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Central Line-Associated Bloodstream Infection Prevention in the Long-Term Acute Care Setting

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CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION PREVENTION IN THE LONG-TERM ACUTE CARE SETTING

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Abstract

Sustained reduction of central line-associated bloodstream infections remains elusive in many institutions, including the long-term acute care hospital (LTACH), despite a focus on improving patient outcomes. A clinical practice survey was distributed electronically to nurses working in the LTACH setting. The survey provided for an anonymous assessment of knowledge related to policy/procedure, fidelity to practice as well as site-specific barriers to adherence to clinical practice guidelines. Results revealed opportunities for education related to clinical practice guidelines and basic central line-associated bloodstream infection strategies as well as perceived barriers to adherence to policy/procedure. Strategies aimed at mitigating gaps and barriers are essential for preventing infections in this medically complex population.

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CHAPTER 1

INTRODUCTION

The purpose of this chapter is to introduce the dilemma of central line-associated bloodstream infections (CLABSI) and the scope of this problem that challenges the long term-acute care setting. Additionally, the significance and relevance for nursing administration practice will be highlighted.

Background

In response to the Institute of Medicine's report, *Crossing the Quality Chasm* (2001), acute care settings are being challenged to create a culture of safety. Efforts include monitoring hospital-acquired complications and putting interventions into place to reduce or eliminate incidence. One such complication is the central-line associated bloodstream infection (CLABSI). It is estimated that while 80,000 CLABSIs occur annually in the intensive care unit (ICU), the actual rate for CLABSI would be tripled if it were to include the non-ICU setting (Klevins et al., 2007; Maki, Kruger, & Crnich, 2006; Mermel, 2000).

Central venous catheters are a vital link to treatment for patients diagnosed with acute illnesses. These devices are used to provide life-saving treatment as well as side effect management. Central venous catheters can also provide a safe and efficient method for blood sampling for individuals who would otherwise be exposed to frequent and often times painful peripheral venipuncture procedures. Central venous catheters, as defined by the Centers for Disease Control (CDC), are catheters whose tip terminates in a great vessel (O'Grady et al., 2011). These catheters are used in the treatment of the medically

complex patient in the intensive care unit (ICU) as well as the non-ICU setting throughout the acute care hospital.

Although central venous catheters provide a critical link to treatment, they are also associated with a risk of infection. Maki, Kluger, and Crnich (2006) performed a systematic review of the literature to better understand the risk of bloodstream infections associated with the various types of intravascular devices. Peripheral intravenous catheters had the lowest rate of infection with 0.5/1,000 catheters days while peripherally inserted central venous catheters (PICC) had rates of 2.1/1,000 catheter days in populations in the acute care setting. Surgically implanted long term catheters pose a lower risk than PICC lines. PICC line catheter infection rates in the acute care setting approached infection rates of short term central venous catheters in the ICU setting. In this study, the authors estimate that 20% of health care-associated infections are related to the use of central venous catheters.

A central line-associated bloodstream infection (CLABSI) is defined by the U.S. Centers for Disease Control and Prevention's (CDC's) National Healthcare Safety Network (NHSN) as a primary bloodstream infection in a patient with a central venous catheter in place within the 48 hour period prior to the development of positive blood cultures (CDC, 2012; Horan, Andrus, & Dudeck, 2008). Criteria are used to determine the specific source of the infection which may or may not be attributed to the central venous catheter. The term catheter-related bloodstream infection (CRBI) is not interchangeable as CRBSI describes a clinical definition with laboratory culture of central venous catheter tip positivity. As Tokars, Klevens, Edwards, and Horan (2007) report, it is difficult to precisely establish if a bloodstream infection is a catheter-

associated bloodstream infection due to a variety of factors. Since some bloodstream infections are secondary to other sources that may not be easily discerned, it is recognized that the CLABSI surveillance definition may overestimate the true incidence.

The CDC/NHSN standard definition allows for facilities to estimate the magnitude of this health care-associated infection as well as to monitor trends and facilitate interfacility and intrafacility comparisons. NHSN facilities voluntarily reported their surveillance data for aggregation into a single national database. Data are reported out for the ICU and non-ICU settings as well as specialty care areas that provide for unique care needs such as the long-term acute care setting. The National Database of Nursing Quality Indicators (NDNQI) began to report benchmarking of CLABSI rates for non-ICU settings in June of 2011.

Central venous catheters are not without risk. NHSN data reports a higher central line utilization ratio for oncology units than non-ICU settings with subsequently higher mean rates of central line-associated bloodstream infections per 1,000 central venous catheter days (Edwards et al., 2009). These data highlight the fact that as work related to safety and improved outcomes in the acute inpatient setting continues to evolve, it is imperative to focus on specific vulnerable populations.

Scope of the Problem

Central line-associated bloodstream infections are associated with increased cost and length of stay. One of the first studies to analyze the socioecononomic impact of nosocomial infections was done by Jarvis (1996). The author analyzed morbidity, mortality, cost and prevention. At the time, it was estimated that approximately 2 million nosocomial infections occurred annually. Jarvis estimated that the average added length

of stay in the acute care setting was 7 to 21 days. A subsequent analysis by Laupland, Lee, Gregson and Manns (2006) supports the original data with an estimated increase in length of stay by 8 days.

According to Jarvis (1996), mortalities associated with bloodstream infections are 50% overall and 35% attributable. In a study by Morgan, Lomotan, Agnes, McGrail, and Roghmann, (2010), 31% of the of the "unexpected deaths" in the acute care setting were related to hospital-associated infections – the most common of these hospital acquired infections being CLABSI. Klevens et al. (2007) calculated a case-fatality rate of 12% to 25% for central line-associated bloodstream infections with similar rates supported by Wenzel and Edmond (2001).

