ADVANTAGES OF CLINICAL SIMULATOR OVER TRADITIONAL EDUCATION METHODS ALONE

A RESEARCH PAPER

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BY

ALICE OSTENDORF
DR. NAGIA ALI – ADVISOR

BALL STATE UNIVERSITY

MUNCIE, INDIANA

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Chapter I
Introduction

As today’s nurses practice in a constantly changing healthcare environment in which patients have high acuity related to complex issues and needs, in combination with shorter lengths of stay and earlier discharges, nurse educators are challenged to adequately prepare undergraduate students to be clinically competent, safe and practice-ready at graduation (Rhodes & Curran, 2005). As technology advances and healthcare arenas become more sophisticated, so is there a growing expectation that nurses make sound clinical judgments, deliver high-quality care and be accountable for patient outcomes.

Multiple articles and studies in the nursing literature report an increased use of simulation in nursing education. Various benefits, challenges, and applications for simulation have been reported, along with outcomes achievement. Reilly and Spratt (2007) report student nurses value being able to practice safely in simulation sessions without having the burden of having to communicate with patients or families, as is expected in actual clinical settings. Students also report improved retention when doing nursing versus watching or reading about it. Educators use simulation to better prepare
student nurses for diverse, complex and challenging healthcare environments. Simulation use, in conjunction with traditional curriculum, is thought by many to best impart competency and practice readiness in nursing graduates. Regardless of the specific or desired outcome, the role of simulation has been, and remains, an important focus for improving nursing education.

The purpose in replicating Alinier, Hunt, Gordon and Harwoods’ study (2006) is to compare if scenario-based simulation training improves the quality of undergraduate nursing students’ learning specific to clinical skills, competence and perceived confidence. Differences in the control group, experiencing only traditional curriculum, will be compared to the experimental group, having simulation training in addition to traditional curriculum, in the Objective Structured Clinical Examination and Likert-type questionnaire before and after simulation training. Findings will help nurse educators identify whether scenario-based simulation training in nursing education improves clinical skills’ learning, students’ competence and perceived confidence.

**Background and Significance**

The history of simulation learning in healthcare dates back to 1911 when the first life-size mannequin, *Mrs. Chase*, was developed by the doll maker M.J. Chase Company and entered the classroom. This first mannequin was completed at the request of Lauder Sutherland, then principal of a hospital training school in Hartford, Connecticut (Hyland & Hawkins, 2009). Use of very simple mannequins like Mrs. Chase grew in popularity in nursing programs in the 1950s as a way to practice skills taught in the classroom.
Because early mannequins lacked detail and animation to make them at all life-like, they were primarily used only to introduce and practice psychomotor skills.

The use of simulation as a teaching model began in 1939, when simulators became part of required training in aviation for commercial and military pilots (Hyland & Hawkins, 2009). Simulation was mandated to allow pilots to safely gain experience managing dangerous circumstances or situations while in a controlled environment. The incorporation of simulation into teaching was a response to the public’s increasing concern for pilot errors. Similar to the purpose of simulation in nursing today, initial simulation models were developed to measure and improve competency and safety in an ever unpredictable and complex work environment.

Hyland and Hawkins (2009) describe high fidelity simulators as capable of closely reproducing both normal and abnormal human physiology in response to computer programmed commands. Sophisticated software programs and interfaces facilitate staging even the most complex patient condition and emergency scenario learning experiences. Functions and purpose of simulation include skills acquisition and practice, remediation, development of critical thinking, and evaluation. As technology becomes more sophisticated, teaching tools evolve into more complex and real methods for teaching.

Hyland and Hawkins (2009) acknowledge student learning considerations and benefit are of utmost importance and concern in simulation learning. While not a focus in this study replication, it is important to note nursing educators have questions about business plans for program development, as well as teaching and learning practices.
Issues regarding the role of faculty, simulation design, curriculum planning, instructor training and departmental/program financial investments must also be considered as important to the eventual frameworks, designs and successes of simulation use in nursing education.

Statement of Problem

New graduate nurses are expected to enter the workforce with practice readiness and skills’ competency of an experienced nurse. Nurse educators are increasingly using patient simulators to simulate patient experiences and scenarios in order for students to have a variety of skills’ practice and care delivery experiences (Alinier, Hunt, Gordon, & Harwood, 2006). It has not been established whether use of simulators is advantageous over traditional education techniques alone. Evaluating nursing skills will help establish the value of and justify resources allocated to using simulators.

Purpose of the Study

The purpose of this investigation is to compare pretest/post-test differences in the Objective Structured Clinical Examination (OSCE) in two groups of students, one that had simulation training supplementing the traditional curriculum (experimental group), and the other who received traditional curriculum only (control group). Independent variables are traditional education methods and scenario-based simulation training. Dependent variables include clinical skills learning, clinical competence and perceived confidence.

With the evolution of managed care and resultant earlier discharges, in combination with increased complexity and acuity of inpatient care, graduate nurses must quickly
demonstrate critical thinking and practice readiness in order to safely function as independent caregivers. Additionally, as public and patients are better informed in today’s healthcare environment, they do not want nursing students practicing on them to learn. Finally, despite the challenges of decreased availability of clinical sites, fewer nursing faculty and higher acuity of hospitalized patients, healthcare consumers and employers alike expect new nurses to be prepared to function safely in clinical settings upon graduation (Hyland & Hawkins, 2009).

In order to determine effectiveness and benefit of simulation in nursing education, considering the above conditions and challenges, student outcomes that include scenario-based simulation training, as compared to traditional curriculum only, must be evaluated. Findings will help nurse educators identify whether simulation training in nursing education improves clinical skills’ learning, students’ competence, and/or confidence.

Research Questions

1. Are there differences in the Objective Structured Clinical Examination score, representing skills’ learning and competence, before and after simulation training, in the experimental group of students compared to the control group having traditional curriculum only?

2. Are there reported differences in reported perceptions of confidence before and after simulation training in the experimental group of students compared to the control group having traditional curriculum only?
Theoretical Framework

A weakness of Alinier et al.’s study (2006) was its lack of a conceptual framework to guide the research effort. In replicating the study, however, Albert Bandura’s Social Cognitive Learning Theory, based on self-efficacy, will serve as a conceptual framework to guide examining simulation and its influence on nursing students’ skill competence, confidence and practice readiness.

In 1977, Bandura first described self-efficacy as the capability to execute actions required to attain a goal (Leigh, 2008). Bandura stresses most learning occurs by observing and modeling behaviors, after which information is cognitively categorized and filed in memory for use to guide future actions (Rhodes & Curran, 2005). Bandura emphasizes the importance of creating realistic learning settings that incorporate environment, behavior, and thought in promoting the acquisition of complex skill sets, and thus guides recognizing the importance of simulation in undergraduate nursing clinical judgment skills development (Rhodes & Curran).

Definition of Terms

Competence: Conceptual

Several complementary yet varied definitions for nursing competence exist. Taber’s (2005) defines professional competence as proficiency in the application of the arts and sciences of healing. Individuals with professional competence possess combined communication skills, a dedication to serving others, empathy, good judgment and technical knowledge.
Cassidy (2009) asserts nursing competence relates to individual nurse aptitude and proficiency, including the knowledge and skill to deliver safe and effective care in practice. There is a distinction between competence, someone’s intentions or aptitude to engage in clinical activity, and competency, the behavioral performance during episodes of practice.

Schmalenberg, Kramer, Brewer, Chmielewski, Cox, Kishner, Drugman, Meeks-Sjostrom, & Waldo (2008) describe competent nurses as those whose performance demonstrates evidence of autonomous clinical decision-making, prioritizing and multitasking, interpersonal competence, technical skills, knowledge and optimal patient outcomes.

*Competence: Operational*

Competence will be measure by the score differences between the control and experimental groups in two separate 15-station Objective Structured Clinical Examination (OSCE) sessions (a classic experimental pretest/posttest design). The OSCE 1, or pretest, will occur prior to any intervention, while the OSCE 2, or posttest, will occur after the experimental group participates in simulation.

*Confidence: Conceptual*

Bandura asserts “confidence can be defined as a judgment about one’s perception of ability” (Leigh, 2008, p. 3). However, little is written about what exactly defines professional confidence, and there is surprisingly little written regarding its development or strategies to promote it (Brown, O’Mara, Hunsberger, Love, Black, Carpio, Crooks, &
Noesgaard, 2003). Brown et al. expresses professional confidence as developmental, dynamic, complex and essential, whose meaning includes feeling, knowing, believing, accepting, doing, looking, becoming and evolving. “Confidence is a stronger sense of myself so that I am not so scared of what other people are thinking about me or how they are going to look at me” (Brown, et al., p. 165).

Confidence: Operational

Confidence will be measured by a 5-point Likert-type scale of students’ perceptions of confidence. It will be completed at the time of post-testing (a comparative descriptive design).

Traditional Education Method and Simulation Method: Conceptual

A traditional nursing curriculum refers to an education model that includes a didactic component taught in the classroom as well as application of knowledge and skills teaching occurring in clinical settings with actual patients. Skills laboratories in traditional curriculums are used only for skills and physical assessment acquisition (Hyland & Hawkins, 2009).

Simulation refers to use of human mannequins who, depending on cost and level of operating complexity, can mimic basic or programmed human physiology. Such mannequins are incorporated into nursing school curriculums in varying degrees, from use in simple psychomotor skills’ practice to complex, instructional designs involving teams of student providers who respond to unexpected, changing and sometimes high acuity, simulated case scenarios.
Limitations

A limitation when replicating this study, as was an issue in Alinier et al's. project (2006), is the potential for lack of generalizability related to the limited geographic area and selected sample. In order to generalize the findings to the broader whole of nursing students, study participants must be comprised of a mix of academic strength, traditional, nontraditional, cultural and ethnically diverse students.

Another potential limitation is that if sample size is less than desired, or considered inadequate, there may be insufficient power to detect simulation’s effect as statistically significant based on design measures and intended outcomes. There is also a presumed link between clinical experience and higher levels of nursing competence. Therefore, if simulation use is found to increase clinical competence, it will be important that future studies determine whether improved competence is related to use of simulation, or simply the result of increased instructive practice that could occur with more basic, or less technologically driven, case scenario activities.

Assumptions

This classic experimental study replication is grounded in assumptions that include the following (a) nurse educators constantly seek a means to improve student nurses’ psychomotor skills and practice readiness for actual clinical experience, both while in school and following graduation; (b) improving student nurses’ competence during nursing education will advance their practice readiness upon entering the workforce following graduation; and (c) facilitating the development of student confidence is
important to meeting nursing profession and consumers’ demands in today’s high acuity, increasingly complex, client-driven healthcare arenas.

