FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

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Research II

SP-17 NURS 507-5035

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May 11, 2017
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Introduction

Background of the Problem

Central line acquired blood stream infections (CLABSI) rates are associated with high mortality rates and evidence suggests CLABSI is associated with poor patient outcomes. The estimated cost of CLABSI is “$3,700 – 29,000” per patient, due to the increased length of the hospital stay, which is not reimbursable (Joint Commission, 2012). It is estimated that “500 – 4,000 United States patients die annually” due to CLABSI (Joint Commission, 2012).

Information about CLABSI is well researched. The Infectious Disease Society of America (IDSA) and Centers for Disease Control (CDC) guidelines encourage frequent and ongoing education programs and training of health care providers to decrease central line associated blood stream infection rates (O’Grady, et al., 2011). The CDC’s recent recommendations in its 2017 “Guidelines for the Prevention of Intravascular Catheter-Related Infections” states that health care workers should be educated on intravascular catheter use, maintenance, and infection control measures, citing 11 studies supporting these recommendations (CDC, 2017).

According to Parra et al. (2010), the knowledge level of staff and CLABSI rates is directly correlated to the level of familiarity with guidelines and protocols on CLABSI. McAlearney and Hefner (2014) conducted interviews of 50 nurses at eight hospitals and found there was importance to having the CLABSI educator available to answer questions and demonstrate CLABSI prevention protocols. “You want a nurse educator who can keep staff cohesive, going in the right direction (McAlearney & Hefner, 2014).” Royer (2010), who collected six years of CLABSI rates (2003-2009), demonstrated a drop in CLABSI from 0.63 to zero for 17 months at a 350 bed acute care hospital by creating a care bundle. The care bundle
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which achieved and sustained zero CLABSI includes rigorous central line education for the health care professional (Royer, 2010).

The need to educate and support health care staff to prevent CLABSI is important. Technique variations and occasional noncompliance is common. Poor technique is common in health care facilities with poor patient central line care (Barnes, Rearden & McHugh, 2016; Royer, 2010). Successful education programs support and encourage staff. Educators who observe care, correct technique and provide surveillance can act as a change agent to promote successful patient care outcomes (Reed, Brock & Anderson, 2014).

Central line acquired blood stream infections or CLABSI rates are associated with high mortality (Joint Commission, 2012). With a larger population of new nurses and a zero tolerance for CLABSI, the investigator plans to educate nurses on current standards and CLABSI prevention.

Purpose

The purpose of this study is to increase nursing knowledge by educating WICU nurses using focused CLABSI education and simulation testing and comparing variables (nursing knowledge and education) prospectively with the SICU. The investigator predicts that by increasing education in the WICU, nursing knowledge will increase. The level of CLABSI nursing knowledge for both the WICU and SICU will be compared at the beginning of the study by pre-testing all nurses. Post-tests will be given to the WICU nurses and will take place after a four-week education program for WICU nurses. Managers from both units will encourage all staff to complete the testing. Posters, handouts and visual cues are used in the WICU to improve compliance with CLABSI prevention. Population to be studied are ICU nurses who care for patients with central lines.
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Significance to Nursing

Nurses play an important role in CLABSI prevention, as they have direct contact with patients and perform a majority of central line maintenance. Nurses are often the best positioned health care team member to reduce infection risk. Because of their frequent contact with patients, nurses can advocate for central line removal if it becomes necessary.

In 2014, the Centers for Medicare and Medicaid Services (CMS) began to penalize hospitals for poor performance with respect to selected hospital-acquired conditions, including CLABSI (Barnes, Rearden, and McHugh, 2016). Soon after, magnet hospital recognition became part of the credentialing which supports better patient care and outcomes. Magnet designation is operated by the American Nurses Credentialing Center and recognizes nursing excellence (Barnes et al., 2016). Patients seek care at the best institutions and public data shows risk factors which influence poor outcomes. Patients may choose to receive care at another facility based upon poorly managed hospital-acquired infections. Poor patient outcomes impact nursing negatively, as the consumer may refuse to be treated by the nurses and facility. This research program intends to educate the nurse by providing focused CLABSI prevention education with the goal of increasing nursing knowledge. The investigator predicts the education program will enhance nurses’ knowledge benefiting the patient and CLABSI rates.

Theoretical Framework

This research project will utilize Pender’s Health Promotion Model (HPM) (Sakraida, 2010). Pender’s model stems from a belief that nurses are responsible for care that results in improved health and enhanced existence for the individual (Pender, 1996). Pender presented specific strategies for nurses that provide health promotion and prevention services. She believed disease prevention should be the primary focus in health and central to any
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transformation within the health care system (Sakraida, 2010). This framework will guide our central line associated blood stream infection (CLABSI) reduction goal.

**Literature Review**

The purpose of this study is to increase nursing knowledge by educating WICU nurses using focused CLABSI education and simulation testing and comparing variables (nursing knowledge and education) prospectively with the SICU. The investigator predicts that by increasing education in the WICU, nursing knowledge will increase. Hospital acquired infections such as CLABSI can be devastating complications. They are costly and can increase mortality.

The use of standardized steps for central line care, known as a central line bundle (CLB), has been shown to improve central line infection rates. Hospitals decreased infection rates, mortality and costs by teaching the steps to staff utilizing the CLB. According to Curlej and Katrancha (2016), components of the CLB included daily review with staff on line care, hand hygiene, maximal sterile barriers, chlorhexidine skin asepsis and optimal catheter site selection. After an education intervention, nursing recall was 30% and scores on testing showed there was increased knowledge from baseline to 86% (Curlej & Katrancha, 2016). A similar self-study module tested and informed staff of methods for pre- and post-central line insertion care and found significant decreases in CLABSI by educating staff using a self-study module (Guerin, Wagner, Rains, & Bessesen, 2010). Policy steps and education were reviewed monthly with staff. Inspection of the insertion site was performed daily. Relative risk for a CLABSI during the post-intervention period compared with the pre-intervention period was found to be 0.19 (95% confidence interval, 0.06-0.63; \( p = .004 \)) (Guerin et al., 2010). The use of CLB was also implemented at Wake Med Health & Hospital in the intensive care unit (Dixon & Carver,
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE (2010). This study was different from the study above in that education took place annually and during orientation for newly hired nurses. Nurse educators and central line champions were assigned to each floor to monitor central lines and assist staff. Dixon and Carver (2010), achieved a 73.7% reduction in CLASIs over three months. These studies were similar in that they used the CLB to provide steps of care for the central line, improve education and decrease CLABSI rates. Differences in the timing of education and the use of nurse educators was specific to each facility.

