but the patient acuity levels have changed. It is important for students to practice decision making before performing skills on patients. It is believed by Feingold, Calaluce, and Kallen (2004), that the use of simulators will assist nursing students develop clinical decision making skills.

Purpose of the Study

The purpose of this study is to describe perceptions of students and faculty about the realism of the type of experience, to determine if knowledge gained in lab simulations can be transferred to the clinical setting, and to determine the value of the learning experience. This study is a partial replication of Feingold, Calaluce, and Kallen (2004) study.

Research Questions

1. What are the students’ and faculty members’ perceptions of patient 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

This study will employ Knowles (1990) Adult Learning Theory as the theoretical framework in an attempt to understand and explain the learning behaviors of undergraduate nursing students. According to Knowles, the adult learner is self-directed
in the acquisition of knowledge and focused on the process of knowledge attainment.
Unlike the child who relies on outside sources to facilitate learning, the adult learner
takes the initiative in diagnosis learning needs, formulating a learning plan and setting
goals, seeking out and implementing pertinent resources, and evaluating the learning
process.

Knowles (1990) proposed that adult learning focuses on the process of learning
rather than the actual content of what is taught. This concept, which Knowles (1990)
termed andragogy, is the foundation for adult cognitive learning theory. From Knowles
(1990) concept of andragogy flow five major assumptions related to adult learner
behaviors. The theoretical framework introduced in this study appropriately reflects how
the undergraduate nursing student learns and the steps Knowles (1990) proposes
throughout the learning process closely mimic the nursing process; identification of
educational need, formulation of a learning plan, implementation of the proposed
learning plan, and evaluation of the learning process.

Definition of Terms

Simulation Realism

Operational: Feingold et al. (2004) utilized a 20-item Likert scale tool designed
by Halamek et al. (2000) to elicit student responses regarding simulation scenario
realism. Instrument subscale item ‘realism’ correlated with student perception of the
simulation using four “realism-of-the-simulation” items. Likert scale responses ranged
from 4 = strongly agree to 1 = strongly disagree for this subscale variable.
A 17-item survey designed by Feingold et al. (2004) utilized the same Likert scale ranges
to measure faculty responses for the variable of realism.
**Simulation Transferability**

Conceptual: “ability to transfer skills learned in simulation into the real clinical world” (Feingold et al., 2004, p. 159).

Operational: Feingold et al. (2004) utilized a 20-item instrument designed by Halamek et al. (2000), assigning three “ability-to-transfer-skills” survey items. A Likert scale ranging from 4 = strongly agree to 1 = strongly disagree was used to measure individual student responses for this variable.

A 17-item survey designed by Feingold et al. (2004) utilized the same Likert scale to measure faculty responses for the variable of transferability.

**Simulation Value**

Operational: Feingold et al. (2004) employ a 20-item tool, designed by Halamek et al. (2000), using six “overall-value-of-the-experience” survey items to measure student and faculty perceptions regarding the value of the simulation experience. A Likert scale ranging from 4 = strongly agree to 1 = strongly disagree was used to measure individual responses for this variable.

A 17-item survey designed by Feingold et al. (2004) utilized the same Likert scale to measure faculty responses for the variable of value.

**Demographic Variables**

Operational: demographic variables of gender, age, self-reported grade point average (GPA), and ethnicity were measured by Feingold et al. (2004) using Chi-square testing and analyses of variance (ANOVAs) for differences among the student population respondents.
Limitations

Limitations for this study may include a lack of comparison of grades for the simulation and clinical experiences and a small population size. Individual interviews with student’s post-simulation experience and videotaping of the simulation interactions may also prove helpful in defining conditions by which simulation exercise can be used to the fullest potential.

Assumptions

Feingold et al. (2004) build this study around the following assumptions:

1. Clinical simulation is consistent with cognitive learning theory because it is interactive, builds on prior knowledge, and relates to real clinical problems.
2. Active participation in realistic clinical simulations may promote critical thinking skills in students.
3. Simulation experience can increase student comfort level with technology so the patient becomes the focus of care.
4. Clinical simulation can provide students with the opportunity to repeatedly practice in a safe environment and this practice is essential for learning skills.
5. Transfer of learning is facilitated when simulation experience is as realistic as possible.

Summary

Simulation experience will never replace the real clinical setting for undergraduate nursing students but has been shown to be an effective alternative to the myriad of issues affecting the healthcare educational industry today (Feingold et al., 2004). With student access to clinical sites becoming more and more limited, educators are becoming hard-pressed to initiate innovative strategies to facilitate the fulfillment of
student clinical learning outcomes. HPS use is proving, through an ever-increasing collection of research and literature, to be an excellent adjunct to the student clinical experience (Nehring & Lashley, 2004; Parr & Sweeney, 2006; Wilson et al., 2004).

Applying Knowles (1990) Adult Learning Theory as a framework, this study is designed to investigate and explore undergraduate nursing student and faculty perceptions regarding the realism, transferability of skills learned in simulation exercise into the real clinical setting, and the value of simulation experience. HPS use in undergraduate nursing education can assist educators in providing a significantly positive learning experience for students.
Chapter II
Literature Review

Introduction

The practice profession of nursing requires nursing students to learn and apply numerous performance markers prior to graduation. Students are expected to incorporate psychomotor and clinical decision-making skills together with the development of confidence in newly acquired skills and the ability to transfer those skills into clinical practice. A large majority of nursing schools have begun to incorporate the use of human patient simulation (HPS) exercises into course curriculum, affording nursing students the opportunity to learn and practice technologic and clinical decision-making skills in a safe and relatively low-stress (Feingold, Calaluce, & Kallen, 2004; Nehring & Lashley, 2004; Rhodes & Curran, 2005).

According to Feingold, Calaluce and Kallen (2004), trends in healthcare related to cost containment changes in institutions have led to fewer areas for learning experiences with less supervision, increased patient acuity levels requiring increasingly advanced technological interventions, and shifts from the traditional hospital-based nursing programs to university-based settings. The availability of simulation technologies with increasing levels of realism have also led to an increased use of HPS in undergraduate nursing programs. The purpose of this study is to evaluate the perceptions of students and
faculty about the realism of HPS experience, to determine if knowledge gained in lab
simulations can be transferred to the clinical setting, and to determine the value of the
learning experience. This study is a partial replication of Feingold et al.’s (2004) study.

Theoretical Framework

Knowles (1990) Adult Learning Theory emphasizes the responsibility of the adult
learner to be self-directed and accountable for decisions. Self-directed as defined by
Knowles (1975, p.18) describes a process “in which individuals take the initiative, with
or without the help of others, in diagnosing their learning needs, formulating learning
goals, identifying human and material resources for learning, choosing and implementing
appropriate learning strategies, and evaluating learning outcomes”.

Knowles (1984, 1990) Concept of Andragogy explains the differences in the
learning behaviors among children versus adults. The belief that adult instruction is
focused more on the process of learning rather than the content being taught reflects the
core concept of Knowles andragogical theory. Knowles’ interest in the development of
mature minds led to the idea that learning is the responsibility of people all over the
world to transform themselves into mature adults (Knowles, 1975).

According to Knowles (1990), the concept of andragogy is premised on five
crucial assumptions about the characteristics of the adult learner. These assumptions
include:

1. Self-concept: A human beings self concept moves from one of being dependent
toward one of being self-directed as they mature.

2. Experience: A growing reservoir of experience becomes an increasing resource for
learning as one matures.
3. Readiness to learn. Readiness to learn becomes oriented increasingly to the developmental tasks of one's social roles.

4. Orientation to learning. Time perspective changes from one of postponed application of knowledge to immediacy of application, and orientation toward learning shifts from subject-centeredness to problem centeredness.

5. Motivation to learn: Motivation to learn becomes internal with maturation.

According to Knowles (1990), the purpose of evaluation in education is to improve teaching and learning. Clinical simulation is consistent with cognitive learning theory because it is interactive, builds on prior knowledge, and relates to real clinical problems (Knowles, 1990). Knowles (1990) Adult Cognitive Learning Theory provides a useful model which assists in the evaluation of both teaching and the learning experiences of nursing students.

Statement of Organization of the Literature

The literature review consists of information from both quantitative and qualitative methodologies of research studies designed to uncover the perceptions of students and faculty regarding the realism, transferability of learned skills, and the value of HPS use in nursing curriculum. The literature review is organized into the following 3 sections: student and faculty perceptions of simulation realism, simulation transfer to real clinical experience, and value of simulation experience.
Student and Faculty Perceptions of Simulation Realism

Research conducted to address the issues related to the enhancement of clinical decision-making skills through the use of Human Patient Simulations has revealed the potential to increase confidence in students by reducing the anxiety and stress during the clinical experience. The technology of HPS presents a realistic and interactive patient scenario that provides an excellent opportunity for student learning and skills enhancement. This finding was reported in a quantitative and qualitative analysis conducted by Bremner, Aduddell, Bennett, and VanGeest (2006). The authors explored students’ reactions to simulation and identified best practices.