CLABSI's increase the cost of healthcare significantly. Several studies reveal costs ranging from $3,700 to $53,000 per infection (Digiovine, Chenoweth, Watts, & Higgins, 1999; Dimick, et al., 2001; Shannon et al., 2006). In 2011, the CDC estimated the cost of each infection to be approximately $16,555 (CDC, 2011a). In countries with prospective payment systems based on Diagnostic Related Groups (DRGs), hospitals lose money for each nosocomial infection (CDC, 2011b). As evidenced by the analysis of the cost of CLABSI, the business care for this quality improvement work becomes clarified and the financial incentives for the development of infection control programs aimed at prevention of nosocomial infections more explicit.

Risk factors for the development of central line-associated bloodstream infections range from site selection for catheter placement and a lack of sterile technique for insertion to maintenance practices and duration of catheter placement (Edwards et al., 2009). Strategies associated with prevention of central line-associated bloodstream

infections have been aimed at practices related to both insertion and maintenance. Intervention studies have primarily focused on areas such as intensive care or hemodialysis setting because of the number of overall patients with central lines and the vulnerability of these patient populations.

One of the initial studies related to catheter-related bloodstream infection prevention was conducted as a collaborative cohort study predominantly in the ICU settings in Michigan in early 2005. As part of a Keystone initiative in the ICU setting, 108 ICUs agreed to participate in the study with 103 units reporting data from March of 2004 through June of 2005. All of the units agreed to implement process improvement initiatives aimed at infection reduction involving insertion and maintenance of the central venous catheter (Pronovost et al., 2006).

Changes resulted in large and sustained reduction in rates of CLABSIs that were maintained throughout an 18 month study period. During this time frame, there were units with greater than 6 months without a CLABSI. Pronovost et al. (2006) estimate that the interventions associated with the collaborative study and subsequent reduction in CLABSI rates resulted in saving 1,578 lives and over 81,000 hospital days. Estimated cost savings by the team was $165 million. Follow up data showed that the reduced rates of catheter related bloodstream infection achieved in the initial 18 month post-implementation period were sustained for an additional 18 months as participating intensive care units integrated the intervention into practice (Pronovost et al., 2010).

Clinical Practice Guidelines

Clinical practice guidelines for the prevention of central line-associated bloodstream infections were first developed in 2002 by the Centers for Disease Control

(CDC) and updated in April of 2011. The Society of Healthcare Epidemiologists of America (SHEA), the Infectious Disease Society of America (IDSA) and other societies have developed evidence graded guidelines for the prevention of catheter-related infections (Marschall et al., 2008; O'Grady et al., 2011). Several of the guideline recommendations are supported by clinical trials or systematic reviews and include elements related to both central venous catheter insertion as well as maintenance practices.

In 2009, the Quality and Safety Research Group from Johns Hopkins University published a toolkit aimed at the elimination of CLABSI (Johns Hopkins Medicine, 2009). The document represents practical recommendations by the leading champions in infection prevention and healthcare quality improvement: SHEA, IDSA, American Hospital Association (AHA), Association for Professionals in Infection Control and Epidemiology (APIC), and the Joint Commission. The elements of the toolkit are included in the Joint Commission's Patient Safety Goals (The Joint Commission, 2010).

The applicability of the different elements of the guidelines depends on the clinical practice setting. Hospitals in which central venous catheters are not inserted on the clinical unit or by unit-based personnel would not focus on evidence-based practice (EBP) recommendations related to insertion on the unit level. These include full-barrier precautions during catheter insertion, avoiding the femoral site when possible and maintaining a sterile field while inserting the line. Evidence-based practices related to central line maintenance may be the most appropriate for the non-ICU clinical setting. These include a focus on hand hygiene, line site maintenance with Chlorhexidine

Gluconate, appropriate preparation of the line entry site, and daily review of the necessity of the central venous catheter, as well as guidelines for tubing and end-cap changes.

Current support for implementation of these evidence-based practice guidelines using a variety of strategies is apparent in several studies (Berenholtz, 2004; Chaberny, 2009; Dixon, 2010; Guerin, 2010; Olrich, 2011; Posa, 2006; Pronovost, 2006). In fact, multiple settings have been able to link unit-based initiatives to a reduction in CLABSI rates using a combination of strategies related to staff engagement and compliance with evidence-based practice guidelines. As evidenced by this work, implementation of prevention strategies to reduce/eliminate the risk of catheter-associated bloodstream infections is vital to the mission of creating a culture of quality and safety in the acute care setting.

Long-Term Acute Care Setting

Long-term acute care hospitals (LTACHs) were first created in the 1980's to facilitate discharge of the medically complex patients from acute hospitals to an alternate care setting in an effort to reduce Medicare spending (Medicare Payment Advisory Commission, 2008). Also known as long-term care hospitals and frequently confused with nursing homes, approximately 47% of all LTACHs exist as hospital-within-hospitals with the remaining LTACH settings existing as free-standing facilities. These settings must function completely separate from their acute inpatient affiliate entities with their own administrations and ancillary services. In addition to compliance with all standards for the accreditation of an acute care hospital, LTACHs are required to accommodate "medically complex" patients, with an average length of stay of greater than or equal to 25 days (Medicare Payment Advisory Commission, 2008).

LTACHs were originally intended to meet the need of prolonged weaning of patients from mechanical ventilation (Lundberg & Noll, 1990). Over time, these settings have evolved to admit patients with a variety of diagnoses such as sepsis, pneumonia, degenerative nervous system disorders, and postoperative or posttraumatic infections (Munoz-Price, 2009). In addition to mechanical ventilation management and weaning, care needs for these complex patients frequently include complex wound care, feeding tube management, intravenous antibiotic therapy and dialysis.

