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Simulation as Staff Development for Competency in Nursing Care of Patients with Chest Tubes

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By

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Abstract

There is an estimated 98,000 to 400,000 hospital errors that result in patient harm or death annually (David, Gunnarsson, Waters, Horblyuk and Kaplan, 2013; James 2013). As a member of the health care team nurses coordinate and provide continual care to the hospitalized patient (American Association of Colleges of Nursing, 2011; Parker, 2014). Patient safety is promoted when nurses are competent in their knowledge, skills, attitude, and performance related to evidence-based practice, protocols, and standards of care (; American Nurses Association, n.d; Schroeter, 2009). The purpose of this evidence-based project was to promote patent safety by developing and maintaining competency and skills performance in the nursing care of patients with respiratory compromise requiring management of chest tubes. Twenty-three Registered Nurses participated in the project and completed the simulation in nine groups. Individual chest tube knowledge was significantly increased following the simulation. Group scores showed competency in care of patients with a chest tube, and the individual satisfaction with simulation as learning modality was high. The simulation offered the participants the opportunity to increase knowledge and maintain competency in care of patients with a chest tube and offers an experience that helps to provide safe care when they are required to care for a patient with chest tubes.

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Table of Contents

Simulation as Staff Development for Competency in Nursing Care of Patients with Chest Tubes

Background and Significance

Problem Identification

Registered nurses (RNs) are the member of the health care team accountable for coordination and continual care of the hospitalized patient (American Association of Colleges of Nursing, 2011; Parker, 2014). National programs such as Quality and Safety Education for Nurses have developed in response to the Institute of Medicine report (2003) focused on the gaps in education of health care professionals as well as gaps related to the maintenance of competency and research outcomes related to patient safety (Cronenwett et al., 2007). In the nursing profession competence comes from the knowledge, skills, attitude, and performance related to evidence-based practice, protocols, and standards of care that have been found to promote patient safety. Lack of knowledge, lack of competence in performing skill or procedures, nonadherence to policy guidelines, fatigue, poor communication, and distractions have been shown as areas that lead to error (Pham et al., 2012; Valiee, Peyrovi, & Nasrabadi, 2014).

Context of Problem

Competence is one's ability to perform while competency shows the actual performance (American Nurses Association, n.d.; Schroeter, 2009). Competence and competency are not mutually exclusive and require specific knowledge, skills, attitudes, and performance. The maintenance of competency must be purposeful and ongoing (American Nurses Association, n.d.). Methods to measure competence should be focused on all domains, cognitive, affective, and psychomotor (American Nurses Association, n.d.; Schroeter, 2009).

Competence is developed and maintained over time. New graduates begin their nursing career with the knowledge and experiences they received during their nursing education. This is the basis from which they develop competence but new graduate competence may not be at the level expected in the practice environment (Numminen et al., 2014). When compared to experienced RNs, Lima, Newall, Kinney, Jordan, and Hamilton (2014) found that competence of new graduates was lower when compared to other studies with more experienced RNs. Green (2015) found that after instituting a competency program confidence and competence rose in new graduates. It is crucial that new graduates have competent skills to safely take care of patients.

Lack of experience is another factor that is a barrier to competence. Competency is developed by actual experiences over time (Benner, 1982). The passage of time as a RN does not necessarily translate to competence in all aspects of nursing care but does shape the ability to think about situations and plan accordingly. The RN transitions from novice to expert and most often can be considered competent after two to three years of experience. The more years of experience the higher the expertise (Lima et al., 2014; McHugh & Lake, 2010). Takase (2013) found that competence increases quickly at the beginning of a nursing career up to 10 years of experience and then plateaus or has a very slow increase. Numminen, Meretoja, Isoaho, and Leino-Kilpi (2013) had similar findings; competence increases with age and experience but plateaus in older ages and long work experience.

The third factor deals with having actual opportunity to perform skills to maintain competency. In order to be competent in providing nursing care, the RN must have encounters that provide them the opportunity to see and implement nursing care, knowledge related to specific nursing care, opportunities to perform skills, opportunities to mature, and opportunities to use experience to improve knowledge (Lejonqvist, Eriksson, & Meretoja, 2012). Numminen et al. (2013) found that competency is associated with how often skills are performed. If RNs are not given the opportunity to practice skills they are not able to develop and maintain competency. Lack of exposure could hinder the ability to be competent.

Scope of Problem

Patient safety is promoted when RNs are competent in their knowledge, skills, attitude, and performance related to evidence-based practice, protocols, and standards of care (American Nurses Association, n.d.; Schroeter, 2009). Patient safety is impacted by the high acuity of patient health problems when admitted to hospitals as well as the complexity of the health care system, equipment, and technology (Institute of Medicine, 2011). Safe, quality nursing care requires the RN to coordinate care through continual observation and intervention in response to changes in patient status (Dresser, 2012; Parker, 2014). Respiratory assessment is a priority that indicates patient status and decline and requires early intervention to improve patient outcomes (Garvey, 2015). The early intervention requires RNs to be competent in medical devices that impact respiratory status such as chest tubes (Jha, Prasopa-Plaizier, Larizgoitia, & Bates, 2010; Swayze & Rich, 2012).

Consequence of Problem

Lack of competence in any aspect of the coordination of care by RNs may contribute to hospital errors. Hospital errors are estimated to be responsible for injury or death in 98,000 to 400,000 patients annually (David, Gunnarsson, Waters, Horblyuk and Kaplan, 2013; James 2013). The estimated cost of hospital errors is between $735 billion to $980 billion per year (Andel, Davidow, Hollander, & Moreno, 2012). This cost comes from the increased medical cost as well as the personal cost to patients and families. One area that has been shown to be related to errors is the use of medical devices (Jha, Prasopa-Plaizier, Larizgoitia, & Bates, 2010). RNs at the bedside are responsible for the care associated with a medical device and require ongoing training to ensure that the medical device is being used in accordance with the manufacturer and the facility requirements (Swayze & Rich, 2012). Chest tubes are medical devices that are used with patients that have respiratory problems when there has been a loss of negative pressure in the pleural cavity (Kane, York, & Monton, 2013; Muzzy & Butler, 2015). The nursing care associated with chest tubes is important, as there are complications that can occur if the chest tube is not managed properly. Respiratory distress, tension pneumothorax, and even death are complications of a chest tube and can be either prevented or recognized early with competent care of a chest tube.

Evidence-Based Intervention

The maintenance of competency must be purposeful and ongoing to ensure that the care that is given follows established guidelines for safe quality care (American Nurses Association, n.d.). Staff development is a method that is used in nursing to develop and maintain competency. Nurse satisfaction with the staff development method is also important to consider because satisfaction impacts performance (Levett-Jones et. al, 2011; van Soeren et. al, 2011). Simulation, used in staff development, is best practice that can improve patient care competencies and increase nurse satisfaction with staff development. Simulation in nursing education has been shown to improve nursing students' ability to provide quality, safe patient care, and is now being used by educators in health care facilities to provide evidence of patient care competencies (Hallenbeck, 2012). Simulations are a life-like situation that uses mannequins, standardized patients, or computer generated scenarios that focus on psychomotor skills, problem solving, and clinical reasoning (Jeffries, 2005). Both the Joint Commission and the Institute for Healthcare

Improvement (IHI, n.d.) advocate for the use of simulation in staff development (Castillo, 2013). Castillo (2013) the medical director for the Joint Commission urges the use of simulation for events that do not commonly happen. The IHI reports that using simulation shows commitment to patient safety (Institute for Healthcare Improvement, n.d.)

Purpose of Project

The purpose of this evidence-based practice (EBP) project was to promote patient safety by developing and maintaining competency and skills performance in the nursing care of patients with chest tubes through the use of simulation. The first objective was to improve the knowledge of RNs of caring for a patient with chest tubes. The second objective was to improve the competency of the nursing staff in caring for patients with chest tubes. The last objective was to identify the nursing staffs' satisfaction with simulation as a staff development methodology.

Theoretical Framework

The National League for Nursing/Jeffries Simulation Framework (NLN/JSF) guides the development and evaluation of simulation scenarios so that educators can determine effectiveness of techniques used and evaluate learning outcomes (Jeffries, 2005). The five components that make up the NLN/JSF are: teacher/facilitator, student/participant, educational practices in simulation, simulation and design features, and outcomes. Each component consists of variables that impact the participants' ability to meet the objectives of the simulation.

The facilitator guides the participants indirectly through the simulation so that the focus is on the participant, not the educator. The participant needs to be aware of expectations, motivated to learn, and accountable for learning during the simulation. Educational practices in simulation include the variables active learning, feedback, diverse learning styles, student-faculty feedback, and high expectations. Much effort needs to be placed on the educational practices so that each participant is able to be successful and that they are provided an avenue to discuss how they feel about the simulation and their performance. The component of simulation and design features includes the variables objectives, fidelity, problem solving, student support, and reflective thinking. The last component of the framework is outcomes. This component deals with evaluation of the simulation scenario and of the learners. The learning outcomes should be evaluated to decide if the outcomes were met by the learners. The variables that can be measured are learning, skill performance, learner satisfaction, critical thinking, and self-confidence.