Hospitals appointed staff who were experienced in central line care as expert educators or central line champions. Educators are an important component in a quality CLABSI reduction program. According to Reed, Brock, and Anderson (2014), expert nurse educators were key to the discovery that bedside nurses were inconsistent in applying aseptic technique. The usual standard of care was to scrub the hub for 15 seconds with an alcohol prep pad prior to making any connections, but observational rounds showed actual scrub times to be notably shorter. According to Reed et al. (2014), assigning appointed staff to observe proper protocol led to improved hand washing and changed health care workers’ habits to improve patient care.

Team leaders and educators were used to guide staff and improve outcomes in several CLABSI reduction studies. A study by Pronovost et al. (2002), designated one physician and a nurse from both day shift and night shift as team leaders to provide expert coaching, guidance, and corrections to central line technique. Team leaders oriented new staff to familiarize health care workers on CLABSI policy. The study showed the overall median rate of catheter-related bloodstream infection decreased from 2.7 (mean, 7.7) infections per 1000 catheter-days at baseline to zero (mean, 2.3) at zero to three months after implementation of the study intervention. Morrison, Raffaele and Brennamen (2017) designated team leaders who taught
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policy by use of personalized report cards. The designated team leaders provided confidential feedback to nurses allowing for correction without intimidation and created a valuable way to implement teaching moments to reduce CLABSI rates. The education fostered leadership, communication, and reinforced the need for open conversation about central line care (Morrison, Raffaele, & Brennman, 2017). According to Morrison et al. (2017), a reduction in risk factors contributing to CLABSI took place. Before the feedback intervention the CLABSI rate for critical care was 0.19 per 1,000 line days, or 1 CLABSI and one year after the project ended, the CLABSI rate for critical care was 0.0 and for the medical-surgical units it was 0.57 per 1,000 line days or 10 CLABSI (Morrison et al., 2017).

Hand hygiene strategies using soap and water or alcohol-based waterless disinfectant was a main intervention to prevent infection in multiple studies. According to Warren (2004), handwashing technique is vital to any education program on CLABSI reduction. Conventional soap and water or alcohol-based hand rub should be performed before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter. Hand washing is a requirement before donning sterile gloves. Sterile gloves are required for insertion of central lines, dressing changes, and anytime aseptic technique is required (Garrett, 2016; O’Grady, et al., 2011). The removal of soil, bacteria, and viruses through hand washing or the use of approved alcohol-based hand rubs significantly reduced the risk for infection transmission (Garrett, 2016; Humphrey, 2015). In a 2013 study, only 68.1% of health care workers (HCWs) surveyed knew the correct hand hygiene procedures for insertion and maintenance of central venous catheters. This provided evidence that education programs are a fundamental piece of any CLABSI monitoring program (Bianco, Coscarelli, Nobile, Pileggi, & Pavia, 2013).
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Hand washing is the single most effective method for prevention of hospital acquired infections. There are five core steps in the patient care process for which hand hygiene is indicated for health care providers: before touching the patient, after touching the patient, before clean or aseptic procedures, after touching a patient’s surroundings, and after body fluid exposure and risk of exposure (Garrett, 2016). According to Humphrey (2015), microbes from the hands of health care workers (HCWs) can play a role in pathogenesis by contaminating the catheter hub or skin of the patient during medication administration, manipulation of the catheter, or dressing changes. Hand washing is a key element to an education program.

Noncompliance of dressing changes and hub connectors can add to CLABSI risk. Education programs should stress that documentation and performance of central line care is essential on every shift. Nursing notes should include a description of central line, a description of site condition, description of patency on each lumen including the color of the lumen (Morrison, 2012). Seven days is standard policy in a CLABSI reduction program to change a central line dressing, and a semi-permeable dressing to cover the catheter site is acceptable. If the patient is bleeding, or diaphoretic post insertion, the use of gauze dressing is acceptable but must be changed every 24 hours if soiled (O’Grady, et. al., 2011). A study by Bianco, Coscarelli, Nobile, Pileggi and Pavia (2013), found only 63% of HCWs felt a central line dressing should be replaced if loose or 43% of HCWs believe tubing sets used to administer blood, blood products or fat emulsion should be replaced within 24 hours of initiating the infusion. Additionally, only 55.4% of HCWs surveyed documented central line dressings (Bianco et al., 2013). Education promoting proper documentation can prevent mistakes and reduce CLABSI risks (McAlearney & Hefner, 2014). By documenting placement date of a central line, staff can monitor how long the line has been in place.
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Munoz-Price et al. (2012) stated that the best way to roll out change or a “scrub the hub” campaign was to remove all alcohol wipes from storage supplies. Alcohol wipes or packets were removed and replaced with single-use chlorhexidine swabs resulting in a decrease in CLABSI rates from 8.6 per 1000 catheter days to .05 per 1000 catheter days in Unit A (Munoz-Price et al., 2012). Changes to policy and procedures need to be discussed with staff, especially nurses. When initiation of new policy occurs, it is helpful for staff to understand change. This study is an example of why nurses need to be informed and updated. In a similar light, the study below discusses the different perspectives of the health care team and talks about resolution of issues that can be considered for better quality of care.

A study by McAlearney and Hefner (2014), uncovered barriers to practice and suggested resolution of problems between the health care team. Most importantly, the study uncovered suggestions for what could be done to foster better. Many teams are involved in patient care (nurses, physicians, administration personnel, patients and families) and teams have differing perspectives. Nursing care is tasked with limited time and resources, competing priorities and physician resistance. A critical factor to designing and implementing any CLABSI prevention program is to include nurses in infection control initiatives (McAlearney & Hefner, 2014). In this study, facilitators of CLABSI prevention were mentioned across interviewee groups and include education, leadership, data and technology, and the use of consistent clinical processes to create success within the team (McAlearney & Hefner, 2014). Nurses are the front line to many disciplines and most importantly in patient care initiatives.

According to Wuerz (2016), the first step to improved vascular access program included the assessment of staff and their knowledge as it relates to central venous access device management. This study recommends frequent education modules, peer review programs and
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hands-on management teams to implement continuous CLABSI monitoring. Similar guidelines by O’Grady et al. (2011), recommended hands on evaluations to periodically assess knowledge of CLABSI and adherence to guidelines. Additionally, sustained education, continued support, evaluation of goals, and reduction of microorganisms within the healthcare environment are goals for best practice in CLABSI reduction (O’Grady et. al., 2011).