The sample consisted of 56 novice nursing students in a nursing course in a baccalaureate program performing a head-to-toe assessment using the HPS. After completing a pre- and post-assessment for the learning experience, 41 of the students completed a two-part questionnaire (Bremner et al., 2006).

The survey was comprised of two sections. Section one used a Likert rating scale to identify students’ perceptions: (a) overall perception of the experience, (b) opinions for incorporation of HPS into the curriculum on a mandatory basis, (c) confidence levels regarding physical assessment skills, (d) relief of stress levels after HPS experience, and (e) reduction in anxiety levels on the first hospital-based clinical day after HPS use. The tool for section two was a written questionnaire asking for students’ comments regarding the simulation experience. The responses were grouped by frequency into general themes reflecting teaching/learning utility, realism, limitations, and confidence/comfort. Reliability and validity of the instrumentation was not discussed (Bremner et al., 2006).

Overall, student perceptions concerning HPS use in the curriculum revealed 95%
of students reporting the experience to be good to excellent. Findings regarding HPS use in the curriculum revealed 68% of the students believed the experience should be made a mandatory course requirement. Another 61% felt an increase in confidence level regarding assessment skills and 42% percent believed the experience afforded them a form of stress reduction regarding their first day of hospital clinical (Bremner et al., 2006).

Students’ qualitative comments revealed perceived benefits to the use of HPS as a learning tool. Students (29%) related HPS was worthwhile in learning heart and lung sounds, 22% found the hands-on experience helpful, and 20% liked the effect of learning and remediation without risks to the patient. Students (24%) perceived the HPS was realistic in terms of a teaching instrument although 22% cited limitations and believed that this reasoning revolved around the small amount of time provided to actually work with the simulator. Two percent of the students commented positively on an increased comfort level in regards to touching the patient and confidence in performing head-to-toe assessment skills after the simulation experience (Bremner et al., 2006).

The authors concluded that HPS is a useful tool in the acquisition of confidence and skills levels among novice nursing students. The teaching and learning strategies of today’s healthcare providers have evolved and new and diverse formats to deliver education are necessary in order to promote adequate clinical decision-making and critical thinking skills (Bremner et al., 2006).

Until recently, nursing service in hospitals has used HPS mainly as an adjunct to skills enhancement in the critical care setting. HPS use is growing in popularity as a teaching tool in undergraduate and graduate nursing programs. In every aspect of patient
care, hands-on experience is the best teacher. The use of HPS can provide a controlled environment that assists students in the reduction of fear and alleviation of anxiety produced in the institutional setting, thereby promoting an environment that enhances and stimulates learning in a lifelike atmosphere. The purpose of a qualitative pilot study conducted by Rhodes and Curran (2005) was to examine the critical thinking judgment skills of students regarding complex situations encountered in the clinical setting through the use of HPS.

The sample consisted of 21 senior level nursing students during an acute medical-surgical course rotation. Two faculty members from the course also participated. The study took place on campus. Researchers divided the students into groups of four or five. Groups were rotated through a hands-on orientation of the HPS. During the orientation each student was given time to take blood pressures, listen to heart and lung sounds, and visualize the catheterization of the HPS (Rhodes et al., 2005). Students arrived for the simulation and faculty assigned each a specific role. The roles included recorder, team leader, and two care providers. Faculty roles were to provide support, facilitate and guide activities, and monitor appropriateness of interventions used during the simulation phase (Rhodes & Curran, 2005).

The chart and report for the patient were provided and the students were expected to assess changes in heart rate and blood pressure and adjust interventions accordingly. Analysis of lab data and appropriate notification of physician during the interaction were also expected of the students. The HPS was programmed through a scenario involving hemorrhagic shock. The students performed all interventions with minimal assistance needed only to carry out an order for the initiation of whole blood. The scenario lasted
approximately 20 minutes with a 50-minute debriefing session immediately following for both students and faculty (Rhodes & Curran, 2005).

Sessions were videotaped in order to allow students a chance to visualize performance and critically evaluate interventions. Immediate feedback was provided to students by faculty who acted to facilitate and guide in this phase of the study (Rhodes & Curran, 2005).

A 13-item survey developed to obtain feedback regarding students’ perceptions of the simulation experience was provided to the students after the debriefing phase. The survey tool, developed by faculty, began with several demographic questions and then addressed questions regarding expectations of the experience, support and effectiveness of faculty, believability of the scenario, helpfulness of debriefing, recommendations for use with undergraduate students, strengths and weaknesses of the experience, and recommendations for future simulations (Rhodes & Curran, 2005).

Students reported overall positive feelings towards the experience and thought it would be beneficial to any student. Several students did not regard the HPS as comparable to a real patient but many noted that critical thinking skills were employed during the experience. The students found faculty to be helpful in guidance and support and found the simulation scenario to be realistic. Unanimously, the students reported the usefulness of simulation exercises for undergraduate nursing and endorsed recommendations for its incorporation into the curriculum. The negative comments reported were; “too many students”, “felt disorganized”, “scenario was too short”, and “I don’t like role-playing” (Rhodes & Curran, 2005, p. 261).

*Simulation Transfer to Real Clinical Experience*
In the clinical situation, it is not easy for students to learn that different patients respond differently to treatments and medications. Bearson and Wiker (2005) examined the benefits and limitations with the use of an HPS as a patient substitute for an actual day experience among junior level nursing students, by conducting an exploratory, descriptive research study involving nursing students. Faculty identified the learning outcome as knowledge, ability, and confidence.

The sample consisted of two groups of baccalaureate nursing students, both of which had completed 5 weeks of a 6-week first clinical rotation. Until this time, students had been providing total care to one patient on two consecutive days of the week. The 2-hour simulation sessions took place on campus and each of the two groups participated in three different simulated experiences. Scenarios centered on the operative environment and depicted patient status levels ranging from a young, healthy adult male with no major problems/disease entities, to the older male with a history of multiple disease processes and unhealthy habits and lifestyle. Upon completion of the three scenarios, students completed a survey about the simulated experience (Bearson & Wiker, 2005).

The survey was a short tool using a 4-point Likert scale (4=strongly agree to 1=strongly disagree). The students rated agreement on four positive statements used to describe the sessions. Three open-ended questions regarding what the students had learned from the experience, what the students needed to improve the experience, and recommendations for future HPS simulations finalized the survey (Bearson et al., 2005).

Findings of the student’s perceptions of the learning experience revealed a positive perception among the students regarding the learning experience. The areas recognized included the students’ increase in knowledge of medication effects (mean =
3.13), differences in patients’ responses (mean = 3.31), ability to administer medications safely (mean = 3.06), and confidence in administration skills (mean = 3.0). Students agreed the simulation was valuable, but should not be substituted for a clinical day experience (Bearnson & Wiker, 2005).

Student responses to open-ended questions indicated an increase in confidence in skills and critical thinking ability, assessment, and recognition of abnormal findings. Students chose to administer pain medications 100% of the time on all scenarios presented and used team collaboration to share vital information about the scenarios to make decisions after in-depth discussions. Students expressed an increase in knowledge, working as a team, and collaboration (Bearnson & Wiker, 2005).

Bearnson and Wiker (2005) concluded that the use of HPS was effective in teaching clinical skills and the application of learned information in practice is beneficial for nursing students. Access to HPS increases students’ learning possibilities while providing a safe and effective environment for learning among baccalaureate nursing students.

Simulation experience in nursing education can take on many different forms but the preferred outcome is universally the same; applicability of skills acquired from the experience into clinical practice. Wilson, Shepherd, Kelly and Pitzner (2004) assessed and compared the realism of a low-fidelity manikin with traditional methods of instruction in order to examine nurses’ perceptions of its suitability as a teaching method.

Volunteer nurses (n=70) from two Southern Health Hospital sites, 57 females and 13 males, comprised the sample. The mean age was 37 years. The authors divided the volunteers into two groups: site 1 and site 2. Of the participants, 45.7% had post-graduate
qualifications with nearly 45% having been in current positions for less than 5 years.

Eleven participants (15.7%) were undergraduate nursing students finishing a clinical rotation course. Manikins were set up in an adult ward on site 1 and in a training room on site 2 with no formal briefing provided to participants regarding the manikins (Wilson et al., 2004).