The NLN/JSF guides the use of simulation in nursing education but can also be used for staff development. The component of design characteristics guides the development of a simulated experience to be used for staff development. The component of outcomes can measure quality, safe patient care, by using the variables of knowledge and skills performance. The NLN/JSF provides a framework as the basis to design simulation scenarios and to evaluate participants. This is useful in staff development because the simulation needs to be well designed to meet the objectives and the participants need to be evaluated based on their performance in the simulation scenario to assess the participants' ability to meet the expectations.

Literature Review

Simulation has been shown to be beneficial as a staff development initiative. One of the benefits includes development and maintenance of competency in skills performance. This review focuses on simulation in the hospital setting using staff development.

A systematic review by Hallenbach (2012) included 16 articles focused on simulation for hospital RNs. The purpose of the review was to provide current evidence on the use of simulation in staff development. Most of the studies reviewed evaluated the impact of simulation on RN confidence and satisfaction with simulation. The articles were rated using the Research

Quality Review Rating Scale, with ratings ranging from free from major flaws to not at all free. The articles that were considered expert opinion were not rated. Three studies were not at all free of flaws, three were somewhat free of flaws, one was moderately free of flaws, two were mostly free of flaws, and one was free of major flaws. Hallenbach found that simulation increased satisfaction, confidence, and teamwork in the majority of studies reviewed. However, one randomized control trial (RCT) reviewed showed no significant differences between the control group and the simulation group. This review is useful to staff development RNs. Overall Hallenbach's provided support for simulation as an intervention to increase satisfaction, confidence, knowledge and teamwork for RNs in the acute care setting.

Christian and Krumwiede (2013) conducted a prospective cohort study to evaluate high-fidelity human simulation's (HFHS) impact on nursing self-efficacy and satisfaction related to preeclampsia and eclampsia management. The sample included 49 RNs on a labor and delivery unit in a medical center. Self-efficacy was measured pre and post simulation and at eight weeks by an adapted version of the Self-Efficacy for Obstetric Critical Episode Evaluation (Ravert, 2004). The adapted Self-Efficacy for Obstetric Critical Episode Evaluation is a 21 item Likert type scale with higher scores indicating greater self-efficacy (1 = not at all confident to 5 extremely confident). Cronbach's alpha scores were reported for Ravert's tool and the adapted portion at .88 and .93 respectively. A total of 33 RNs completed all data collection for the study. The RNs had a significant increase in self-efficacy (N= 46; pretest, M = 76.24, SD = 11.97; posttest 1, M = 81.7, SD = 13.27); t (45) = -4.83, p < .001); and at eight weeks (N=33; pretest, M = 77.76, SD = 12.47; posttest 2, M = 83.61, SD = 12.82); t (32) = -2.94, p < .05). Similarly the intervention specific self-efficacy scores were significant among the pre and post HFHS tests (pretest, M = 35.51, SD = 6.25; posttest 1, M = 42.57, SD = 7.5); t (46) = -10.3, p < .001);

(pretest, M = 33.67, SD = 6.11; posttest 2, M = 42.94, SD = 7.88); t (32) = -5.75, p <.001). Christian and Krumwiede concluded that HFHS is useful in training nursing staff because self-efficacy is increased and sustained over time.

Klipfel et al. (2014) also focused on satisfaction as well as teamwork and communication in a quality improvement project. This project specifically investigated the impact of simulation on team performance, satisfaction, and communication. The sample consisted of 18 RNs and five urology residents on a general surgical unit of an acute care hospital. Teamwork was measured post simulation using the Mayo High Performance Teamwork Scale (Malec et al., 2007). The Mayo High Performance Teamwork Scale is a 16 item instrument that uses a Likert type scale with higher scores indicating greater teamwork (0 = rare to never to 2 = consistent). Cronbach's alpha scores for the instrument were 0.85. Satisfaction was measured by a survey created by the quality improvement team leader and used a Likert type scale with higher scores indicating greater satisfaction (1 = strongly disagree to 5 = strongly agree). A total of 18 RNs and five urology residents completed data collection in the quality improvement project. Klipfel et al. (2014) reported an increase in mean score, for the Mayo High Performance Teamwork Scale, of 0.7 or greater for specific questions related to verbal communication, situation awareness during conflict, asking for clarification, and persisting to get a response to questions so that an error does not occur. The mean scores for the satisfaction survey ranged from 4.04 to 4.78 which indicates the participants were satisfied with the experience. Klipfel et al. concluded that simulation did improve teamwork performance and increase satisfaction. A limitation of the study is lack of detail of the statistical analysis and significance.

Hoadley (2009) also looked at satisfaction but included the variables of knowledge, skills of resuscitation, student preferences, and self-confidence. A RCT was used to compare high-fidelity simulation (HFS) to traditional methods, using low fidelity simulation, for teaching Advanced Cardiac Life Support (ACLS) to 53 health care providers in a medical center. American Heart Association (AHA, 2006) ACLS written examinations were given to measure and compare the impact of simulation versus traditional methods of education on knowledge. The AHA (2007) ACLS Mega Code Performance Score Sheet was used to measure resuscitation skills. No reliability testing was reported but content validity was provided by three content experts. The NLN Simulation Design Scale and Student Satisfaction and Self-Confidence in Learning Scale (Jeffries, 2007) were used respectively to assess student perception of simulation and satisfaction and self-confidence. The reported Cronbach's alpha for both instruments is 0.96 for students' perception, 0.94 for satisfaction, and 0.87 for self-confidence. No specific scoring information was provided. When comparing the HFS and traditional education groups, Hoadley found no significant difference, when comparing posttest scores, in knowledge (control, M = 87.67, SD = 9.28; experimental, M = 90.34, SD = 7.75); t (51) = -1.15, p = .26). Similarly, there was no significant difference in skills performance (t (51) = -1.61, p = .12). No statistical significance for student satisfaction (control, M = 22.54, SD = 2.69; experimental, M = 22.52, SD = 2.43) and self-confidence (control, M = 35.08, SD = 4.34; experimental, M = 35.03, SD = 3.28). The RCT design was a study strength. Although not statistically significant, the HFS group scored higher than the traditional group on the post-test for knowledge and the ACLS Mega Code Performance Score Sheet.

Disher et al. (2014) used a quasi-experiment design to compare the impact of HFS simulation on knowledge and self-confidence among 23 RNs working on a step down unit. Knowledge was measured pre and post simulation using a researcher developed 12 item multiple choice/true false instrument with four options to each question with only one correct answer.

Validity was established by experts. Self-confidence was measured using a self-confidence scale developed by Hicks, Coke, and Li (2009). The self-confidence scale is a 12 item Likert scale format (1 = strongly disagree; 5 = strongly agree). Cronbach's alpha for the scale was reported as 0.93 and 0.96. After HFS, RNs had significant improvements in knowledge (pretest, $M = 72.73$, $SD = 13.52$; posttest, $M = 81.82$, $SD = 11.81$, $p = .005$) and self-confidence levels (pretest, $M = 4.40$, $SD = .42$; posttest, $M = 4.59$, $SD = .39$, $p = .004$). Strengths include using a pre and post simulation test to measure knowledge and self-confidence. The study was limited by including no control group for comparison, small sample size, and no reliability measured for researcher developed tool to measure knowledge.

Huseman (2012) conducted a similar study with a larger sample size. Huseman's quasi-experimental descriptive design included 178 direct patient caregivers at an acute care facility. There were random code blue drills with a high fidelity simulator over a three-month period. After the three months actual response times in minutes to code blue were recorded. There was a significant decrease in the time to chest compression and epinephrine administration (pre-training, $M = 0.867$; post-training, $M = 0.214$; $t\ (27) = 2.8717$, $p = .0079$); (pre-training, $M = 4$; post-training, $M = 0.929$; $t\ (27) = 4.6602$, $p = .0001$). The response time to defibrillation was not significant (pre-training, $M = 3.286$; post-training, $M = 1$; $t\ (12) = 1.7778$, $p = .1008$).There were no significant findings in the maintenance period for chest compressions, epinephrine, or defibrillation (chest compressions, $t\ (7) = 0.5517$, $p = .5983$; epinephrine, $t\ (7) = 0.5517$, $p = .5983$; defibrillation, $t\ (10) = 0$, $p = 1$). Huseman concluded that simulation can improve response times in code blue situations but need to be continually used because the decrease in response time did not remain in the maintenance period.

Butlas, Hassler, Ercole, and Rea (2014) conducted a RCT that compared high-fidelity simulation (HFS) to traditional educational methods among 60 pediatric staff nurses to determine whether HFS improved knowledge retention, skills performance, and teamwork. Knowledge was measured post simulation and at 6 months using a standard AHA Pediatric Emergency Assessment, Recognition, and Stabilization (PEARS) written examination that consisted of 24 multiple choice questions. No validity or reliability information was reported. Skills performance was measured during initial training and at 6 months using a researcher developed PEARS Behavioral Measures Check-Off Tool (BMCT) which was adapted from the AHA PEARS, check off form. A total of 55 points were possible for the respiratory scenario and a total of 40 points were possible on the circulatory scenario. The higher the score on the BMCT the higher the performance. Validity was not established but two researchers scored the participants and inter-rater reliability was established. Teamwork was evaluated during initial training and at 6 months using the Mayo High Performance Teamwork Scale (Malec et. al, 2007). The reported values for Malec's et. al tool for person reliability was 0.77, person separation 1.85, item reliability 0.096, and item separation 5.04. A total of 33 nurses, 19 experimental and 14 control, completed all data collection for the study. The findings suggest that knowledge retention declined for both the simulation and the traditional method groups (initial PEARS written test control, M = 23.38; experimental, M = 22.63; follow-up PEARS written test control, M = 21.50; experimental, M = 21.2, $p = 0.537$). Skills performance improved for the HFS group (respiratory control, M = 26.96; respiratory experimental, M = 40.39, $p < .001$; circulatory control, M = 19.66; circulatory experimental, M = 31.54, $p < .001$). Teamwork increased from the initial assessment to the six-month follow up (initial, M = 150.32; follow-up, 178.19, $p = .001$). The simulation group scored higher than the control group on the BMCT for both the respiratory and circulation content ($p < 0.001$). Teamwork was not statistically significant between the two groups. Strengths of the study include the RCT design and measuring the two groups initially then six months later. Weaknesses include small sample size. The findings suggest that HFS could be used in practice for staff development for an increase in skills performance.