Several studies recommended education be taught in a non-punitive way. This allowed time for conversation and feedback, providing opportunities for staff to build relationships and fostered accountability within the unit (Wuerz, 2016). When implementing an education program, areas showing improvement should be rewarded appropriately. Those that need improvement should be monitored and educated (Wuerz, 2016).

Feedback and open communication, given appropriately, allowed the identification of areas to for improvement, allowed staff to approach administration and left the door open without intimidation. Nurses appreciated the feedback by report card and having a no blame policy that helped to identify electronic medical record documentation fields which were difficult to navigate (Morrison et al., 2017). Changes in care occurred by fostering a better documentation process. Nurses were able to improve the electronic chart and were allowed open dialogue with administration (Morrison et al., 2017). Comments made by nurses during the delivery of the report card added value to the documentation process, fostered team building and allowed for better communication.

Team building and improved patient safety occurred when nurses and physicians collaborate effectively. A study by Boev and Xia (2015), examined the relationship of nurses and physicians when responsibilities were shared and how this affected hospital acquired infection rates. ICUs with favorable perception of nurse-physician collaboration were associated
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with lower rates of CLABSI. For every 0.5 units increase in nurse-physician collaboration, the
rate of CLABSI decreased by 2.98 (Boev & Xia, 2015).

Rounding with the team members facilitated communication and plan of care. Different studies
discussed the importance of rounding with physicians daily to ask if the central line is necessary
(Ireland, Wolk & Berstrom, 2017; Warren et al., 2004). Physicians who acknowledged
suggestions and were open to discussion helped to decrease central line associated blood stream
infection rates. According to recommendations by Ireland, Wolk, and Bergstrom (2017), risks
were too high to keep a central line in a patient for the purpose of blood draws. It was no longer
enough to inquire whether a central line was indicated, the recommendations were to check with
the rounding team daily and document the indication of the central line (Ireland et al.,
2017). This communicated the need for the line and documented those responsible for continued
use.

Two similar studies used a pre-and post-test design to show differences in knowledge
levels as a result of education of staff (Coopersmith, et al., 2002; Humphrey, 2015). Mandatory
testing of ICU nurses, monthly information on CLABSI rates, and a multidisciplinary team
approach were used to improve infection rates in the ICUs (Coopersmith, et al., 2002).

A different nursing education intervention yielded statistically significant improved
knowledge of central line care among ICU staff (pretest mean score = 4.6 and posttest mean
score = 8.4; \( p = .0001 \)) (Humphrey, 2015). Prior to the intervention, evidence based practices on
CLABSI were reviewed by both staff and investigator, interviews were performed and
observations of the RNs completed. Education proved to be successful here.

The purpose of this study is to increase nursing knowledge by educating WICU nurses
using focused CLABSI education and simulation testing and comparing variables (nursing
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knowledge and education) prospectively with the SICU. The investigator predicts that by increasing education in the WICU, nursing knowledge will increase. To review, research has shown positive use of a bundle, this includes education. Care and maintenance of the line includes a site check, and documented care, and purpose of the line. Health care workers need to include hand hygiene before touching the patient or the central line to prevent infection. Effective use of chlorhexidine, proper dressing care and scrubbing the hub for 15 seconds decreased CLABSI. Tubing for fluids needed to be changed every 72 hours and lines needed to be dated. Tubing for lipids and blood infusion sets needed to be changed more frequently. Fostering team building with nurses and physicians reduced risks for infection to the patient. Communication was important to change electronic documentation and made a difference in the flow of daily events for nursing. Nurse educators, who were caring and compassionate, understood that hands on learning was important and sustained education made a difference. The investigator will provide the best possible education to promote increased nursing knowledge based upon the recent evidence.

Methodology

Several types of catheters are used in hospitals, especially in intensive care units (ICUs), for a variety of reasons. Central lines provide fluids to correct electrolyte and water imbalances. They are necessary for transfusion of blood and blood products, for infusion of medicine, to provide total parenteral nutrition, and to monitor hemodynamic functions. Widespread use of catheters may lead to several complications, including infections that cause significant morbidity, mortality and economic loss. Will improved nursing knowledge, and competency of central line care result from focused CLABSI education?
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Research Question/Hypothesis

This research project is to determine if focused central line associated blood stream infection (CLABSI) education will improve nursing knowledge within the Weinberg intensive care unit (WICU). Focused CLABSI education will be given to nurses working in the WICU. The hypothesis is that WICU nurses who receive focused central line education will experience increased CLABSI knowledge compared to surgical intensive care unit (SICU) nurses. The investigator predicts focused central line education will increase nurses’ CLABSI knowledge in the WICU.

Bloom's Taxonomy was created in 1956 under the leadership of educational psychologist Dr. Benjamin Bloom. He identified three domains of effective learning (Bloom, 1956). For the purposes of this study, we will incorporate the cognitive and psychomotor domains to promote effective learning. The CLABSI education program will incorporate simulation (psychomotor domain) to assist nurses with CLABSI skill development and coordination and technique to improve care of central lines. Technique of each nurse will be compared with the nursing practice audit and dressing integrity audit (see appendix I). These audits address necessary steps for care of the central line. This will allow the investigator to observe variations in nursing care. Corrections will be demonstrated during actual observation, so the nurse can learn appropriate technique.

Definition of variables

The variables to be defined and described are: 1) CLABSI, 2) central line catheters, 3) knowledge and performance of CLABSI competency and 4) education.

The clinical definition of a CLABSI as classified by the Centers for Disease Control and Prevention (CDC) National Nosocomial Infection Surveillance is an infection that is primary or
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE secondary. CLABSI is defined as primary bacteremia in the presence of a central line catheter. Secondary bacteremia is defined as a bloodstream infection that develops as a result of a documented infection with the same microorganism at another body site. A primary bloodstream infection (bacteremia) is defined by the following criteria: isolation of a recognized pathogen from a blood culture (Staphylococcus aureus, Enterococcus species, Candida species) (CDC, 2017). This is infection that is not related to another site and accompanies fever greater than or equal to 38.0 degree Celsius. It is accompanied by chills or hypotension and either of the following: 1) common skin contaminant (eg, diphtheroids, Bacillus species, Propionibacterium species, coagulase-negative staphylococci or micrococci) isolated from two blood cultures drawn on separate occasions within 24 hours and unrelated to infection at another site or 2) common skin contaminant isolated from a blood culture from a patient with an intravascular device receiving appropriate antimicrobial therapy ordered by the physician (CDC, 2017).