Summary

As healthcare technology, acuity and client expectations for quality increase, so does the expectation for newly practicing nurses to enter the workforce demonstrating a practice readiness and competence similar to that of experienced nurses. At the same time such expectations for early practice readiness and clinical competence exist, the availability of student practice and experiences in the clinical setting are more limited for patient safety and ethical reasons (Alinier et al., 2006). It is for such reasons that use of new training tools, such as scenario-based simulation, are of interest and a priority in nursing education. However, in order to establish whether use of simulators is advantageous over traditional educational techniques alone, further evidence and robust research studies are needed.
Chapter II

Literature Review

Introduction

New graduate nurses are expected to enter the workforce with practice readiness and competency skills of an experienced nurse. Nurse educators are using patient simulators to simulate patient experiences for students in order to provide a variety of experiences and skills (Alinier et al., 2006). It has not been established whether use of simulators is advantageous over traditional education techniques alone. Evaluating nursing students’ skills will help establish the value of using simulators in education curriculums.

The purpose of this study is to compare if human patient or scenario-based simulation training improves the quality of undergraduate nursing students’ learning specific to clinical skills, competency, and confidence level. The literature review includes selected studies associated with simulator use and its effectiveness in nursing students’ learning. Theoretical literature examines theories and conceptual models or frameworks that can support advantages of simulation training used with traditional teaching methods.

Qualitative research studies on the use of simulation in nursing education are abundant and include theories, hypotheses, and questions generated about simulation use in nursing education. Quantitative design studies demonstrate more objective, robust
outcomes by examining previous studies of scenario-based simulation training benefits over traditional education methods alone. While multiple qualitative and quantitative studies have been done in recent years, most published research related to use of simulation and nursing student education is qualitative.

Many different types of simulation exist. This literature review does not focus on types of simulation used, but rather on findings relating to theories of nursing student learning, skill acquisition and competence, simulation use in college curriculums, student-reported experiences with simulation, and the benefits of using simulation over traditional teaching methods alone. The relevance of and evidence from such studies facilitate nurse educators identifying whether scenario-based simulation training in nursing education improves clinical skills’ learning and students’ competence. Better understanding simulation’s effect on learning outcomes can best guide its use in nursing education and curriculums.

Organization of Literature

Supportive literature is divided into four sections (a) theoretical frameworks related to critical thinking, nursing skill acquisition, and experiential learning; (b) designing, implementing, and integrating simulation into program curriculums; (c) nursing student experiences with simulation based training; and (d) evaluating benefits of scenario-based simulation training benefits.

Theoretical Frameworks

Waldner and Olson (2007) examine theoretical nursing models thought to support frameworks for implementing simulation as a learning approach in nursing education.
The authors examine the relevance of Benner’s theory of novice to expert development of nursing skills and Kolb’s experiential learning theory as frameworks to support simulation in the context of nursing education by retrospectively applying each to multiple previous study designs and instruments. Benner’s model is thought to determine what is, should, or could be taught in simulation, while Kolb’s theory helps determine how simulation accomplishes learning goals.

Benner’s model seems focused on assessment skills and would ideally support student learners shifting from assessing individual pieces of clinical situations to expertly assessing entire clinical situations and making decisions based on such assessments (Waldner & Olson, 2007). Simulation provides excellent clinical experiences and scenarios that allow students to improve assessment skills by seeing the consequences of decisions, as well as be immersed in the consequences of flawed decisions without harming actual patients, thereby helping transition learners toward a competent level. Simulation aids skill acquisition by decreasing anxiety and increasing exposure to abnormal or unusual clinical situations students may not otherwise experience. Benner describes such experience as refining knowledge through experience.

Waldner and Olson (2007) fail to reveal exact details of how Kolb’s theory serves as a framework to the degree Benner’s theoretical framework achieves relevance. The authors assert simulators provide opportunities that accommodate learners in a way real life patients do not and should not be expected to, a key in learning according to Kolb. Complex simulations most help Kolb’s divergent learners, but the time and effort to create such simulations may limit their use.
Concluding assertions of theoretical frameworks relevant to use of simulation and nursing student learners, Waldner and Olson (2007) acknowledge simulation does not consistently fit within any one nursing framework. Students benefit from describing practical learning experiences and by using Benner’s model to assess their level of proficiency in order to better understand what it is they are striving for. Benner and Kolbs’ theoretical models can serve as ‘scaffolds’ for ensuring student experiences include appropriate sequences for developing nursing knowledge. At the very least, the authors hope their conclusions of Benner and Kolbs’ models can be seen as a beginning to theoretically ground development and use of simulations in nursing education.

Martin’s (2002) descriptive correlational study focuses on the relationship between critical thinking, decision-making and clinical nursing expertise during a clinical simulation. Martin develops a midrange Theory of Critical Thinking of Nurses, developed from Benner’s novice to expert and Paul’s four domain critical thinking models. Martin’s theory asserts that as novice nurses become experts and develop clinical expertise through experience and the acquisition of knowledge, critical thinking is developed and used for objective and appropriate clinical decision-making.

Martin’s (2002) research examines the level of critical thinking used and quality of decisions made by a stratified convenience sample of 149 beginning nursing students, unlicensed graduates of similar programs, and expert nurses graduated from similar Midwest nursing programs. Dependent variables of critical thinking were measured as a series of adjectives, such as clear, relevant, justified and significant, by the Elements of Thought Instrument (ETI). Quality of decision-making was measured as a Likert-type
scale decision score. Independent variables were (a) level of clinical nursing expertise, (b) type of basic nursing education (ADN or BSN), (c) and demographic variables.

Martin’s (2002) findings were (a) mean scores for student critical thinking were lower than those for graduates and experts, with ANOVA demonstrating significant differences in ETI scores among the three levels of clinical expertise ($F[2, 144] = 11.79, p < .001$); (b) no significant differences in critical thinking between ADN and BSN students at any of the three levels of expertise; (c) a progression of mean decision scores from lowest at the student level to the highest at the expert level were found, with ANOVA demonstrating significant differences for the three levels of expertise ($F [2, 149] = 11.114, p < .0001$); and (d) significant relationships among critical thinking, decision-making, and several demographic features, such as age, GPA and years in nursing, were found. No significant relationship specific to gender, health care experience before entering the nursing program, additional experience while in the nursing program, prior degrees, clinical practice area, or nursing certification were found.

Martin’s (2002) findings suggest nurses use more critical thinking during a decision-making situation as they gain levels of clinical expertise, as predicted by the Theory of Critical Thinking of Nurses. Several confounding factors included small sample size, lack of randomization and geographic similarity of the sample. There is need for further research of critical thinking in clinical situations. By understanding the role of experience in learning to think critically, nurse educators could better design curricula and opportunities to aid nursing students in learning this skill.
Designing, Implementing, and Integrating Simulation

Students in multiple studies report simulation as beneficial and want it incorporated in school curriculums (Leigh, 2008). Lab simulation is purported as a safe, non-threatening environment ideal for practicing patient care. Nursing students report improved critical thinking skills, leadership skills, decision-making, problem-solving, and prioritization abilities with simulation participation. Literature supports human patient simulation as an effective method to teach nursing education such as applying knowledge to practice, learning from mistakes, learning from peers, and identifying gaps in knowledge. Character benefits of simulation are team work, realism and hands-on learning as identified by students, particularly when simulation is both presented and perceived as legitimate, authentic and realistic.

Childs and Sepples (2006) participate as part of a three-year, multi-site, national study designed to explore, implement and evaluate the use of simulation in nursing. Participating schools served as collaborators in the overall goals, but were given the latitude to test or implement other selected components of the project in order to gain insight into the usefulness of simulation in nursing. The authors elected to study simulation development, implementation process and then measure student satisfaction as an outcome at the College of Nursing and Health professions at the University of Southern Maine.

Childs and Sepples (2006) present simulation as a well documented method of teaching skills to students. The authors state research demonstrates certain student learning outcomes as more readily achieved when simulation is used. Examples of such
outcomes include students retaining knowledge learned in simulation for longer periods than when traditional methods are used to teach the same skill, quicker skill acquisition, higher learner satisfaction with the learning process, enhanced critical thinking that in turn increases self-confidence and improves problem-solving abilities. The authors close the purpose review of their research with a supporting culmination statement by Confucius, “I hear and I forget, I see and I remember, I do and I understand” (p. 155).

Childs and Sepples’ (2006) design was descriptive exploratory, and study framework for simulation scenarios was the simulation model designed for a National League for Nursing (NLN) and Laerdal collaborative project. Faculty participants met to discuss overall purpose and resources, and simulation scenario designs were completed with consideration for intended curriculum outcomes. Four simulation scenarios were created, each with increasing complexity and for use with a group of 55 senior capstone students.

One of Childs and Sepples’ (2006) study goals was to test the validity and reliability of two instruments used in the eight-site national study. The Educational Practice Scale for Simulation (EPSS) is a 16-item instrument using a five-point scale to measure whether the four educational practices of active learning, collaboration, diverse ways of learning and high expectations are present in simulation and of what importance to each learner. The Simulation Design Scale (SDS) is a 20-item scale allowing students to evaluate five design features of the simulations (a) objectives/information, (b) support, (c) problem solving, (d) feedback, and (e) fidelity. Students also completed the 13-item scale University of Southern Maine (USM)-specific instrument, which allowed students
to rate their level of confidence gained through simulation, usefulness of the simulation experience, and feelings about the teaching method. Students were also asked to rank the four simulation stations specific to personal preference at the end of the laboratory experience.

The study concludes that the EPSS and SDS were both valid and reliable instruments. Results of the eight-site analysis were not published at the time of Childs & Sepples’ (2006) article. USM students reported feedback and objectives/information were the most important features in the simulation, closely followed by level of complexity and fidelity. Students rated feedback as the most important educational practice, followed closely by collaboration, active learning, high expectations and diverse learning. Overall, students reported the experience as overwhelmingly positive and ranked each independent station experience highly.

Childs & Sepples (2006) summarize a number of additional valuable lessons learned, stating the study experience would be used as the basis for future planning and implementation of simulation in nursing education. The authors acknowledge developing and implementing simulation laboratory experiences required more time than traditional learning approaches, but that in the long run may be more beneficial for student learning and course outcomes. Traditional teaching tends not to provide the same degree of interactive, focused, energetic laboratory experiences that contribute to learning psychomotor skills and development of critical thinking, as reported from student evaluations.
Kuiper, Heinrich, Matthias, Graham, and Bell-Kotwall (2008) conduct a descriptive design study focused on simulation as an evidence-based educational practice facilitating valuable teaching and learning strategies. Such strategies promote situational cognition and clinical reasoning that guide students’ abilities to solve problems. Experiential learning through practice with a simulator is speculated to refine assessment and practice skills that then facilitate safe, effective care delivery (Kuiper et al., 2008).

Kuiper et al. (2008) explore the impact of patient simulation experiences on situational cognition of nursing students, with a long term goal of preparing a workforce who can effectively manage clinical issues. The constructivist theory of learning was the theoretical framework, which supports instructional approaches to learning through experience. It facilitates clinical reasoning skills practice relying on situational cognition during patient simulation.