Patients who are admitted to this setting frequently have a history of prolonged lengths of stay in the acute care setting from which they were transferred. It is not uncommon for this stay to include ICU. More often than not, patients have multiple co-morbidities, have central lines in place, and are at high risk for hospital acquired infections (Votto, 2011; Wolfenden, Anderson, Valedar, & Srinivasan, 2007). In an active surveillance study by Gould, Rothenberg and Steinberg (2006), 64% of patients admitted to the LTACH setting were found to be colonized or infected with multidrug-resistant bacteria. As a result, hospital-acquired infections among LTACH units are high with rates of central line-associated bloodstream infections (CLABSI) ranging 7.20 to 16.44 cases per 1,000 central venous catheter days (Brizek et al. 2007; Wolfenden, Anderson, Veledar, & Srinivasan)

The Institute for Healthcare Improvement launched the 1,000,000 Lives Campaign in 2004 to improve the quality and safety of care for the hospitalized patient. One of the targets of this work was to reduce preventable complications such as central venous catheter-associated bloodstream infections. In addition to an ethical obligation to protect this population from harm, the Joint Commission, Michigan Hospital Association,

and the Centers for Medicare and Medicaid Services have also recognized the importance of focusing on central line-associated bloodstream infections in the acute care setting.

The Joint Commission National Patient Safety Goal 07.04.01 for 2010 relates to central line-associated bloodstream infections. Elements include: implementation of evidence-based practices to prevent central line-associated bloodstream infections, and education for staff who are involved in managing central lines regarding central line-associated bloodstream infection prevention. Additionally, this safety goal calls for patient education regarding CLABSI prevention and a strategy for communicating CLABSI information to unit-based staff and monitoring compliance with evidence based practice (The Joint Commission, 2010).

Beginning in 2011, the Michigan Hospital Association (MHA) began to require reporting of all central line-associated bloodstream infections at the individual nursing unit level. Previously, the Centers for Medicare and Medicaid Services (CMS) made a decision that, beginning in October of 2008, Medicare would no longer provide reimbursement over and above the typical Inpatient Prospective Payment System (IPPS) rate under certain circumstances. These were identified as care required treating conditions that were not present on admission and identified as high volume and/or high cost complications that could be prevented through application of evidence-based practice guidelines. This was mandated by Section 5001(c) of the Deficit Reduction Act (Centers for Medicare and Medicaid, 2005).

Additionally, the Association for Professionals in Infection Control and Epidemiology (APIC) reiterates a culture of “zero tolerance” for health care-associated infections such as CLABSI. The APIC Vision 2012 also includes this in their strategic

plan. Thus the expectation of APIC is that healthcare workers will apply infection prevention and control measures as well as to have access to the resources or support to do so (Association for Professional in Infection Control and Epidemiology, 2008).

Significance and Relevance for Practice

Central line-associated bloodstream infections are associated with an increased risk of mortality, cost and length of stay. This harm is not inevitable. Progress has been made in recent years to reduce this hospital-acquired infection with estimates that 65-70% of CLABSIs may be preventable (Umscheid et al., 2011). This suggests that in a healthcare environment challenged to reduce costs and improve patient outcomes, attention to this issue and potential solutions is mutually beneficial.

It is important to also recognize elements of a changing financial environment that could be contributing to poorer patient outcomes in the acute care setting. Lang, Hodge, Olson, Romano, and Kravitz (2001) performed a systematic review with evidence suggesting that better nurse staffing was associated with lower failure-to-rescue rates, lower inpatient mortality rates, and shorter hospital stays. A longitudinal regression analysis of California acute care hospitals conducted by Harless and Mark (2010) revealed similar results. The authors purport that increased registered nurse full-time equivalents per 1,000 inpatient days were associated with statistically significant reductions in mortality and failure to rescue. The author postulated overall lower mortality rates related to infection protection practices as well. As the financial burden of health care continues to affect the acute care setting, information from these studies highlight the fact that potential cost-saving strategies from a system perspective could contribute to central line-associated bloodstream infection prevention strategies.

According to Aday, Begley, Lairson, and Balkrishnan (2004), health services research is aimed at the performance of a healthcare system. The system may be evaluated through attention to effectiveness, efficiency and equity. Nursing Sensitive Indicators such as the incidence of central line-associated bloodstream infections are measures of effectiveness in healthcare. Quality improvement projects aimed at the prevention of hospital-acquired conditions such as the central line-associated bloodstream infection will serve to ultimately improve the health of the LTACH population.

In summary, central line-associated bloodstream infections are a significant problem both in the acute care and the LTACH environments. Patient risks include issues related to increase length of stay and risk of long term complications that may even include death. System risks include un-reimbursable expenses and a clear failure to meet quality and safety standards. For these reasons, work related to CLABSI prevention is vital.

CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to provide a review of literature that is relevant to CLABSI prevention strategies. This review was used to guide the development of the plan for this administrative project. Search methodology, quality appraisal and research related to CLABSI prevention will be presented. In addition, a summation of dominant themes found in the literature are presented.

Search Methods

This integrative review was performed using methodology described by Melnyk and Fineholt-Overholt (2011). Articles included in this literature review were identified through several literature searches of the following databases: Cumulative Index for Nursing and Allied Health Literature (CINAHL, 1982-2011); PubMed; Cochrane Library; MEDLINE; ScienceDirect, UpToDate, and Gray Literature. The searches were limited to studies dating from 2005 to present, those in English, and those studies using combinations of the keywords: central line-associated bloodstream infection; CLABSI; central venous catheters; CVC; hospital acquired infections; HAI; quality improvement; infection prevention; long–term acute care; and LTACH. Pediatric literature was largely excluded due to the wealth of this literature focusing on the neonatal intensive care setting with little applicability to the adult population. Titles and abstracts of 68 articles were reviewed with 18 included in this review of the literature. Literature that was eliminated from this review was done so based on the relevance to the project.