Nursing Anne Complete, provided by Laerdal for this study, represented a low-fidelity human patient simulator (LFHPS) capable of simulating practice with tracheostomy, oral and nasal intubation, stoma management, and intravenous cannulation skills. The simulator was coupled with an auscultation simulation training device to augment breath, heart, and bowel sounds (Wilson et al., 2004).

The survey used was a 52-item questionnaire. The first part elicited demographic data. The second and third part included questions regarding: (a) appearance, (b) movement, (c) procedures, and (d) sounds of the manikin. Survey participants were asked to assess the four categories individually on two criteria; realism and comparison. Responses for realism were recorded using a 5-point Likert scale (5=agree, 3=neutral, 1=disagree) (Wilson et al., 2004).

Comparison responses were designed to reflect past individual experiences with learning styles and modalities. The following format for recording comparison responses was used: 5=similar to an actual patient, 4=superior to existing training products, 3=superior to an instructional program, 2=superior to textbook, and 1=not applicable. Provisions were made at the end of each sub-section for additional comments. The fourth section contained nine questions designed to examine perceptions regarding suitability of Nursing Complete Anne as a teaching tool. Again, the 5-point Likert scale regarding
realism was utilized for the additional comments. Validity and reliability were provided concerning terminology and language accuracy (Wilson et al., 2004).

Findings reflected positive reports overall for all four categories of appearance, movement, procedures, and sounds. The majority of all participants (95.5%) believed Nursing Anne Complete to be realistic in appearance, superior to existing training products, and suitable for teaching. Comparative analysis of demographic data was not feasible due to the small number of participants (Wilson et al., 2004).

ANOVA results showed six items with significant differences among participant sites. These areas included sounds (systolic murmur, hyperactive bowel sounds, hypoactive bowel sounds) and procedures (denture removal/replacement, changing stoma bag, female catheterization). The non-parametric Kruskal-Wallis test was used for comparison between the nurses on sites 1 and 2. No differences among sites regarding appearance existed. Several differences regarding movement were found to be significant including head tilt, arm rotation, and leg rotation. Only one nursing procedural difference was reported in regards to subcutaneous injections but several differences in comparison quality emerged between sites in the areas of normal bowel sounds, hyperactive bowel sounds, and hypoactive bowel sounds (Wilson et al., 2004).

Feedback provided through additional comments proved useful. Comments including male urethra being too large, female labia lacking pliability, stiffness of eyelids providing for difficulty in irrigation, an anatomically incorrect below the knee amputation, and speaker placement for auscultation of breath sounds in the manikins back to provide for a more realistic assessment were cited. As hypothesized, the findings supported the expectation that nurses and nurse educators regard Nursing Anne
Complete, a low-fidelity simulator, as realistic, suitable for educational purposes, and superior to existing training methods (Wilson et al., 2004).

Nursing education is designed to equip students with numerous psychomotor skills. Throughout the course of the nursing students’ education, multiple strategies directed towards the enhancement of clinical decision-making skills are developed by faculty to be utilized by students. The National League for Nursing (NLN), in collaboration with Laerdal Corporation, conducted a 3-year, multisite study designed to explore, implement, and evaluate the use of simulation in undergraduate nursing education. An out branch of this research took place at the College of Nursing and Health Professions at the University of Southern Maine. This study sought to test and measure the reliability and validity of two instruments used in the eight site national study and measure the outcome of student satisfaction of a simulation experience. The framework for this study was the Adult Cognitive Learning Theory (Childs & Sepples, 2006).

Fifty-five senior nursing students participated in the simulation experience. The sample was comprised of traditional baccalaureate and second-degree optional students. Four learning stations with increasingly complex scenarios were developed and implemented by 3 faculty members and one graduate research assistant. Lab work-study students were also available to help guide students through the stations. Student groups of 4 to 5 rotated through the four scenario stations after a 2-hour lecture over arrhythmia recognition and response. Prior to beginning the timed events, students were briefed on the experience and signed consent for evaluation completion and photographing. Flow sheets and time schedules for the scenarios were provided to students at this time (Childs & Sepples, 2006).
The Educational Practice Scale for Simulation (EPSS), a 16-item Likert scale instrument measuring four educational practices (active learning, collaboration, diverse learning strategies, and high expectations) and the Simulation Design Scale (SDS), a 20-item scale designed to evaluate five simulation features (objectives, support, problem-solving, feedback, and fidelity) were found to be reliable and valid. Both tools were used during this study and in the cumulative NLN/Laerdal longitudinal study, which began in 2005. A 13-item survey scale designed to allow students to rate level of confidence gained during the experience, usefulness of the experience, and feelings regarding the simulation teaching method was also administered post-simulation experience (Childs & Sepples, 2006).

The students reported an overall positive experience but found the mock code scenario to be quite stressful. In spite of this, students felt that the learning experience afforded an increased confidence level in the clinical setting because of a greater understanding of the activities occurring during code situations (Childs & Sepples, 2006).

Students reported drawbacks of feeling pressed for time and noted that mannequin voice recordings and gender did not always coincide, but felt that the learning experience was extremely worthwhile and valuable. Many students stated that the simulation exercise taught more than any other learning opportunity presented in the nursing program (Childs & Sepples, 2006).

The authors concluded that the development and implementation of simulation experience, although time and energy consuming for staff, is beneficial for student learning and course outcomes. Interactive simulation scenarios are valuable tools for the
acquisition of psychomotor and clinical decision-making skills, and as an aid to increase confidence levels in practice (Childs & Sepples, 2006).

Simulation experience offers nursing students the opportunities for learning that are often not supplied in the clinical setting. Human Patient Simulator (HPS) use has been employed in the past to teach patient safety, clinical judgment and psychomotor skills, augment learning and enhance decision-making skills. Although the last 15 years of HPS use in nursing schools has provided nurse educators with a vast amount of knowledge regarding its applicability into nursing curriculum, the full scope of HPS use has yet to be discovered. One study conducted by Parr and Sweeney (2006) sought to evaluate student perceptions regarding the use of HPS in the development of patient care and clinical decision-making skills.

Twenty-one final semester baccalaureate nursing students attending San Diego State University’s School of Nursing participated in the qualitative study. All the students were enrolled in a critical care nursing course with clinical placement in an adult intensive care unit. Students were placed into groups of 5 for the HPS exercise and 2 critical care faculty members facilitated the simulation experience (Parr & Sweeney, 2006).

Post-simulation evaluation surveys were completed by 17 (81%) student participants. The tool utilized was a 6-item Likert scale survey that included one open-ended suggestion item. The instrument was designed to obtain student perceptions regarding the value of the transferability, time spent, continuation of development of skills, challenge to decision-making skills, ability to critically think, and continued use
for future curriculum. Reliability and validity were not reported on by the authors (Parr et al., 2006).

Students reported the HPS experience challenged thinking and decision-making most often (mean=4.29) and would recommend the course for future students (mean=4.24). Areas of lowest mean scores reflected the students perceived the value of HPS to test decision-making skill (mean=3.88), development of learned patient care skills (mean=3.71), and transferability of the HPS experience into real practice (mean=3.41) (Parr & Sweeney, 2006).

Eight students (47%) offered open-ended comments. Written comments were similar to verbal comments from students during the HPS exercise and centered on themes related to unclear guidelines and faculty expectations of student performance. Students (n=4) related a great experience overall but reported a need for at least a brief orientation to the simulation lab (n=4) and more time in instruction on medication preparation before beginning simulation (n=4). Reports of ill preparedness for the simulation experience were provided (n=2) as were a need for scenario improvements (n=1), simulations of less complexity (n=1), and more guidance and feedback from faculty during the simulation experience (n=1). Student suggestions were also made for a white laboratory board to be incorporated into the exercise allowing students to share pertinent patient information with others (n=1) (Parr & Sweeney, 2006).

The authors agreed that HPS use cannot replace clinical experience but can provide students with realistic opportunities to practice safely. Parr and Sweeney (2006) advocated for nursing education’s continuing effort to integrate HPS use into critical care
nursing course curriculum and the development of more complex scenarios by which to evaluate the achievement of student skills and learning outcomes.

Value of Simulation Experience

The use of simulation experience has grown considerably in nursing education. The need to provide a safe environment in which students can practice clinical decision-making skills prior to the application of those skills in the institutional setting is paramount. Feingold, Calaluce, and Kallen (2004) evaluated nursing students’ and faculty perceptions of the value of the simulation experience.