A structured debriefing activity, the Outcome Present State-Test Model (OPT) of clinical reasoning, followed both authentic clinical and high fidelity patient simulation experiences. Debriefing sessions occurred after clinical experiences and simulation sessions. Actual clinical experience OPT were compared to the same type debriefings after simulation experiences, looking for similarities and differences indicating need for possible curriculum development or refinement. A second purpose was to determine if the OPT model could be used as an effective debriefing model following patient simulation (Kuiper et al.).

Kuiper, et al. (2008) used a purposive sample of 44 students in a medical/surgical course who were assigned to complete 5-6 OPT worksheets after actual clinical
experiences, while 55 students participated in similar authentic clinical experiences with OPT completion in addition to simulation scenarios. The OPT tool was refined several times to secure inter-rater validity and reliability of scoring. Students completed OPT model worksheets for both experience types. Debriefing for both experiences dealt with how clinical problems were solved and the efficacy of the interventions attempted.

Kuiper et al. used a paired sample t-test comparing the scores of each section of the OPT model by students, which revealed no significant difference in clinical reasoning and its development between authentic clinical experiences and high fidelity patient simulation ($t = -.680, p = -.504$).

Although the study was limited by a small sample and descriptive design, Kuiper, et al. (2008) proved comparable clinical reasoning outcomes with both actual and actual with simulated clinical experience. There is a need for controlling variables, as well as additional research exploring simulation evaluation. Simulation needs to be coordinated with didactic education and actual clinical experiences. Maturation of cognition, individual learning styles and best pace for comprehension must also still be studied. Simulation offers a unique environment for errors in decision and judgments without jeopardizing patient safety, while at the same time enhancing clinical reasoning competence, but can never replace the need for actual clinical experience.

Kardong-Edgren, Starkweather, and Ward (2008) design a prospective, descriptive design study detailing integrating simulation into a nursing program’s clinical foundations course. Current research guides design and implementation. The purpose was to design simulation scenarios using the Nursing Education Simulation Framework,
compare student perceptions of simulation experiences, and characterize faculty perceptions of implementing simulation processes.

Because curriculum varies from one nursing school to the next, implementing simulation requires each program sequence information and scenarios to coincide with the school’s didactic and more traditional curriculum components. Kardong-Edgren et al. (2008) highlight the importance of such considerations by citing research confirming speed with which students acquire skills when using patient simulators, a simulation mirror, and reinforcing didactic content. Debriefing is an additional vital element, as it allows students to deconstruct their own performance which reinforces information learned as well as well as improves retention of the knowledge.

Kardong-Edgren et al. (2008) utilize The Nursing Education Simulation Framework to provide guidance for designing and planning simulation implementation. The framework links five concepts (a) educational practices, (b) the teacher, (c) the student, (d) the design characteristics of the simulation, and (e) outcomes. This framework guided three scenarios creation and planning in the foundations course of the participating college.

The study sample was 100 undergraduate students enrolled in their first clinical course. The 31 skills initially taught in the class were traditionally learned by completing packets in a learning center. Scenarios were developed so to coincide with a progressive format over the semester and were built into the curriculum. Each scenario had clear objectives, which were shared with students in the pre-simulation briefing. Learning modules and skills practiced during the scenario were completed prior to the experience,
and students were oriented to the simulators well in advance of the simulation experience (Kardong-Edgren et al., 2008).

Kardong-Edgren et al. (2008) utilized the National League for Nursing’s three scenario evaluation tools in the study. A 16-item Educational Practices Questionnaire (EPD) tool, with five point Likert-type scale items, measured the educational practices of active learning, collaboration, high expectations and diverse ways of knowing. The Simulation Design Scale (SDS) was a 20-item tool, with a five point Likert-type scale, used to measure feedback regarding presence and importance of scenario design features like objectives and information, student support, problem solving, and guided reflection/debriefing. Finally, The Student Satisfaction and Self Confidence in Learning (SSSCL) was a 13-item questionnaire also using a Likert-type scale. The instrument measured satisfaction with simulation and self-confidence in obtaining the teaching needed for the simulation after each simulation session.

Kardong-Edgren et al. (2008) used ANOVA to assess significance of student responses in a post hoc analysis on statistically significant results for each tool. The EDQ revealed students perceived best practices specific to active learning, collaboration, diverse ways of learning, and high expectations with each scenario. The SDS revealed students highly rated (a) objectives and information, (b) support, (c) problem solving, (d) feedback, and (e) fidelity, finding each item very important. Lastly, the SSSC found no significant differences between fine points for student satisfaction and self-confidence.

The faculty general themes of feedback included (a) simulation facilitates a creative and interactive teaching and learning environment, (b) requires additional time for
assistive personnel training, and (c) because it offers repetitive practice, aids in solidifying foundational technical, interpersonal, cognitive reasoning, and critical-thinking skills (Kardong-Edgren et al., 2008). Although not all faculty perceived the simulation experience as better than other modes of learning and skill evaluation, the majority viewed it as valuable enough to proceed with implementing throughout the curriculum. For the first time in collective faculty memory, all 100 students enrolled in the course passed the end of semester written exam. One faculty member noted simulation was of benefit because “repetition allowed students to practice and retain foundational skills while building more advanced skills, such as problem-solving and ethics” (p. 11).

Kardong-Edgren et al. (2008) concluded their study design was not flawless. Despite the overwhelming positive feedback by faculty and students, there were identifiable study limitations necessitating further observation and research. These limitations included the sample being only one cohort of similar students, a design lacking in the ability to compare student results, and use of novice faculty to both run and debrief the simulations.

Nursing Student Experiences with Simulation

With national attention on graduate nurse practice readiness, nursing schools are increasingly using simulation both as a complementary and alternative teaching strategy. However, no real evidence exists to confirm simulation as enhancing clinical judgment over conventional teaching methods. Lasater (2007) conducts a qualitative, exploratory
study using grounded theory methodology to examine student experiences in high-fidelity simulation.

Lasater’s (2007) study purpose was to examine the experience dimension of simulation including (a) students’ self-reported confidence in their clinical judgment skills; (b) students’ aptitude for critical thinking, a component of clinical judgment; (c) qualitative observations of student clinical judgment during simulation; and (d) students’ experience with simulation as conveyed through focus groups.

Oregon Health & Science University (OHSU) School of Nursing used high fidelity simulation in place of one clinical day each week throughout a clinical course. 48 junior-level traditional and nontraditional students, enrolled in Nursing Care of the Acutely Ill Adult in the winter of 2004, were included. Students were divided into two groups of 12, attending simulation two mornings a week. Groups were further divided into four groups of three students each. One group of three acted as the scenario team while the other three groups of nine students observed the scenario from the debriefing room. Each three student group engaged in a weekly scenario, with each student being the primary nurse, responsible for patient care interventions and delegation, every third week. Debriefing sessions, with faculty moderators and attended by all 12 students in the group, immediately followed each simulation session (Lasater, 2007).

Lasater (2007) observed 39 of the 48 students during the scenario based simulations and debriefings throughout the winter term. The author had hoped to have both traditional and nontraditional students in the focus groups, since they may have
experienced simulation differently, but only 15 nontraditional students agreed to participate.

Focus group participants were given the definition of clinical judgment and the conceptual framework used for the observations during simulation. After consenting participants and answering their questions, a 90 minute focus group session occurred in the same simulation lab utilized throughout the semester to foster best remembering the experiences. Participants were allowed to moderate their group, with several predetermined questions serving as prompts. Sessions were videotaped for accurate future analysis. Lasater (2007) took notes on student comments and occasionally asked open-ended questions to clarify a comment's intent or meaning.

Lasater (2007) organized data into categories of most pertinent comments and by what stood out as important to participants. The videotapes and notes were retrospectively reviewed, multiple times, in an effort to best identify primary themes. Thirteen identified themes were identified and then fit into five major codes which were further analyzed against the transcript. Lasater did a reliability test by watching the audiovisual recording multiple times. Codes were tested against the manuscript and fit 95% of the time.

Lasater (2007) identified a major strength of clinical simulation as its ability to integrate learning by bringing together (a) theoretical bases from classes and readings, (b) psychomotor skills from the skills laboratory, and (c) lessons learned from clinical practice in order to get students to critically think about what to do. One student stated “you had to actively work through” (p. 272) the issues and integrate all of the
learning. Participants reported learning *little things* that couldn’t be gleaned from readings but were critical for patient care.

Students appreciated exposure to simulated patient groups they may not otherwise have a chance to encounter in clinical experiences, and the low-risk nature of simulation. Lab simulation forced students to anticipate what could happen in a real clinical setting. Several participants reported learning more from the debriefings when they weren’t the primary nurse, because it allowed them to be more task oriented and to “step back to think more about what I would have done” (Lasater, 2007, p. 274). Students also indicated wanting feedback regarding potential results of their inappropriate simulated scenario choices.

The author noted high-fidelity simulation fostered meaningful collaborative and narrative learning in the student group. This included learning from each other’s simulation experiences, learning in teams, and learning from the experiences of other students and faculty through interjected stories during the pre-simulation learning sessions and debriefings (Lasater, 2007). Important study limitations include small number of participants, a focus group comprised of all nontraditional students, and limited cultural and ethnic diversity of the students. Lasater noted the use of simulation required faculty to alter their teaching approach, which may be difficult for some who have more traditional teaching experience.

Lasater’s (2007) work has meaning to nursing in the shared original and in-depth perspectives of students’ learning via clinical simulation. Additional research needs to
find a link between the effectiveness of simulation performance and real clinical practice. Focus groups can (a) ensure goals of simulation in nursing education match student perceptions, and (b) experience the benefits of debriefing after clinical simulation to allow discussion that embellishes the physical experience.

Reilly and Spratt’s (2007) research is a qualitatively informed curriculum research project investigating the perceptions of second year undergraduate nurses and their teachers experiences with high-fidelity simulation. Because second year students had a total of 30 clinical practice days, and third year students had 75, the school increasingly experienced difficulty securing enough clinical placement sites to meet curriculum demands. The case-based pilot study involved a small, volunteer cohort of second year students in the bachelor nursing program. 21 students participated in Stage One, and 20 students in Stage Two.

The study took place in Tasmania, Australia. However, schools of nursing in the United States experience similar clinical placement challenges. Because students’ clinical experiences occur in a wide variety of health care settings, and with limited staff for student ratios, schools find it difficult to monitor students’ experiences and clinical practice learning. It is challenging to assess the degrees to which each location engages students in equivalent learning experiences and in relation to curriculum. For this reason, in order to ensure students are given the same learning and assessment opportunities, concurrent to didactic and actual clinical experiences, teaching faculty need to explore using theory taught case-based learning in tutorial settings such as simulation-based learning (Reilly & Spratt, 2007).
Reilly and Spratt (2007) cite indicators for quality teaching and learning by the Carrick Institute for Teaching and Learning in Higher Education and benchmarking criteria from McKinnon, Walker and Davis benchmarking guidelines for Australia Universities as providing valid framework with which to audit unit curriculum. In Stage One, paired students participated in simulated scenarios. Each pair had 40 minutes to complete two patient scenarios, while being observed by the researcher, specific to communication in deciding care intervention needed for a good outcome. Other than to communicate answers students asked the manikin, the researcher did not interact with the student pair. At the end of the session, verbal feedback of performance was provided, as well as 5 minutes for questions and to debrief.