Central line catheters are clinically classified as having the tip of the catheter terminating in one of the great vessels or near the heart. Central line catheters are used for infusion, withdrawal of blood, or hemodynamic monitoring (CDC, 2017). These include peripherally inserted central catheter (PICC) lines, dialysis catheters, hohn catheters, arrow catheters, mediports, and power ports. All central lines present on admission or inserted on patients within each unit during the time of the study will be observed.

Education will be measured by observation and recall of information on a 50-question test with a minimum passing score of 80% (operational definition). The operational definition of nursing knowledge from CLABSI education will be measured by comparing test scores, (50 question test), comparing both pre-and post-test scores of nurses in both WICU and SICU. For the WICU nurses, an increase in post test scores will provide numerical data to demonstrate an
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increase in knowledge relating to focused central line education. WICU nurses will demonstrate care of a central line on mannequin with a central line. All necessary steps (see appendix 1) to perform a dressing change will be observed for each nurse in the study.

Performance of CLABSI competency is demonstration of care by the nurse using simulation. The investigator will evaluate the nurses’ ability to care for a patient’s central line with the use of simulation. Simulation will be used as a component of psychomotor learning. Simulation has advantages in nursing education as it allows development of skill, critical thinking ability, and confidence (Cant & Cooper, 2010). This is the definition of clinical nursing.

Education is defined as acquiring general knowledge and skills and developing the powers of reasoning and judgment. According to Dr. Benjamin Bloom (1956), two of the three domains of learning are cognitive and psychomotor. In this study, testing will measure nursing knowledge and simulation will measure how nurses care for central lines, or nursing skills. CLABSI prevention posters and handouts will be given to WICU nurses. To measure education, nurses will be given a 50 question test. The investigator plans to compare the pre-test scores and post-test scores of each WICU nurse to show how focused CLABSI education (dependent variable) affected scores (independent variable).

Research Design

A quasi experimental design is planned in three separate periods: pre-education for three months followed by education for one month and post-education for three months. According to Polit and Beck (2017), a study using an intervention where participants are not randomly assigned is a quasi experimental design. A nonequivalent control group, pre-test post-test design
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is planned in this study (Polit & Beck, 2017). This is where an intervention is used on the entire unit (WICU) and a similar unit does not get the intervention (SICU).

During the pre-education phase, the investigator plans to observe care on central lines in both SICU and WICU and formulate an education program based on observations of central lines. A focused CLABSI education program will be created based upon direct observations.

On March 30th, pretesting for all nurses working in the WICU and SICU will be given and collected by the investigator. Education will begin on April 1st and will be presented to the WICU nurses for four weeks. On May 1st, all WICU and SICU nurses will be post-tested.

During the post-education phase or May 1 – July 30, the investigator will analyze the data, present the data and make recommendations based on the data.

Population

This study will be conducted in two separate intensive care units located within the Johns Hopkins Hospital, a Magnet status hospital with 1,191 beds. The surgical intensive care unit (SICU) is a closed 20 bed unit located on the ninth floor of the Zayed Tower. There are 74 nurses total working on this unit. The SICU nurses care for kidney and liver transplant, vascular surgery, femoral bypass and thrombus surgery patients. The WICU is a closed 20 bed unit with 64 nurses, located on the third floor of the Weinberg building. The WICU nurses care for ear, nose, and throat surgery, thoracic surgery, gastrointestinal surgery, gynecology oncology surgery, and general ICU surgery patients. An average of 1,400 patients are admitted to both units annually with a mean length of stay of 3.8 days (Inside Hopkins, 2017).

The target population will be all ICU nurses who care for patients with central lines. The population to be studied will be a convenience sample of all nurses working in the SICU and WICU from January 1, 2017 – May 30, 2017. The SICU/WICU is accessible and is physically
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located at the researcher’s place of employment. To determine the sample size and make sure the sample size is large enough, a power analysis will be done. The power will need to be .80 and the effect size will need to be .3 for a medium effect size. The effect size is the weight of the relationship between variables. In this case, the variables are education and nursing knowledge and the investigator is looking to obtain a medium effect. According to Polit and Beck, a power analysis is used to reduce the risk of “Type II error,” when the researcher concludes that a relationship does not exist between variables when in fact it does (Polit & Beck, 2017).

This convenience sample of nurses from the WICU will be recruited, tested, educated and retested. The SICU nurse population will be the control group and they will be pre-tested and post-tested using the same test. It is realistic for the investigator to assume 20% or more of the nurses will refuse to consent to the study and refuse testing.

Inclusion criteria for nurse participation in the study includes being a full-time or part-time bedside WICU or SICU registered nurse who is employed at the Johns Hopkins Hospital and can read, write, understand English and demonstrate care. Nurses will need to give approval or consent to participate in the study. They may withdraw from the study at any time. Exclusion criteria include nurses who decline to sign the consent.

Data Collection

Pre-testing is planned for March 30, 2017 and post-testing is planned for May 1, 2017. All consented nurses will be assembled and given 45 minutes to complete each test. Each test will take place in a monitored room and will be given in exactly the same way. For both pre-test and post-testing schedules, the WICU nurses will be tested at the beginning of each nurses’ shift (07:00, 11:00, 15:00, 19:00, 23:00). The SICU nurses’ testing will take place two hours after the start of each shift (9:00, 13:00, 17:00, 21:00, 1:00). All testing will be administered by the
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The clinical tool used to measure CLABSI knowledge is a 50-question test that was used in a study in Trabzon, Turkey (Yilmaz, Caylan, Aydin, Topbas & Koksal, 2007). The test is comprised of true-false and fill-in-the-blank questions. Each correct answer scores one point, and each incorrect answer scores 0 points. The Cronbach alpha, a widely-used tool or index that estimates internal consistency of the tool, is determined to be 0.71 (Yilmaz et al., 2007). The coefficient alpha, or Cronbach alpha, estimates the extent to which various parts of a tool reliably measures what it claims to measure. Coefficients of 0.80 or higher are considered desirable (Polit & Beck, 2017). The total score or correct answers will be multiplied by two and will be evaluated as a proportion of 100. The pre- and post-test design and will give a numeric value.