Daniels et al. (2010) used a similar design and variables to investigate the impact of simulation on knowledge, performance, and teamwork in 27 obstetrical RNs and residents. A multiple choice, 20 item, shoulder dystocia and eclampsia questionnaire developed by experts was used to measure knowledge before any instruction and one month after instruction. No validity measure was reported. Expert checklists were used to measure performance and teamwork, for eclampsia and shoulder dystocia, one month after the initial training for the didactic group and the simulation group. Eclampsia and shoulder dystocia checklist scores range from -1 to 1(-1 = incorrect maneuver, 0 = incorrect maneuver or ineffective teamwork, and 1 = correct maneuver and effective teamwork) with a higher score indicating higher performance and teamwork. No validity measurement was included. Thirteen participants from the didactic (control) group and 14 from the simulation group completed all study data collection. There was no difference in knowledge scores between the simulation and control groups but there was an increase in performance in the simulation group for both shoulder dystocia (experimental, M = 11.75; control, M = 6.88; $p = 0.002$) and eclampsia (experimental, M = 13.25; control, M = 11.38; $p = 0.032$). The team scores were each higher for the simulation group when compared to the control group. Strengths include using a RCT and having two types of scenarios to compare the two groups. Weaknesses include a small sample size and not reporting validity for tools.

Domuracki, Moule, Owen, Kostandoff, and Plummer (2009) conducted a RCT to investigate simulation for cricoid pressure training compared to traditional training. The researchers recruited 101 medical students, nursing staff, nursing students and 101 patients that would not require cricoid pressure during induction of anesthesia. Force applied during cricoid pressure on a simulator and on actual patients was measured using a force recording system that gave a continual measure of force applied. Participants in the simulation group provided a higher percentage of appropriate cricoid pressure on actual patients (38%) when compared to the control (19%, $p = 0.035$).Strengths include using a RCT trial that showed an actual link between simulation and clinical practice. A limitation is experience level of the participants was not controlled in the study.

Gerolemou et al. (2014), also investigated HFS in a prospective controlled study that comparing baseline and post simulation sterile technique skills and the incidence of catheter-related blood stream infections (CRBSI). The sample included 46 critical care RNs at a teaching hospital. Sterile technique was measured pre and post simulation over a six-week period by a researcher developed sterile techniques assessment tool. The assessment included 24 items with dichotomous scale (Yes or no). CRBSI rates were reviewed before and after the intervention up to 12 months. There was a significant increase in sterile technique among RNs from baseline to post simulation ($p < .01$; median difference, 15; 95% CI, 14-16). There was also an 85% decrease in CRBSIs post simulation. Gerolemou et al. concluded that simulation is effective in training RNs in sterile technique skills and aides in the reduction of CRBSIs. Strength of the study is that the investigators measured sterile technique at different phases and examined the incidence of CRBSIs after the implementation of the simulation.

Using a similar setting, Lavoie, Pepin, and Boyer (2013) conducted a descriptive educational project looking at HFS with debriefing and participant perception and used an open-ended questionnaire for measurement. The participants included five RNs finishing orientation to an intensive care unit at a teaching hospital. The participants reported that HFS with debriefing helped with prioritizing care, nursing assessment, clinical judgment, and understanding the thought process of making decisions about patient care. Overall the participants reported that HFS was useful and did improve skills and communication. A strength of the study was that it focused on debriefing. Limitations included the sample size being very small, no quantitative data or themes described.

Similarly, Cain, Riess, Gewttrust and Novalija (2014) used HFS in a quality improvement project using simulation to increase knowledge of treatment of malignant hyperthermia. The sample included 19 RNs and 10 surgical technologists at an academic medical facility operating room. The outcomes reported by Cain et al. were improvements in role clarity, anticipatory response and overall team cohesion and interaction. However, no statistical analysis was reported for these outcomes and no evaluation instruments were described by the investigators. A weakness of the project reported is that no statistical analysis is reported.

In an EBP project Purdue (2013) implemented a simulation that focused on SBAR communication. The project took place at a rural hospital and included 20 inpatient staff RNs. SBAR knowledge was measured pre and post simulation by a six item multiple choice/true false project leader developed questionnaire with a maximum possible total points of 25. No reliability and validity data were reported. Self-evaluation of competency was measured pre and post simulation with a project leader developed Likert type scale survey (1 = strongly disagree and 4 = strongly agree). Competency was measured using the Creighton Simulation Evaluation Instrument (C-SEI) which is scored with a 0 for not competent, 1 for competent, or not applicable for each component with 10 points possible for SBAR competency (Todd et al., 2008) A Cronbach's alpha score of .98 was reported from a previous study(Adamson et al., 2011).

After implementation of the simulation the RNs had an increase in knowledge, (pre-test, M = 20 ± 3.7; posttest, M = 23.8 ± 1.47, t (19) = 4.60, p = 0.00) competency self-evaluation, (pre-simulation, M = 2.85 ± .59; post-simulation, M = 3.40 ± .50, *t* (19) = 2.98, p = 0.01) and all nurses scored all 10 points on the C-SEI.

Simulation is an evidenced-based method for providing staff development. Out of the 13 studies reviewed one is a systematic review of literature, four are RCTs, one is quasi-experimental, one is a prospective cohort, one is a prospective controlled, two are descriptive studies, two are quality improvement projects, and one is an EBP project. Overall the most common variables studied were how simulation impacted satisfaction, confidence, teamwork, knowledge, skills performance and perception. In a systematic review, Hallenbach (2012) found an increase in skills performance, satisfaction, confidence, and teamwork across multiple studies. Several researchers, Cain et al. (2014), Daniels et al. (2010), Disher et al. (2014), and Purdue (2013), studied knowledge after simulation and found that it increased. However, Daniels failed to reach statistical significance. Bultas et al. (2014), Daniels et al. (2010), Domuracki et al. (2009), Gerolemou et al. (2014), and Huseman (2012) also found a significant increase in skills performance following simulation. Self-confidence has also been shown to be increased following simulation by Christian et al. (2013) and Disher et al. (2014). Klipfel et al. (2014) found an increase in satisfaction with simulation as a staff development method. Additionally, Bultas et al. (2014), Cain et al. (2014), Daniels et al. (2010), and Klipfel et at. (2014) found a significant increase in teamwork after simulation.

Each study used staff RNs and other health care professionals, in a hospital setting. The use of other health professionals aided in the investigation of simulation's impact on teamwork. The sample sizes in the majority of the articles were not that large. The smallest sample was five and the largest was 178. While the staff RNs in each study were practicing in hospitals, they were not all in a similar department. Each of the studies used simulation but the scenarios were different based on the department where the staff RNs worked.

The evidence from this review support the use of simulation for RNs in a hospital setting to improve knowledge, skills performance, and satisfaction of RNs with simulation as a staff development method. Not only is skills performance increased by implementing simulation as staff development but there is a component of increased confidence as well. The RNs that participated in simulation reported an increase in their confidence, which can also impact their ability to perform skills. It is thought that this increase in skills performance and confidence will carry over to competency in clinical practice. Domuracki et al., (2010) investigated simulation compared to performance of cricoid pressure in clinical setting after performing a simulation or traditional training. There was evidence that the increased skill performance does carry over to competency in actual patient care. Gerolemou et al. showed a decrease in CRBSIs post simulation focusing on sterile technique.

Agency Description

Setting

The site of the project was a 199 bed urban, acute care hospital that also serves rural areas. The hospital offers the services of emergency, medical\surgical, intensive care, surgery, and cardiac cath lab. The population served is more than 83,000 patients. The medical/surgical telemetry unit includes 20 beds, 15 beds are medical/surgical telemetry and five are orthopedic beds.

Target Population

RNs providing direct patient care on the medical/surgical telemetry unit of the acute care hospital were chosen by administrative leadership to participate in the project. Typical patients on the medical/surgical telemetry unit have a medical diagnosis of osteoarthritis with joint replacement, cellulitis, and esophagitis. The average daily census is 17.6 patients and the average length of stay is 2.92 days. Of the patients that are admitted to the medical/surgical telemetry unit 41% are above the age of 70 with a body mass index (BMI) greater than 25 for 72% of the population admitted. At the time of implementation this unit was scheduled to become a cardiothoracic telemetry care unit.