Students in Reilly and Spratts’ (2007) Stage One sessions who agreed to participate in Stage Two were divided into two focus groups. Interview sessions were conducted to gather students’ perceptions of participating in the simulation, and whether they thought simulation influenced their learning in clinical practice. These sessions began three days after Stage One ended. Focus groups were audio taped and then transcribed so the researcher could aggregate and perform thematic analysis of responses. The purpose of the first focus group interview was to understand students’ thoughts of using and participating in simulation learning, and to discover their perceptions of impact on learning. The second focus group was asked to reflect broadly on the practice experiences vis-a-vis simulation-based learning scenario participation.

Stage Three of Reilly and Spratts’ study (2007) involved focus groups of academic faculty involved with teaching in the unit. These educators participated in interviews
exploring their perceptions of the pedagogical applications of scenario-based simulation, and in the program generally. Because themes that arose from the academic groups were similar to those from the student groups, data analysis was aggregated for reporting purposes and the benchmarking curriculum audit concurrently done.

Reilly and Spratts’ (2007) results were that simulation-based scenarios provide *authentic* teaching and learning experiences. Although limited by small cohort size, students reported preferring interactive simulation learning as opposed to didactic learning, and felt more confident they would “remember what had been done in the scenario” (p. 546) when encountering the same situation in practice. Academic staff similarly discussed benefits of simulation over didactic learning alone in that it both “gets to the intellectual component behind the [nursing] skill” (p. 546) as well as contextualizes the skill learning.

Students perceived confidence as increased before and after the two clinical simulation experiences. A significant theme following simulation was “it showed the importance of understanding why you are doing things…I thought, ok, I actually know what to do now” (Reilly & Spratt, 2007, p. 547). Academic staff concluded simulation-based exercises facilitate critical thinking “because of the scenario they are able to problem solve because there are consequences for inappropriate actions” and the “practice to theory linkage” is strengthened because students “get a deeper picture of the conditions of people” (p. 547).

When the 2002 Winter Olympic Games came to Salt Lake City, some nursing students at Brigham Young University (BYU) were unable to complete their final week
of clinical experience. Heightened security related to the Olympics caused students to be unable to get to their assigned hospital. Aware simulation was increasingly being used in healthcare education, Bearson and Wiker (2005) conducted an exploratory, descriptive study evaluating learning outcomes of student knowledge, ability and confidence with the alternative simulation-based scenario medication administration experiences.

Participants were two groups of first-year baccalaureate students, and their instructors, experiencing alternative clinical learning with a newly acquired human patient simulator. The purpose was to explore benefits and limitations of using a simulator as a substitute for the one day of missed actual clinical experience. These students had previously been on a postoperative unit and completed five of the six weeks in their first hospital rotation.

The simulation-based learning required students to complete three different patient scenarios, all related to a new postoperative patient experiencing pain. Additionally, the patient simulator unexpectedly experienced wheezes, a heart murmur, unilateral decreased breath sounds and other symptoms requiring students assess, respond to, and reassess their patient’s condition. The students had a stethoscope, patient monitor, medication record and drug guide book for use. During scenarios, students could consult with other students or ask questions of the two faculty members present, who also made occasional suggestions. The learning skill goals were to choose and administer the appropriate pain medication from the drugs ordered as needed, evaluate and respond to physiologic effects of the pain medication given. Students were to also recognize effect
differences in the same dosage of the same medication on different patients, and to work
together as a team in making decisions (Bearnson & Wiker, 2005). Bearnson & Wiker
(2005) had students complete a Likert-type scale survey of how positive, or not, they
perceived the simulation experience. Students additionally answered three open-ended
questions asking what had been learned, what would improve the experience, and
whether they would recommend participating in simulation again. About half the students
also wrote journal entries about the sessions, from which themes were categorized.

Bearnson and Wikers’ (2005) results showed students’ perceptions of the learning
experience as positive, with 4 being strongly agree to 1 of strongly disagree. Mean scores
ranged from 3.00 to 3.31 for perceptions of increased knowledge of medication,
increased knowledge of differences in patient responses, increased ability to safely
administer medications and increased confidence with medication administration skills.
Open-ended questions showed students valued learning as related to importance of
performing a thorough assessment, recognizing abnormal findings and using critical
thinking to plan care based on assessment findings with the human simulator. They also
liked the unexpected and abnormal findings the simulator presented, since learning with
healthy patients doesn’t always present such opportunities.

The specific aim of the study was met, with sessions having multiple benefits
justifying continued use of the simulator in clinical learning. Students were “decidedly
positive and enthusiastic about the experience” (Bearnson & Wiker, 2005, p. 424). The
only drawback reported was that the simulator can only accommodate a few students at
one time. The authors concluded because human patient simulators offer safe and
effective experiential learning with nursing students, more studies are needed to help
identify the best models for implementing the technology into nursing curricula.

Feingold, Cataluce, and Kallen (2004) examine the shifting setting of clinical
nursing education from hospital-based to university, using simulation, by evaluating
student and faculty responses to the use of a computerized patient simulator (SimMan)
following interactive, clinical scenario experiences. Four faculty and 97 senior year
bachelor’s of science students, 50 from fall semester and 47 from spring semester,
enrolled in an advanced acute care course are participants. No framework is mentioned,
and a descriptive exploratory study design is used.

Feingold et al. (2004) review literature supporting the benefits of simulation in
nursing education. Psychomotor skill acquisition, facilitated by opportunities for repeat
practice in a safe environment, is present in simulation experiences. Clinical simulation is
optimal for practicing problem-solving in a safe environment, with an added benefit of
faculty support and immediate feedback. Use of clinical simulation is further supported
by the cognitive learning theory because it is interactive, builds on prior knowledge and
relates to real clinical problems.

Due to information provided during the literature review, Feingold et al. (2004)
hypothesized that clinical simulation involving assessment, clinical decision making,
communication and psychomotor performance would be an accurate test of students’
clinical competence and provide learning experiences with high transferability to real life.
Study questions and data collection were to include student and faculty perceptions of
patient and scenario realism, student ability to transfer knowledge from simulated scenarios to real clinical experiences, and the value of the overall learning experience. The hope was survey data would provide future direction for simulation use, as well as justify continued use of simulation technology in the curriculum.

Two standard critical care patient scenarios were used with SimMan, one at semester beginning and other at semester’s end. Both times, the students entered the test area, received a short verbal report and assessed the patient prior to the clinical condition deteriorating. Students were required to prioritize problems, take action, communicate with the patient, the patient’s family, and other members of the healthcare team. During the sessions, faculty gave immediate feedback if appropriate, used the scoring tool results to determine student placement at the semester start and core critical behaviors and indicators of clinical decision making at the end (Feingold et al., 2004). While study researchers did not participate in student assessments, it was an interesting adjunct to the study intent and felt to be a valuable tool for faculty use in optimizing teaching efforts based on individual student performance and need.

A 20-item Likert-type scale survey was used to evaluate student satisfaction with the experience. 28 out of 50 students responded to the first survey, which was then given unaltered to a second group having the same simulation experiences in the subsequent semester. 37 of the 47 second semester participants responded to the survey. Mean and standard deviations of student responses to each of the three survey subscales and individual items, along with percentages of faculty member agreement, were reported. The value of the experience subscale had the highest level of agreement among students,
with a mean of 3.04, while the transferability to actual clinical situation had the lowest level of agreement, mean of 2.52. Among students, the technical skills taught in simulation had the highest agreement, with a mean of 3.53, while the lowest was the interaction with simulation improved clinical competence (Feingold et al., 2004).

A 17-item Likert-type scale survey was used for faculty member feedback, which also included items asking what faculty support and training were needed related to the new technology. Unlike student participants, 100% of faculty believed the experience prepared students to perform in real clinical settings. All faculty members also felt the simulation scenario recreated a realistic clinical situation; and the pace and flow were realistic. Faculty consistently noted simulation was an effective teaching tool to prepare students for actual clinical settings, but that it took extra time. Faculty overwhelmingly reported inadequate existing support to use the simulation technology (Feingold et al., 2004).

Feingold et al. (2004) discussed and reported other demographic variables, some of significance and others not, not here included, that would be an important consideration in future studies. The authors suggest more studies are needed to validate predictive value of simulation performance to real clinical performance, to explore reasons for why not all students believed simulated practice prepares them for actual clinical settings, and to further clarify conditions under which simulation technology works best. Feingold et al. agreed with previous study findings that simulation cannot replace actual clinical experience, and the need exists to better clarify conditions under which simulation works
best. At the very least, in the interest of patient safety demands for adequately trained caregivers, patient simulation has a role in early preparation of students who will encounter acutely ill patients in environments with highly complex technology demands. Alinier, et al. (2006) conducted a quantitative, classic experimental pretest/post-test and comparative descriptive design study with 99 volunteer undergraduate nursing students in the United Kingdom. Their intent was to determine the effect of scenario-based simulation training on nursing students’ clinical skills and competence. Students were randomly allocated to either a control or experimental group. The experimental group was exposed to simulation training in addition to traditional curriculum, while the control group received traditional curriculum only. Subsequently, all students were re-tested and completed a questionnaire.

There were 50 students in the control group and 49 in the experimental group. Students were randomized after an initial assessment session was completed using a 15-station Objective Structured Clinical Examination (OSCE). The OSCE is a recognized and effective evaluation tool for assessing the practical skills of healthcare students. The study hypothesis was that the experimental group would perform better than the control group. Students in the experimental group participated in scenario-based, hands-on training sessions in a simulated intensive care setting over two afternoons. Six months after the initial OSCE, the same assessment was repeated to determine whether or not the simulation experience had an effect on students’ level of competence and confidence (Alinier et al., 2006).
Alinier et al. (2006) structured the simulation sessions in order to give students in the experimental group realistic clinical experiences in a safe environment while avoiding their being prepared for the second OSCE examination. Students were separated into four subgroups. Two groups attended two separate, five weeks apart, 3 hour each simulation sessions together focusing on patient care and clinical skills. One group acted as non-participating observers while the other group participated in the scenario.

All four subgroups participated equally as scenario participants and observers. Practice theme focus during sessions included (a) teamwork and communication in the context of a clinical environment, (b) situation awareness, (c) decision-making, and (d) clinical skills. Both groups participated in debriefing and student performance discussions at session end, benefiting from analyzing the actions during scenarios, participating in the debriefing and hearing advice given. The debriefing was non-threatening in structure and participants received recommendations on issues they may have overlooked during the scenarios.