A mannequin will be available for staff to demonstrate care of a central line. This will be set up in the WICU conference room during April 1 – April 30, 2017. Simulation will be made as realistic as possible and supervised by the investigator. A supply cart will be available for nurses caring for the simulator patient with a central line. Each available nurse will be required to complete all actions listed on the practice audit and dressing integrity audit (see appendix I). Any nurse who omits critical actions on the nursing practice audit or dressing integrity audit will be required to repeat the simulation training.

Data analysis plan

Inferential statistics draw conclusions about the population being studied and applies the conclusions to the general population. The investigator plans to observe, educate and test WICU nurses’ knowledge on CLABSI prevention. If the results show that a focused central line
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education plan increases nursing knowledge, then the same education should be provided to all ICU nurses. By studying results of the CLABSI education program and its effect on nursing knowledge, the investigator will be able to determine if increasing CLABSI education does increase nursing knowledge within the ICU nursing population. The investigator plans to compare the mean scores of the pretest from WICU and SICU nurses to ensure that both groups have similar central line knowledge prior to the intervention. By understanding the mean score of pretest scores for WICU and SICU nurses, a comparison of baseline knowledge can be made of both groups. Comparison of post-test scores will also be performed between the two groups.

With a $t$-test, the investigator can determine if the difference in the mean test scores has significance by comparing the mean of the two groups. A $t$-test is a parametric statistical test for analyzing the difference between two means (Polit & Beck, 2017). By comparing two groups or providing a comparison of two mean group differences, the investigator can determine differences in scores. In this study, pre-test scores of the WICU nurses and pre-test scores of SICU nurses will be compared to see if there are significant differences in the baseline of CLABSI knowledge. Comparison of pre-test and post-test scores of the WICU nurses will give the investigator test scores that will show a correlation of focused CLABSI education.

In this study, a $p$-value will be calculated to compare the strength of evidence between pre-and post-test scores. The investigator is looking for a value of significance or a $p$-value of less than or equal to 0.05. A $p$-value of less than or equal to 0.05 indicates strong evidence against a null hypothesis and would suggest there is a 95% probability that nursing knowledge increased from comparing test scores (Polit & Beck, 2017). The study will use a statistician to compile the results of pre-and post-test scores. The investigator seeks to demonstrate that an increase in CLABSI education results in the increase of nursing knowledge and performance.
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The investigator would like to show that the study sample is representative of the target population of nurses. Demographic data will compare characteristics of nurses in the WICU and SICU, such as gender, length of time on the job, and level of nursing education. Again, p-values will be used to compare strength of evidence between the characteristics of nurses and between the nurses in the two units (gender, level of education, time in position). This personal information will be collected with each test and compared.

A Pearson’s r correlation will be used to show a scatter plot of dots showing a relationship between education and increased nursing knowledge. By using time in months on the X axis and pre- and post-exam scores of the WICU nurses on the Y axis, the investigator can determine if there is a correlation on scatter plot (Polit & Beck, 2017). The statistical software that will be used is called IBM SPSS Statistics (SPSS). To show a correlation of variables, the scatter dots will appear to look like a slope that goes from the bottom left slanting upward to the top right on an XY graph. This would indicate an increase in the independent variable (focused CLABSI education) and will be associated with an increase in dependent variable (nursing knowledge). The Pearson’s r is a tool for quantitative research design and is used to show correlation. It describes the direction of a relationship between two variables. In this research project, the investigator hopes to achieve a moderate or strong positive correlation on a scatter plot using an XY graph (Polit & Beck, 2017).

After completing observations, on March 30, 2017 and at the beginning of each nurses’ shift, a 50 question CLABSI prevention test will be administered to nurses who give consent and participate in the study. The WICU and SICU are in separate buildings. The investigator will plan to give WICU testing at the beginning of the nurses’ shift (07:00, 11:00, 15:00, 19:00, 23:00), covering all shifts. On the same day and two hours after the start of each shift in the
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

SICU (9:00, 13:00, 17:00, 21:00, 01:00), nurses will be tested by the investigator covering all shifts. Nurses working the shift will be tested one hour and two hours respectively into the shift and all shifts will be tested the same way and with the same test. Staff attending the testing session will be consented and will be assembled and given the test in a monitored room where staff will be encouraged to individually complete the test without assistance. Nurses will be given 45 minutes to complete the test. The test will be collected immediately after completion by the investigator on each floor and placed in a double locked cabinet where only the investigator will have access to the test scores.

After all pretests are collected, and beginning April 1-30, 2017, a targeted education program will be presented to the WICU Nurses. The education program will be over a four-week period where the investigator will give 30 minute lectures (three times a week to account for all shifts), simulation, handouts, posters and observation. Simulation sessions will be given to WICU nurses focusing on knowledge and performance of CLABSI skill. Observations on dressing integrity and nursing practice (see appendix I) will be completed. These 30-minute education sessions will be performed throughout the four weeks of education, April 1st – 30, 2017.

The educational program will cover the following content areas, as recommended by the CDC (2017).

Hand hygiene

Hand hygiene is widely recognized as the single most important infection control intervention; however, national compliance with hand hygiene practice remains relatively low. The removal of soil, bacteria, and viruses through hand washing or the use of approved alcohol-based hand rubs significantly reduces the risk for infection transmission across the
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continuum of care (CDC, 2017). There are five “moments” for hand hygiene that meet compliance standards with the CDC and include the following: 1) before touching the patient, 2) after touching the patient, 3) before clean aseptic procedures, 4) after touching a patient’s surroundings, and 5) after body fluid exposure and/or risk (CDC, 2017). Central line care givers and nurses should carefully follow facility protocol and practice regular hand hygiene when clinically indicated to reduce the potential transmission of CLABSI and transfer of microorganisms (CDC, 2017).

Assessment of need and prior to insertion

Documenting the indication for the central line is always good practice to prevent unnecessary central line placement. The main reasons patients receive a central line include to transfuse blood and blood products, infuse medicine, provide total parenteral nutrition, and monitor hemodynamic functions. Nurses should be aware that all healthcare personnel who insert central lines should have completed a credentialing process to determine competency before inserting. Nurses assisting with central line placement should be aware of the correct choices for central line insertions. The upper extremity site is the first choice for catheter insertion in adults. Catheters should be selected based on their intended purpose and duration of use. For instance, a PICC line or a midline should be inserted when the duration of intravenous (IV) therapy will likely exceed six days (CDC, 2017). The femoral site should be avoided for central lines in adult patients as it is associated with greater risk of infection and deep venous thrombosis in adults. Central lines should be placed in an alternative site to reduce the risk of infection. The risk of noninfectious complications should be assessed on an individual basis when determining which site to place the central line (CDC, 2017). Nurses should always check
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE
for contraindications such as use of blood thinners, pacemaker, dialysis fistula or mastectomy sites before placing the line.