The sample was comprised of baccalaureate nursing students in the senior year course rotation of Advanced Acute Care of the Adult. The faculty in the sample consisted of four Acute Care of the Adult instructors. Faculty presented two standardized patient scenarios with SimMan in the Patient Care Learning Center (PCLC). The study took place over a two-semester period. Twenty-eight of 50 (56%) students participated in the fall semester surveys (Group 1) and 37 (78%) completed the spring semester surveys (Group 2). Researchers assessed the students at both the beginning and the end of each semester, using only minimally differing scenarios with SimMan. Students were graded both times from a checklist involving critical behavior and clinical decision-making skills. The two groups of students were similar (Feingold et al., 2004).

The instrument utilized in both semesters was a 20 item survey tool using a 4-point Likert scale format to obtain student agreement to each item (4=strongly agree to 1=strongly disagree). From the 20 items, three areas of evaluation were recognized: realism of the simulation, transferability of the skills learned by simulation into clinical practice, and value of the learning experience. Researchers also found that demographic
variables such as age, gender, and ethnicity were insignificant between the participants of Group 1 and Group 2 therefore the study combined findings for both the groups (Feingold et al., 2004).

The four faculty members were surveyed about faculty support and training using the same 4-point Likert scale format on a 17-item instrument. In addition to the areas of realism, transferability, and value, faculty were surveyed on items related to faculty support and training regarding the use of simulation technology. Feingold et al. (2004) reported reliability and validity of the survey tool was established by previous work.

Findings from the student’s value survey revealed the majority of students believed that SimMan provided a realistic simulation. Student survey results were categorized into 3 subscales of value (mean = 3.04), transferability (mean = 2.52), and realism (mean = 2.83). Regarding the question of transferability, less than half (46.9%) of the students believed the simulation experience prepared students to better assimilate into the clinical setting in the areas of confidence, competency, and performance of skills.

More than two-thirds of the students in the study perceived the simulation experience to be of value in its ability to recreate real-life situations (64.1%) while a majority (87.7%) agreed that the experience was an adequate test of clinical decision making skills (Feingold et al., 2004).

Findings from the faculty survey revealed faculty was confident that what was learned by SimMan could be transferred into the clinical setting. There was agreement among faculty (100%) regarding the realism of the pace and flow of the simulation experience and the value of simulation experience as an effective tool to teach clinical skills (Feingold et al., 2004).
Feingold et al. (2004) concluded that the use of Human Patient Simulation in the baccalaureate nursing education setting holds value for both students and faculty. Simulation experiences can be realistic and a good test of clinical decision-making skills.

Qualitative research regarding baccalaureate nursing students’ perceptions of HPS is sparse due to the novelty and availability of this technology. Historically, HPS use has been confined to the arenas of anesthesiology and graduate level use. Nehring and Lashley (2004) conducted an international survey to explore the quantity and quality of HPS use and student opinions regarding its use. The study also sought to examine other uses for HPS technology.

Surveys were mailed in January 2002 to 66 nursing programs and 150 simulation centers, hospitals and other higher education institutions with nursing programs. Thirty-three schools of nursing in the United States and one in Japan responded along with six simulation centers located in Australia, England, Texas, New Zealand, and Germany. Nursing schools (82%) were public institutions with 12 schools offering baccalaureate and graduate degrees and eleven offering associate degrees only. Participants were given 2 months to complete the survey and completion implied consent to participate (Nehring & Lashley, 2004).

The authors designed an instrument that consisted of a 37-item closed and open-ended survey. Validity was attained by comparing items with current literature on HPS and a review of items by advanced practice area nursing personnel skilled and knowledgeable in the use of HPS. Reliability was not addressed (Nehring & Lashley, 2004).
The survey had seven questions regarding demographic information. The remaining survey items covered topics of nursing courses using HPS, percentage of faculty working with HPS, competency evaluations, continuing education, student opinions, and other uses for HPS (Nehring & Lashley, 2004).

Findings revealed that community colleges used HPS the most hours overall especially in advanced medical-surgical courses. In the university setting HPS was used to enhance basic skills courses. However, 6 out of 18 graduate programs reported using HPS in their physical assessment and nurse anesthesia specialization courses (Nehring & Lashley, 2004).

Almost 94% of the schools had 25% or less of faculty members using HPS as a teaching tool and ninety-four percent reported no compensation for staffing the lab. Nearly 20% of all respondents conveyed feelings of personal satisfaction with learning about and using the HPS as a teaching instrument (Nehring & Lashley, 2004).

Researchers examined receptivity to the use of HPS, and approximately 50% of respondents reported positive feelings among staff related to this issue. Only three schools indicated negative feelings to receptivity. Issues related to fear of new technology, nursing student education level not being high enough for HPS use, limited amount of students being able to use HPS simultaneously, and student and faculty time involvement necessary to learn the technology being extensive were cited (Nehring & Lashley, 2004).

Findings from competency evaluation revealed that 21 schools provided student opinions through course evaluations, surveys, and verbal reports. Thirteen respondents believed HPS should be used to evaluate competencies in undergraduate programs, and
seven stated it should not be used as an evaluation tool. Respondents provided positive comments regarding HPS usefulness in the development of critical thinking skill, their transition into clinical practice, theory application, and safety and comfort issues (Nehring & Lashley, 2004).

Prior to this survey, three universities conducted HPS research. Areas under investigation included knowledge and retention with HPS use, reliability and validity of scenarios, and exam score comparison studies for anesthesia students (Nehring et al., 2004).

Nehring and Lashley (2004) concluded that HPS was used most often by faculty in community college settings, however, university based programs are aiming HPS use towards a higher level of skills achievement among their student body.

Patient acuity levels and the need to maintain patient safety quite often limit the role of the nursing student. Due to this fact, students often find themselves in an observational rather than a ‘hands-on’ role; the former requiring minimal, if any, decision making involvement. MacDowall (2006) conducted a study to assess the perceived levels of confidence and competence of undergraduate students following training on a simulator.

Twenty-three final year medical students studying in an U.K. hospital undergraduate program participated in the 3-session study. Laerdal SimMan patient simulator was set up on a standard hospital bed in a training room equipped with monitor, crash trolley, oxygen, and miscellaneous supplies found on the hospitals’ ward units. The author (MacDowall, 2006) created three different scenarios in which SimMan could be physiologically programmed and altered by either keyboard or remote.
A 12 item 5-point Likert scale (1=strongly disagree to 5=strongly agree) questionnaire was administered to students before and after the simulation experience. The questionnaire labeled “Student Assessment of Confidence or Ability Before and After SimMan Training” was designed to elicit quantitative information only. A second questionnaire with the same 5-point Likert scale, designed to elicit qualitative feedback regarding length and number of sessions, enjoyment of sessions, and worth of simulation experience for future students, was administered at the end of the final session (MacDowall, 2006).

Students (n=23) completed the pre- and post-session quantitative survey and paired data from each of the twelve items was analyzed using the Wilcoxon signed rank test. Post-session questionnaire findings revealed that students perceived an increased confidence or ability to: immediately assess (mean=4.17), commence with the right treatment (mean=4.22), understand the monitoring method (mean=4.57), administer oxygen correctly (mean=4.48), start an IV fluid correctly (mean=4.00), order appropriate investigations (mean=4.09), interpret lab/observation data (mean=4.09), prescribe drugs/infusions safely (mean=3.70), document actions (mean=4.13), communicate as a team member (mean=4.35), and possess knowledge and skills needed for becoming House Officer (mean=3.83). However, student’s reported a decreased perception from pre-session (mean=4.22) to post-session (mean=3.30) questionnaire results regarding concern in doing the wrong thing (MacDowall, 2006).

Qualitative results provided strong agreement regarding the length of sessions (91.3%), enjoyment in taking part in the sessions (82.6%), continuation of the use of SimMan in fifth-year teaching programme (91.3%), and increased confidence for
becoming a house officer (82.6%). The majority of students felt that the time involvement was worthwhile (91.3%) (MacDowall, 2006).

The findings from MacDowall’s (2006) study clearly revealed a perceived increase in confidence and ability among undergraduate students in areas essential for success after simulation exercise. This study further demonstrated the benefits to assessment skills acquisition, collaboration, and teamwork among students following a clearly outlined and structured learning experience. The author concluded that this study supported incorporation of simulation experience as an integral part of undergraduate curriculum.

Simulation experience has been shown to be an acceptable means by which students gain confidence and affords a safe environment for application of learned principles into practice. Collaboration and teamwork are vital components necessary for students to possess in order to function safely, responsibly, and accountably as healthcare professionals. Wallin, Muerling, Hedman, Hedegard, and Fellander-Tsai (2007) conducted a prospective study, based on cognitive psychology that examined the effect HPS training exerted on team attitude and behavior. The authors utilized the crew resource management (CRM) team coordinating training programme, whose basic principles are based on behaviors that are identifiable, teachable, and applicable to high acuity environments.

