A TOOL TO EVALUATE SIMULATIONS IN NURSING EDUCATION

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of the requirements for the degree of
Master of Science in Nursing

By

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ABSTRACT

The purpose of the study is to test the interrater reliability of a tool to evaluate student performance during clinical simulations, using a convenience sample of senior Baccalaureate nursing (BSN) students and clinical instructors. Permission was obtained from Creighton University to use the Creighton Simulation Evaluation Instrument (CSEI) and further test inter-rater reliability. Approval for the protocol was obtained from the University Institutional Review Board (IRB). Six different groups of three to five senior level nursing students (N=24) enrolled in a critical care course completed a scenario involving a patient with congestive heart failure. A total of 126 ratings by three clinical instructors were compared with the ratings by the course coordinator. The percent agreements between the each of the clinical instructors and the course coordinator were calculated for each category of the evaluation tool.

The CSEI tool was effective in evaluation of student performance during a simulation involving a patient with acute exacerbation of CHF. However, results were not consistent between evaluators. Thorough training of evaluators, greater precision in defining the behaviors associated with each competency, and greater clarity in explaining the underlying dimensions of the tool is recommended in order to improve the reliability of the instrument.

This thesis is approved for

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DEDICATION

This thesis is dedicated to the students of Eleanor Mann School of Nursing, University of Arkansas. It is my sincere hope that the use of simulation as a teaching strategy will help them become safe, compassionate, caring nurses.

Additionally, this work is dedicated to my father and mother who never had the opportunity to complete college. They valued education and worked hard to provide educational opportunities. As the first family member with an advanced degree, I share my successes with them.

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Introduction

Our current healthcare system presents several challenges for nursing education: profound changes in science and technology, patients with increasingly complicated diagnostic and treatment regimens, increased enrollment of nursing students, a shortage of nursing faculty (Benner, Sutphen, Leonard, and Day, 2009), decreased availability of clinical sites, employer expectations of new graduates to transition quickly into the role of caregiver, and increased concern for patient safety issues (Jeffries, 2009). Clinical simulation is considered an innovative tool for teaching students about the real world of nursing in an efficient and cost effective manner (Jeffries, 2005). The National Council of State Boards of Nursing (NCSBN) reports that simulation is being used increasingly as an alternative to traditional clinical rotations (Hayden, 2010). The NCSBN defines simulations as "activities that mimic reality of a clinical environment and are designed to demonstrate procedures, decision-making and critical thinking through techniques such as role-playing and the use of devices such as interactive videos or mannequins" (cited in Gaberson & Oermann, 2007, pp. 123-124). Medium fidelity simulators provide some feedback to students, such as heart and lung sounds. High fidelity simulation produces the most lifelike scenarios, using a full-body human patient simulator (HPS) that reacts to student manipulations in realistic ways, such as speaking, coughing and breathing chest action. Hayden (2010) reported on the results of a survey conducted by the NCSBN of 1,060 pre-licensure nursing programs in the United States. Overall, 87% reported that students receive high fidelity or medium fidelity experiences, and 54% of those programs use simulation in at least five clinical courses. Seventy seven percent indicated that they are substituting simulation for clinical time or would do so if permitted.

As nursing programs increasingly integrate simulation throughout the curricula and substitute simulation for clinical time, validation that simulation equips learners with skills that lead to improved clinical judgment is needed (Seropian, Brown, Gavilanes, and Driggers, 2003) along with reliable and valid evaluation instruments that can measure learning outcomes and the effectiveness of simulation as a teaching strategy (Kardong-Edgren, Adamson, and Fitzgerald, 2010).

Review of Literature

The component of mastering clinical skills that is missing in traditional skills lab settings is context (Gantt, 2010). Complexities of context require being able to perceive characteristics and aspects of patient care situations that may alter the manner in which nursing care is delivered (Bambini, Washburn, and Perkins, 2009). While skills checklists are valid tools to measure the technical components of patient care, educators realize that nursing students must also know the underlying conceptual bases and rationales, and are asking how simulations can be planned and evaluated with tools that capture concept and skills acquisition (Gantt, 2010). Most evaluation tools in nursing evaluate learning outcomes in the cognitive, affective, and psychomotor domains separately. In real practice situations, however, these behaviors occur simultaneously. The challenge is to develop simulation evaluation tools that measure learning in all three domains simultaneously. Kardong-Edgren et al. (2010) conducted a review of 22 currently published evaluation instruments for evaluation of simulations. Their research concluded that the tools coming closest to measuring learning outcomes in the psychomotor, affective, and cognitive domains simultaneously appear to be those created by Herm, Scott, and Copley (2007), Lasater (2007), Radhakrishnan, Roche, and Cunningham, (2007), and Todd, Manz, Hawkins, Parsons, and Hercinger, (2008).