The OSCE was evaluated and determined to be a valid tool for content and accuracy specific to its design and use in this study. Processes to ensure interrater reliability as well as proper informed consent were completed. Statistics software was utilized to evaluate data. Statistical significance of the difference in OSCE results were evaluated using t-tests. A Mann-Whitney U-test was used to analyze the difference between students’ perceptions of stress and confidence (Alinier et al., 2006).
Alinier et al. (2006) results found the two study groups, control and experimental, had comparable demographic profiles. The main result difference in performance between the two was OSCE scores. The improvement in performance was 7.18 percentage points (95% CI 5.33 – 9.05) for the control group and 14.18 percentage points (95% CI 12.52 – 15.85) for the experimental group. The difference of 7 percentage points between the means was highly statistically significant with (a) independent sample t-test $df = 97, p < 0.001$; and (b) test for equality of variance $F = 0.623, p = 0.432$. Perceptions of stress and confidence were not significantly different between the two groups. The differences regarding working in a technological environment and its effect on perceptions of stress or confidence were not significant between the control and experimental groups. Therefore, the authors concluded the improvements in training does not lead to improved overall confidence in using the skills; and students who are not confident also report being stressed when exposed to working in a technological environment.

In conclusion, Alinier et al. (2006) find students appreciate simulation experiences and find sessions provide valuable learning. However, faculty report simulation sessions as difficult to organize and evaluate students from a number-of-faculty-involved perspective. There were numerous study challenges in design and methods, but overall the study provided robust, quantitative analyses of simulator use in nursing education via this randomized control study.

One of the faculty participants reported that the “general feeling amongst the group was that this session, combined with observation and practice, is vital for preparing
students for emergency situations on the ward or in recovery” (Alinier et al., 2006, p. 367). One of the student participants reported being praised by her clinical instructor for her actions during a cardiac arrest. She indicated she was able to put into practice what she’d learned in the simulation session. It was hoped that the results of their study would encourage simulation training exercises counting toward practice or placement hours, which could facilitate partial resolution to compensate for shortage of clinical placement sites. Simulation is additionally useful and safe for introducing practice in new procedures or medication administration.

**Benefits of Scenario-based Simulation**

In a non-robust but somewhat compelling, weak observational exploratory study, Comer (2005) describes ungraded, two phase simulation scenarios used as adjunct clinical experiences directly relating to and matching classroom didactic content. Clinical simulation of real-life patient care situations relating directly to didactic classroom material facilitates students building patient care skills while applying theoretical knowledge in a controlled setting. The author states such simulations reinforce the information learned in lectures and promotes an active learning environment.

Comer (2005) further delineates the benefits of simulation as opportunities to develop essential skills and meet outcomes required for clinical practice in a non-threatening environment, without the demands of caring for a patient. Role-playing simulations can be closely controlled by faculty members and developed with increasing levels of difficulty to match student readiness. Patient care simulators encompass
cognitive, psychomotor and affective learning domains and can accommodate learning preferences of all nursing students. Simulation provides (a) visual learners the opportunities to observe clinical situation experiences, (b) auditory learners opportunities to listen to verbal communications taking place during the role-play portion of simulation, and (c) kinesthetic, or tactile, learners hands-on use of equipment and demonstration of assessment skills during simulation. Comer (2005) describes the simulation scenarios as instructional, with situations and environment structure intended to provide clinical situations and hands-on learning coinciding with didactic classroom instruction. Participants were encouraged to ask for information from the instructor throughout the exercise. Simulations lasted no longer than 20 minutes in order to minimize stress and maximize retention of knowledge imparted. The exercise was intended to be supportive and pleasant. Debriefing occurred after each simulation to emphasize key points and reinforce student critical thinking and clinical judgment. Significant to success of simulation was the faculty ability to design scenarios relevant to current course content.

Student responses were favorable to simulation experiences reinforcing lecture content. The didactic course content covered respiratory failure, burns, cerebrovascular accidents, head, chest and abdominal trauma. The clinical simulations were developed for hypoxia and hypovolemic shock. While 10 of the 30 students taking the class historically failed the first exam, failures after adding simulations dropped the failure to only 5 of 30 students (Comer, 2005).
Brannan, White, and Bezanson (2008) conduct a prospective, quasi-experimental pretest/post-test study design examining experiential learning provided by simulation. Students participated in clinical decision making, practice skills and observe outcomes from clinical decisions during simulation exercises. The purpose was to compare effectiveness of two instructional methods of teaching specific to nursing content of acute myocardial infarction on junior year nursing students’ cognitive skills and confidence. By comparing traditional classroom-only instruction with students who additionally participate in interactive human patient simulation, the authors hope to show experiential learning enhances student learning, information synthesis and application of clinical concepts to patient care situations.

Brannan et al. (2008) hypothesize participants receiving instruction with the simulation method regarding clinical treatment of patients with acute myocardial infarction would demonstrate (a) higher levels of cognitive skill achievement, and (b) confidence in abilities to provide nursing care to such patients when compared to students receiving traditional classroom instruction only.

One hundred and seven junior year baccalaureate nursing students enrolled in the adult health course in fall and spring semesters participated. Group One, 53 students enrolled in fall semester, received traditional classroom instruction only, while Group Two, 54 students enrolled in spring semester, received instruction including HPS methods. Both student groups completed pre-testing using the Acute Myocardial Infarction Questionnaire (AMIQ), Cognitive Skills Test, Confidence Level (CL) tool and
a Demographic Data Form. The same AMIQ and CL tools were completed as posttests (Brannan et al., 2008).

Brannan et al. (2008) demonstrated no statistically significant differences in variables existed between the two groups, such as demographic and educational characteristics. Hypothesis one was supported by the results. Groups who had received the simulation instructional method achieved significantly higher AMIQ posttest scores than those who got traditional lecture teaching only, $t = 2.0$, $df = 79$, $p = 0.05$. Hypothesis two, however, was not supported. Confidence level was not found to significantly differ between the two groups of students, $t = 2.5$, $df = 96$, $p = 0.01$. Based on paired $t$-testing of pretest and posttest CL tool scores for assessment, planning, implementation and evaluation of the acute myocardial infarction patient, no statistically significant differences were evidenced between the two groups despite considerable gains between pretest and posttest by both groups.

Brannan et al. (2008) limited the research value of their results by not randomly assigning the intervention group. Demographic data did, however, demonstrate control and experimental groups to be similar but replication of the study should include randomization of the two groups. Additional measures for increased confidence in the experimental group, after caring for an actual acute myocardial infarction patient in the clinical setting, compared to the pretest confidence score, may also be of value.

Concluding the study, Brannan et al. (2008) offer that in the search nursing faculty have to find more effective teaching methods to help students understand the practice of nursing, results from this study can aid in providing valuable and efficient methods to
facilitate teaching and learning. Lecture and discussion seem forever grounded in pedagogical practice. This study acknowledged the positive components of traditional teaching methods. It also revealed learner-centered strategies that can actively engage students with realistic patient responses and involve them in decision making may be more useful when presenting complex content. While simulation offers effective and convenient methods for teaching in a variety of content areas, it requires substantial amounts of faculty resource in time to develop and implement. For this reason, additional research is needed to decide best practices and whether simulator use reasonably achieves optimum learning outcomes when compared to other methods.

Goldenberg, Andrusyszyn, and Iwasiw (2005) conduct a study using an exploratory descriptive design to investigate the effect of simulation on a convenience sample of 66 part-time and full-time third year baccalaureate nursing students. Bandura’s theory of self-efficacy model in health teaching served as the framework, which offers students’ expectations that self-efficacy will lead to their desire and ability to perform required health skills.

Role playing and case study simulations were combined into a 13-week course, Professional Issues II: Teaching and Learning. Faculty-developed simulation situations from what were intended as likely real clinical situations students might encounter in practice. In the simulation experiences, students were to assess the patients’ learning needs and developmental stage, then propose a teaching plan based on Bandura’s theory.

The two half-day simulations occurred shortly before end of first semester. Each student in the group role played characters of an actual clinical encounter (nurse, client,
family member, observer coach), and assumed a different role for each case. As students role played, faculty circulated and asked questions, corrected misconceptions, and supported deliberations. Debriefing then provided analyzing the case and sharing observations and insights based on theories learned in the class (Goldenberg et al., 2005).

Within two weeks of simulation exercise, Goldenberg et al. (2005) voluntary participants completed a two-part, 63-item Baccalaureate Nursing Student Teaching-Learning Self-Efficacy Questionnaire derived from reviewed literature and researcher developed. Prior content validity of the tool had been established, and Cronbach’s alpha reliability coefficient for the sample was 0.97. Twenty two usable questionnaires were returned, for a 33% return rate. Group demographics of the 22 were accounted for and determined to be statistically similar to those of the total group (n = 66).

Goldenberg et al. (2005) used parametric tests of the 4-point scale responses to answer the research questions. Student participants’ self-efficacy scores were significantly higher, $p = 0.001$, reflecting greater overall confidence specific to health teaching following participation (mean = 3.55) when compared to before (mean = 2.96). Significant differences, $p = 0.001$, were also found between student pretest and posttest scores for assessment, implementation and evaluation portions of health teaching. No differences in planning scores were noted. Likewise, no significant relationships were found between students’ health teaching scores and the selected demographic variables using Pearson’s correlation ($r$), although this may have been the result of small sample size. Finally, descriptive statistics of frequency were used to report students’ ratings of simulation effectiveness as a teaching method. More than half the students rated
simulation as an effective teaching method, while another one third rated them as very effective.

In closing, Goldenberg et al. (2005) assert successful performance in simulated situations as the most influential source of efficacy. Bandura’s dimensions’ perspective of self-efficacy in learning was also supported by the (a) vicarious learning experiences occurring as students observed their classmates in simulation, and (b) students believing health teaching was a task they could learn so put forth effort throughout simulations to successfully perform the task with future clients. Increased confidence in performing skills related to cognitive, psychomotor and affective domains occurred as students actively participated in role playing and case study simulations. However, the role of faculty in student preparation, as well as successfully developing simulation content and skills matching the learners’ needs and capabilities, is essential to success. Ongoing focus and research to optimize orientation, faculty development programs and administrator support are necessary in order to increase faculty comfort and support in managing such participative teaching strategies.

Ravert (2008) proposed a study to examine whether measures of critical thinking show differences between three student groups using human patient simulator (HPS), non-simulator, and control. A second purpose was to determine if the students’ preferred learning style had any moderating effect on critical thinking scores. Because patient simulation is increasingly being used in nursing education, despite few quantitative studies supporting clear benefit to students’ critical thinking, nursing research in this
study intended to measure whether critical thinking shows differences between three groups of baccalaureate students. Two groups in Ravert’s (2008) study participated in enrichment activities, one group in five patient scenarios using a patient simulator and the other in five small group discussions regarding the patient scenarios. The third group served as the control group and received traditional teaching methods without enrichment activities. Twenty-five total students volunteered and participated, n = 13 in the non-HPS group, n = 12 in the HPS group, and n = 15 in the control group. The study sample was found to be demographically similar. Variables measured were critical thinking disposition, critical thinking skill, and preferred learning style. A 75-item Likert-type scale response format for (a) disposition measured truth-seeking, (b) open-mindedness, (c) analyticity, (d) systematicity, (e) critical thinking self-confidence, (f) inquisitiveness, and (g) cognitive maturity. Critical thinking skill was evaluated using a 34-item multiple choice instrument with subscales that draw together the major core critical thinking skills of analysis, evaluation, inference, deductive reasoning and inductive reasoning. Because critical thinking is a complex concept, scores were more indicators of overall strength and weakness, not individual ability. Preferred learning style inventory used a sentence completion format, which ultimately categorized learning style quadrants into diverging, assimilating, converging or accommodating (Ravert, 2008).