**Insertion of line**

Two people are required for the central line insertion procedure. Nurses assisting with a central line should perform a time out before placing the line. There is a mandatory checklist in the electronic record for the inserter and assistant to follow to prevent from skipping essential steps. The second person or nurse is present for a surveillance check and to make sure the sterile field is maintained. Both health care workers should wear personal protective gear (e.g. cap, mask, gloves, sterile gown, sterile gloves for inserter, mask and a large sterile drape covering the patient from head to toe) during the insertion. This substantially reduces the incidence of CLABSIs compared with standard precautions (sterile gloves, small drape) (CDC, 2017). Infection prevention practices should be adhered to at the time of central line insertion. An all-inclusive supply cart should be used that contains necessary components for aseptic catheter insertion. Before the catheter insertion, an alcoholic chlorhexidine antiseptic containing more than 0.5% chlorhexidine should be used for skin preparation at the insertion site. The nurse should allow the site to completely dry before attaching dressing.

Inserting a central line with the minimum number of ports or lumens is essential for management and to reduce infection. If a catheter is inserted during a medical emergency and an adherence to aseptic technique cannot be ensured it should be replaced within 48 hours.

**Dressing changes**

Dressing changes should be completed every seven days or more frequently if the dressing is soiled, lose or damp. The nurse should change gauze dressings every 48 hours, especially if it is lifting off the skin or is wet. For assessment purposes, it is important to view
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

the insertion site. If there is a gauze dressing over the insertion site, the nurse should replace it with a transparent dressing as soon as possible. The gauze dressing, if soiled, can contaminate the site and a transparent dressing allows the nurse to see any signs or symptoms of infection. Skin disinfectant using an alcoholic chlorhexidine solution containing a concentration greater than 0.5% is preferred. There is a growing body of evidence that chlorhexidine-containing skin preparations are superior to other options such as povidone iodine and alcohol. Several studies have documented the use of a chlorhexidine-containing preparations and show a decrease of CLABSIs by 49% relative to povidone-iodine preparations (CDC, 2017 & O’Grady et al., 2011). Chlorhexidine antiseptic should be used to cleanse the insertion site and allowed to dry. The nurse should not wave or blow on the chlorhexidine site after application, as this can contaminate the site.

Nurses should evaluate and document their evaluation of the catheter insertion site daily. All signs or symptoms of infection (redness, tenderness, drainage at the site) should be documented. If unsure, always ask someone to assess. The need of the line should be evaluated daily, discussed with the team and removed as soon as possible to prevent CLABSI. Central lines should be removed if the patient develops signs of phlebitis (warmth, tenderness, erythema or palpable venous cord, drainage) or if the patient develops infection.

Hub Care

Nurses should scrub the hub for 15 seconds before accessing the line and the needleless connector should be dry prior to accessing the line. Vigorous scrubbing of the needleless connector is necessary before each access. Staff should allow it to air dry completely before connecting lines. The current CDC guidelines (2017) for the prevention of intravascular catheter related infections shows disinfection of needleless access sites appears to be most effective in
Focused central line education will increase nurses’ CLABSI knowledge reducing colonization when using chlorhexidine gluconate. Needleless connectors should be changed with appropriate frequency (with line changes and blood draws) and connectors changed as often as the administration set. Some hospitals are now changing connectors using sterile gloves and a mask.

**Care of the Administration Set**

Nurses should change tubing and administration sets every 72-96 hours after initiation of use. When giving fluid that enhances microbial growth (lipid emulsion and blood products), nurses should change the tubing every 24 hours or more frequently per policy. Nurses should make sure tubing is labeled, dated and timed to prevent infection. Appropriately capped lines are an important piece to prevent infection.

**Assessment and action when infection is suspected**

Redness, pain or swelling should alert the nurse to a potential central line infection. Infection occurs when bacteria growth in or around the line has spread to the patient’s bloodstream. The nurse should check and document all symptoms which include pain or tenderness along the path of the catheter and sudden fever or chills. The nurse should take the patient’s vital signs including temperature and contact the physician. CLABSI is treated with antibiotics. Culturing the tip of the catheter is important to determine CLABSI and the organism of infection. The nurse should document the time the infection is suspected and all of the evidence in the electronic record.

Maintaining a clean and sanitary clinical care environment is necessary to protect everyone from exposure to infection. Medical devices that come in contact with patient’s skin can contaminate central lines. Examples of these devices are blood pressure cuffs, glucometers, ultrasound machines, thermometers, and pulse oximeters. These items elevate the risk for
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Contamination. Since these devices are often shared between patients, a broad-spectrum disinfectant should be used to wipe each item before reusing (CDC, 2017).

Health care teams should discuss the need for the central line catheter daily and should remove unnecessary central lines. One of the most effective strategies for preventing CLABSI is reducing the length of time of the central line within the patient. The decision regarding the need for a catheter is complex, and it is difficult to standardize into practice. The nurse can assist in this process by asking about the need for the central line during daily rounds. Documenting the need and reason for the line should be part of the daily assessment. To reduce lengthy exposure to central line catheters, the health care team should adopt a strategy to systematically evaluate the line daily.

**Integrity of the design**

**Validity and Rigor**

This study has some limitations. The investigator will attempt to mitigate reactivity by observing data during January 1-March 29, 2017. Reactivity is a defect in the data collection plan where nurses may know they are being observed and may perform care differently (Polit & Beck, 2017). The investigator plans to observe care of central lines, perform simulation with nurses and educate nurses working in the WICU. These factors make it difficult to make an unforeseen connection. To mitigate reactivity the study will be unannounced from January 1-March 29th, and this will allow the investigator to record observations without the nurses knowing. According to Polit and Beck (2017), observation in health care environments is an important data-gathering strategy, and observations yield better data when people are unaware of being observed.
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The investigator will plan to analyze each group that will be compared in this study and will make sure they do not have major differences in characteristics. A threat to the internal validity of a study can result from preexisting differences between groups. This is called a selection threat (Polit & Beck, 2017). This could cause differences in the representation of the sample and ultimately the population that will be studied. If groups are comparable, there will be a better chance that the focused education program and post-test differences are the result of the study. The investigator plans to compare characteristics of the groups, especially between WICU and SICU nurses. This will assure the population of nurses are comparable and it represents the population of nurses to be studied. Characteristics of the population to be studied include gender, length of time in position, and level of education.