The experience level of the 23 RNs on the medical/surgical telemetry unit is 14% new graduates, 35% less than one year agency experience with a mean of 6.9 years. The educational makeup of medical/surgical telemetry unit includes one diploma, 13 associate degrees in nursing, and eight Bachelor of Science degrees in nursing. Staffing of the medical/surgical telemetry unit consists of a nurse manager, Clinical Nurse Leader (CNL), RNs, certified nursing assistants, unit clerk, and a telemetry technologist. The CNL is responsible for staff development. The patient to RN ratio goal is 5:1 but can be flexed to 6:1. Each shift also has a charge nurse that does not have a patient assignment unless required to meet the needs of the patient census on the unit. There were a total of 26 patients with chest tubes at the agency in the year 2014.

Congruence of Capstone Project to Selected Organization's Mission, Goals, and Strategic Plan

The agency is committed to improving health and providing excellence in patient care. Excellence in care is promoted through the use of staff development and implementation of simulation for developing and maintaining competency. Staff development that establishes and maintains competency enables the RNs to serve the patients with quality, safe care. Currently, care of patients with a chest tube is reviewed on an annual basis via web-based education describing care of patients with a chest tube and demonstration of the chest drainage unit (CDU; J. Peppiatt Chief Nurse Education, Research and Performance Improvement, personal communication, May 30, 2014). The simulation project is an expansion of the current practice for staff development on care of patients with a chest tube. The simulation will evaluate the RN's competency and provide hands on practice in caring for a patient with a chest tube.

The agency has shown a commitment to utilizing healthcare simulation. A simulation center was opened and employs two nurse educators with a focus on simulation for all disciplines within the facility. The simulation center houses high-fidelity Laerdal simulators, a dedicated simulation area, and a control room with a two way mirror that allows for viewing of the simulation as it occurs.

Description of Stakeholders

The agency administration, specifically the administrator of nurse education and performance improvement, were the key stakeholders to initiating the project. Additionally, the medical/surgical telemetry unit's leadership of manager and Clinical Nurse Leader support was needed for implementation. Support was provided by all the stakeholders to implement simulation as staff development. The agency administration chose care of patients with a chest tube as the focus of the simulation.

Simulation in staff development involves developing and implementing scenarios that are based on patient care competencies. Scenario development related to the care of chest tubes requires the participant to implement best practice in the care of a patient with a chest tube. This will be accomplished using a high-fidelity patient simulator, the National League of

Nursing/Jeffries Simulation Framework (NLN/JSF; Appendix A), and the Simulation Design Template (Jeffries, 2010; Appendix B).

Design

A pre-test, post-test design was used in the EBP of simulation as staff development. The simulation was mandatory for all RNs employed at the agency on the medical/surgical telemetry unit. Although the simulation was mandatory, the participants volunteered to complete the surveys. A two-hour time frame was provided that included a pretest, prebriefing, simulation scenario, debriefing, posttest and evaluation survey. The participants completed a six item demographic survey (Appendix C) as well as a 10-item knowledge test pre and post simulation. Prebriefing included learning objectives and allowing participants to familiarize themselves with the simulation area. Critical behaviors to be evaluated during the simulation were identified prior to the simulation by the project leader collaborating with the CNL. The simulation scenario incorporated application of patient care and debriefing. The participants took the posttest and survey after completion of the simulation.

Methods

The EBP project used simulation as staff development in the care of patients with chest tubes. The first objective was to improve the competency of the nursing staff in caring for patients with chest tubes. The second objective was to improve the knowledge of RNs caring for a patient with chest tubes. The last objective was to identify the nursing staffs' satisfaction with simulation as a staff development methodology.

Project Description

The specific chest tube simulation scenario was developed by the project leader through collaboration with agency CNL and incorporates EBP care of chest tubes. Care of a patient with a chest tube can be complicated for RNs that are not familiar or have little experience. The nursing care of a patient with a chest tube involves respiratory assessment, control of pain, assessing the site of insertion, assessing the chest drainage unit (CDU), measuring the drainage, assessing the suction control chamber, the water seal chamber, and the tubing (Durai, Hoque, & Davies, 2010; Frazer, 2012; Kane, York, & Minton, 2013). Changes in assessment findings could indicate a potential problem with the chest tube and should be explored. When assessing the skin around the chest tube insertion site the RN should feel for crepitus. This is an abnormal finding and should be reported to the HCP and is typically caused by incorrect placement of the chest tube. The CDU should be maintained below the level of the patient's chest at all times.

Further assessment and management of the CDU includes measuring and assessing drainage in the collection chamber. If at any time the drainage suddenly increases or becomes cloudy the HCP needs to be notified. Another portion of the CDU that needs to be assessed is the suction control chamber. A dry suction water seal will not have any bubbling. The water seal chamber should not have continuous bubbling but the water could move up and down with respiration. If there is an air leak bubbling will be noted. The RN should assess to see a cause for the air leak. This is done by clamping the tube either at the patient chest or at the CDU. If the tubing is clamped at the chest and the bubbling continues there is a leak in either the tubing or the CDU. If the bubbling stops the air leak is either at the insertion site or in the pleural cavity. An air leak in the tube can be fixed by placing a piece of tape over the affected site. The air leak from the insertion site may need added petroleum dressing or for the dressing to be reapplied depending on the cause. Assess all connections of the tubing and never strip or milk the tube. The tube should not be clamped unless ordered or attempting to find the source of an air leak (Durai, Hoque, &Davies, 2010; Frazer, 2012; Jane, York, & Minton, 2013; Muzzy & Butler, 2015). If the chest tube is removed unexpectedly, Muzzy and Butler (2015) recommend placing a gloved hand over the insertion site and calling for help. Place petroleum and dry gauze over the site as quickly as possible. If the patient is experiencing respiratory distress have the patient exhale while your hand is removed from the site and cover it back when inhaling. A tension pneumothorax could occur if air entered the pleural space.

On the day of the scheduled simulation time the RNs participated in a prebriefing including outlining expectations of the simulation by reviewing specific objectives related to care of a patient with a chest tube which is congruent with the components of the NLN/JSF of participant and simulation and design features (Jeffries, 2005). The RNs were given the opportunity to ask questions regarding simulation and familiarize themselves with the simulation lab environment. Next the RNs received report on the simulated patient and initiated care of the patient. There was no interruption for feedback during the scenario but there was a time for reflection and feedback during debriefing following the scenario (Jeffries, 2005). The participants were given 30 minutes to complete the scenario and 30 minutes for debriefing.

IRB Approval

Approval from the acute care facility's Quality Improvement committee was obtained. See letter from Jennifer Peppiatt Chief Nurse Education, Research and Performance Improvement (Appendix D). Additionally, internal review board approval was obtained from Eastern Kentucky University (EKU).

Measures and Instruments

The project leader evaluated each group of participants during the simulation. This evaluation was used to measure outcomes, which are consistent with the NLN/JSF component of outcomes (Jeffries, 2005). Care of patients with a chest tube knowledge was measured using a pre simulation and post simulation test (Appendix E**)**. The test was developed to meet specific requirements for knowledge of the agency specific CDU and for internal use at the agency. The same test was used pre and post simulation and is a 10 item multiple choice/multiple answer questionnaire. The same participants' test scores were used both pre and post simulation. A paired t-test was used to analyze the data.

Competency with care of patients with a chest tube was measured by the Creighton Competency Evaluation Instrument (C-CEI) following specific training developed for instrument use (Appendix F**)**. Hayden, Keegan, Kardong-Edgrin, and Smiley (2014) modified the C-CEI from the Creighton Simulation Evaluation Instrument. Content validity was rated by 35 faculty members and has a range between 3.78 and 3.89. The Cronbach's alpha was greater than .90. Permission to use the instrument is granted after online training is completed (Appendix G). The C-CEI measures the areas of assessment, communication, clinical judgment, and patient safety. There are also specific competencies under each category that are scored with a 0, 1 or not applicable. The specific performance competency requirements were developed through collaboration between the project leader and the medical/surgical telemetry unit's CNL. The agency required annual competency outline served as a guide.

Satisfaction with learning in a simulation was measured by the Student Satisfaction and Self-Confidence in Learning instrument after completing the simulation scenario (Appendix H). Reliability for the student satisfaction portion of the instrument has a Cronbach's alpha score of 0.94 and the self-confidence portion of the instrument has a Cronbach's alpha of 0.87 (Jeffries & Rizzolo, 2006). There are five questions that measure satisfaction and eight questions that measure self-confidence. The instrument uses a five-point Likert scale (1 = strongly disagree to 5

= strongly agree). Permission to use the instrument was granted by the National League for Nursing (Appendix I)

Implementation

Participation in the simulation was mandatory as a requirement of employment for all RNs on the medical/surgical telemetry unit. However, RNs on the medical/surgical telemetry unit were recruited during staff meetings (Appendix J) to participate in the project and a cover letter explaining participation was reviewed during the meetings and prior to the simulation (Appendix K). An information flyer was distributed at the staff meeting and posted on the unit with the link to the Atrium chest tube education site used for annual competency (Appendix L). The RNs were scheduled for specific session times to complete the simulation in a group and were either relieved from duty to attend the scheduled session, attended after a completed shift, or came in on an off day. Participants were grouped together based on scheduled session time. Each group was scheduled for no greater than four participants. Completion of survey items implied consent for information to be analyzed for the purposes of the project. Confidentiality was maintained during collection and analysis of data via the use of identification numbers on all surveys and data collected. These were kept in envelopes and distributed to the RNs upon arrival to the simulation center. All RNs signed a roster for attendance, which was given to the CNL as evidence of attendance. No identifying information was included on the data collection instruments.