Quality Appraisal

The goal of this integrative literature review is to synthesize findings of research related to strategies aimed at reducing the rate of central line-associated bloodstream infections. Pursuant to this purpose, no studies were excluded based on study design or methodology. Due to the nature of the interventions aimed at hospital associated infections, there was a lack of randomized controlled trials in the literature. Most studies used cohort methodology with pre and post intervention statistics with clear methodology and reporting of a central venous catheter infection rate based on CDC criteria per 1,000 central line days. All but three studies were published in peer-reviewed journals with a majority focusing on the Intensive Care Unit (ICU) patient population. Three systematic reviews were reviewed as well as two evidence-based practice guidelines.

Results

Researchers in all but two of the studies employed more than one strategy aimed at prevention of central line-associated bloodstream infections (Berenholtz et al., 2004; Chaberny et al., 2009; Guerin, 2010; Guerin, Wagner, Rains, & Bessesen, 2010; Harnage, 2008; Marra et al., 2010; Posa, Harrison, & Vollman, 2006; Pronovost et al., 2006; Royer, 2010; Rinke et al., 2012; Rutherford, 2010; Tsuchida et al., 2006; Warren et al., 2006). Dixon and Carver (2010), Munoz-Price, Hota, Stemer and Weinstein (2009) and Popovich, Hota, Hayes, Weinstein, and Hayden (2010) focused on a single intervention. All but one of the studies lacked randomization with quasi-experimental pre and post intervention designed data collection used most often. One study used a control group (Berehnoltz et al., 2004).

Ten studies focused exclusively on the ICU setting (Berenholtz et al., 2010; Coopersmith et al., 2002; Dixon & Carver, 2010; Guerin, 2010; Guerin et al., 2010; Harnage, 2008; Marra et al., 2010; Posa et al., 2006; Popovich, Hota, Hayes, Weinstein, & Hayden, 2010; Rutherford, 2010). One of the studies focused on both the ICU setting and an inpatient combined adult and pediatric bone marrow transplant unit (Warren et al., 2006). Two studies focused on all inpatients in the acute care setting (Royer, 2010; Tsuchida et al., 2006). One study focused solely on the LTACH setting (Munoz-Price, Hota, Stemer and Weinstein, 2009).

Researchers in two studies reported efficacy in terms of risk reduction (Guerin et al., 2010; Chaberny et al., 2009). Warren et al. (2006) reported data post intervention in terms of a relative ratio. As noted, most studies included multifaceted interventions aimed at reduction in central line-association bloodstream infections. Five themes were identified across the studies. These themes were professional education; implementation of specialized teams to care for central lines; monitoring and feedback; unit-based presentation of CLABSI rates/surveillance data; and equipment modifications to prevent CLABSI. The themes are discussed in the order of prevalence among the studies.

Professional Education

An element of professional education was the most widely discussed intervention in the professional literature aimed at the prevention of central line-associated bloodstream infections. Three studies did not discuss a direct effort to improve the knowledge of their healthcare professionals as an element of the effort to reduce CLABSI (Popovich et al., 2010; Olrich, 2011; Harnage, 2008). This strategy suggests that any intervention aimed at infection protection that was implemented in which CLABSI risk

and prevention strategies were highlighted for staff would, by nature, alert staff to the importance of infection protection and their role in prevention.

Behrenholtz et al. (2008) developed a quality improvement team that focused on prevention of CLABSI. This team used a variety of strategies to engage both nurses and physicians in recognizing their role and opportunity to prevent this devastating health care-associated infection. The authors used a Poisson regression model to explain changes in infection rates over time between the control unit and the intervention unit. CLABSI rates in both the intervention unit and the control unit decreased significantly post-intervention with the intervention unit decreasing from 11.2/1,000 to 0/1,000 catheter days and the control unit decreasing from 5.7/1,000 to 1.6/1,000 catheter days.

Eleven studies discussed educational interventions ranging from in person inservicing of nurses and physicians to self-study modules. Two focused on an oncology versus ICU setting. Chaberny et al., 2009, developed what they referred to an intensive training course for staff related to evidence-based practice guidelines in the inpatient oncology setting. This post-intervention study focused on the incidence of CLABSI per 1,000 neutropenic days in the immunocompromised population. A multivariate analysis of risk factors and chi-square analysis revealed significant reduction in CLABSI rates and risk in this vulnerable population. Additionally, the investigators were able to identify that patients with a diagnosis of acute myelogenous leukemia undergoing a bone marrow transplant were the most susceptible of their neutropenic study subjects. Warren et al., (2006) focused on an education-based intervention of self study modules with pre and post test for all physicians and nurses caring for patients in twelve ICU units and one

bone marrow transplant unit in their hospital. These locations experienced an overall decrease in CLABSI rate from 11.2/1,000 to 8.9/1000 catheter days.

Nine of the studies focusing on educational interventions were performed in the ICU setting. These interventions included inservicing, posters, flyers and newsletters as means of communicating vital information. All showed a decrease in CLABSI rate as a result of these efforts (Coopersmith et al., 2002; Dixon & Carver, 2010; Guerin, 2010; Guerin et al., 2010; Posa et al., 2006; Pronovost et al., 2006; Royer, 2010; Rutherford, 2010; Tsuchida et al., 2006). Of interest, Rutherford (2010) used a concept referred to as infestation. For the purposes of education, infestation is a unique interactive educational technique using stations to highlight best practices related to infection prevention techniques. This method, coupled with infection control rounding and unit-based champions resulted in a significant reduction of CLABSI's from 13.4/1,000 catheter days in 2008 to an average rate of 2.66/1,000 catheter days approximately 12 months post-intervention.

Safdar and Abad (2008) performed a systematic review regarding the use of educational interventions for the prevention of healthcare-associated infections. A total of 26 studies focusing on a variety of educational programs showed that implementation of educational interventions with a variety of strategies may result in significant reduction in CLABSI rates.