Measurement tools, methods of evaluation and statistical analysis were considered acceptable. Comparison of the three groups was done using a general linear model procedure. Ravert (2008) found all three groups experienced a moderate to large effect size in critical thinking scores of disposition and skill. While the disposition and gain
scores were moderate to large for all three groups, there was no statistically significant gain score in disposition. Skills, however, demonstrated a statistically significant \((p = 0.000)\) gain score for design and pre-score covariate. The power to detect the effect of group or learning style differences wasn’t possible due to small sample size, but was thought not to be a moderating factor in the study since all three groups achieved gains in disposition and skill. While Ravert (2008) acknowledged numerous limitations based on sample size, participant characteristics, simulator and instrument issues, she does conclude both enrichment activities were reported as helpful for a variety of reasons by students. The author recommends additional research needs to include replication of her study with a more diverse sample and corrected variable and instrument issues. However, this studies participant experiences were helpful in addressing current questions and issues. Ravert’s reported student perceptions provide valuable insight into the need for researchers looking not just at simulator use, but also at other learning enrichment tools for potential use in increasing nursing student skills, critical thinking abilities and nursing practice readiness.

Radhakrishnan, Roche, and Cunningham (2007) conduct a quasi-experimental pilot study aimed at validating the influence of systematic practice with human patient simulation on nursing students’ clinical performance. Senior year, second-degree baccalaureate nursing students participated. The authors attempt to identify nursing clinical practice parameters influenced by HPS.

Radhakrishnan et al. (2007) invited 20 students to participate, with 12 in the final sample. Students were randomized into either the intervention \((n = 6)\) or control \((n = 6)\)
groups. The intervention group participated in two one-hour practice simulations with a complex two-patient assignment, in addition to clinical requirements of the 320-hour capstone course. The control group received no simulated practice. At the end of the semester, both groups participated in a two-patient clinical HPS scenario. The objectives evaluated were safety, basic assessment skills, prioritization, problem-focused assessment, ensuing interventions, delegation and communication.

All students participated in the end of semester simulation scenario, and were evaluated by using the faculty-developed Clinical Simulation Evaluation Tool (CSET). A key listing of expected behaviors with a numeric scale to indicate performance and for point scoring was used. To avoid bias, a faculty member experienced with the curriculum and an expert in the clinical area but unfamiliar with the student, and blinded to group membership, evaluated all subjects (Radhakrishnan et al., 2007).

Intervention group students achieved significantly higher scores for Safety ($p = 0.001$) and Basic Assessment Skills ($p = 0.009$) than students in the control group. There were no significant differences in performance of other clinical category parameters examined. The primary differences in the statistically significant category scores were related to only one subcategory within each, patient identification for Safety and assess vital signs within the Basic Assessment Skills. These findings, therefore, cannot be generalized to assuming additional simulation practice sessions would improve complex patient care performance since the majority of clinical performance categories, and subcategory skills within each, showed no difference in clinical performance between the two groups (Radhakrishnan et al., 2007).
Although this pilot study used only a small, homogeneous convenience sample, it appears to be the first to test nursing students’ performance by randomizing the sample and blinding the faculty observer responsible for scoring. Faculty also evaluated each category of performance by assigning specific scores to actual subcategory behaviors within what is considered standard nursing practice categories. In order to optimally use and recommend educational benefits to simulation use, the authors conclude additional, more robust studies with larger and more diverse sample groups are needed (Radhakrishnan et al., 2007).

In order for more robust, quantitative studies to be done, reliable simulation evaluation instruments to accurately measure student performance and safety in caring for patients must be developed for use. Hence, the purpose of Todd, Manz, Hawkins, Parsons, and Hercinger’s study (2008) was to develop and evaluate such an instrument. The authors develop and test such an evaluation tool and implement its use with senior nursing students. Sample participants evaluated, \( n = 72 \), were divided into groups of 4-5 students each. Content validity was established via the literature and from the review of the tool by an expert panel. Reliability was established using sixteen different simulation sessions, each session having a different student group being evaluated by two trained evaluators. Agreement between evaluators was as well established.

Specific desired behaviors expected of students during simulation were organized according to the American Association of Colleges of Nursing (AACN) core competencies, each of which is well supported in multiple healthcare literature sources. These core competencies provided the framework necessary for the evaluation instrument
and included the categories critical thinking, communication, assessment, and technical skills. Each category was further defined by its 4-11 unique and delineated content subcategories, or skills (Todd et al., 2008). Todd et al. (2008) method of evaluating student behaviors was developed using a 0 for does not demonstrate competency or 1 for demonstrates competency. Each simulation experience might have included some or all behaviors needing rated on the instrument. Certain behaviors and skills could be ranked not applicable if exceeding the level of the student, without affecting the overall student score. Validity was ensured by utilizing seven faculty members experienced in simulation use, all of whom had evaluated the tool. Selection was based on active involvement with simulation in the School of Nursing, and attendance or presentation at a national or international conference on the topic of simulation. All had been involved, as well, in development of the simulation lab, taught in the simulation center each semester, and demonstrated a passion for the benefits of the experience as influencing other faculty to begin to try this teaching strategy.

Detailed, robust data on content validity questionnaire results were reported by Todd et al. (2008). The seven faculty members rated the individual behaviors on the instrument using a Likert-type scale with one being strongly disagree to four for strongly agree. The panel concluded each behavior should be included in the Simulation Evaluation Instrument (SEI) ($M = 3.84, SD = 0.12$) and reflected in the corresponding category ($M = 3.82, SD = 0.12$). Behaviors were felt to be easy to understand ($M = 3.82, SD = 0.23$). The inter-rater reliability was highest under assessment, communication and critical thinking. The lowest percent was for performs procedures correctly and technical
skills. The content validity of the SEI was supported by an expert review panel, as well as the underlying framework of the categories. While additional reliability corrections were needed for *performs procedure correctly* and *interprets subjective/objective data*, the findings were encouraging for the instrument having adequate validity and reliability.

Because faculty have long been concerned with the subjective nature of simulation and traditional teaching methods evaluation, a valid and reliable instrument should facilitate providing opportunity for more objective, quantitative studies. The instrument additionally aids in identifying gaps in teaching/learning. Limitations of the study were reported as small sample size, location of study being only one private university, and only two different scenarios were used. Study replication with a broader population of students and larger group of evaluators utilizing a variety of scenarios is needed. However, Todd et al. (2008) pilot study results support the SEI as a potentially valid and reliable instrument for evaluating student performance in simulated clinical experiences. Data thus far indicates ease of use, and that it is understandable and evaluates essential nursing behaviors. The authors close saying “the SEI offers a springboard for future research in quantitative evaluation in simulation” (p. 14).

*Summary*

Concluding this literature review, it is evident available data and robust research supporting the role of simulation in nursing education exists, but is somewhat lacking when one considers the scope of integration simulation is making into nursing education. Many of the studies admittedly need replicated using larger sample sizes, and with more
diverse groups of student and/or faculty participants. Variables must also be accounted for and, if meaningful, included in the study designs. Theoretical models and conceptual frameworks support simulation integration into nursing education, and guide implementation and importance to skills and critical thinking development. Self-efficacy has important implications to clinical performance, so determining whether and to what extent patient simulation impacts self-efficacy needs further studied.

The studies reviewed clearly identify a role for human patient simulation in nursing education, but fail to demonstrate absolute benefit due to (a) the time-consuming nature of designing, implementing, and integrating simulation into program curriculums; (b) a lack of research reporting objective, data-driven positive nursing student experiences with simulation-based training over traditional or other methods; and (c) benefits of scenario-based simulation training over other methods not so significant as to unequivocally support human patient simulator integration into nursing education curricula based on evidence currently available. For this reason, more robust studies such as Alinier et al. (2006) need replicated to further examine benefits and evidence-based outcomes supporting recommendations to programs of nursing.
Chapter III
Methodology

Introduction

In this replication of Alinier et al.’s study (2006), the purpose is to compare whether scenario-based simulation training improves quality of undergraduate nursing students’ learning specific to clinical skills, competence and perceived confidence. Differences in the control group, experiencing only traditional curriculum, will be compared to the experimental group, having simulation training added to traditional curriculum, in the Objective Structured Clinical Examination, before and after simulation training, and Likert-type scale questionnaire at post-testing. Findings will help nurse educators identify if scenario-based simulation training improves clinical skills’ learning, competence and/or students’ perceptions of confidence. This information will in turn aid determining the value of using simulators in nursing education.

Research Questions

1. Are there differences in the Objective Structured Clinical Examination score, representing competence, before and after simulation training in the experimental group of students compared to the control group having traditional curriculum only?
2. Are there reported differences in reported perceptions of confidence before and after simulation training in the experimental group of students compared to the control group having traditional curriculum only?

*Population, Sample and Setting*

Participation in this study will be open to consecutive cohorts of undergraduate students in their junior year medical-surgical course at a large baccalaureate nursing program in Cincinnati, Ohio. Participation will be voluntary and initiated via a participation invitation to all junior year students in the course for three consecutive years. Of the anticipated 200 invited students, based on historical class sizes, it is intended at least 125 will volunteer to participate by attending both the initial and subsequent Objective Structured Clinical Examination (OSCE). No students enrolled in the course and willing to participate will be excluded.

For the sample to be representative, it must be similar to the target population in as many ways as possible (Burns & Grove, 2005). While a fairly large number of students may not participate or even drop out of the study, it is hoped the average age, gender distribution, and previous experience with simulation distribution will be similar and reliable when comparing control and study groups to each other so results can be considered representative of the second year population at large (Alinier et al., 2006). For this reason, participating students will be randomly allocated to either a control or experimental group after an initial assessment session.
Protection of Human Subjects

The study will be submitted to the institutional review boards of Ball State University and University of Cincinnati for approval prior to any researcher contact with faculty or participants. Ethical principals for research will be carefully and thoroughly considered, and ethical conduct will be a priority. Global considerations and careful evaluation as to the need and importance of determining whether scenario-based simulation training in nursing education improves clinical skills’ learning and students’ competence will also be accomplished.

Access to students for invitation to participate will be gained through second year course faculty of intended participant students. All student invitees will be informed as to the purpose, requirements, duration and anticipated benefits of the study. Clearly informed, non-punitive consequences for decisions not to participate will be explicitly communicated.