Radhakrishnan et al. (2007) conducted a quasi-experimental pilot study to evaluate the effects of simulation practice using the HPS on the clinical performance of a convenience sample of senior nursing students in a bachelor of science in nursing (BSN) program completing a second degree. Clinical performance with and without HPS practice was compared to identify the performance areas sensitive to improvement with HPS practice. Twelve students were randomly assigned to a control or intervention group. The intervention group participated in two one hour practice simulations in which they provided nursing care for two complex patients. Each student was given a report for each patient that included health history, history of the current problem, complete order set (including medication), and comments from a nurse on the previous shift. Participants were instructed to assess the patients and prioritize care. After each simulation, students participated in a debriefing during which the faculty guided a discussion on the student's performance. The control group had no practice simulations. For the posttest, both the intervention and control groups participated in a mandatory simulation exercise involving two complex patients. A Clinical Simulation Evaluation Tool was developed by the faculty and designed to measure safety, basic assessment skills, prioritization, problem-focused assessment, ensuing interventions, delegation and communication. No reliability or validity testing is reported. Students in the intervention group scored significantly higher than the control group in the dimension of safety and basic assessment. There was no difference on other dimensions evaluated (focused assessment, intervention, delegation, and communication).

Lasater (2007b) developed a quantitative instrument, the Lasater Clinical Judgment Rubric (LCJR), based on the four dimensions of Tanner's Clinical Judgment Model: noticing, interpreting, responding, and reflecting. The rubric expands the four dimensions into eleven indicators with behavioral descriptions of student behaviors at beginning, developing, accomplished, and exemplary levels. A qualitative-quantitative-qualitative design was used as the method for a cycle of theory-driven-description-observation-revision-review to develop and pilot test the rubric in scoring student's performance. Thirty-nine third-year students were observed in the simulation laboratory during the seven week study time frame. The researcher concluded that the LCJR provides performance expectations as well as language for feedback and assessment of student's clinical judgment development and that the rubric has relevance for acute care, long term care, and community health. The author reported that studies of interrater reliability of the rubric and correlation between the simulation laboratory and clinical setting are in development (Lasater, 2007b).

Nursing faculty from two different courses at St. Cloud State University collaborated to create a single simulation scenario incorporating patient safety; therapeutic communication; professional boundaries; head-to-toe physical assessment; planning, prioritizing, and implementing appropriate interventions; pain assessment; medication administration; documentation and communication of findings; and critical thinking and decision-making (Herm et al., 2007). Specific criteria relating to each of these competencies were identified and an evaluation rubric was developed. A simulation scenario was created using the evaluation rubric as a guide. Faculty members identified consistent scores and observations in their grading rubrics and concluded that the simulation evaluation tool demonstrates inter-rater reliability. The tool has not been evaluated for reliability or validity.

Todd et al. (2008) developed The Creighton Simulation Evaluation Instrument (CSEI) and pilot tested it with senior nursing students. The tool is based on the American Association of Colleges of Nursing (AACN) core competencies (critical thinking, communication, assessment, and technical skills). These core competencies are integrated throughout the 1998 version of the *Essentials of Baccalaureate Education for Professional Nursing Practice*. Twenty two behaviors were identified as essential to include in the instrument. The purpose of the pilot study was to test the validity and reliability of the instrument using simulated clinical experiences that provide an opportunity to practice all of the competencies simultaneously. Content validity was determined by an expert panel and review of the literature. Interrater reliability was reported to be 0.85 to 0.89. The authors conclude that additional research needs to verify the results with different evaluators, varying levels of students, and different scenarios (Todd et al., 2008). The CSEI was developed to evaluate a team in simulation. A group score is given, allowing faculty to evaluate group dynamics such as communication and teamwork. One of the objectives related to patient safety is development of inter-professional teamwork skills (Cronenwett, Sherwood, Barnsteiner, Disch, Johnson, Mitchell, Sullivan, & Warren, 2007).

A tool developed by Ironside, Jeffries, and Martin (2009) based on The Quality and Safety Education for Nursing (QSEN) knowledge, skills and attitudes also measures outcomes in the psychomotor, affective, and cognitive domains simultaneously. The QSEN project was designed to respond to the Institute of Medicine's report, *To Err is*

Human: Building a Safer Health System. Six competencies related to patient safety and quality care (safety, patient-centered care, collaborative/teamwork, informatics, quality improvement, and evidence based practice) were defined; and the knowledge, skills, and attitudes (KSAs) required by nursing students to achieve competency in each category were enumerated (Cronenwett et al, 2007). The purpose of the study by Ironside et al. (2009) was to determine if multiple-patient simulation experiences improve patient safety competencies and to determine the relationship between student factors (age, GPA, and tolerance for ambiguity) and the achievement of patient safety competencies. The conceptual framework used was the Jeffries Simulation Model (Jeffries, 2005). Sixty-seven students enrolled in the 10-week Management Course on eight Indiana University campuses were invited to participate in the study. The first simulation took place in weeks three and four of the course. The second simulation took place in weeks nine and ten. Each student completed two different 20 minute scenarios involving four patients. The scenarios were selected based on similarity with the volume and complexity of patients typically assigned to a nurse new to practice. Before the first simulation experience and after the second simulation, students took the Multiple Stimulus Ambiguity Tolerance Scale –I, a 22 item measure of ambiguity tolerance. Investigators evaluated the patient safety competencies of the students using an instrument composed of the 16 KSA criteria from the QSEN project. The instrument is dichotomously scaled, with the evaluator indicating whether each criterion was met or not met. Internal consistency reliability was acceptable with a Cronbach's alpha = 0.89. Interrater reliability was not reported. The exploratory study demonstrated a correlation between simulation practice with multiple patients and increased safety competencies (Ironside et al, 2009).

Conceptual Framework

The Nursing Education Simulation Framework (NESF), developed to guide the design and development of simulations and to conduct research in a systematic fashion (Jeffries, 2005), was chosen as the theoretical framework for the study.