A systematic review focusing on educational interventions only was performed by Cherry, Brown, Neal and Shaw (2010). The authors focused on those interventions that lead to competence in aseptic insertion and maintenance of central venous catheters in acute care. Their review of 47 articles revealed the following themes: Educational

interventions have the greatest effect when used in conjunction with audit, feedback and modification of system/environment to support compliance with evidence-based practices; interventions have a greater impact if baseline compliance to best practice is low; and repeated educational sessions using active participation have a small, additional effect on practice changes when compared to education alone.

In summary, educational interventions are common elements of CLABSI prevention programs. Many times, they are paired with other interventions which make it difficult to discern the outcome of each specific intervention. Conclusions from these studies indicate that this type of intervention has a positive effect on CLABSI prevention efforts.

Specialized Teams

Four of the studies focused on implementation of unit-based teams to facilitate and champion evidence-based practice implementation. Guerin et al. (2010) implemented an Intravenous Team with the goal of implementing and sustaining high quality intravenous catheter care. The authors describe a team partnership with Infection Control staff to provide hands-on training and education to all levels of providers in two ICUs. In their clinical settings, infection rates were reduced from 12.9/1000 catheter days in fiscal year 2006 and 6.0/1,000 catheter days in fiscal year 2007 to 5.1/1,000 catheter days in fiscal year 2008 and 1.9/1,000 catheter days in fiscal year 2009.

Royer (2010) chose to implement a “Vascular Access Team” (VAT). The role of this team was to supervise all vascular access including insertion of peripherally inserted central catheters (PICCs); provide all care and maintenance of central lines and peripheral catheters; and oversee the implementation of process/equipment changes focused on

reducing central line-associated bloodstream infections. Staged interventions, beginning with the introduction of the VAT, resulted in an overall 67% decrease in CLABSI rates for the inpatient population.

Olrich (2011) used a quasi-experimental design that included both the implementation of a "bundle" including a "PICC" team and a change in equipment. This team assumed ownership of peripherally inserted central venous catheters for an oncology/gynecology unit. Given the patient population, PICC lines would be the predominant central line of choice for these patients. Olrich reports an average of 3.69 infections /1,000 catheter days prior to implementation of the team with a reduction to 0.75/1,000 catheter days 8 months after implementation.

Harnage (2008) discussed an institution that, historically, had an Intravenous Team that was responsible for insertion and primary maintenance of all intravenous lines. This team had the opportunity to focus on a quality improvement project that included a review of the literature from practice and product technologies with proven efficacy in the prevention of central line-associated bloodstream infections that they bundled and implemented. These strategies included an early assessment for all patients for appropriate line placement as well as team insertion of all PICC lines. This team focused on insertion and maintenance bundle technique as well as the implementation of a neutral pressure connector device and daily monitoring of compliance. Although this study did not report a reduction in CLABSI rate per 1,000 central line days, they were able to share the number of CLABSIs in relation to PICC lines placed. Prior to bundle implementation, there were 767 PICC lines placed with 11 infections. In year one of the

bundle, there were 1,558 lines placed with no infections and year two revealed 2,278 lines places with, again, no infections.

In these studies, specialized teams clearly assisted in CLABSI reduction at the unit level. These teams both insert and maintain central venous catheters using evidence-based practice. CLABSI reduction data alone could justify the budget for these teams in a healthcare organization. For those operating in a budget neutral environment, findings would suggest that one could make a strong and compelling business case for the addition of a team with these responsibilities.

Monitoring and Feedback

Five studies specifically focused on compliance monitoring and feedback as critical elements of success in CLABSI reduction. Harnage (2008) shared a significant reduction in infections through the use of daily monitoring of central lines. This monitoring focused on both compliance related to maintenance practices as well as line necessity. Marra et al., (2010) instituted monitoring of bedside performance of practices related to both insertion and maintenance in the second phase of their quasi-experimental study. This phase allowed the authors to measure compliance associated specifically with education as compared to other interventions implemented during quality improvement efforts in this setting with improved bedside performance of critical elements of central line care.

Two of the studies focused monitoring and feedback primarily on insertion bundle compliance. Monitoring, whether accomplished by unit-based personnel or a specialized team, allows for timely intervention for breech in bundle elements required for sterile insertion. Posa et al., (2006) used monitoring and feedback in addition to education in

order to affect infection rates in adult ICU settings in two hospitals of a health system. This monitoring focused on line insertion only versus maintenance with a subsequent pre and post intervention decrease in CLABSI rate from 7.6/1,000 to 2.24 per 1,000 catheter days. Tsuchida et al., (2006), too, combined monitoring and feedback with education to reduce bloodstream infection rates from 4.0/1,000 to 1.1/1,000 catheter days.

Rutherford (2010) used weekly rounding with infection control personnel and peer coaching as an element combined with education to reduce average CLABSI rates from a high of 13.43/1,000 in 2008 to 2.66/1000 catheter days. Interestingly, part of the peer coaching in this study involved the use of text message reminders to staff during the course of their work day to remind them of EBP associated with central line maintenance.

In summary, monitoring and feedback may take various forms in the care setting through the use of interdisciplinary partners as well as peers. Seldom implemented alone, engaging unit staff with real-time feedback had a consistently positive impact on unit-based CLABSI rates.

Unit-Based Transparency

Four of the studies found in a review of the literature highlighted a process for unit-based presentation of surveillance data and CLABSI rates. Historically, data have been readily available for the ICU setting with slowly-emerging strategies for collecting these data and reporting in the non-ICU settings. Chaberny et al., (2009) was the only study to focus on oncology patients – specifically, those with hematologic malignancies and subsequent neutropenia associated with treatment.