The investigator plans to complete each observation with a checklist that classifies observed central line care into necessary skills. According to Polit and Beck (2017), the investigator needs to be careful to define categories so that the observer will know when one behavior ends and a new one begins. A checklist will be used to complete each nursing observation. The investigator needs to be objective, not influenced by emotion, personal prejudices or subjectivities. The investigator needs to recognize behaviors which could impact results and be subjective. Once the investigator builds trust with nursing, observations can improve and better data can be captured. One example of building trust with nurses is to listen without judging. Offering an open, communicative environment for questions leads to an open and communicative environment for simulation (O’leary, 2010).

Ethical considerations

This study will make sure all nurses will be given informed consent. The investigator plans to obtain informed consent on all WICU and SICU nurses by obtaining each nurses’
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signature on the consent form (appendix II). The investigator will plan to explain involvement, including time commitment, type of activity (50 question test), and all topics to be covered before obtaining consent. Informed consent implies that participants are competent, meaning they have reasonable comprehension and can make self-directed choices, and are not being forced or pressured to participate. Participants will be informed they may decline participation in the study at any time without fear of retribution. The investigator will treat all nurses with respect. Protection of privacy and identity of each nurse will be very important and any identifiable data will be protected. The data will be placed in a locked cabinet in a locked room and the keys will remain with the investigator. There is no conflict of interest between investigator and the study participants.

Permission

The investigator has permission from: 1) Johns Hopkins Hospital Institutional Review Board, 2) Notre Dame of Maryland Institutional Review Board and 3) Managers in the SICU and WICU.

Informed consent

Informed consent will be obtained at the beginning of the study. The investigator will explain the study and time commitment and benefit expected of each individual nurse. Nurses will need to sign the consent form and time and date the consent. Explaining the study and obtaining consent will be done in private to protect nurses’ confidentiality. The investigator will plan to sign, date and time the consent form. If nurses choose not to participate, no pressure will be placed on any nurse and confidentiality will be maintained. All consent forms will be held in strict confidence with the investigator in a locked cabinet and within a locked room. The investigator needs to assure confidentiality that the nurses’ data will not be shared.
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Risks and benefits

There are minimal risks to participate in this study. According to Polit and Beck (2017), minimal risk is defined as risks encountered in normal daily situations. Testing will be done in confidence; simulation exercises will be held in a closed room to maintain confidentiality. Anyone who declines to be in the study will be treated with respect. Sensitive and discreet treatment will be given to all participants (Polit & Beck, 2017). Nurses who choose to participate in the study will benefit by an increase in education. Another benefit would be, the educated nurse could become an expert and could be able to assist and educate future nurses on care of central lines.

Anonymity and confidentiality

The investigator will protect sensitive information by assigning a code or a number to all identifiable information. For example, each test will be re-labeled and personal identification of participants will be removed, a master list will be kept in a locked file cabinet in a locked room where only the investigator holds the master list and key for safety and confidentiality. The investigator will secure storage of all raw data, and restricted access of this material will be limited to the investigator. Destruction of the raw data will occur after the study is complete.

Hypothetical Results

The investigator predicts there will be increased nursing knowledge to WICU nurses who participate in the focused CLABSI education program. The investigator predicts the WICU nurses will document central line care daily, noting signs and symptoms of infection. Dressings and IV lines will have appropriate dates and times and will be changed to protect the patient from CLABSI. Nurses will improve and strengthen hub care and will scrub the hub as demonstrated in the focused CLABSI education program. Hand washing and compliance with
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

Wearing personal protective gear will improve. Nurses will have improved confidence and will be able to demonstrate CLABSI prevention skills when caring for a patient with a central line. Nurses will be better prepared to assist with central line insertions. They will know to verify each step of the procedure against the hospital checklist. Nurses will have a better understanding of their role assisting with central line insertions and will be able to monitor deviations in protocol.

Implications for Nursing Education

The implications for nursing education practice will be to improve patient care and patient outcomes. Nurse educators can help to improve technique and allow nurses to gain confidence, especially when using simulation. Simulation provides a safe setting where nurses can ask questions and practice skills by using a mannequin. Simulation allows individuals to enhance their knowledge at any level. This means knowledge can increase on simulation whether the nurse is a beginner or an expert. Nurses can gain confidence and can lead by example after having the opportunity to practice skills.

The investigator recommends a change to increase education to WICU nurses. This education recommendation will have a CLABSI focus and will increase nurses’ knowledge by testing and use of simulation. A goal for change and motivation for this research is to provide CLABSI education twice a year to build confidence, improve patient outcomes and improve CLABSI knowledge within the WICU.

Nursing education provides a way to set standards and norms and increase familiarity with central line care. By promoting education on focused central line care in the WICU, a message is implied to all health care providers to provide improved central line care. The investigator is supported and has approval of the manager(s) in the WICU and SICU and
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

Supportive management can assist in implementing educational changes. Implementing change in the WICU means providing resources to implement this change. This education program can be used as a resource on focused CLABSI education. Empowering the nurse with the correct practice and instilling confidence can help to change care and practice. The investigator understands the WICU nurse and the culture of the unit. By understanding the culture and knowing the focus of the unit, the investigator knows how to improve teamwork, effectiveness, and sustainability. The educator’s job in improving skill and critical thinking will be to support staff and encourage them. Providing this supportive environment, encourages the nurse to gain confidence and lead by example. Eventually, this can lead nurses to train and precept others. Increasing education in the WICU allows a culture where accountability can be safely voiced and openly received. Nurses will be informed that their actions are a very important part of infection prevention. Informed nurses provide the best care, and informed nurses protect themselves and the institution from legal ramifications.

Presenting research that is current, evidence based, and achievable is one way to communicate with peers and administrators. The investigator plans to present the results of the education program and suggest it be implemented twice a year. Presenting research that is proven and successful, can promote change. To help promote change, nurses may attend conferences and return to present topics that are relevant to their specialty. Institutions often invite guest speakers to talk about current and relevant research. Nurses can learn from a variety of sources especially each other, and it is very important to stay informed. By staying current in education, the nurse promotes herself and motivates the work force and protects the integrity of the patient (Hickey & Kritek, 2012). Focused education can improve all nurses’ knowledge from beginner to expert.
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

Conclusion

A focused CLABSI education program can prevent patient mortality and increase nursing knowledge. CLABSI education should be continually evaluated and tailored to improve nursing knowledge based upon evidence based research. Nurses have a large part in protecting patient’s central lines by staying informed. The model which encourages the nurse to provide the best care and practice health promoting behaviors is Pender’s Health Promotion model. Observing care of central lines, testing and educating nurses with a focus on national standards, nursing knowledge can be improved. Nurses need to be informed since their actions are a very important part of infection prevention. Informed nurses provide the best care, and informed nurses protect themselves and the institution from legal ramifications.