THE NESF was designed by a national group organized by the National League for Nursing in partnership with the Laerdal Corporation to answer the questions:

- What teaching and learning practices used with simulations contribute to positive outcomes?
- What is the role of the teacher?
- How does the simulation design contribute to the overall teaching and learning experience? (Jeffries, 2005, p. 96).

The NSEF (see Appendix A) is grounded in learning theory and has five major components: student factors, instructor factors, educational practices, design characteristics, and educational outcomes (Jeffries, 2005, p. 97). Student factors, instructor factors, and educational practices are based on Chickering and Gamson's (1987) seven principles for good practices in undergraduate education. The best practices in education incorporated into the NSEF include: encouraging contact between students and faculty, developing reciprocity and cooperation among students, encouraging active learning, giving prompt feedback, emphasizing time on task, communicating high expectations, and respecting diverse talents and ways of learning (Jeffries, 2005).

Design characteristics include the provision of clear objectives to students prior to the simulation, the degree of fidelity and complexity based on available equipment and student factors, the provision of cues during the simulation appropriate for the knowledge level of the students, and a debriefing immediately after each simulation (Reese, Jeffries, & Engrum, 2010). Educational outcomes include increase in knowledge, improved skill performance, student satisfaction, enhanced critical thinking, and improved self-confidence in the clinical setting. Jeffries (2005, p. 102) describes each of the variables and reviews nursing and other healthcare literature as well as related literature from non-healthcare literature that tests the relationships within the framework.

A multicenter trial to evaluate simulation based on the NSEF in nursing education was completed (Jeffries & Rizzolo, 2006). Based on the three-year study, Jeffries (2008) identified successful strategies for implementing simulations in nursing education:

- Ensure that specific simulation objectives match the content of the simulation. The scenario should be created using problems that are typically encountered in the practice setting, along with problem-solving skills that are typically required,
- Set a time limit for the scenario and debriefing and adhere to it,
- Design assignments so that students know their specific role during the simulation. Assigned roles need to be within the student's scope of practice,

- As an instructor, try not to interrupt students when they are attempting to solve problems on their own,
- Involve a limited number of learners (two to six) in the simulation in addition to one to two observers/recorders. Have students wear name tags and appropriate clothing for the role (Jeffries, 2008 p. 71-72).

Henneman and Cunningham (2005) introduced simulation into the senior year acute/critical care elective at the University of Massachusetts. They identified fidelity and objectives/information as important design elements in the framework they established for developing simulations. In their experience, the hands-on experience of manipulating life-like props increases the likelihood of students retaining what they learned in a simulation, while malfunctioning equipment or missing props interrupt and diminish the learning experience. They recommend basing learning objectives on the program or course objectives and choosing objectives that are best taught through simulation rather than traditional modes of teaching such as lecture or group work.

Larew, Lessans, Spunt, Foster, and Covington (2006) discuss the development of a simulation protocol structure and provide examples of its use in a mandatory learning experience for 190 adult health students at Maryland Baltimore School of Nursing. The design characteristics complexity and cues are addressed. Benner's (1984) concepts regarding the performance and learning needs of nurses with varying levels of clinical competency are incorporated into the development of the protocol. Throughout the clinical simulation, cues or prompts are provided that follow a vague to specific progression.

The debriefing process allows students to reflect on their simulation experience as it relates to the learning objectives and the goals of improving critical thinking ability, clinical judgment, and clinical performance. Students should carry out most of the discussion (Wickers, 2010) as they analyze the simulation and how well they managed the patient care situation. Since patient safety was a major objective in the Henneman and Cunningham (2005) simulation experience, their process stresses creating a safe environment for the debriefing so that students feel comfortable discussing mistakes. They explain to students that mistakes are part of the learning process and that simulation allows for learning from mistakes before caring for an actual patient. They encourage students to discuss their uncomfortable feelings and deal with them in a safe environment versus a clinical setting. Students acknowledged that being videotaped and being observed by instructors not involved in their teaching or evaluation was particularly stressful (Henneman & Cunningham, 2005).

Simulation encourages students to take an active role in management of a complex patient problem. Participating in a realistically simulated experience can be stressful. To create a safe learning environment that encourages active learning, Weller (2004) suggests allowing students to choose their own roles within teams, allowing less confident students to take a more minor role.

Study Purpose

The purpose of this study is to evaluate a quantitative instrument to objectively assess student performance during simulated clinical experiences (SCE) across settings and instructors and make a contribution to the science of nursing simulation by reusing and testing reliability of the evaluation tool developed by Todd et al. (2008). According to Kardong-Edgren et al. (2010), one way to move simulation science forward is to provide data for reliability and validity statistics for existing tools, using large sample sizes in more than one geographic location

Methodology

Permission was granted from Creighton University School of Nursing to use the SEI (see Appendix B) and further test its interrater reliability. Approval was obtained from the University Institutional Review Board.

Development of the clinical simulation experience (CSE)

The CSE was designed as a nongraded, but mandatory, learning experience for BSN critical care students as part of their orientation to clinical rotation. The critical care course facilitator assisted in the selection of a standardized clinically accurate scenario from the Medical Education Technologies, Inc., Sarasota, Florida (METI), Program for Nursing Curriculum Integration. A scenario involving a patient with congestive heart failure (CHF) exacerbation was chosen because it provided opportunity for students to identify common patient problems, such as dyspnea, and demonstrate appropriate interventions. The simulation requires students to use assessment and problem solving skills through the use of cues that are revealed in the patient's history and clinical presentation (Larew et al., 2006).