Participants completed a demographic survey and pre-test to evaluate their knowledge of care of patients with a chest tube prior to the simulation. During the simulation the project leader using the C-CEI evaluated scenario participant competency. After debriefing the participants took a posttest to evaluate their knowledge of care of patients with a chest tube. Participants were asked to complete the Student Satisfaction and Self-Confidence in Learning instrument to evaluate satisfaction with simulation as a staff development method.

Data were analyzed using Statistical Package for the Social Sciences (SPSS) version 21. Descriptive statistics and frequencies were calculated for demographic data and Student Satisfaction and Self-Confidence in Learning instrument. A paired t-test (two-tailed) was used to compare differences in mean knowledge scores pre and post simulation.

Results

A total of 23 RNs participated in the simulation. The majority of participants were female with a mean age of 41 years (age range; 25 to 65 years), years of experience ranged from 0 – 32 years with a mean of 9 years. The mean years worked on medical/surgical telemetry unit was 3 (range = 0 to 13 years, Table 2). The percentage of RNs holding either an Associate's degree or BSN were equal at 49% (Table 1). Three of the participants listed a certification in a nursing specialty.

Table 1

Participant Description

Descriptor	Number	Percentage
Female	22	96%
Male	1	4%
Associate Degree	11	48%
Bachelor's Degree	11	48%
Master's Degree	1	4%
Specialty Certification	4	20%

Note. N = 23

Table 2

Experience

	Range	Mean ± SD
Age	25 to 65	41 ± 12
Years of Nursing Experience	0 to 32	9.4 ± 2.2
Years of Experience on Current Unit	0 to 13	3 ± 4

A paired-samples t-test (two-tailed) was conducted to compare mean differences on chest tube knowledge before and after the chest tube simulation. There was a statistically significant increase in chest tube knowledge scores from pre-test (M= 6.17, SD = 1.4) to posttest (M = 7.04, SD = 1.82), t (22) = -2.65, *p* = .015 (two tailed). The mean increase in chest tube knowledge scores was .87 with a 95% confidence interval ranging from -1.55 to -.19. The eta squared statistic (.24) indicated a large effect size.

Table 3

Chest Tube Knowledge Pre and Post Simulation Scores

Variable	Mean ± SD	*t*	*df*	*p*
Pre-test Score	6.17 ± 1.40	-2.65	22	.015*
Posttest Score	7.04 ± 1.82			

Note. N = 23

The 23 participants completed the simulation in nine groups. All groups received a competence score of at least 76% on the C-CEI (M = 89, SD = 6.27). The four main categories of assessment, communication, clinical judgment, and patient safety have components that are scored with either a 0, 1, or not applicable. Eight of the nine groups scored 100% in the assessment and communication categories. The components missed in the assessment category were: 1. Obtains pertinent data and 2. Assesses the environment in an orderly manner. The component missed in the communication category was: Responds to abnormal findings appropriately. All groups scored 100% in the clinical judgment category. In the patient safety category no groups received 100%. The components in the patient safety category that were missed were: 1. Uses patient identifiers, 2. Utilize standard practices and precautions including hand washing, and 3. Perform procedure correctly. No groups used patient identifiers, 5 groups did not utilize standard practices and precautions including hand washing, and 2 groups did not perform procedure correctly. (Figure 1)

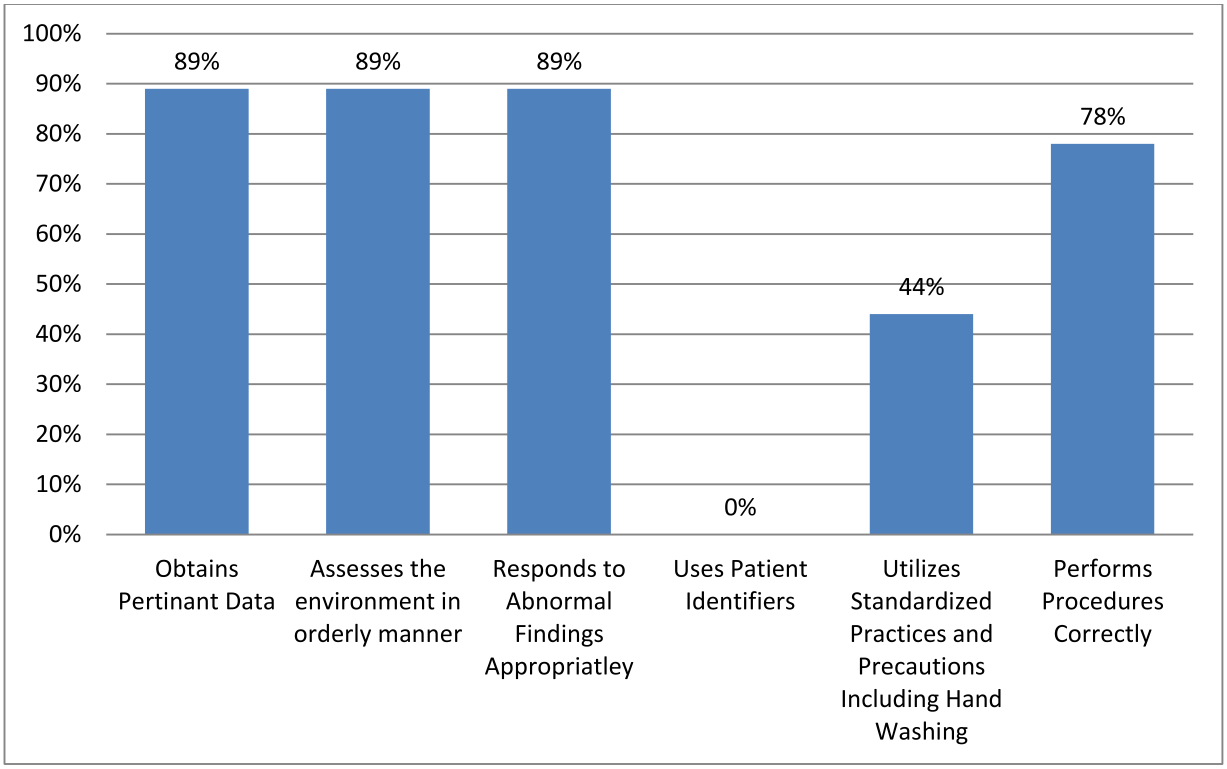

Figure 1. C-CEI Evaluation Components Not Reaching 100%.

Satisfaction with current learning was rated following the simulation scenario. The participants rated the simulation high (M = 23.35, SD = 2.27). The maximum total score for the scale was 25.

Discussion

Consistent with the NLN/JSF the variables that were measured in this project included knowledge, competency, and learner satisfaction when participating in a HFS scenario based on the care of the patient with a chest tube. Similar to studies using simulation, knowledge of care of patients with chest tubes was increased after participating in the simulation scenario (Cain et al., 2014; Daniels et al., 2010; Disher et al., 2014; Purdue, 2013). While the increase in knowledge was statistically and clinically significant the actual mean change was less than one point.

Skills performance is a variable that many studies have shown an increase following simulation (Bultas et al., 2014; Daniels et al., 2010; Domuracki et al., 2009; Gerolemou et al., 2014; Huseman, 2012). Skills performance in care of patients with a chest tube was evaluated during the simulation as part of total competency score. All participants did receive an overall total score that indicated competency in care of patients with a chest tube. However, there were two groups that did not perform procedures specific to the category of Patient Safety on the C-CEI. The focus during debriefing was on the care of the patient with a chest tube and allowed time for hands on practice with the skill. However, under the Patient Safety category no groups used patient identifiers and the majority of the groups did not use standardized practices and precautions including hand washing. These are basic nursing skills and expected performance prior to any patient intervention. It is often argued that simulation is a simulated environment and participants may omit required safety measures as a result of being unable to completely suspend disbelief (Hicks, Coke, and Li, 2009). Pre-briefing and realism could be important components to the simulation design and practice to enhance the participant's ability to suspend disbelief. Pre-briefing provides the learner with expectations, allows opportunity to explore the environment, and sets the tone for the realistic nature of the simulation scenario. Attention was given to pre-briefing and creating a realistic environment for this simulation scenario. As nurses become more familiar with simulation their ability to immerse themselves in the scenario may become easier. However, no nurses used patient identifiers during the simulation scenario. This is an area that can be explored further as this is a crucial practice when providing safe patient care.

Satisfaction with the learning modality is important when considering options for staff development. The nurses that participated in the simulation for care of a patient with a chest tube were satisfied with simulation as a learning modality. Simulation can be useful in staff development because it does increase knowledge, provides an opportunity to rate competency, and offers a learning modality that nurses are satisfied as participants.

While the increase in chest tube knowledge did have a significant increase there were some items on the chest tube knowledge test that a majority of the participants did not answer correctly on either the pre or posttest. These test items could be reviewed to ensure the validity of the chest tube knowledge test. An additional limitation included the inequity of group size as they participated in the simulation scenario. This inequity occurred as result of difficulty in scheduling nurses off the unit to attend the simulation.

Care of patients with a chest tube is a component of annual review at the agency. This project incorporated simulation on one medical/surgical unit but could be expanded to include all nurses as a component of the annual review for care of patients with a chest tube. Each nursing area has a Clinical Nurse Specialist or a CNL that implements staff development and plays a key role in the continuation of simulation as staff development. The area of most concern for continuing the use of simulation for care of patients with a chest tube is scheduling. There were complications when scheduling the nurses on one unit. The logistics of scheduling all nurses at the agency would need to be well planned.