Volunteer participants will be randomly assigned an anonymity number and sign consent immediately prior to attending the first OSCE session. Participating students will articulate a clear understanding of the ability to withdraw at any time and without giving rationale for reason. Students randomized to the control group will be invited to attend simulation training sessions following their second OSCE session so to avoid perceived or actual disadvantage based on group assignment. All study participants will additionally be informed they will receive a certificate of attendance for placement in their professional portfolio upon study completion.
Procedure

Students who volunteer to participate will be randomly allocated to either a control or experimental group after the initial assessment session. Methods to evaluate outcome will include examining score differences between the groups in two separate 15-station Objective Structured Clinical Examination (OSCE) sessions (a classic experimental pretest/posttest design). The OSCE 1, or pretest, will occur prior to any intervention, while the OSCE 2, or posttest, will occur after the experimental group participates in simulation. There will be a six month interval between the OSCE 1 and OSCE 2, with simulation sessions for the experimental group occurring five weeks apart between the two examinations. A 5-point Likert-type scale questionnaire to measure students’ perceptions of confidence will be completed at the time of post-testing (a comparative descriptive design), along with collecting demographic information from students in both groups.

Students in the experimental group will be put into subgroups of four, with two subgroups then attending two three hours each scenario-based simulation sessions focusing on clinical skills and patient care. The same subgroups’ pair will participate in the two sessions, with one group participating in the scenarios while the other observes, and changing group roles for the subsequent session.

Each 15-station OSCE session can accommodate 15 students at a time, who will rotate through the stations spending 5 minutes at each station. The OSCE will include four theoretical stations having questions on safety and nursing practice, while the other 11 stations will require students use clinical knowledge, technical ability and
communication skills (Alinier et al., 2006). Each station will be supervised by an examiner and focus on a different clinical skill or aspect of practice performed.

Examiners will complete precise criteria sets on performance for each station. The entire OSCE session will last 90 minutes. Examiners will be thoroughly briefed and prepared in advance to ensure examination findings are based on objective judgments.

Simulation sessions will begin with a series of activities intended to introduce the students to simulation and what to anticipate in the scenario while gaining students’ confidence and helping them relax. Scenarios will be audio and videotaped so to display what is occurring to the group observing in a separate room. Communication, teamwork, situation awareness, decision-making, and clinical skills will be points for discussion in debriefing sessions to follow the simulation session, which both observers and participants will attend.

The intent of the experimental groups’ simulation sessions will be to provide realistic clinical experiences, in a safe environment, without providing any specific preparation for the OSCE 2. Again, there will be at least 5 weeks between the second simulation session and OSCE 2 for any subgroup.

Prior to OSCE 2, a questionnaire to obtain demographic information, as well as previous use of technology in nursing practice, and student level of confidence when working in scenario-based simulations will be completed. The OSCE 2 will have similar skill and practice stations to the OSCE 1, but stations will be rearranged so the location testing of a particular skill or practice station in OSCE 1 will be different in OSCE 2. Following completion of both simulation and OSCE sessions, research coordinators will
adopt an open door policy to discuss student performance and show them measured progress between OSCE sessions.

Research Design

A classic experimental design with randomized control and experimental groups participating in a pretest/posttest will provide the greatest amount of control possible when examining causality of simulations effect on clinical competence (Burns & Grove, 2005). A comparative descriptive design will be used to examine differences in control and experimental groups perceived confidence. Comparative descriptive designs describe differences in variables, in this study confidence, in two or more groups while in a natural setting (Burns & Grove). Demographics as a variable will be described using a comparative narrative format. Throughout the study, both groups of students will follow their normal curriculum. Experimental group students will additionally receive hands-on scenario-based training in a simulated intensive care setting over two afternoons. Reassessment of both control and experimental groups will occur six months following the first OSCE.

Instrumentation, Reliability and Validity

Only students participating in the OSCE 1 (the pretest prior to randomization) and OSCE 2 (posttest) will be considered to have completed study participation and included in the study results’ reporting. Data will be collected, for each study year, via a pretest/posttest and questionnaire. Prior to the start of the second OSCE, demographic information will be obtained. This information will help determine if the randomly
selected study groups demonstrate validity and reliability when compared to each other and also with regard to representativeness of the second year student population at large.

Since the OSCE began being used to assess clinical competence of healthcare trainees in 1979, it has increasingly been recognized as a valid, reliable and useful method for assessing practical skills in most allied health professions (Alinier et al., 2006). A panel of educators will be involved in the validation of this study’s 15 stations for content and accuracy. All OSCE examiners will be trained by the study’s principal investigator, and once trained to a particular station will remain allocated to that station as consistently as possible.

Data Analysis

Data analysis will be performed using the most recent version of Short Pulse Spallation Source (SPSS) statistical analysis and data mining software available. Experimental and control group OSCE performance and questionnaires will be examined. Statistical significance of the difference in OSCE results will be evaluated using t-tests. T-test is a parametric analysis technique used to determine significant differences between measures of two samples (Burns & Grove, 2005).

The Likert-type questionnaire data used to evaluate student perceptions of confidence will be organized into categories based on most pertinent comments and what stands out as important to students. The Likert-type scale is an instrument designed to determine the opinion of a subject via scales quantifying degree to which test participants agree, or don’t, with declarative statements (Burns & Grove, 2005). A Mann-Whitney U-test will then be used to analyze the difference between students’ perceptions of
confident. According to Burns & Grove, Mann-Whitney $U$-test successfully analyzes ordinal data with 95% of the power of the $t$-test to detect differences between groups of normally distributed populations.

Summary

In this chapter, the design, instrumentation and procedures to be used in replicating Alinier et al.’s study (2006) was described. The specific questions being asked relate to improvements in clinical skills and confidence in the experimental group of students receiving scenario-based simulation training in addition to traditional curriculum, compared with students receiving traditional curriculum only. A volunteer convenience sample of three cohorts of junior year nursing students, totaling at least 125, will be used. Data will be collected following two 15-station OSCE, from a Likert-type questionnaire examining perceptions of confidence, and demographics between the control and experimental group.

Many studies describe student participants of simulation exercises as having stressed both value and appreciation of hands-on, safe opportunities for practice learning and evaluation of patients away from actual patients. A growing number of qualitative, and to a lesser degree quantitative, outcome measures in previous studies have also shown simulation to have a favorable impact on teaching in nursing education. Additional studies must build upon concepts included in this and other earlier studies. Future studies should incorporate frameworks supporting recognition of need for robust, credible designs in order that study conclusions can either move the agenda forward to
objectively and favorably recommend incorporating simulation into nursing education, or at least delineate clear advantages and limitations.
References