Only in the past two decades has CRM training been designed and implemented for the healthcare profession. Until recently, CRM training was used extensively in aviation, nuclear power plants, and offshore industries. Wallin et al. (2007) cited the 1990’s development of teamwork training for the medical industry, introducing crisis
management training in the anaesthesiology field. This development work was a key component of the research.

Fifteen medical students, 7 males and 8 females, participated in the 5-day study. All subjects were between the ages of 21.8 to 25.3 years. All had recently learned to elicit a medical history and perform a complete physical evaluation but lacked basic surgical, trauma, and orthopedic knowledge. Henceforth, 2 didactic lectures in trauma care, surgical, and orthopedic trauma preceded student participation in the study (Wallin et al., 2007).

Students were familiarized before the study with the simulation room, which was equipped as an emergency unit, the medical equipment, and the human patient simulator. Eight trauma scenarios were constructed based on commonality of injuries, urgency and acuity, and need for prompt decision-making and treatment. Four trainers were available to assist five students through each of the eight scenarios. Performance evaluation, in-scenario and post-scenario feedback, and video recording were also available to students from trainers (Wallin et al., 2007).

Behavioral performance was obtained via videotaping and analysis was performed by 3 trained observers: an anesthesiologist and 2 research psychologists. The instrument, the Emergency Medicine Crisis Resource Management (EMCRM) survey, measured 10 behavioral items and one team leadership skills item on a 5-point Likert scale (1=not acceptable to 5=excellent) (Wallin et al., 2007).

Team attitudes were measured using the short version of the Operating Team Resource Management Survey (OTRMS) which utilizes a 5-point scale ranging from ‘disagree strongly’ to ‘agree strongly’. Pre- and post-training data were compared using a
Wilcoxon signed-ranks test of difference. The probability was <0.05 and considered statistically significant (Wallin et al., 2007).

The results were categorized by ‘participant reactions’, ‘behavior’, and ‘attitudes’. The majority of ‘participants reactions’ responses (n=14) reported the experience to be very realistic and recommended the course to other students (Wallin et al., 2007).

Behavioral results reported perceived student improvement throughout all 11 items from pre- to post-survey. Areas of lowest mean inter-rater reliability included knowledge of the environment (0.60), anticipation of and planning for potential problems (0.60), and utilization of resources (0.60). Areas of high mean inter-rater reliability included ‘communication with other team members’ (0.76) and ‘recognition of limitations/call for help early enough’ (0.78) (Wallin et al., 2007).

Results related to attitudes produced an overwhelming difference between pre- and post-training item ‘there are no circumstances where a junior team member should assume control of patient management’ (P=0.025). All participants (n=15) strongly agreed with this statement post-simulation experience. The findings demonstrated that the participants improved teamwork skills and were able to apply a standardized procedure as a team effort into practice post-simulation experience (Wallin et al., 2007).

Findings from this study supported a highly structured simulation experience. Wallin et al. (2007) provided evidence that the use of dynamic teaching strategies employing HPS exercises and training methodologies improved student team member behavioral skills and attitudes in the high acuity environment.

Methods to develop knowledge, technical skills, and sound clinical decision making in nursing students have been sought by nursing educators for many years.
Clinical experiences alone cannot afford students the safe, confident, and effective learning environment needed. Recently simulation experience has stepped into center arena to help address all three educational issues faced by students and educators. Long (2005) conducted a simulation exercise study designed to explore the experiences of nursing students and ancillary healthcare professionals. The author applied Benner’s (1984) Novice to Expert Theory principles as the theoretical background for this study.

In 2004, thirty-six San Diego State University sophomore-nursing students enrolled in a medical surgical course rotation participated in the study. Students were placed into groups of 8 to 10 and were provided a clinical worksheet with information regarding the patient’s status. Simulation sessions were 4 hours in length and individual students assumed the role of primary care giver during each 20-minute scenario.

The instrument designed to elicit feedback from the students regarding the enhancement of learning and relevancy of the simulation to current course curriculum was a 3 question survey using a 1 (not at all) to 10 (maximum possible) scale. Verbal feedback and comments were also recorded for further analysis (Long, 2005).

Findings from the study revealed overall satisfaction among students regarding the simulation experience. Students (n=36) reported a belief that the experience enhanced learning about the primary patient (9.5), enhanced learning regarding other students’ patients (9.3), and perceived the experience to be relevant for the current course (9.6) (Long, 2005).

Students reported both positive and negative open comments as well. Positive comments included learning from others by watching, realism of the experience, ease of transferability of skills practiced into the clinical setting, bringing the ‘big picture’
together, and the learning of vast amounts of material in only one day’s experience (Long, 2005).

Negative comments elicited from students included the feeling of not learning other patients as well as one’s own, length of the total session being too long, and slow student reaction times at the beginning of the experience. Other comments recorded included the need for the provision of more in-depth patient information for better student preparation, and scenarios being a little confusing because the student could not remember the pathophysiology of the diseases presented. Long (2005) noted in the findings that much of the literature on simulation experience with nursing students emphasizes the necessity of maintaining a life-like scenario. This proved helpful during this study but faculty pauses during scenarios to assist and teach were also considered by faculty to be beneficial to student learning outcomes.

Despite the abundance of current literature regarding best practices for simulation experience, continued exploration for best practices must be performed. The author concluded that simulation programs can play an integral part in promoting patient safety while providing a safe environment for students to practice and gain confidence in both psychomotor and clinical decision-making skills (Long, 2005).

The preparation of nursing students capable of practicing competently in an ever-changing healthcare environment is an issue of tremendous importance for nursing educators. The use of simulation in nursing curriculum may present a viable option that assists educators in the quest to supply a safe environment for students to learn and incorporate sound clinical decision-making skills into practice. Schoening, Sittner, and Todd (2006) examined students’ perceptions of a pre-term labor simulated clinical
experience (SCE) as a method of instruction, emphasizing the importance of the educators’ role in promoting positive student outcomes.

The framework utilized in Schoening et al.’s (2006) study reflected cognitive learning theory and was based on the findings from a similar study conducted by Feingold et al. (2004). According to Schoening et al.’s (2006) review of the literature, students demonstrated an increase in self-efficacy after completing simulated experience. A convenience sample of 60 baccalaureate-nursing students during spring semester comprised the study population. All students were in the second semester of the junior level. The majority (n=59) were female with an average age of 22 years (Schoening et al., 2006).

A non-experimental pilot evaluation study was designed to identify and refine simulated learning activities, learning outcomes, and student perceptions of the experience. Faculty developed a preterm labor SCE with students participating during the last 2 weeks of a 4-area rotation. Each rotation lasted 3 weeks and clinical groups consisted of 7 to 8 students. Areas of rotation included medical/surgical, psychiatric, high-risk obstetrics/community, and pediatrics (Schoening et al., 2006).

A 4-phase SCE model was utilized consisting of: phase 1 (orientation), phase 2 (participant training), phase 3 (simulation), and phase 4 (participant debriefing). Upon completion of phase 4, students completed a 4-point Likert scale (1=strongly disagree to 4=strongly agree) 10 item evaluation designed to elicit student responses regarding achievement of learning objectives. The authors developed the evaluation tool and validity of the categories was reviewed by 2 doctoral prepared nurse educator faculty members with expertise in qualitative research. Questions related to student perceptions
regarding increased confidence in the clinical setting, skills improvement, and increased knowledge levels were also provided. Students were invited to write narrative comments and several students provided feedback from weekly journal entries (Schoening et al., 2006).

Content analysis procedures were used to analyze obtained data. Categorical grouping of similar concepts was performed after completion of a line-by-line entry analysis. Quantitative data indicated students' perceived SCE to be an effective means of meeting course objectives and increased confidence in the clinical setting (mean=3.64). Students also reported an increase in skills improvement (mean=3.80) and use of critical thinking skills (mean=3.68) post SCE (Schoening et al., 2006).

Qualitative data received from student narratives and reflective journals revealed many positive themes related to technical skills enhancement, increased critical thinking ability, and clinical decision-making skills. Students also reported an increased ability to collaborate and communicate (Schoening et al., 2006).