Implications

Competent nursing care is an important aspect in providing safe patient care. In order to be competent nurses must have knowledge. Simulation has been shown to increase knowledge and skills performance and offers a unique opportunity to assess competence. As nurses continue to provide care in complex ever changing environments, it becomes more crucial to provide opportunities to increase knowledge, skills performance, and assess and maintain competence through staff development. The nurses that participated in the care of patients with a chest tube simulation did not routinely care for patients with chest tubes. The simulation offered them the opportunity to increase their knowledge and maintain competency in care of patients with a chest tube and enables them to provide safe care when they are required to care for a patient with chest tubes. It is easier to maintain competency when something is routine and our experience is high. It is not as easy if we do not have encounters very often. Simulation can increase those encounters so that the nurse is competent when the need arises.

Conclusion

This project showed simulation to be an effective method for staff development in the care of a patient with a chest tube. This is consistent with the literature based on simulation as staff development. After participating in the simulation the nurses had a significant increase in knowledge related to the care of patients with chest tubes. They also earned a competence score and were satisfied with simulation as a learning modality for staff development.

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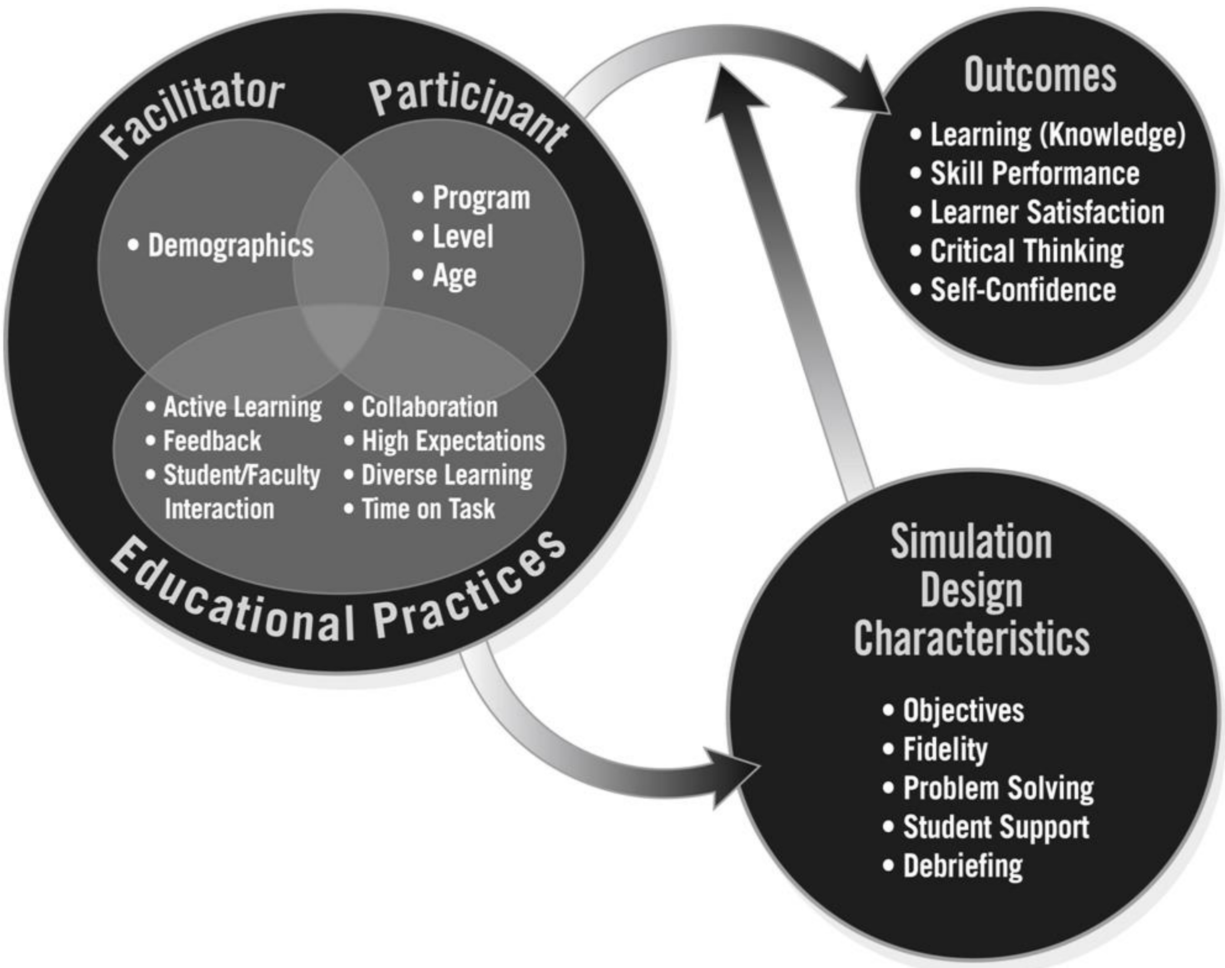
Appendix A

The National League of Nursing/Jeffries Simulation Framework



Appendix B

Simulation Design Template

Date:
Discipline: Nursing
Expected Simulation Run Time: 30 min
Location: VA Simulation Center

File Name: MedSurg Chest Tube
Student Level:
Guided Reflection Time: 30 min
Location for Reflection:

Admission Date: Today **Today's Date:** 8/xx/15 **Brief Description of Client** Name: Charles Smith Gender: M Age: 65 Race: C Weight: kg Height: cm Religion: Christian Major Support: Wife Phone: Allergies: PCN Immunizations: Attending Physician/Team: Past Medical History: Hypertension History of Present illness: Mr. Smith is a 65 year old male who was brought to the Emergency Department today after falling off a ladder at his home yesterday. Although he felt short of breath he did not want to come to the hospital. The SOB continued to get worse and his wife talked him into coming in. He presented to the ED with SOB and pain on his left side. He has bruising and abrasions noted on left chest. Vital sign: T-98.0, P-110, R-28, B/P- 150/92, O2 sat- 82% RA. Absent lung sounds to left	**Psychomotor Skills Required Prior to Simulation** **Cognitive Activities Required prior to Simulation** [i.e. independent reading (R), video review (V), computer simulations (CS), lecture (L)]

lung base. Left Pneumothorax identified via x-ray. Left side chest tube placed. Mr. Smith is being transferred to 3North. **Social History: Lives at home with his wife.** **Primary Medical Diagnosis: Pneumothorax** **Surgeries/Procedures & Dates:** **Nursing Diagnoses: Ineffective breathing pattern**	

Simulation Learning Objectives

1. Apply critical judgment when caring for a veteran with a chest tube in a simulation

2. Synthesize assessment information to recognize deterioration in a veteran with a chest tube in a simulation

3. Implement evidence-based practice in the care of a veteran specifically focusing on a chest tube in a simulation.

4. Apply knowledge and skills to intervene when complications develop with a chest tube.

Fidelity (choose all that apply to this simulation)

Setting/Environment

- ☐ ER
- ☒ Med-Surg
- ☐ Peds
- ☐ ICU
- ☐ OR / PACU
- ☐ Women's Center
- ☐ Behavioral Health
- ☐ Home Health
- ☐ Pre-Hospital
- ☐ Other:

Simulator Manikin/s Needed: Yes

Props:

Equipment attached to manikin:

- ☒ IV tubing with primary line fluids running at mL/hr
- ☐ Secondary IV line running at mL/hr
- ☐ IV pump
- ☐ Foley catheter mL output
- ☐ PCA pump running
- ☐ IVPB with running at mL/hr
- ☐ 02
- ☐ Monitor attached
- ☒ ID band
- ☒ Other: Atrium chest drainage unit that is cracked with another available to change

Equipment available in room

- ☐ Bedpan/Urinal
- ☐ Foley kit
- ☐ Straight Catheter Kit
- ☒ Incentive Spirometer
- ☐ Fluids
- ☐ IV start kit
- ☐ IV tubing
- ☐ IVPB Tubing
- ☐ IV Pump
- ☐ Feeding Pump
- ☐ Pressure Bag

Medications and Fluids

- ☒ IV Fluids:
- ☐ Oral Meds:
- ☐ IVPB:
- ☐ IV Push:
- ☐ IM or SC:

Diagnostics Available

- ☒ Labs
- ☐ X-rays (Images)
- ☐ 12-Lead EKG
- ☐ Other:

Documentation Forms

- ☒ Physician Orders
- ☒ Admit Orders
- ☐ Flow sheet
- ☐ Medication Administration Record
- ☐ Kardex
- ☐ Graphic Record
- ☒ Shift Assessment
- ☐ Triage Forms
- ☐ Code Record
- ☐ Anesthesia / PACU Record
- ☐ Standing (Protocol) Orders
- ☐ Transfer Orders
- ☐ Other:

Recommended Mode for Simulation
(i.e. manual, programmed, etc.)
Programmed

☒ 02 delivery device (type) Variety ☐ Crash cart with airway devices and emergency medications ☐ Defibrillator/Pacer ☒ Suction ☐ Other:	
Roles/Guidelines for Roles ☒ Primary Nurse ☒ Secondary Nurse ☐ Clinical Instructor ☐ Family Member #1 ☐ Family Member #2 ☐ Observer/s ☐ Recorder ☐ Physician/Advanced Practice Nurse ☐ Respiratory Therapy ☐ Anesthesia ☐ Pharmacy ☐ Lab ☐ Imaging ☐ Social Services ☐ Clergy ☐ Unlicensed Assistive Personnel ☐ Code Team ☐ Other: **Important Information Related to Roles:** **Significant Lab Values:** **Physician Orders:**	**Student Information Needed Prior to Scenario:** ☐ Has been oriented to simulator ☐ Understands guidelines /expectations for scenario ☐ Has accomplished all pre-simulation requirements ☐ All participants understand their assigned roles ☐ Has been given time frame expectations ☐ Other: **Report Students Will Receive Before Simulation** **Time: 1400** **S**: Mr. Smith is a 65 year old male that fell off a ladder and has a pneumothorax. **B**: Although he felt short of breath he did not want to come to the hospital. The SOB continued to get worse and his wife talked him into coming in. He presented to the ED with SOB and pain on his left side. He has bruising and abrasions noted on left chest. Vital sign on arrival: T-98.0, P-110, R-28, B/P- 150/92, O2 sat- 82% RA. Absent lung sounds to left lung base. Left Pneumothorax identified via x-ray. Left side chest tube placed. Current Assessment: V/S B/P- 138/88, P-102, R-22, T-98.4, O2 Sat-96% 2L/NC, Pain-4/10 tolerable pain level 3/10. Alert and oriented x3 Absent lung sounds to left lung base Chest tube in place, dressing C/D/I, chest drainage unit set to -20mm Hg, no drainage noted. BS +

	Multiple abrasions to skin 22g IV to saline lock Wife at the bedside **A** Ineffective breathing pattern r/t decreased lung expansion **R** Begin admission

References, Evidence-Based Practice Guidelines, Protocols, or Algorithms Used For This Scenario (site source, author, year, and page):

Durai, R., Hoque, H., & Davies, T. (2010). Managing a chest tube and drainage system. *Association of periOperative Registered Nurses Journal*, *91*(2), 275-283.

Frazer, C. A. (2012). Managing chest tubes. *Med-Surg Matters*, *21*(1), 9-12.

Kane, C. J., York, N. L., & Minton, L. A. (2013). Chest tubes in the critically ill patient. *Dimensions of Critical Care Nursing*, *32*(3), 111-117. doi:10.1097/DCC.0b013e3182864721

Muzzy, A. C., & Butler, A. K. (2015). Managing chest tubes: Air leaks and unplanned tube removal. *American Nurse Today*. 10(5), 10-13.

Scenario Progression Outline

Timing (approximate)	Manikin Actions	Expected Interventions	May Use the Following Cues
20 min	V/S B/P- 138/88, P-102, R-22, T-98.4, O2 Sat-96% 2L/NC Pain 3/10 Crepitus Absent lung sound right CDU tipped over and cracked and suction control chamber set at -30cm Water seal bubbling at 5.	Perform hand hygiene Identify veteran Assessment v/s pain neuro respiratory Inspect Auscultate Palpate CDU Drainage Air leak chamber Suction control chamber Recognize error Tubing clamp Dressing Skin Change CDU	Role member providing cue: wife Cue: Is that supposed to have a crack in it?
10 min	Wife turns veteran and chest tube comes out v/s 160/90 110 28 85% Veteran reports SOB	Place sterile Vaseline gauze dressing over site Notify HCP	Role member providing cue: wife Cue: oh no! I think this tube came out.
			Role member providing cue: Cue:
			Role member providing cue: Cue:
			Role member providing cue:

			Cue:

Debriefing/Guided Reflection Questions for This Simulation

(Remember to identify important concepts or curricular threads that are specific to your program)

1. How did you feel throughout the simulation experience?

2. Describe the objectives you were able to achieve?

3. Which ones were you unable to achieve (if any)?

4. Did you have the knowledge and skills to meet objectives?

5. Were you satisfied with your ability to work through the simulation?

7. If you were able to do this again, how could you have handled the situation differently?

8. What did the group do well?

10. What were the key assessments and interventions?

11. Is there anything else you would like to discuss?

12. What supplies are needed at the bedside of a patient with a chest tube?

13. Show me on the CDU the location to determine an air leak.

14. How do you know that?

Complexity – Simple to Complex

Suggestions for Changing the Complexity of This Scenario to Adapt to Different Levels of Learners

Appendix C

Simulation as staff development for Competency in Nursing Care of Chest Tubes
Demographic Survey

Age:

☐ 18 - 25

☐ 26 - 40

☐ 41 - 55

☐ ≥ 56

Hold a Specialty Certification:

☐ Yes **Certification**: ________________

☐ No

Sex:

☐ Male

☐ Female

Years of Experience:

Highest Nursing Degree Obtained:

☐ Diploma

☐ Associate

☐ Bachelor

☐ Masters

☐ Doctorate

Years Worked on Current Unit:

Appendix D

Approval Letter from the Department of Veterans Affairs

DEPARTMENT of VETERANS AFFAIRS **MEMORANDUM**

Date: July 8th, 2015

From: Jennifer Peppiatt MSN, RN CNL
Chief Nurse Education, Research, Performance Improvement, CLC, Mental Health

Subj: Chest Tube Simulation Quality Improvement Project

To: Eastern Kentucky University DNP Faculty/IRB

Thru: Jennifer Dent

We are very excited to be working with one of your DNP students, Jennifer Dent. She will be performing Chest Tube Simulation along with education both pre and post simulation. This project will be considered a quality improvement project and will assist us in maintaining competency for our front line staff. This is not considered a research project and therefore will not require IRB approval at the Lexington VA Medical Center. If you have any further questions please don't hesitate to contact me.

Thank you,

Jennifer L. Peppiatt MSN, RN, CNL

Appendix E

Care of patients with a chest tube Pre-Test

1. When setting up a dry suction water seal system the HCP orders Chest tube to -20 cm H2O. The chamber that correlates with this order is
    a. the water seal chamber
    b. the suction control chamber
    c. The collection chamber
2. The suction is to be set at -20 cm H2O. When applying suction the nurse should
    a. Turn on wall suction to -70 mm Hg
    b. Turn on wall suction to -120 mm Hg
    c. Gradually increase suction until bubbling is seen
    d. Increase wall suction until orange bellows expand to delta mark
3. The veteran is complaining of shortness of air and the spO2 is 91%. There has been no drainage noted from the chest tube over the last 8 hours and assessment has not revealed kinks or that it is clamped. The nurse should
    a. Normal finding
    b. Strip the chest tube
    c. Increase the suction
    d. Notify the HCP
4. There is a new onset of continuous bubbling in the water seal chamber. The nurse should
    a. Continue to monitor normal finding
    b. Decrease suction until bubbling stops
    c. Stretch the tubing out off of the bed assessing if bubbling stops.
    d. Pinch tubing closest to patient assessing if bubbling stops
5. Select all that apply to clamping a chest tube.
    a. Clamp the chest tube with HCP order
    b. Clamp the chest tube when patient ambulates
    c. Clamp the chest tube no longer than one minute
    d. Clamp the chest tube when going off the unit for testing
    e. Clamp the chest tube to change chest drainage unit
6. If the chest tube is accidentally removed what should the nurse do first?
    a. Notify HCP
    b. Reinsert the chest tube
    c. Cover site with a sterile dressing
    d. Get a thoracotomy tray to the bedside
7. What is the veteran at risk for when a chest tube that has been placed for a pneumothorax has been clamped without an order?
    a. Pleural effusion
    b. Tension pneumothorax

   c. No risk; normal finding
   d. Cardiac tamponade
8. Which of the following is the first step to setting up a chest drainage unit?
   a. Fill the water seal chamber with sterile water
   b. Attach the chest tube to the chest drainage unit
   c. Apply suction to the chest drainage unit
9. Select all that apply when assessing a chest tube and chest drainage unit
   a. Water seal to 2cm
   b. Bellows to the delta mark
   c. Bubbling in the water seal
   d. Clamp at base of tubing next to chest drainage unit
   e. Fluid levels every 12 hours
10. A veteran with a chest tube needs to go to radiology. Which of the following should the nurse not do?
   a. Remove suction from chest drainage unit
   b. Delegate to CNA to attach suction to chest drainage device upon return
   c. Ensure the water seal chamber is to 2 cm
   d. Ensure that the chest drainage unit is below the level of the chest for transport

Appendix F

Creighton Competency Evaluation Instrument (C-CEI)

0= Does not demonstrate competency
1= Demonstrates competency NA= Not applicable

Date: / / MM / DD / YYYY

Student Name:
Staff Nurse Instructor Name:

Circle Appropriate Score for all Applicable Criteria - If not applicable, circle NA

ASSESSMENT				**COMMENTS:**
1. Obtains Pertinent Data	0	1	NA	
2. Performs Follow-Up Assessments as Needed	0	1	NA	
3. Assesses the Environment in an Orderly Manner	0	1	NA	
COMMUNICATION	0	1	NA	
4. Communicates Effectively with Intra/Interprofessional Team (TeamSTEPPS, SBAR, Written Read Back Order)				
5. Communicates Effectively with Patient and Significant Other (verbal, nonverbal, teaching)	0	1	NA	
6. Documents Clearly, Concisely, & Accurately	0	1	NA	
7. Responds to Abnormal Findings Appropriately	0	1	NA	
8. Promotes Professionalism	0	1	NA	
CLINICAL JUDGMENT				
9. Interprets Vital Signs (T, P, R, BP, Pain)	0	1	NA	
10. Interprets Lab Results	0	1	NA	
11. Interprets Subjective/Objective Data (recognizes relevant from irrelevant data)	0	1	NA	
12. Prioritizes Appropriately	0	1	NA	
13. Performs Evidence Based Interventions	0	1	NA	
14. Provides Evidence Based Rationale for Interventions	0	1	NA	