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Vangosen, L., personal communication, December 22, 2016, Vascular access team meeting minutes at Johns Hopkins Hospital


FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

Appendix I

Dressing Integrity - Observation Audit

<table>
<thead>
<tr>
<th>Unit</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Line Dressing</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Central line dressing is intact and 100% adhered.</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>2. This is a pediatric dressing.</td>
<td>Y</td>
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<tr>
<td>3. Dressing is saturated.</td>
<td>Y</td>
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<tr>
<td>4. This dressing has been changed within the last 48 hours.</td>
<td>Y</td>
<td></td>
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<tr>
<td>5. The gauze dressing has been changed within the last 72 hours.</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>6. No signs of dressings are霉, outlined by disinfection on or at flow sheath or electronically.</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>Administration Set</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>7. All IV tubing is shielded with non-transparent material.</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. All IV tubing is changed every hours or per policy for particular fluid infusing</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>9. All IV tubing has a sterile dead-end cap in place when not in use.</td>
<td>Y</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>10. All syringes have sterile dead-end caps in place.</td>
<td>Y</td>
<td></td>
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<tr>
<td>11. All flanges have a non-vented device in place.</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>TOTAL NUMBER</td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>

PERCENT COMPLIANCE

Number of control measures = 108 = % compliance
Total number of responses

Comments: __________________________

Nursing Practice - Observation Audit

<table>
<thead>
<tr>
<th>Unit</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
<th>Y/N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nonline access device care</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. The RN performed appropriate hand hygiene prior to preparing to access the line for medication administration, blood sampling or changing the device.</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. The RN secured the access device at least 1-2 inches above the line to minimize movement of the line.</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>3. If changing the needleless access device, the RN scrubbed the needle at least 20-30 seconds prior to dry completely.</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dressing change techniques</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>4. The RN performed appropriate hand hygiene prior to preparing to change central line dressing.</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>5. The RN removed the old dressing and place gloves to remove existing central line dressing.</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. The RN removed the old dressing and place gloves to remove existing central line dressing.</td>
<td>Y</td>
<td></td>
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</tr>
<tr>
<td>7. The RN placed the site with CHG for 30 seconds and allowed to dry completely prior to placing new dressing.</td>
<td>Y</td>
<td></td>
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<tr>
<td>8. The RN performed sterile technique to CHG - please refer to FAP for recommended alternative.</td>
<td>Y</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>9. The RN maintained sterile technique and form the dressing change kit - for the duration of the dressing change procedure.</td>
<td>Y</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>TOTAL NUMBER</td>
<td></td>
<td></td>
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</tbody>
</table>

PERCENT COMPLIANCE

Number of control measures = 108 = % compliance
Total number of responses

Comments: __________________________
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

Appendix II

Protocol title: Focused Central Line Education Will Increase Nurses’ CLABSI Knowledge
Application number: IRB
Sponsor: NIH R03
Infusion nurse society
Principal Investigator: Cindy Knezich, RN, BSN
Johns Hopkins Hospital
1550 Orleans Street
Baltimore, MD 21231
Phone: 410-955-5000

Nurse Consent:

1. What you should know about this study:
   - You are being asked to join a research study. This consent form explains the research study and your part in it. Please read it carefully and take as much time as you need. Ask your study team to explain any words or information that you do not understand.
   - You are a volunteer. If you join the study, you can change your mind later. There will be no penalty or loss of status within Johns Hopkins Hospital if you decide to quit the study.
   - You are being asked to join this study and will be given a 50 question test on central line care; this will need to be completed within 45 minutes
   - Simulation on focused CLABSI education will take place in a private setting, nurses will need to complete steps in caring for a central line while being observed.

2. Why is this research being done?
   - This research is being done to determine if focused central line care education for nurses will reduce CLABSI rates.
   - We are looking to increase nursing education
   - You are being asked to join the study because you are a nurse who cares for patients with central lines

3. What will happen if you join this study?
   - If you agree to be in the study, there is a pre-and posttest to complete. You will be observed while providing central line care for a patient.

4. What are the risks or discomforts of the study?
   - There are no anticipated discomforts expected from this study. All test scores will be kept confidential and will be stored in a secure cabinet, accessible only by the investigator. Nurse Managers will not have access to the test scores

5. Are there benefits to being in the study?
   - Focused CLABSI education on central line care is a direct benefit to you for participating in the study. If you take part in this study, you may increase your knowledge of central line care. You could also help others in the future by assisting other nurses to care for central lines.

6. What are your options if you do not want to be in the study?
   - You do not have to participate in this study. If you do not participate, your employment status at Johns Hopkins will not be affected.

7. Will it cost you anything to be in this study?
   - There will be no cost to you for participating in this study.
FOCUSED CENTRAL LINE EDUCATION WILL INCREASE NURSES’ CLABSI KNOWLEDGE

8. Will you be paid if you join this study?
   • You will not be paid for your participation in this study.

9. Can you leave the study early?
   • You can agree to be in the study now and change your mind later.
   • If you wish to stop, please tell us right away.
   • Leaving this study early will not affect your employment at Johns Hopkins Hospital.

10. How will your privacy be protected?
    • There are rules to protect your private information. Federal and state laws and the federal medical privacy rule also protects your privacy.
    • By signing this form you are providing permission, called your “authorization,” for the investigator to enroll you in the study.

11. Will the study require any of your other health care providers to share your health information with the researchers of this study?
    • None of your healthcare information will be collected.

12. What treatment cost will be paid if you are injured in this study?
    • We do not anticipate any injury from this study.

13. What does your signature on this consent form mean? Your signature on this form means that:
    • You understand the information given to you in this form.
    • You accept the provisions in the form and you agree to join the study.
    • You will not give up any legal rights by signing this consent form.

The investigator can provide you with additional information if you have any questions, call 410-955-5000 during regular business hours.

We will give you a copy of this signed and dated consent form

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<tr>
<th>Signature of participant</th>
<th>Print name</th>
<th>date/time</th>
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<tbody>
<tr>
<td>Signature of person obtaining consent</td>
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