These authors performed a prospective surveillance study by collecting data on patients with at least two consecutive neutropenic days. The first 18 months of the study

involved collecting data, comparing it with reference data and presenting this to staff. Training was followed by a process to collect post-intervention data, evaluate data using multivariate analysis, and share with staff. Incidence data showed a reduction in CLABSI from 24.3/1,000 to 16.2 /1,000 neutropenic days with this educational intervention when combined with unit-based presentation of surveillance data.

Marra et al. (2010) used direct feedback related to both insertion and maintenance elements in ICU and step-down units. These data were sent out to both physicians and nurses via e-mail as well as displayed using bar graphs in poster format on the unit. Compliance data were coupled with CLABSI surveillance data. Descriptive data revealed an increase in compliance with insertion and site care elements as well as a significant reduction in CLABSI rates.

Pronovost et al. (2006), in a collaborative cohort study, chose to implement a number of interventions that included the presentation of the numbers and rates at both monthly and quarterly staff meetings. A regression model showed a significant decrease in infection rates with incidence-rate ratios decreasing from .62/1,000 at 0-3 months to .34/1,000 catheter days at 16 to 18 months post-implementation of interventions. One of the strengths of this study is that it involved multiple clinical sites.

Orlich (2011) used a quasi-experimental design to replicate similar work of implementing a maintenance bundle on an individual non-ICU unit – specifically, gynecology/oncology. In this setting, a multidisciplinary team focused on education of EBP elements for prevention of CLABSI. Monthly infection rates were reported on the unit level. Data were collected 52 months prior to the formation of the team and

subsequent efforts with pre-study data showing an average of 3.69 infections per 1,000 catheter days and post-implementation data revealing 0.75 infections/1,000 catheter days.

More recent strategies identified aimed at unit-based transparency include an intention discussion from healthcare providers encouraging and empowering family members to speak up when they recognize a breach in practice standards as well as root-cause analyses at the unit level for each individual infection (Rinke et al., 2012). This strategy combined with the use of basic infection-prevention measures led to a 64% reduction in infections in hospitalized pediatric oncology children. Further research on the use of these strategies in the adult setting is warranted.

In summary, monitoring and feedback on the unit level is commonly combined with other CLABSI prevention strategies. It is a means of assuring adherence to evidence-based practice guidelines that could be performed in no other manner. Although perhaps not as popular as other interventions due to the time-consuming nature of this intervention, it was found to be effective.

Equipment Modifications

Eight studies implemented CLABSI prevention strategies that included modifications to existing equipment or practices. Munoz-Price et al. (2009), Dixon and Carver (2010) and Popovich et al., (2010) focused on equipment without involving education, monitoring and reporting strategies to enhance efforts related to infection risk reduction. Munoz-Price et al. is one of the only studies published regarding infection prevention in the LTACH setting. The researchers conducted a quasi-experimental study of patients admitted to a 70 bed LTACH unit over the course of two years. Prior to the intervention, the standard of care was daily soap and water bathing for patients. The

intervention involved a change to daily 2% Chlorhexidine (CHG) baths. The researchers found a net reduction of 99% in CLABSI rates. Dixon and Carver (2010) highlight a 73.7% reduction in CLABSI rate for a 9 bed surgical ICU setting using the same bathing technique with a starting CLABSI rate of 12.07/1000 catheter days.

Conversely, Popovich et al. (2010) performed a similar intervention in a quasi-experimental, pre-post study on a 30-bed surgical ICU setting. In their trial of CHG bathing versus traditional soap-and-water, CHG bathing had no effect on CLABSI rates. Of interest is that this alternate bathing method resulted in a decrease in blood culture contamination by 50%. These studies suggest that the utility of CHG bathing should be evaluated in controlled trials to determine the efficacy of CHG bathing in reducing the incidence of CLABSI. That being said, patient bathing is a routine part of care in the ICU setting. A review of the literature did not reveal a study of CHG bathing in a non-ICU like setting in which patient/family engagement and nursing workflow would be an important consideration in compliance with this practice.

Five studies focused on changes in central line dressing change practices and products. Chaberny et al., (2009) combined previously discussed interventions with a change to semi-permeable versus gauze dressings and the insertion of CHG impregnated central venous catheters resulting in a significant reduction in infections. Pronovost et al., (2006) and Tsuchida et al., (2006) chose to change from a traditional Betadine preparation of the catheter insertion site to CHG as part of the catheter site maintenance protocol. Royer (2010) changed to a clear and swabbable positive displacement needleless connector and added the CHG impregnated Biopatch® disc to the insertion sites. The Biopatch® conversion resulted in a reduction in CLABSI rates of 31% while

the needleless connector resulted in a further reduction of 53% reduction in CLABSI rates to a rate of zero that has been maintained for over 17 months. Orlich (2010) also chose to change needleless connectors with a subsequent reduction in CLABSI rates.

Clinical practice guidelines by Band and Gaynes (2010) and O'Grady et al. (2011) support interventions that align with other strategies found in the literature for prevention of infection with both insertion and maintenance. Professional education is the cornerstone of a robust infection prevention program. The authors highlight the fact that healthcare personnel must be receive education with periodic assessment and re-training related to evidence based practices. Neither guideline calls for the development of a specific team to manage central lines but one could argue that this is the highest level of assurance that there is adequate training of staff.

Both of the clinical practice guidelines support monitoring and feedback of adherence to practice guidelines as well as unit-based presentation of data. O'Grady et al. (2011) support equipment modifications such as the Biopatch® disc and antibiotic impregnated catheters only when the implementation of a comprehensive strategy to reduce rates of CLABSI has not produced significant results.

Equipment modifications frequently involve not only change in practice but increase in cost for caring for the patient/central venous catheters. Conclusions from the literature review do not unequivocally support all of the potential targeted equipment modifications with a need for further research as well as cost-benefit analysis.

Summary

Literature on the subject of central line-associated bloodstream infection prevention is focused predominantly in the ICU setting and quite limited by single-setting

data. Although many prevention strategies have focused on the ICU setting, both the medical-surgical and LTACH settings care for patients with central lines with resulting significant CLABSI rates and would seemingly benefit from similar attention.