To address the design characteristic fidelity in the Simulation Model, attempts were made to provide a simulation as close to a real-life clinical situation as possible. A hospital room with a nursing station area was simulated and a medical record was created. The HPS was outfitted with a nasal cannula for oxygen, a foley catheter, and a cardiac monitor consistent with the clinical history of CHF. A separate area for medications was established. Protocols for medication administration from clinical agencies where students are rotating were provided.

Prior to the simulation, groups of five senior level BSN students enrolled in the critical care course were oriented to simulations and given a handout outlining learning objectives, the specific patient background, and questions to prepare for the scenario. Students were introduced to the room, the HPS, and the props. Students were also oriented to a standardized communication tool, I-SBAR-R, a modified version of SBAR presented by Grbach, Struth, and Vincent (2008). The AACN *Essentials of Baccalaureate Education for Professional Nursing Practice* (2008) state that communication and collaboration among healthcare professionals is critical to delivering high quality and safe patient care. The Joint Commission also emphasizes safety practices, and includes in the 2009 update to *National Patient Safety* Goal #2; "improve the effectiveness of communication among caregivers". SBAR, an acronym for a communication tool used by the students' clinical sites, stands for situation (S), background (B), assessment (A) and recommendation (R). It is a direct form of communication that requires the nurse to be brief and concise, think critically based on their assessments, and use assertiveness skills to make recommendations (Enlow, Shanks, Guhde, and Perkins, 2010). The variation of the SBAR tool adds an (I), requiring nurses to identify themselves and their patient and a second (R), requiring reading back of changes in the plan of care or any new orders (see Appendix B and C).

Preparation of raters

The researcher and the critical care course coordinator agreed to utilize the evaluation method established and tested by Creighton University. The method consists of assigning a *0 = does not demonstrate competency*, or a *1 = demonstrates competency.* If a particular behavior is not included in a scenario, evaluators have the option of identifying the behavior as not applicable (NA) (Todd et al., 2008). A discussion worksheet further defining expected behaviors for each competency on the SEI was completed by the researcher and the course coordinator (see Appendix D). To control for teacher factors in the Simulation Model, a training session for the evaluators included an introduction to scenarios, an explanation of the SEI and scoring method, an explanation of the ISBARR tool, a brief description of the SCE, and the role of the evaluator in the SCE. Evaluators were told not to teach or facilitate during the SCE. The group scoring method was explained, as this represents a change from the current clinical evaluation where each student is evaluated individually. The evaluators were provided with a handout which included a description of the scenario in detail, a list of questions to facilitate the debriefing, and a list of prompts.

Pilot test

The researcher and course coordinator, faculty members of the School of Nursing with experience in evaluating students in the clinical setting, pilot tested the instrument. A group of five students enrolled in the critical care course completed the scenario. Interrater reliability was tested by having the faculty evaluate the simulation simultaneously and independently record data according to the instrument's instructions. The data was then used to compute an index of agreement between observers (Polit & Beck, 2008). Interrater reliability of the tool was 88%; 88% in areas of assessment and communication, 100% in critical thinking, and 75% in technical skills. Based on results of this pilot study, a need for further development of assumptions regarding when a specific technical skill can be evaluated as performed correctly was identified.

The pilot study provided faculty an opportunity to become familiar with simulation as a teaching strategy. During the scenario, students appeared to be overwhelmed and required more prompting and more time to resolve problems than was originally anticipated. As a result, the scenario protocol was modified according to a model developed by Larew et al. (2006) at the University of Maryland Baltimore School Of Nursing based on Benner's (1984) conceptual framework regarding the different levels of clinical competency. Benner predicts that nurses who are functioning at the competent level will identify problems based on subtle cues more quickly than novice nurses (Benner, 1984). This was demonstrated when the critical care clinical instructors first read the scenario and identified several patient problems from the baseline cues. Because the novice critical care students required more prompts before recognizing the patient problems, a prompt set (appendix) with scripted patient and team member prompts that proceed from vague to specific was developed. The prompt set also controlled for the design factors of complexity and cues in the Simulation Model and made the scenario more standardized and reproducible.

Procedure

Six different groups of three to five senior level nursing students (N=24) enrolled in a critical care course completed the scenario. Students arrived in the simulation room dressed in their uniforms and prepared to practice as if they were in a clinical session. Each group was again oriented to the environment, manikin, monitors, nursing station, and medication area. The course coordinator performed the role of the emergency department nurse and provided background information. Students were provided with the patient chart, which also contained cues such as physician orders. The researcher performed the roles of physician and lab technician during the scenario. Students were informed that the scenario would end after 45 minutes; however, it would stop sooner if they completed everything they could do or were unable to continue.

Each group was debriefed immediately following the scenario. The completed SEIs were used to guide the debriefing and identify areas of student strength and concerns. A total of 126 ratings by three different clinical instructors were individually compared with the ratings by the course coordinator. The percent agreements between the each clinical instructor and the course coordinator were calculated for each competency of the evaluation tool for each of the six groups.