The authors concluded that the data collected from this study implied that simulation experience might better prepare graduate nursing students for the real clinical environment, further reinforcing the earlier work of Feingold, Calaluce, and Kallen (2004). In addition, suggestions for future research designed to measure knowledge outcomes, increased self-efficacy, skills mastery, and transferability of acquired skills and knowledge using reliable and valid tools were made by the authors (Schoening et al., 2006).
Summary

Recent changes in healthcare delivery are centered on cost containment and patient safety. Increased patient acuity levels and decreased clinical site availability for student learning are merely two major forces influencing the need for nursing educators to forge a new frontier that emphasizes innovative methods of instruction. The use of Human Patient Simulation experience can support nurse educators in the quest to facilitate clinical decision-making skills in undergraduate nursing students while providing an effective learning modality and a safe practice environment (Schoening et al., 2006; Bremner et al., 2005).

In an effort to explain how undergraduate nursing students acquire knowledge, research studies applying Knowles (1990) Adult Cognitive Learning Theory as a framework have been conducted. Knowles (1990) major assumption that the adult learner is pro-active in and responsible for one’s own knowledge acquisition has been successfully applied to the acquisition and development of clinical skills in nursing students (Feingold et al., 2004). According to Knowles (1990), educators have a responsibility to guide the student and must maintain control of the educational processes throughout the learning experience. However, as adult learners, nursing students cannot depend solely on educators to supply the information and skills necessary for professional success, but must take an active lead in becoming the professional.

Research literature shows that the use of HPS as a teaching tool in terms of its realism is important to nursing education (Feingold et al., 2004; Nehring & Lashley, 2004). For students however, the realism of the simulation experience holds tremendous value towards enhancing clinical practice skills (Bremner et al., 2006; Rhodes & Curran,
The technology presents realistic and interactive patient care scenarios, providing an excellent environment to educate and improve nursing student technical skills, knowledge base, and clinical decision-making behaviors (Bremner et al., 2005).

Simulation experience has been utilized in nursing education for many years to assist with the augmentation of student knowledge acquisition and transferability of skills into the actual clinical setting. Clinical opportunities and patient availability is limited and simulation has been thought to benefit the teaching and learning of clinical skills in nursing students. The data obtained from Wilson et al.’s (2004) study suggest simulation experiences provide nursing students with the opportunity to learn new techniques and reinforce existing knowledge and skills in a controlled, safe environment. High energy, interactive scenarios are valuable experiences for developing technical skills and clinical decision-making by students (Childs & Sepples, 2006). Although simulation will never completely replace human patient interaction, it can provide students a realistic opportunity to practice the safe acquisition of patient care skills and promote the transferability of those skills towards real clinical interactions (Parr & Sweeney, 2006).

Simulation based teaching has proved valuable as an addition to undergraduate curriculum and has been highly rated by students (MacDowall, 2006; Wallin et al., 2007; Long, 2005). Student’s value the ability to ‘put the big picture together’ post simulation experience (Schoening et al., 2006). Nevertheless, research conducted to elicit the perceptions among students and faculty regarding the value of simulation experience has provided differing opinions. Feingold et al.’s (2004) study found the majority of students and faculty identified mannequin simulation exercises to be realistic and valuable. However, only half of the student participants believed the skills learned from simulation
experience would transfer into the clinical setting, compared to 100% of faculty. These findings reinforce an overwhelming necessity for further research to be conducted in the area of simulation use in schools of nursing.

Bremner et al. (2006) identified major limitations to the use of HPS including the complexity and time requirements for setup and learning, lack of incentives for faculty to learn the technology and develop scenarios, and the initial cost involvement for purchasing the technology. Drawbacks to the use of HPS in regards to initial attainment cost may limit its availability to many institutions. The number of students able to interact at one time with HPS is limiting as well (Rhodes & Curran, 2005). However, a possible solution may be on the horizon. With the National League for Nursing’s current statement (March 5, 2007) regarding the use of HPS in our nursing schools as a viable solution to healthcare cost containment and the decreasing number of clinical teaching sites available, government subsidies may become increasingly available to assist nursing schools to absorb the cost of Human Patient Simulator acquisition and setup.
Chapter III
Methods and Procedures

Introduction

For centuries, in many disciplines, simulation learning has been used as a teaching and learning tactic. Role play is one simulation technique that provides students a risk-free and low stress environment in which to acquire and develop decision-making skills. Human Patient Simulation (HPS), a more recent form of simulation teaching, is another new face on the educational scene that can assist students in the development of critical thinking, professional values, and learning outcomes. HPS use is increasing in nursing schools because not only are there not enough clinical experiences available for students but patient acuity levels have increased. It is important for students to practice clinical decision-making before performing skills on patients (Feingold et al., 2004; Nehring & Lashley, 2004). This chapter details the methodology and procedures to be used in this replica study.

Purpose

The purpose of this study is to describe perceptions of students and faculty about the realism of the type of experience, to determine if knowledge gained in lab simulations can be transferred to the clinical setting, and to determine the value of the learning experience. This study is a partial replication of Feingold, Calalupe, and Kallen (2004) study.
Research Questions

4. What are the students’ and faculty members’ perceptions of patient scenario realism?

5. Can students transfer knowledge from lab scenarios to real clinical experience?

6. What is the value of the learning experience?

Population, Sample and Setting

This study will be conducted at a large state university in the Midwest. The university is located in a moderately sized town with clinical access to a nearby teaching hospital and several other non-teaching institutions. Student to faculty ratio in the undergraduate nursing program is approximately 10:1. The chosen population will be undergraduate baccalaureate nursing students attending the university during the fall semester of the senior year. The sample will include all senior nursing students enrolled in the spring rotation of a 16-week Adult Health 3 course. The anticipated sample will include approximately 24 senior baccalaureate-nursing students and three full-time tenure faculty facilitating the course. The student must be senior level and enrolled in the elective advanced critical care course. Participant accumulative GPA must be 3.2 or higher for enrollment consideration into the advanced critical care course elective. All participants must be able to read and write English and hold a current certification in Basic Life Support. All students will be enrolled and have placement in the parallel clinical course for Adult Health 3. All students will complete the simulation experience as part of their course requirements thereby ensuring a 100% participation rate. Faculty criteria include faculty members currently instructing the advanced critical care course
and must have at least three years prior experience with the use of a high-fidelity human patient simulator.

Protection of Human Subjects

All documents included in this study will be submitted to the Institutional Review Board at Ball State University for approval before proceeding with this study. Permission for use of the satisfaction survey tool and faculty resource tool will be obtained from the developing authors prior to beginning. Students will be informed that participation in the study is voluntary and there is no inherent risk from either participating or not participating. Student responses to the survey questionnaire will convey consent to participate in this study. Students and faculty will be asked to respond anonymously by withholding names on the survey questionnaires. Participating faculty will provide consent upon completion of a faculty survey tool. No subjects will receive compensation for participation.

Procedures

After approval from the Institutional Review Board, approval of the research project shall be obtained from the Vice President of Nursing Services at Ball Memorial Hospital. The nursing manager of the Intensive Care Unit will be notified and provided an explanation, plan, and research study dates and times. All written documents used in the study will also be provided.

The simulation will take place during the sixth week of the clinical lab experience in the hospital critical care unit setting where the students are currently practicing. The setting, chosen for student comfort level to assist in reducing anxiety produced by changes in environment of practice, will be in an examination room adjacent to the
critical care unit. Simulation will be designed to allow each student a 2-hour hands-on scenario of a patient suffering cardiogenic shock.

Students will be grouped in teams of four, one student in the team leader role, handling patient vital signs and making decisions regarding patient care and the other students acting as team member, providing medications, oxygenation, CPR, defibrillation, etc. Simulation experiences will be conducted for each student team on two consecutive days during actual clinical time. Each student will be provided time to act in team leader role.

Upon completion of the clinical course rotation, faculty members will distribute student questionnaires and collect data during the one-hour post-conference. Students will fill out a 20-item questionnaire regarding the students’ perception of the realism of the HPS experience, transferability of simulated skills, and the value of the experience obtained during the remaining 12-weeks of real clinical practice. A 5-point Likert scale approach will be chosen for cost-effectiveness and universal ease of understanding and use. Student responses will be recorded on Scantron sheets and results will be categorized according to themes by faculty conducting the project.

After student completion of questionnaires, faculty will complete a 17-item Likert scale design survey tool related to HPS experience resource issues. The authors have developed the faculty survey tool.