15. Evaluates Evidence Based Interventions and Outcomes	0	1	NA
16. Reflects on Clinical Experience	0	1	NA
17. Delegates Appropriately	0	1	NA
PATIENT SAFETY 18. Uses Patient Identifiers	0	1	NA
19. Utilizes Standardized Practices and Precautions Including HandWashing	0	1	NA
20. Administers Medications Safely	0	1	NA
21. Manages Technology and Equipment	0	1	NA
22. Performs Procedures Correctly	0	1	NA
23. Reflects on Potential Hazards and Errors	0	1	NA
COMMENTS		**Total:**	
Revised for DEU use 8/20/2013		**Total Applicable Items: Earned Score**	

Appendix G

Name Jennifer Dent
Institutional affiliation Eastern Kentucky University 521 Lancaster Ave. Richmond, Ky 40475
859-622-1000
How do you plan to use the C-CEI© DNP Project
If using "Other", please explain
Use the area below for any questions you have or to provide additional information.
Agreement for use of the Creighton Competency Evaluation Instrument (C-CEI©)

I understand that I have been granted permission by the creators of the C-CEI© to use the C-CEI© for academic and/or research purposes.

I confirm that I will complete the required training prior to use of the C-CEI©. In addition, I agree that all individuals working with the C-CEI© will also complete the required training prior to using the instrument.

I agree that I will use the C-CEI© only for its intended use, and will not alter the C-CEI© in any way.

I understand that I may be asked to share results on any validity or reliability data as determined with the creators of the C-CEI©.

I AGREE
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Appendix H

Student Satisfaction and Self-Confidence in Learning

Instructions: This questionnaire is a series of statements about your personal attitudes about the instruction you receive during your simulation activity. Each item represents a statement about your attitude toward your satisfaction with learning and self-confidence in obtaining the instruction you need. There are no right or wrong answers. You will probably agree with some of the statements and disagree with others. Please indicate your own personal feelings about each statement below by marking the numbers that best describe your attitude or beliefs. Please be truthful and describe your attitude as it really is, not what you would like for it to be. This is anonymous with the results being compiled as a group, not individually.

Mark:

1 = STRONGLY DISAGREE with the statement
2 = DISAGREE with the statement
3 = UNDECIDED - you neither agree or disagree with the statement
4 = AGREE with the statement
5 = STRONGLY AGREE with the statement

Satisfaction with Current Learning	**SD**	**D**	**UN**	**A**	**SA**
1. The teaching methods used in this simulation were helpful and effective.	1	2	3	4	5
2. The simulation provided me with a variety of learning materials and activities to promote my learning the medical surgical curriculum.	1	2	3	4	5
3. I enjoyed how my instructor taught the simulation.	1	2	3	4	5
4. The teaching materials used in this simulation were motivating and helped me to learn.	1	2	3	4	5
5. The way my instructor(s) taught the simulation was suitable to the way I learn.	1	2	3	4	5
Self-confidence in Learning	**SD**	**D**	**UN**	**A**	**SA**
6. I am confident that I am mastering the content of the simulation activity that my instructors presented to me.	1	2	3	4	5
7. I am confident that this simulation covered critical content necessary for the mastery of medical surgical curriculum.	1	2	3	4	5
8. I am confident that I am developing the skills and obtaining the required knowledge from this simulation to perform necessary tasks in a clinical setting	1	2	3	4	5
9. My instructors used helpful resources to teach the simulation.	1	2	3	4	5
10. It is my responsibility as the student to learn what I need to know from this simulation activity.	1	2	3	4	5
11. I know how to get help when I do not understand the concepts covered in the simulation.	1	2	3	4	5
12. I know how to use simulation activities to learn critical aspects of these skills.	1	2	3	4	5
13. It is the instructor's responsibility to tell me what I need to learn of the simulation activity content during class time..	1	2	3	4	5

Appendix I

Dear Jennifer,

It is my pleasure to grant you permission to use the "Educational Practices Questionnaire," "Simulation Design Scale" and "Student Satisfaction and Self-Confidence in Learning" NLN/Laerdal Research Tools.

In granting permission to use the instruments, it is understood that the following caveats will be respected:

1. It is the sole responsibility of (you) the researcher to determine whether the NLN questionnaire is appropriate to her or his particular study.
2. Modifications to a survey may affect the reliability and/or validity of results. Any modifications made to a survey are the sole responsibility of the researcher.
3. When published or printed, any research findings produced using an NLN survey must be properly cited. If the content of the NLN survey was modified in any way, this must also be clearly indicated in the text, footnotes and endnotes of all materials where findings are published or printed.

I am pleased that materials developed by the National League for Nursing are seen as valuable, and I am pleased that we are able to grant permission for the use of the "Educational Practices Questionnaire," "Simulation Design Scale" and "Student Satisfaction and Self-Confidence in Learning" instruments for your important work to advance the science of nursing education.

Warm Regards, Amy

Amy McGuire | Administrative Coordinator, NLN Chamberlain Center | National League for Nursing | www.nln.org |

amcguire@nln.org | Tel: 202-909-2509 | The Watergate | 2600 Virginia Avenue NW, 8th Fl, Washington, DC 20037

Appendix J

Staff Meeting Script

Hello, my name is Jennifer Dent and I am a Doctor of Nursing Practice student at Eastern Kentucky University. Part of my requirement to complete the DNP program is to implement an evidence-based practice project. The focus of my project is patient safety. Competency is needed to provide safe patient care. Simulation is an EBP staff development method that can develop, maintain, and evaluate competency.

The simulation that will be used for staff development and evaluation of competency will cover chest tube content and care. You will be asked to complete a pretest to evaluate knowledge of care of patients with a chest tube and a posttest for comparison of knowledge before and after the simulation on care of patients with a chest tube. During the scenario you will be evaluated using a valid and reliable instrument that measures competency. You will care for a simulated patient that has a chest tube in group of 2 nurses. Once the scenario is completed you will take a posttest and a survey to evaluate simulation as a staff development method. You will have 2 hours to complete the entire process from pretest to evaluation.

You will be assigned a time based on your work schedule and be asked to leave the unit and go to the VA simulation center during your assigned time. Once the simulation is completed you will return to the unit.

I will ask that you sign an informed consent on the day of the simulation that will allow me to use the data that will be collected in the capstone project. The use of your data for my project is strictly voluntary. The data that is collected for knowledge and competency will be kept by the VA and placed in your file. For this reason your names will need to be on the forms. Any data that you allow me to use will be analyzed and reported in aggregate data with no personal identifying information. The survey that concludes the simulation will be anonymous and any surveys that are returned will be used in my data collection.

If you would like to prepare before the simulation scenario on chest tubes go to the Atrium site that you use during annual review. The link is

This simulation is intended to help you develop and maintain competency and is designed to give you a hands on scenario that offers you the opportunity to practice in a safe environment. We truly want you to be successful in the care of a patient with chest tubes and will go over your success and anything that did not go as you would have liked in debriefing that will be nonjudgmental. Once again this is designed as a method to help you display your competence and to assist you if you are not as competent as you would like to be.

Thank you so much for the opportunity to work with you!

Appendix K

Jennifer Dent

Eastern Kentucky University

Department of Baccalaureate & Graduate Nursing

Dear Nurse,

I am completing a Doctor of Nursing Practice (DNP) at Eastern Kentucky University. A portion of the requirement to complete the DNP is to conduct an evidence-based practice (EBP) project. I am inviting you to participate in this EBP project that will include the use of simulation as staff development for nursing care of patients with chest tubes. Simulation as staff development can improve knowledge and confidence. There are no risks to participation in the project and your participation in having your information collected is voluntary.

Participation in the project will require you to complete a pre and post test to measure knowledge of care of patients with a chest tube, a survey after the simulation, and competency evaluation during the simulation. All information collected before, during, and after the simulation will be confidential and in no way impacts your position with the institution.

Your participation is appreciated but is voluntary. You do not have to participate and can stop your participation at any time.

I will be happy to answer any questions that you may have. You can contact me at 859-685-5903 or capstone advisor, Dr. Donna Corley at 859-622-6316.

Thank you,

Jennifer Dent

EKU DNP Student

Appendix L

Simulation Information Flyer

Chest Tube Care Simulation

Develop and maintain competency in the care of a patient with a chest tube.

Where: VA Simulation Center

When: Date and time will be assigned

Review: Chest Tube information on SWANK 509

Learning Objectives:

- *Apply critical judgment when caring for a veteran with a chest tube in a simulation*
- *Synthesize assessment information to recognize deterioration in a veteran with a chest tube in a simulation*
- *Implement evidence-based practice in the care of a veteran specifically focusing on a chest tube in a simulation.*
- *Apply knowledge and skills to intervene when complications develop with a chest tube.*

Please consider consenting to allow the use of your data to be included in my Capstone Project

Questions?
Contact Jennifer Dent

jennifer_dent2@mymail.eku.edu