Results

Interrater reliability of the tool was 83% with instructor one; 71% with instructor two; and 98% with instructor three. The percent agreements under assessment ranged from 50% to 88%. The percent agreements under communication ranged from 50% to 100%. The critical thinking category demonstrated a range of scores from 88% to 100%. The technical skills category demonstrated a range of scores from 70% to 100%. There was 100% agreement with the course coordinator and all three instructors in determining which student groups achieved a passing score of 75% (four out of six groups).

Table 1. Interrater Reliability

	Percent agreement		
Assessment			
Obtains pertinent subjective data	50	100	100
Obtains pertinent objective data	50	50	50
Performs follow up assessments as needed	50	0	100
Assesses in a systematic and orderly manner using correct technique	100	50	100
total	63	50	88
Communication			
Communicates effectively with providers	50	50	100
Communicates effectively with patient	100	50	50
Writes documentation clearly, concisely and accurately			
Responds to abnormal findings appropriately	50	50	100
Promotes realism/professionalism	100	50	100
total	75	50	88
Critical thinking			
Interprets vital signs (T, P, B/P, pain, pulse ox)	50	100	100
Interprets lab results	100	100	100
Interprets subjective/objective data	100	50	100
Formulates measureable priority outcomes	50	100	100
Performs outcome driven interventions	100	100	100
Provides specific rationale for interventions	100	100	100
Evaluates interventions and outcomes	100	100	100
Reflects on simulation experience	100	100	100
total	88	94	94
Technical skills			
Uses patient identifiers	100	100	100
Utilizes standard precautions including hand washing	100	100	100
Administers medications safely	*100*	50	83
Manages equipment, tubes, and drains therapeutically	100	100	100
Performs procedures correctly	100	0	67
total	*100*	*70*	90
TOTAL	83	71	84

Discussion

Results from this study suggest that the SEI tool was effective in evaluation of student performance during a SCE involving a patient with acute exacerbation of CHF. However, results were not consistent among evaluators. This study differs from other studies in that there were multiple raters. Each clinical instructor evaluated the two groups that were assigned to their clinical rotations. Interrater reliability scores from the pilot study and with rater number three are encouraging and indicate usability of the SEI. Variability among the raters demonstrates the need to increase the reliability of the evaluation process. A major limitation of this study was the time allotted for training of the raters. Because orientation time was limited, the raters did not go through the scenario themselves prior to the student completion of the scenario. They also did not participate in the discussion describing specific behaviors related to the competencies in the tool. Thorough training of evaluators, greater precision in defining the behaviors associated with each competency, and greater clarity in explaining the underlying dimensions of the tool is recommended in order to improve the reliability of the process. Another limitation of the study is lack of fidelity of the simulation environment. As is the case in many schools of nursing, the first HPS was purchased in 2010 without a plan for immediate implementation. Following the purchase, the researcher obtained training on use of the HPS from a simulation representative. At the time of the study, the simulation lab did not have a working sink in the room, an infusion system, an outlet for oxygen, or the ability to videotape the scenario. An authentic simulation center will be incorporated into a new nursing school facility due to be completed in 2012. The plan is to incorporate simulation into the curriculum as some of the clinical hours from the junior medicalsurgical course and the senior critical care course are reallocated to patient simulation. The goal is to get a simulation evaluation tool in place prior to full implementation of simulation training.

Implications for Education and Research

Before using the SEI on a larger scale at this School Of Nursing, the reliability should be increased. With observational scales, the most effective means of enhancing reliability is thorough training of observers (Polit & Beck, 2008).

> The reliability of an instrument is a property not of the instrument but rather of the instrument when administered to a certain sample under certain conditions (Polit & Beck, 2008, p. 457).

It is important for faculty to prepare for the SCE by identifying and reaching consensus on expected behaviors for each competency based on learning outcomes and level of students participating. Findings from this study will guide the development of a more robust training session for instructors evaluating student performance during a SCE. The training will include practicing the actual scenario, reviewing the tool's behavioral categories, and practice using the tool. Arnold, Johnson, Tucker, Malec, Henrickson, and Dunn (2009) had the raters practice by reviewing two investigator-rated videotapes of previously recorded scenarios, using their evaluation tool to rate the performance.

According to the *Essentials of Baccalaureate Education for Professional Nursing Practice* (2008), interprofessional communication and collaboration among healthcare professionals is critical to delivering high quality and safe patient care (AACN). In this study, students worked in teams, planned their own roles within the teams, and evaluated the performance of their teams. They reported that the I-SBAR-R tool was helpful in prompting them to apply communication skills. Although most of their clinical sites use some version of the SBAR reporting tool, students reported having had limited practice using the SBAR or I-SBAR-R tool. The AACN has recommended nursing students engage in learning activities that focus on practicing teamwork and communication through simulation, case studies, and at the clinical sites (Enlow et al., 2010). The skills of effective team work can be built in to simulation scenarios providing opportunity for skill application in leadership, communication, conflict resolution, and situation monitoring (Groom, 2009). Groom (2009) recommends that when team dynamics are part of the simulation, it would be helpful to incorporate team training instruction such as TeamSTEPPS®, an evidence based teamwork system developed by the Department of Defense and the Agency for Healthcare Research and Quality (AHQR) to improve communication and teamwork skills among health care professionals (AHQR, 2006). These tools should be implemented early in the nursing curriculum, creating opportunities to practice using them in scenarios with the goal of preparing students to engage in safe interprofessional communication with physicians and other healthcare providers.