Key interventions aimed at CLABSI reduction involve both insertion and maintenance techniques with a variety of strategies. A primary theme includes education of all personnel who insert and maintain catheters with an ongoing assessment of competency and barriers to EBP. Monitoring of adherence to EBP and feedback is also a successful strategy. Some acute care settings have chosen to accomplish training and monitoring needs through the use of specialized teams.

Availability and discussion of unit-based data is also very important. These data can serve to both highlight opportunities for improvement and the celebration of infection prevention efforts. In an effort to reduce healthcare associated infections, it may be necessary to look at evidence to support equipment that could possibly leverage success with other efforts in infection prevention such as CHG bathing or re-evaluation of dressing techniques.

In all of the studies reviewed, pre-intervention data involved “practice as usual”; that is, caring for central lines in a manner that the organization had deemed acceptable for the time leading up to the intervention. One can no longer simply accept practice as usual for a hospital-acquired condition. Based on the evidence, there is agreement that any strategy to prevent CLABI is better than no strategy at all. Both individual studies and clinical practice guidelines may serve as a guide. Evidence exists regarding successful strategies to reduce CLABI and it is the duty of healthcare professionals to implement these strategies to improve safety and quality for this vulnerable population.

CHAPTER 3

CONCEPTUAL FRAMEWORK

The purpose of this chapter is to highlight the conceptual basis that was used to guide the development, implementation and evaluation of this administrative practice project. In order to address quality of care, one must look to a theoretical framework with a focus on quality. Donabedian's Theoretical Framework was first introduced to healthcare in 1966. As a leader in public health, Avedis Donabedian championed a framework that focused on the systematic evaluation of medical care at the patient level (Donabedian, 2005). Later works by the author include patient satisfaction as well as specific attributes of healthcare that define its quality (Donabedian, 1980, 1990). This model has been used extensively in health services research in order to capture elements that are relevant to patient care quality (Aday, Begley, Lairson,& Balkrishman, 2004). The classic components of this model include evaluation of structure, process and outcomes.

An analysis of the three main dimensions of this theoretical framework: structure, process and outcomes are integral to improving central line-associated bloodstream infection rates in the acute care setting (Appendix A). Conceptually, structure refers to the physical and organizational properties of the settings in which care is provided. Donabedian asserts that high quality care will occur in the right setting (Donabedian, 2005). The structure or setting may refer to variables ranging from supplies and human resources to leadership and the culture of safety. In the example of central line-associated bloodstream infections, structure/setting can refer to factors related to the individual nursing unit such as unit leadership, patient population, staff skill mix and

staffing. Material resources include supplies necessary for care of the central line and their availability. Organizational variables include system leadership, expectations related to quality of care and outcomes as well as transparency as part of a culture of safety.

Conceptually, process relates to the treatment or service being provided to the patient. This is the actual care provided that leads to an improved patient outcome. This is an important part of the theoretical framework in that this concept refers to the actual work associated with the desired outcome. The premise is that the process involves the implementation of evidence-based practice guidelines. Donabedian (1988) emphasizes that the effectiveness of these processes are only as good as current knowledge with processes constrained by the structures in which they operate. If structural elements are deficient, this may have a great effect on process.

As process relates to central line-associated bloodstream infections, this involves the implementation of clinical practice guidelines/policies/procedures aimed at infection prevention for central line placement and management. The goal in quality improvement is to adjust structure and process in order to minimize or eliminate the risk of adverse events impacting outcomes of care.

The final conceptual element of this model is outcomes. As the author defines, outcomes are the results of the treatment provided (Donabedian, 1980); that is, the linking effects of structure and process combined. These may relate to individual performance as well as to organizational benchmarking. Donabedian cautions that outcomes measurement cannot distinguish efficacy from effectiveness – essentially, ideal from actual conditions. Outcomes may not be optimal as a result of poor compliance

with evidence-based practice guidelines or standard practice that is not evidence-based. Outcome measurement must also take into account factors other than interventions that may determine outcomes. An example of this would be unit culture and staffing. Additionally, Donabedian warns that that the most important outcomes may be the hardest to measure – leading one to evaluate easily-measured but irrelevant outcomes.

Outcomes are extremely important as they directly relate to the prevention of central line-associated bloodstream infections. This involves a process to measure and report CLABSI rates on the unit and organization level in order to benchmark with other organizations. Viswanatha (2011) highlights the fact that, although we can measure process and structure, specific outcomes reflect the quality of care provided by a healthcare organization. In light of the fact that outcomes may relate to risk, non-compliance and under-achievement, they provide an organization with a focus for quality improvement initiatives.

In an effort to create a culture of quality and safety, one must work on transparency. Leape (2010) asserts that transparency is essential to motivate caregivers to improve care. Transparency as it related to central line-associated bloodstream infections involves highlighting specific infections on the level of unit and caregiver in order to make visible opportunities for improvement.

Morgan et al. (2010) estimate that 31% of the "unexpected deaths" in the acute care setting are related to hospital-associated infections – the most common of these are associated with central lines. Donabedian's conceptual framework provides a basis for analysis of the structure, process and outcomes that are essential to quality patient care

and the identification of opportunities to eliminate unnecessary risks associated with the use of central lines in the acute care environment.

CHAPTER 4

METHODS

The purpose for this chapter is to outline the project plan, launch a discussion of the health services quality improvement approach, methodology, and a discussion of the potential outcome of the project. In addition, a review the methods and timeline for the clinical practice project will be highlighted.