**Instrumentation**

Student satisfaction survey items will be drafted from Halamek, Kaegi, Gaba, Sowb, Smith, Smith, and Howard (2000) The Simulated Delivery room Training Program Evaluation, the tool cited and used by Feingold et al. (2004). This instrument was
designed by Halamek et al. (2000) to elicit students’ perceptions of simulation experience in the areas of simulation realism, adequacy of program and resources, and value of the training experience. Six areas regarding simulation experience are addressed in Halamek et al.'s (2000) instrument and include introductory materials, physical space, faculty, equipment, scenario, and other issues. Four open-ended questions are also included: What part(s) of the course do you like best, what part(s) of the course do you like least, what could make the course better, and other comments. Halamek et al. (2000) developed the simulation training program designed to mimic the Crew Resource Management (CRM) programs that were already in practice in the field of aerospace. These programs were developed to teach appropriate mechanical interventions in crisis situations and manage collective resources (teamwork) in the process. Halamek et al. (2000) borrowed from the Anesthesia Crisis Resource Management (1990) model that stemmed directly from the aviation CRM model and developed a similar model applicable to neonatal and pediatric resuscitation. However, unlike the field of anesthesia, pediatric patients are often awake and alert and lack the close proximity of monitoring devices. Pediatricians must use close observation and subtle changes as monitoring tools for life-threatening changes. Prompt feedback from colleagues is essential for pediatricians, and because of this, Halamek et al. (2000) designed pediatric simulation scenarios to assist in the training of personnel that applied the principles of the CRM model.

Faculty survey instrument will be a 17-item tool, drafted by Feingold et al. (2004), and designed to elicit faculty feedback regarding support and training issues related to the use of HPS. Perceptions related to student transferability of skills learned, realism of the simulation experience, and value of the simulation experience will be
examined. Faculty support, preparation, orientation, and environmental issues are also addressed on the author developed instrument (Feingold et al., 2004).

Both student and faculty instruments will utilize a 4-point Likert scale to measure the perceived realism, transferability, and value of HPS use. Responses are based on a 1 to 4 response scale with 1 indicating complete disagreement and 4 indicating complete agreement with the item statement. All responses will be recorded and calculated using a Scantron method.

The student satisfaction survey used in this study is a 20-item instrument designed by Halamek et al. (2000) to elicit student perceptions related to the realism of the simulation experience, the transferability of skills learned in simulation to real clinical situations, and the value of the learning experience. Three survey subscales have been created to condense student opinions: Realism (4 survey items), transfer (3 survey items), and value (6 survey items). Seven remaining items will be used to elicit perceptions regarding pace, flow, preparation, physical environment, orientation, decision-making value, and skills value. Faculty survey, designed by Feingold et al. (2004), is a 17-item tool designed to elicit information about faculty perceptions regarding the aforementioned subscales; realism, transferability of skills, and value. Faculty beliefs regarding pace, flow, environment, preparation, and support are also examined.

Reliability and Validity

Feingold, Calaluze, and Kallen (2004) report validity and reliability of the student instrument used as having been reviewed and cited in the literature of Halamek et al. (2000). Halamek et al.’s (2000) Simulated Delivery Room Training Program Survey was developed by the authors for use in a pediatric simulation experience study. Although
validity and reliability are not discussed in depth by the originating authors in the
reported study proceedings, the study and all related documentation was approved by the
Panel on Nonmedical Human Subjects of the Institutional Review Board of Stanford
University. The work of Halamek et al. (2000) was supported by the neonatal
Resuscitation Program of the American Academy of Pediatrics and the Children’s Health
Research Fund. Reliability and validity of the faculty survey tool are not reported.

Research Design

This study will employ a descriptive design research method to explore nursing
student and faculty opinions regarding the realism, transferability of skills, and value of
simulation exercise. Descriptive methodology is used in research when little is known
about a phenomenon. By using a descriptive research design, the researcher attempts to
gain new and valuable information about a subject. From this information, the researcher
develops relationships that will assist in the growth of new theories for further testing.
Methods for gathering information in descriptive research include direct observation,
questionnaires, scales, and physiological measurements (Burns & Grove, 2005 p. 26).

Data Analysis

Student participant statistics will be examined for demographic differences of
gender, age, and ethnicity using Chi square tests for differences prior to data analysis.
Initial analysis of survey data will be completed using descriptive statistics (mean,
standard deviation, and frequency) for the development of survey tool subscales. Student
GPA and subscale responses were additionally examined using two-tailed, independent
t-test to determine the existence of statistical differences (Feingold et al., 2004). T-tests
for independent samples use standard deviation to estimate standard error and are very
useful with small samples (Burns & Grove, 2005 p. 527). ANOVA tests for differences between means were also performed to determine statistical differences between age and subscale independent variables of realism (F=.69), transferability (F=3.11), value (F=.18), and pace/flow (F=4.43). An alpha level of .05 was used for all statistical tests (Feingold et al., 2004).

Standard deviation testing for agreement with survey items showed the highest level of student agreement was associated with the Value subscale (mean=3.04) with the lowest level reported by students in the Transferability subscale (mean=2.52). Interestingly, while 83% of the student participants believed the simulation adequately tested clinical skills and clinical decision-making skills (87.7%), only 46.9% perceived the simulation experience improved clinical competence and only 54.7% believed the experience prepared them for the clinical environment. Faculty survey items, reported only in percentage of collective agreement, provided a greatly different perceived satisfaction rating than student reports. While 100% of faculty perceived the skills learned by students from simulation experience would transfer into the clinical setting, little more than half of the student participants (54.7%) believed the learning experience would transfer (Feingold et al., 2004).

**Summary**

Simulation experience, particularly HPS use, is becoming increasingly popular as an instructional modality in undergraduate nursing curriculum. Although simulation experience will never replace clinical experience, evaluating its value as an educational tool is extremely important for both students and faculty. This study has been designed to examine the perceptions of students and faculty regarding the realism, transferability, and
value of HPS exercises. Approval for this study will be obtained from the IRB’s of Ball State University and Ball Memorial Hospital along with the Vice President of Nursing Services and the Clinical Nurse Manager of the Intensive Care Unit at Ball Memorial Hospital. The targeted population for this study will consist of 24 senior level baccalaureate-nursing students with a foreseen 100% mandatory participation rate.

Students will be briefed during an orientation to SimMan and will proceed through a faculty developed scenario relating to advanced care of the stable and unstable patient. Student survey instruments will be completed at the end of the clinical rotation. Three faculty for BSU will also complete a separate faculty survey tool upon completion of the course. A descriptive study design will be employed by the researcher using descriptive statistical testing for subscale development and Chi square testing to uncover deviations among student participants related to age, gender, and ethnicity.

Theoretically, all nursing students should be able to use the simulation experience to enhance the transfer of clinical decision-making skills into clinical practice. This study will provide beneficial information related to student and faculty perceptions regarding the realism, transferability, and value of HPS use in baccalaureate nursing educational curriculum. Information and suggestions for future uses of HPS in nursing educational programs will also be obtained. Information obtained from the analysis of this study regarding results and recommendations will be presented in written document form and submitted to The Western Council of Higher Education for Nursing’s Communicating Nursing Research Findings.
References


<table>
<thead>
<tr>
<th>Source</th>
<th>Problem</th>
<th>Purpose/Research Questions</th>
<th>Framework or Concepts</th>
<th>Sample</th>
<th>Design</th>
<th>Instruments</th>
<th>Results</th>
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<tbody>
<tr>
<td>1. Bremner et al. (2006)</td>
<td>The evaluation for best practices regarding HPS use and enhancement of clinical decision-making skills has yet to be determined. Evaluating student perceptions regarding the realism of HPS use may help prepare students for first clinical experiences.</td>
<td>Evaluate the value of using HPS technology as an educational methodology from the perspective of novice nursing students.</td>
<td>Van der Vleuten and Newble: Expert Reasoning</td>
<td>56 novice nursing students in a nursing course in a baccalaureate program performing a head-to-toe assessment using the HPS</td>
<td>Quantitative and qualitative analysis</td>
<td>Investigator designed Likert scale tool used to determine quantitative measurement of (a) overall perception of the experience, (b) opinions for incorporation of HPS into the curriculum on a mandatory basis, (c) confidence levels regarding physical assessment skills, (d) relief of stress levels after HPS experience (e) reduction in anxiety levels. Written form questionnaire to elicit student responses to simulation.</td>
<td>Quantitative data: Study documents the value of HPS in areas of teaching/learning, utility, realism, and confidence/comfort. Qualitative data: Students perceived the benefits of the educational methodology to their clinical practice and perceived the scenario as real.</td>
</tr>
<tr>
<td>2. Rhodes et al. (2005)</td>
<td>Educators are finding it difficult to prepare nursing students for more acute and ever-changing clinical environments.</td>
<td>Evaluate the improvement of critical thinking and clinical judgment skills of students post simulation experience.</td>
<td>Benner’s Novice to Expert Theory applying Dreyfus Model</td>
<td>21 senior level nursing students during an acute medical-surgical course rotation. Two faculty members from the course.</td>
<td>Qualitative pilot study</td>
<td>Post-simulation videotaping review/debriefing and 13-item faculty developed survey regarding student perceptions of the simulation experience.</td>
<td>Students perceived the experience to be positive and beneficial and employed critical thinking skills but found it difficult to treat the HPS as a real patient.</td>
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<tr>
<td>3. Beamson &amp; Wiker (2005)</td>
<td>Nursing students often do not</td>
<td>Examine the benefits and Cognitive learning.</td>
<td>Two groups of</td>
<td>Exploratory descriptive</td>
<td>Researcher generated three open-ended</td>
<td>Students reported an increase in confidence</td>
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</table>
understand that patients respond differently to medications and patient care regimens. That response is often not demonstrated effectively in the classroom setting. limitations with the use of an HPS as a patient substitute for an actual day experience. Three open-ended questions regarding: a) what the students had learned from the experience b) what the students needed to improve the experience c) recommendations for future HPS simulations.