With the exception of one student, the study represented the first exposure to simulation using teams and high fidelity simulators. Students agreed that simulation should be incorporated into the curriculum by starting with simple scenarios in the beginning semesters. Currently, assessment and technical skills are evaluated by having students perform a return demonstration. Instead of asking a student to demonstrate suctioning a tracheostomy, faculty can program the HPS to exhibit shortness of breath, increased respirations, diaphoresis, decreased oxygen levels, and crackles in the lungs. The student has to assess the patient, perform the skill, assess the effects of their intervention, and document the findings. With simulation, the skills change to a higher level of complexity (Leigh & Hurst, 2008). Instead of demonstrating a memorized list of tasks, students have to use critical thinking skills to assess the patient before and after an intervention. They are able to relate the skills to real clinical situations and experience outcomes that result from their interventions (Leigh and Hurst, 2008). Utilizing simulation for assessment and technical skill practice and competency early in the curriculum will prevent both novice students and faculty from being overwhelmed during complex scenarios. In the second, third, and fourth semesters, simulations can become progressively more complex. The ongoing experience will decrease students' level of anxiety and enhance their learning (Leigh & Hurst, 2008).

The development of SCE is time and resource consuming, and the technology is expensive. Teaching in a simulated learning environment realistic enough to provide comparable learning outcomes to clinical practice makes faculty acceptance of simulation critical and takes practice (Dillard, Sideras, Ryan, Carlton, Lasater, & Siktberg, 2009, p. 103). According to Jeffries (2008) one of the challenges facing nursing programs as they adopt simulation as a new clinical teaching model is faculty development. She identified four essential elements in preparing faculty for the use of simulations: the use of standardized materials, use of a train the trainer approach, encouraging the development of a simulation design and integration team, and a plan for coordination of the simulation development and implementation activities.

Educational outcomes when traditional clinical experience is replaced with simulation are beginning to be reported in the literature. Schlairet and Pollock (2010) evaluated knowledge acquisition in a fundamentals nursing course with random assignment of students to high fidelity simulation and traditional clinical experiences. Simulated clinical experience was found to be as effective as traditional clinical experience in promoting student's knowledge acquistion. A study comparing traditional clinical time with a combination of clinical time and some simulated clinical experience found significantly fewer actual and potential medication errors with the combined simulation/traditional group (Sears, Goldworthy, & Goodman, 2010). It is not clear what percentage of clinical time was replaced by simulated clinical experiences. Research exploring optimal ratios of simulated to traditional clinical experiences is needed.

Harder (2010) conducted a systematic review of the literature to examine the effectiveness of simulation as a teaching tool in healthcare education. She looked at studies published between 2003 and 2007 that measured outcomes of the simulation use or identified specific learning outcomes. Findings supported her hypothesis that simulation does influence student learning. The majority of the studies indicated an increase in assessment and clinical skills performance, using pretest and posttest scores or Objective Structured Clinical Examination (OSCE) performance to evaluate the performance. The researchers acknowledged that these tools were developed to assess clinical skills in the practice setting and they were adapting them to use in simulations.

Harder (2009) points out the need for the development of evaluation tools designed specifically to measure performance in the simulation setting.

A changing healthcare environment with decreasing clinical sites, faculty shortages, and the demand to prepare students ready to care for more complex patients has been the major influence on the use of simulation as a teaching strategy in healthcare (Harder, 2009). Simulation technology is proving to be effective in teaching psychomotor and clinical reasoning skills. A measurement tool designed specifically for simulations that measures outcomes identified by Jeffries (2005) will help advance the science. In summary, in our experience, the SEI tool was found to be reliable and usable in the evaluation of student performance during a SCE involving a patient with acute exacerbation of CHF. However, results were variable between evaluators, indicating the need for improved training of evaluators, greater precision in defining behaviors associated with competencies, and greater clarity in explaining the tool. A need to implement simulation as a teaching strategy earlier in the curriculum, giving students the opportunity to practice communication and other teamwork skills, was also identified.

Lastly, the study increased the researcher's awareness that nursing educators need new skills as well as time and resources as they incorporate simulations as a learning strategy. It is important to develop a plan for faculty development that incorporates appointment of a simulation champion who has time to learn about the pedagogy and associated research, develop a standardized framework for simulation design, and incorporate a valid and reliable evaluation tool into the simulation learning process. Based on the results of this study, the researcher recommends the use of the CSEI for the evaluation of student performance during clinical simulations.