## Appendix A

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<th>Problem/Purpose</th>
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<tr>
<td>Waldner, &amp; Olson (2007)</td>
<td>Problem: Theoretical nursing models to support frameworks for implementing and using simulation in nursing education are lacking. Purpose: Use learning theories as frameworks to guide educator decisions about simulation and correct sequencing of learning experiences.</td>
<td>Retrospectively applied Kolb &amp; Benner’s theories to previous study participants &amp; designs.</td>
<td>Framework: Benner’s theory of novice to expert and Kolb’s experiential learning theory.</td>
<td>Exploratory.</td>
<td>None.</td>
<td>No specific framework, nursing or other, fits simulation use. Benner’s skill acquisition &amp; Kolb’s experiential learning model provide theoretical experiences to aid development of students’ nursing knowledge. This can start attempts to theoretically ground development and use of simulation in nursing education.</td>
<td>Lacking sample, design &amp; instruments of actual research study, but compelling retrospective application and assertions as to need for development of theoretical frameworks supporting use of simulation.</td>
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<td>Martin (2002)</td>
<td>Problem: Critical thinking increasingly used for clinical decision-making as nursing has evolved from task-oriented to a profession requiring complex cognitive and correlational skills for decision-making.</td>
<td>Convenience sample of 149 nursing students, graduates, and expert nurses from Midwest schools of nursing and health care agencies.</td>
<td>Framework: Benner &amp; Paul’s theoretical models.</td>
<td>Descriptive - correlational.</td>
<td>Elements of Thought Instrument (ETI), videotaped vignettes and demographic data sheets.</td>
<td>Significant differences in ETI scores for clinical expertise and decision scores between the 3 levels, with increases as experience level increased. No significant difference between ADN and BSN or demographic variables and critical thinking and decision-making. Theory of Critical Thinking can serve as understand role of experience in learning to think critically</td>
<td>Lack of randomization, &amp; small, geographically similar sample.</td>
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<td>Childs, &amp; Sepples (2006)</td>
<td>Problem: Simulation commonly used in nursing education but instruments to measure student and faculty experience and benefit are lacking. Purpose: Test validity &amp; reliability of instruments used to measure education practices &amp; simulation designs. Also intent to measure improvements in nursing student perceptions of confidence.</td>
<td>55 senior capstone nursing students at College of Nursing and Health Professions at the University of Southern Maine (USM).</td>
<td>Framework: Simulation Model designed for National League of Nursing and Laerdal use in a national, three year collaborative research project.</td>
<td>Descriptive – exploratory.</td>
<td>20-item Education Practice Scale for Simulation (EPSS), 20-item Simulation Design Scale (SDS) and 13-item USM learning practice and confidence level scale.</td>
<td>EPSS &amp; SDS were valid and reliable instruments. Simulation feedback rated as most important educational practice, followed by collaboration &amp; active learning. Overall experiences very positive. Simulation use valuable &amp; in the long run potentially more beneficial for student learning and course outcomes than</td>
<td>Small sample size and similarities limit generalizing findings.</td>
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<td>Kardong-Edgren, Starkweather, &amp; Ward (2008)</td>
<td>Problem: Initial steps to integrate simulation into nursing programs are overwhelming to faculty and supportive personnel.</td>
<td>Convenience sample of 100 undergraduate nurses enrolled in their first clinical course in a framework: Jeffries Nursing Education Simulation.</td>
<td>Prospective descriptive – typical.</td>
<td>Educational Practices Questionnaire (EPQ), Simulation Design Scale (SDS), and Student Support Questionnaire (SSQ).</td>
<td>Overwhelming support of simulation. Value of repetitive practice of foundational clinician practice.</td>
<td>Sample = one cohort of similar students, design lacks ability to compare novice faculty run and debrief simulation experiences.</td>
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<td>Purpose: Evaluate student and faculty perceptions of the value of simulation following construction and implementation of simulation scenarios into curriculum.</td>
<td>baccalaureate program.</td>
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<td>Satisfaction and Self Confidence in Learning (SSSCL).</td>
<td>skills enhanced learning outcomes. Simulation requires additional faculty time but offers creative and interactive teaching and learning environment to solidify foundational technical and interpersonal skills, along with cognitive reasoning and critical thinking.</td>
<td>student results, novice faculty run and debrief simulation experiences.</td>
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<td>Lasater (2007)</td>
<td>Problem: Nursing schools increasingly use simulation for skills teaching. No real evidence to confirm simulation enhances clinical judgment over use of conventional teaching methods. Purpose: Explore categories and concepts in student-reported experiences with integrating simulation into the traditional curriculum.</td>
<td>39 volunteer junior level students at Oregon Health &amp; Science Scholl of Nursing, 15 of who were nontraditional students.</td>
<td>Framework: Not mentioned. Concepts: Learning aptitude, clinical judgment.</td>
<td>Descriptive-exploratory.</td>
<td>Observation of clinical scenario-based simulation and participant-moderated videotaped focus groups.</td>
<td>13 primary themes and 5 major codes identified and fit 95% of student responses from the transcript. Simulation can motivate critical thinking, necessary for clinical judgment by acting as the integrator of skills application learning.</td>
<td>Limitations of small focus group comprised all nontraditional students, limited cultural &amp; ethnic diversity.</td>
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<td>Reilly, &amp; Spratt (2007)</td>
<td>Problem: Wide variety of healthcare settings and limited staff for student ratios challenge school of nursing faculty to monitor student experiences and clinical practice learning. Purpose: Explore nursing perceptions of benefits &amp; improved learning reality with case-based simulation experiences use concurrent to didactic and actual clinical experiences.</td>
<td>21 Tasmania, Australia 2nd year nursing students; 21 in Stage One and 20 in Stage Two.</td>
<td>McKinnon, Walker and Davis benchmarking guidelines for Australian Universities, and Carrick Institute for Teaching and Learning Higher Educations’ indicators for quality teaching.</td>
<td>Qualitative - case-based observational pilot research study.</td>
<td>Database of simulation performance feedback &amp; Aggregated, thematic analysis of taped focus groups.</td>
<td>Students preferred interaction of simulation as opposed to didactic teaching; believed was a good interactive tool for remembering learned skills. Learning enhanced with simulation because it better contextualizes learning and allows student to practice safely without interpersonal burdens of actual patient.</td>
<td>Small sample size with similar demographics.</td>
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<td>Bearnson, &amp; Wiker (2005)</td>
<td>Problem: Simulation increasingly used to augment learning without understanding benefit. Purpose: Explore the benefits and limitations of using a human patient simulator as a patient substitute for one day of clinical experience.</td>
<td>Two groups of first year baccalaureate students and their faculty.</td>
<td>No framework. Concepts: Student knowledge, ability, &amp; confidence.</td>
<td>Descriptive - exploratory.</td>
<td>4 item Likert-type survey instrument, 3 open ended questions tool, and student journals.</td>
<td>Perceptions of simulator learning positive – multiple benefits and justifies use of simulators in clinical learning. Simulators offer safe, effective learning experiences. More studies needed to identify models for implementing simulation into nursing curriculums.</td>
<td>Drawback that simulator only accommodate few students at a time &amp; requires significant faculty resource.</td>
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<td>Feingold, Cataluce, &amp; Kallen (2004)</td>
<td>Problem: Clinical simulation increasingly used to teach clinical skills and critical thinking, thus shifting nursing education from hospital-based to university settings without evidence simulation learning has transferability to evoke practice readiness. Purpose: Evaluate student and faculty responses to use of a computerized patient simulator following interactive clinical scenario simulations.</td>
<td>4 faculty and 97 senior year BSN students, 28 of 50 from Fall semester and 37 of 47 from Spring semester, enrolled in an advanced acute care course, returned a survey.</td>
<td>Framework: Not mentioned. Concepts: Critical thinking, practice readiness and team learning.</td>
<td>Descriptive - exploratory.</td>
<td>20-item tool scored on a 4-point Likert-type scale for students and a 17-item tool with the same response scale for faculty.</td>
<td>Students and faculty found simulations to be realistic and valuable. Half the students rated simulation experiences as transferable to real clinical setting compared to 100% faculty. Use of computerized, clinical scenario simulation has value for students and educators, but doesn’t replace experiences gained via student supervision and mentoring.</td>
<td>Concerns with how much time simulation requires of faculty.</td>
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<td>Alinier, Hunt, Gordon, &amp; Harwood (2006)</td>
<td>Problem: Simulators are increasingly used in nursing programs without evidence simulators are more advantageous than traditional methods alone. Purpose: Compare pretest/post-test differences in the Objective Structured Clinical Examination (OSCE) in two groups of students, one who had simulation in addition to traditional curriculum and the other who did not.</td>
<td>99 undergraduate, second year nursing students in the United Kingdom; 50 in control group and 49 in experimental group.</td>
<td>Framework: Not mentioned. Concepts: Competency, stress and confidence</td>
<td>Classic experimental with pretest/posttest in a control and experimental group, and comparative descriptive design.</td>
<td>15-station Objective Structured Clinical Exam (OSCE) and 5-point Likert-type scale questionnaire.</td>
<td>Mean scores statistically significant for improved performance in experimental group. Differences in stress perceptions and confidence between the two groups not statistically significant. Simulator use, in conjunction with traditional curriculum, can improve OSCE test scores but has little effect on student confidence and level of stress.</td>
<td>Simulator sessions hard to organize, large number of faculty required to run simulations for number of students.</td>
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<td>Comer (2005)</td>
<td>Problem: Role-playing techniques can serve as an effective substitute or supplement to simulation technology when teaching nursing skills. Purpose: Examine impact of providing risk-free, patient simulation experiences reinforcing lecture information and promoting active learning on clinical skills &amp; clinical judgment development.</td>
<td>One group of 30 undergraduate nursing students.</td>
<td>Framework: Not mentioned.</td>
<td>Exploratory.</td>
<td>Structured scenarios with didactic, contextual dialogue.</td>
<td>Students report increased understanding of course material with participation in clinical simulation experiences. Faculty report decreased failure rate on the clinical course exam corresponding with simulation experiences from ten out of 30 to five out of 30.</td>
<td>Experiences were to be supportive &amp; pleasant - debriefing to emphasize key points, critical thinking &amp; clinical judgment.</td>
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<td>Brannan, White, &amp; Bezanson (2008)</td>
<td>Problem: Simulation being used to replicate experiences in nursing practice education without evidence of successful learning with use. Purpose: Compare effectiveness of two instructional methods of teaching nursing content related to complex patient management &amp; skill mastery – practice readiness.</td>
<td>107 baccalaureate nursing students enrolled in same junior-level clinical course.</td>
<td>Framework: Not mentioned. Concepts: Critical thinking, problem solving, decision-making, and collaboration.</td>
<td>Quasi-experimental, pretest - posttest.</td>
<td>Acute Myocardial Infarction Questionnaire: Skills Test (AMIQ), Confidence Level tool (CL), and Demographic Data Form.</td>
<td>Simulation experience students achieved significant higher AMIQ posttest scores compared to pretest, with regression methods demonstrating simulation was the reason. No significant difference in confidence level scores between two groups. Nursing education will forever be grounded in traditional teaching methods and actual clinical.</td>
<td>Research value limited by not randomly assigning intervention group. More research to decide best practice &amp; whether simulators help achieve optimum learning outcomes compared to other teaching methods needed.</td>
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<td>Goldenberg, Andursyszyn, &amp; Iwasiw (2005)</td>
<td>Problem: Nurses legally and professionally to perform health teaching as dimension of nursing practice. Unknown role of simulation in such teaching-learning and confidence development with skill development for health teaching.</td>
<td>Non-probability convenience sample of 22 part and full time 3rd year nursing students.</td>
<td>Framework: Bandura’s theory of self-efficacy model in health teaching.</td>
<td>Exploratory – descriptive.</td>
<td>2 part 63-item Baccalaureate Nursing Student Teaching-Learning Self-Efficacy Questionnaire.</td>
<td>Overall self-efficacy scores increased significantly ($p = 0.001$) after two sessions of role-playing case study simulations. Increased self-efficacy suggests confidence in faculty comfort &amp; support lacking with such participative teaching strategies.</td>
<td>experiences, but, learner-centered simulation actively engaging students in decision-making and realistic patient responses may be most useful for learning complex content.</td>
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<td>Ravert (2008)</td>
<td>Purpose: Investigate effect on simulation on nursing students’ self-efficacy in health teaching.</td>
<td>25 total baccalaureate students participated: 13 in non-HPS group, 12 in HPS group and 15 in control group.</td>
<td>Framework: Not mentioned.</td>
<td>Quasi-Experimental, Comparative – Pretest &amp; Posttest</td>
<td>75-item Critical Thinking Disposition Instrument, 34-item multiple choice Critical Thinking Skill Instrument, &amp; 12-item Learning Style Inventory.</td>
<td>All groups experienced moderate to large effect size in critical thinking scores. Corrected model for total scale gain score was statistically significant but not significant for learning style or gap between the 3 groups.</td>
<td>Very small per group sample size, similar participant demographics &amp; issues with simulator and instrument encountered.</td>
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<td>Problem: Patient simulation increasingly used in nursing education despite lack of robust studies supporting benefit to student critical thinking.</td>
<td>Purpose: Determine if measures of critical thinking show difference between simulator, non-simulator, and control group. Determine moderating effect of students’ preferred learning style.</td>
<td>Concepts: Critical thinking.</td>
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<td>Radhakrishnan, Roche, &amp; Cunningham (2007)</td>
<td>Problem: No current studies validate simulation’s influence of systematic practice on clinical performance of nursing students. Purpose: Identify nursing clinical practice parameters influenced by simulation in comparing student groups’ clinical performance for safety, basic assessment skills, prioritization, problem-focused assessment, interventions, delegation and communication.</td>
<td>Convenience sample of 12 senior year second degree BSN students randomly assigned to experimental or control group.</td>
<td>Framework: Not mentioned. Concepts: Practice competence &amp; risk-free learning.</td>
<td>Quasi experimental pilot study with control and experimental groups.</td>
<td>Clinical Simulation Evaluation Tool (CSET).</td>
<td>Students who practiced with simulators in addition to traditional clinical training had significant higher scores than control group receiving traditional teaching methods alone. Performance otherwise similar.</td>
<td>Small, homogeneous convenience sample was a weakness but randomizing the sample &amp; blinding faculty observer scoring the students provided value.</td>
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<td>Todd, Manz, Hawkins, Parson, &amp; Hereinger (2008)</td>
<td>Problem: Current lack of tested evaluation instrument to accurately measure student performance. Purpose: Develop valid and reliable simulation evaluation tool and test with senior nursing students.</td>
<td>72 senior nursing students divided into groups of 4 to 5 students each.</td>
<td>Framework: American Association of Colleges of Nursing (AACN) Core Competencies.</td>
<td>Descriptive – correlational.</td>
<td>Simulation Evaluation Instrument (SEI) with Likert-type scale.</td>
<td>Content validity established from literature and review of tool by expert panel. Reliability agreement by evaluators 84.4% - 89.1%. Additional research needed to verify results with different evaluators, students and additional scenarios. A valid, reliable tool to evaluate simulator experiences</td>
<td>Limitations were small sample size, two different scenarios, and one university location.</td>
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<td>improves student assessment skills and therefore clinical performance.</td>
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