<table>
<thead>
<tr>
<th>Study</th>
<th>Methodology</th>
<th>Instrument</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Wilson et al. (2004)</td>
<td>With an increased use of HPS in clinical education, evaluation of the product in terms of learning effectiveness is essential.</td>
<td>Reflective of Adult Cognitive Learning Theory.</td>
<td>The findings supported the expectation that nurses and nurse educators regard Nursing Anne Complete, a low-fidelity simulator, as realistic, suitable for educational purposes, and superior to existing training methods.</td>
</tr>
<tr>
<td>Childs &amp; Sepples (2006)</td>
<td>Nursing students are required to learn a number of skills.</td>
<td>Educational Practice Scale for Simulation (EPSS), a 16-item Likert scale instrument.</td>
<td>HPS is valuable tool for the acquisition of psychomotor and critical thinking ability, assessment, and recognition of abnormal findings along with an increase in knowledge, working as a team, and collaboration.</td>
</tr>
<tr>
<td>Study</td>
<td>Methodology</td>
<td>Findings</td>
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<tr>
<td>Psychomotor skills and incorporate these skills into critical thinking and clinical practice.</td>
<td>Satisfaction of a simulation experience</td>
<td>Theory. Students: a mix of traditional baccalaureate and second-degree optional. Students.</td>
<td></td>
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<tr>
<td>Likert scale instrument measuring active learning, collaboration, diverse learning strategies, and high expectations. Simulation Design Scale (SDS), a 20-item scale to evaluate five simulation features (objectives, support, problem-solving, feedback, and fidelity). A 13-item post-simulation survey scale designed by authors to rate student levels of confidence gained, usefulness of the experience, and feelings regarding the simulation teaching method.</td>
<td>Clinical decision-making skills, and as an aid to increase confidence levels in practice.</td>
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6. Parr & Sweeney (2006) The past 10 years have shown an increase in the use of HPS in nursing curriculum as educators look to HPS use to help provide valuable and transferable clinical experiences to students. Evaluate student perceptions regarding the use of HPS in the development of patient care and clinical decision-making skills. None specified 21 final semester baccalaureate nursing students attending San Diego State University’s School of Nursing and enrolled in a critical care nursing course with clinical placement in Qualitative Design A 6-item Likert scale survey with one open-ended suggestion item designed to obtain student perceptions regarding value of the transferability, time spent, continuation of development of skills, challenge to decision-making skills, and ability to critically think. HPS use cannot replace clinical experience but can provide students with realistic opportunities to practice safely. Authors advocate nursing education’s continuing effort to integrate HPS use into critical care nursing course curriculum and the development of more complex scenarios by which to evaluate the achievement of skills.
| 7. Feingold et al. (2004) | Due to recent trends in healthcare, i.e. cost-containment efforts in hospitals, too few clinical sites available, and increasing patient acuity levels, shifts in nursing education are essential for student learning outcomes. | Evaluate student and faculty perceptions regarding the use of HPS in terms of its realism, transferability of skills, and value. | Knowles Adult Cognitive Learning Theory (1990) | 28 fall semester and 37 spring semester baccalaureate students in a senior year course rotation of Advanced Acute Care of the Adult. Four faculty instructors facilitating the course. | Descriptive, exploratory, quantitative and qualitative design | Students: A 20-item 4 point Likert scale survey tool designed by authors. Faculty: A 17-item 4 point Likert scale satisfaction survey instrument designed by authors. | Students: Majority of students believed that SimMan provided a realistic simulation. 46.9% believed the experience prepared students to assimilate into the clinical setting in the areas of confidence, competency, and performance of skills. 64.1% perceived the simulation experience to be able to recreate real-life situations, and 87.7% agreed the experience was an adequate test of clinical decision making skills. Faculty: Faculty were confident that what was learned could be transferred into the clinical setting. 100% of faculty regarded the realism of the pace and flow of the simulation experience and the value of simulation experience as an effective tool to teach clinical skills. |

| 8. Nehring & Lashley (2004) | Historically, HPS use has been | Examine faculty uses for HPS | None specified | Thirty-three schools of International Qualitative | 37-item closed and open-ended survey | Site Uses: Community colleges used HPS the |
| 9. MacDowall (2006) | Patient acuity levels and the need to maintain patient safety quite often limit the role of the nursing student. Due to this fact, students often find themselves in an observational rather than a | Assess perceived competence and confidence levels in medical students following training on HPS. | Adult Cognitive Learning Theory | 23 final year medical students in an U.K. hospital undergraduates program participated in the 3-session study. | Quantitative and qualitative survey design | Pre- and Post Quantitative: A 12 item 5-point Likert scale questionnaire labeled “Student Assessment of Confidence or Ability Before and After SimMan Training”. Post Qualitative: A 5-point Likert scale survey, to elicit feedback regarding a perceived increase in confidence and ability among undergraduate students in areas essential for success after simulation. Demonstrated the benefits to assessment skills acquisition, collaboration, and teamwork among students following a clearly outlined and |
Collaboration and teamwork are vital components necessary for students to possess in order to function safely, responsibly, and accountably as healthcare professionals. Traditionally HPS has been used for teaching in aviation and the nuclear power industry and only recently has HPS use exploration begun in the field of medicine.

<table>
<thead>
<tr>
<th>Study (Year)</th>
<th>Design</th>
<th>Participants</th>
<th>Measures</th>
<th>Findings</th>
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<tbody>
<tr>
<td>Wallin et al. (2007)</td>
<td>Prospective, Quantitative/Qualitative</td>
<td>15 medical students, aged 21 to 25 years old, who had just learned how to elicit a full medical history and complete a full assessment.</td>
<td>Emergency Medicine Crisis Resource Management (EMCRM) survey which measured 10 behavioral items and one team leadership skills item on a 5-point Likert scale. Operating Team Resource Management Survey (OTRMS) which utilizes a 5-point scale. Videotaping with feedback.</td>
<td>9 of 10 observed team skills improved significantly in response to practice. No change in attitude toward safe teamwork was registered.</td>
</tr>
<tr>
<td>Long (2005)</td>
<td>Exploratory Qualitative Design</td>
<td>Benner’s Novice to Expert Theory 36 San Diego State University nursing students as part of a medical surgical course.</td>
<td>Author designed 3 question survey and tape recording of comments from students.</td>
<td>36 reported a belief that the experience enhanced learning about the primary patient, enhanced learning regarding other students’ patients, and perceived the experience to be relevant for the current course.</td>
</tr>
</tbody>
</table>
regarding student skills acquisition and perceptions of HPS use remains on the forefront.

| Schoening et al. (2006) | The need to increase student enrollments is evident however, qualified students are denied enrollment into nursing schools because of a lack of qualified instructors and lack of clinical sites. HPS use may assist in the partial alleviation of at least one of these factors. | Examine students’ perceptions of a simulated clinical experience as a method of instruction emphasizing the promotion of positive student outcomes. | Based on prior works of Feingold et al (2004) and Adult Cognitive Learning Theory…Self-Efficacy | A convenience sample of 60 baccalaureate nursing students during spring semester. All students were in the second semester of the junior level. 59 were female with an average age of 22 years. | A non-experimental pilot evaluation study. Quantitative Qualitative | Researcher designed 10-item 4 point Likert scale survey to evaluate outcomes fulfillment. Open-ended narrative section. Reflective journal submissions. | Quantitative data: Students’ perceived SCE to be an effective means of meeting course objectives and increased confidence in the clinical setting and an increase in skills improvement and use of critical thinking skills. Qualitative data: Revealed many positive themes related to technical skills enhancement, increased critical thinking ability, and clinical decision-making skills. Students also reported an increased ability to collaborate and communicate post SCE. |