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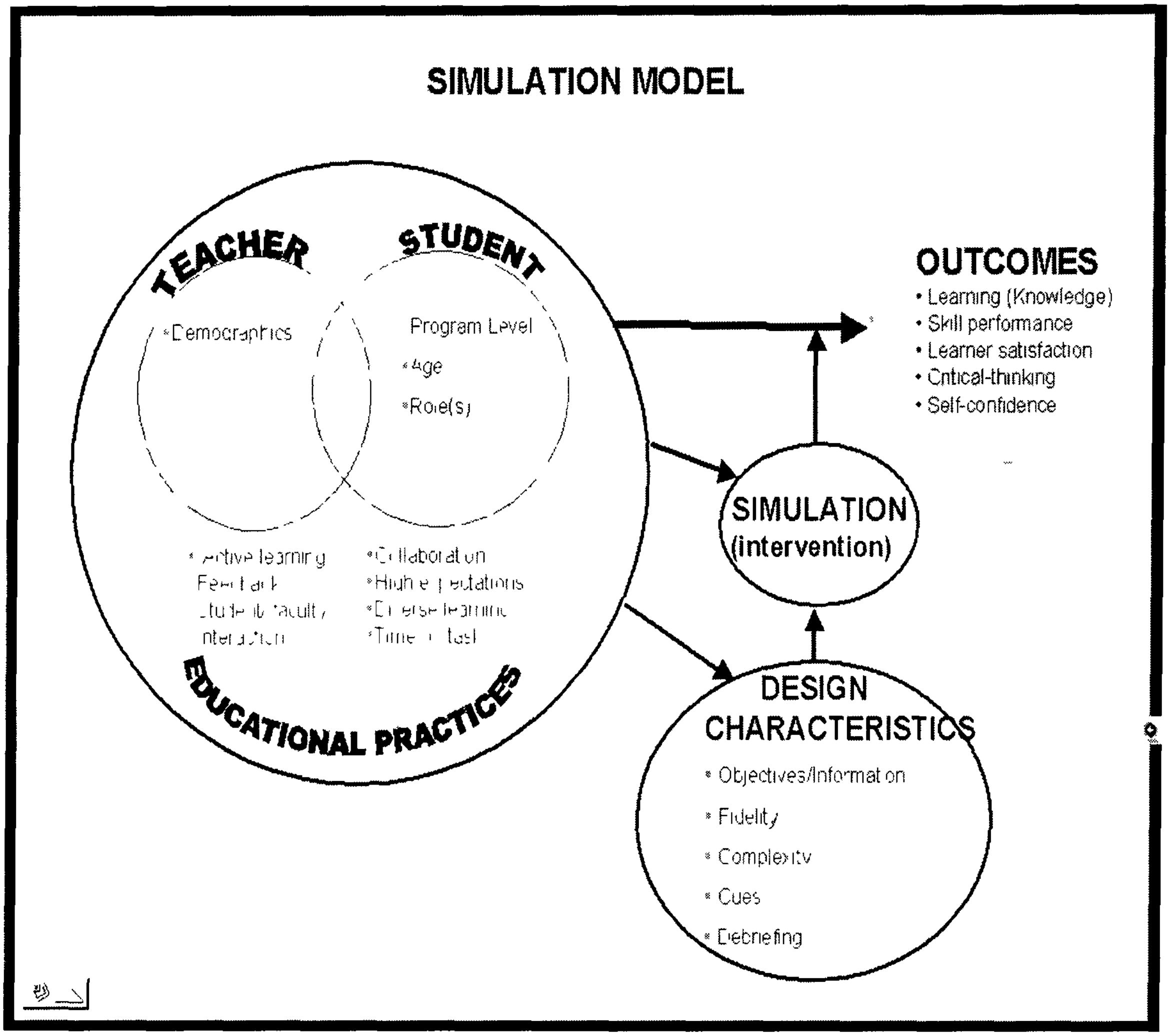
Appendix A

Simulation Model (Jeffries, 2005)



Appendix B

Creighton Simulation Evaluation Instrument

Creighton

Creighton Simulation Evaluation Instrument™ (C-SEI)

[illegible]

Date

GROUP COMMENTS

ASSESSMENT	[illegible]	
Obtains Pertinent Subjective Data	0	1
Obtains Pertinent Objective Data	0	1
Performs Follow-Up Assessments as Needed	0	1
Assesses [illegible]	0	1
COMMUNICATION		
Communicates Effectively [illegible] SBAR, WRBO	0	1
[illegible]		1
[illegible]	0	1
[illegible]		
Promotes Realism/Professionalism	0	1
CRITICAL THINKING		
Interprets Vital Signs (T, P, R, BP, Pain)	0	1
Interprets Lab Results	0	1
Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0	1
Formulates Measurable Priority Outcomes	0	1
Performs Outcome-Driven Interventions	0	1
Provides Specific Rationale for Interventions	0	1
Evaluates Interventions and Outcomes	0	1
[illegible]	0	1
TECHNICAL SKILLS		
Uses Patient Identifiers	0	1
Utilizes Standard Precautions Including Hand Washing	0	1
Administers Medications Safely	0	1
Manages Equipment, Tubes, & Drains Therapeutically	0	1
Performs Procedures Correctly	0	1

Student Participants

Total Score →

If not applicable, no score is given

Passing Score →

Passing score = 0.75 × number of items used

[illegible]

Appendix C

ISBARR Critical Situation Report

Preparing your ISBARR Report Prior to Calling the Physician

1. Assess the patient
2. Review the chart for the appropriate physician
3. Know the admitting diagnosis
4. Read the most recent physician and nurse notes
5. Have the chart in hand and be ready to report allergies, medications, IV fluids, I & O, lab, and test results

---

Identify	State name, title, and unit
Situation	I am calling about: patient name and room number. The PROBLEM I am calling you about is:
Background	State Admission diagnosis and admission date
	State pertinent medical history
	Brief synopsis of treatment if pertinent
Assessment	Most recent vital signs
	Changes in vital signs or assessment from prior assessment
Recommendation	Say what you think would be helpful or needs to be done (medications,
	treatments, tests, x-rays, EKG, CT, transfer to critical care, physician
	evaluation, consultant evaluation
	Ask about any change in orders
Read back	Restate the orders you have been given
	Clarify how often to do vital signs
	Under what circumstances to call back

Appendix D

ISBARR Change of Shift Report

<table>
<tr><td colspan="2">Identify: state name, title, and unit or section</td></tr>
<tr><td colspan="2">Situation: state patient's name and room number</td></tr>
<tr><td colspan="2">Background:
State admission diagnosis and date
Allergies
Code status:</td></tr>
<tr><td>Assessment:
Neurological

Respiratory

O2 therapy: note patients respiratory effort

Cardiac

Musculoskeletal

Skin</td><td>Vital signs

Pain

Abnormal lab results and interventions needed

Radiology results

I & O

Psychosocial</td></tr>
<tr><td colspan="2">Recommendations: what do you think would be helpful or needs to be done:
Patient care goals (identify any changes made)

New orders since you came on duty

Consults done, scheduled or needs to be ordered

Tests/treatments done, scheduled, or needs to be ordered

Discharge needs</td></tr>
<tr><td colspan="2">Read Back: Restate any recommendations made by the staff nurse or clinical instructor</td></tr>
</table>

Appendix E

Student behaviors for simulation evaluation

ASSESSMENT

Obtains pertinent subjective data
- **General patient status**
- **Focused respiratory questions**

Obtains pertinent objective data
- **Vital signs, including pain score and pulse ox**
- **Labs (ABGs**
- **Weight, including pre-hospital weight**
- **Urine output**

Performs follow up assessments as needed
- **Respiratory assessment after Furosemide treatment and neseritide treatment**
- **Subjective assessment after Furosemide and neseritide**

Assesses in a systematic and orderly manner using the correct technique
- **Respiratory assessment – listens to posterior lung sounds**
- **Must listen on skin**

COMMUNICATION

Communicates effectively with providers (ISBARR)
- **Informs physician of patient status using ISBARR**

Communicates effectively with patient and S.O. (verbal, nonverbal, teaching)
- **Acknowledges the patient including introducing their name and role**
- **Implements nursing measures to decrease the patient's anxiety**

Writes documentation clearly, concisely, & accurately
- **n/a in this scenario**

Responds to abnormal findings appropriately
- **gathers the appropriate assessment data before calling the provider**

Promotes realism/professionalism
- **professional dress**
- **professional behavior**

CRITICAL THINKING

Interprets vital signs
- **Notifies provider of abnormal VS results**
- **Able to answer questions about VS either during simulation or debriefing**

Interprets lab
- **Notifies provider of abnormal ABG results**
- **Able to answer questions during simulation or debriefing about labs**

Interprets subjective/objective data (recognizes relevant from irrelevant data)
- **Identify abnormal lung sounds**

- **Interprets EKG rhythm**

Formulates measurable priority outcomes

Performs outcome driven interventions

- **Apply oxygen, elevate HOB, administer furosemide, neseritide**

Provides specific rationale for interventions

- **Able to answer questions during simulation and in debriefing**

Evaluates interventions and outcomes

- ***Able to evaluate expected outcomes of O2, furosemide, neseritide and modify as appropriate***

Reflects on simulation experience

- **discuss strengths and weaknesses in debriefing**

TECHNICAL SKILLS

Uses patient identifiers

- **2 patient identifiers for all medications, IV fluids**

Utilizes standard precautions including hand washing

- **Hand washing or sanitizer before and after all patient contact**

Administers medications safely

- **Six rights**
- **Concentration and rate of furosemide and neseritide administration**
- **Dosage calculation**
- **compatibilities**

Manages equipment, tubes, and drains therapeutically

- **Correct IV access**
- **Correct handling of Foley catheter**
- **Correct use of O2 nasal cannula**

Performs procedures correctly

- ***n/a for this scenario***

Appendix F

Prompt Set for Simulated Clinical Experience: CHF

Baseline preparation	Vital signs: HR 100, BP 158/100, RR 32, SpO_2 is 84% on room air, Temp 36.8oC	Information provided via handoff from ED nurse SpO_2 and HR continually displayed on monitor
Interdisciplinary communication - ISBARR	Student contacts physician to report assessment findings/lab results	Physician questions student to elicit assessment data – student allowed to return to bedside to complete assessment as needed
Vague prompt	the patient's condition worsens with a HR in the 150s, BP in the 170s/120s-130s, RR in the mid 20s and labored and SpO_2 in the low 90s on 2 LPM nasal cannula.	Initiate prompt after students call physician
Specific Prompt	is becoming increasingly anxious and saying that he can't breathe. He wants to sit in the tripod position.	Continue to repeat verbal prompt. Allow student to perform assessment and administer furosemide
Focused assessment, planning, and intervention	the patient's condition improves somewhat with a HR in the 130s, BP in the 140s/100s, RR in the mid 20s and labored and SpO_2 in the mid 90s on 4 LPM nasal cannula. Scant urine. ABG results arrive.	Patient says he can breathe a little easier
Interdisciplinary communication - ISBARR	Student contacts physician to report status/discuss plan of care	Allow student to administer furosemide, nesiritide
Problem resolution	progresses with a HR in the 100s, BP in the high 140s/90s-100s, RR in the upper teens and nonlabored and SpO_2 in the upper 90s on 4 LPM. Breath sounds clear, the cardiac rhythm is sinus tachycardia and the urine output is 500 mL.	Patient states he is a little better