Background for Quality Initiative

Any potential solution or intervention to reduce the incidence of central line-associated bloodstream infections must be developed in conjunction with the clinical setting with careful consideration of the patient population and culture of the organization. An analysis of the system that supports care in this setting is necessary in order to plan and implement any interventions. Existing strategies aimed at a reduction in the number of central line-associated bloodstream infections focus on the ICU setting and vary greatly. Because of the lack of clear and focused data related to interventions in the LTACH setting, an analysis of structure and process variables was an essential key step to a tailored intervention aimed at improving patient outcomes.

As evidenced by requirements by the JCAHO and MHA for 2011, work on establishing a process for tracking CLABSI and process improvement initiatives was a priority for the LTACH. Key nursing leaders in the clinical setting recognized an opportunity for improvement; however, there was a lack of structure/process/issue identification to guide work. The unit had infrastructure and drive to support quality and safety with the need for the development of a team including leaders from the unit and staff level engagement. Although unit-based leadership was in transition, the director of

quality and compliance in the post acute setting acted as executive sponsor was engaged in the goal of this work and was crucial to the success of a project of this magnitude.

The heart of this project was the development, distribution and analysis of a clinical practice survey for staff that focused on policy and procedure for central line maintenance as compared to evidence based practice guidelines (process) and the appropriate supplies available (structure) for CLABSI prevention (outcome). In addition to this, it was important to gauge staff understanding of policies, procedures and barriers to adherence to the guidelines. The thought was that this may range from physical barriers such as the availability of appropriate supplies to knowledge barriers such as staff roles in the prevention of central line-associated bloodstream infections.

The survey was developed in conjunction with unit-based leadership using a multifaceted approach. Clinical policy/practice gap questions were identified based on intermittent reports and questions from nursing staff. CLABSI prevention strategy questions were based on practices observed through clinical rounding. All elements of CLABSI prevention were considered.

The theory behind obtaining information from the clinical practice survey was that the subsequent educational intervention could then be based on findings/conclusions of the gap analysis. This would then be used as a platform for engaging staff in sustainable performance improvement processes in the future. The educational strategy was decided by the educator in conjunction with the infection prevention nurse.

Through the work on this project, nursing leadership chose to adopt a process to support the analysis of central line infections as “defects”. Scrutiny of individual infections down to the level of personnel as well as the type and origin of offending

organism that may provide insight into practices or system issues related to infections moving forward. In summary, ”the key to achieving sustainable, actionable CLABSI reduction is to combine adaptive cultural changes with evidence-based practices and a renewed focus from hospital leaders and clinicians on a culture of safety” (Pennsy/vania Patient Safety Advisor, 2010, p. 8).

Health Services Quality Improvement Approach

There are population and clinical perspectives related to strategies that contribute most to health efficacy. The population perspective focuses on medical care as a contributor to health while the clinical perspective looks to a structure, process and outcomes of medical care. In focusing on the prevention of central line-associated bloodstream infections, clinical policy strategies would include the regulation of professional performance, outcomes assessment and management through the implementation of practice guidelines, and performance monitoring systems.

Clinical practice guidelines.

Field and Lohr (1992) describe clinical practice guidelines (CPG) or evidence-based practice guidelines (EBPG) as “systematically developed statements to assist practitioner and patient decisions about appropriate health care for specific clinical circumstances" (p. 38). They are designed to assist clinician and patient decision making based on a synthesis of evidence. These standards are supported by clinical trials or systematic reviews of the literature to support best practice and have been developed for use in a variety of clinical settings ranging from primary care and mental health outpatient services to acute inpatient settings. Concerned about cost, quality and

consistent care, clinicians, insurers, regulatory agencies, management and even politicians have embraced the concept.

Literature supports a debate between use and utility in the medical community. A variety of researchers describe improvements in treatment processes and patient outcomes based on the implementation of clinical practice guidelines (Grol, 2001; Smith & Hillner, 2001). Bauer (2002) argues that less than half of the studies regarding patient outcomes and clinical practice guidelines highlight improved patient outcomes related to enhanced CPG compliance. It is clear that successful practice change behavior related to clinical practice guidelines includes both incentive to change and a component of accountability.

Adherence to clinical practice guidelines has also been studied in nursing. Ricart, Lorente, Diaz, Kollef and Rello (2003) had the opportunity to review barriers to nursing adherence to evidence-based practice (EBP) guidelines associated with prevention of ventilator-associated pneumonia. Unit level data included fifty-one respondents reporting non-adherence to clinical practice guidelines as high as 22%. The greatest reason for non-adherence was unavailability of resources followed by concerns regarding the effect of the suggested intervention on patients as well as disagreement with reported trial results. Nurses in this study showed different levels of adherence than physicians with a greater focus by nurses on patient-related barriers. The authors concluded that their findings suggest a greater need for the development of guidelines that reduce the variability in implementation with the important point of including the nursing perspective in CPG recommendations.

In 2009, the United States Department of Health and Human Services called upon hospitals in the United States to reduce central line-associated bloodstream infections by 75% (U.S. Department of Health and Human Services, 2009). The Association for Professionals in Infection Control and Epidemiology (APIC) has developed a Vision 2012 statement. This group has the expectation that healthcare workers will have access to and apply CPGs related to CLABSI prevention (APIC, 2008).

There are CPGs associated with the prevention of CLABSI sponsored by CDC, Infectious Diseases Society of America, the Society for Healthcare Epidemiology of America and the Institute for Healthcare Improvement. These guidelines have been endorsed by a variety of professional organizations aimed at the prevention of this largely preventable healthcare-acquired condition.

Several different clinical settings have shown that the implementation of the elements of CPGs has a positive effect on CLABSI (Behrenholtz et al., 2004; Marra et al., 2010). There have been no studies published to date specifically regarding competency validation related to central line maintenance practices and the effect on CLABSI rates.

Performance monitoring.

The second aspect of the clinical perspective that relates to efficacy is the presence of performance monitoring systems. Performance monitoring in healthcare refers to evaluating the extent to which investments in health care are actually improving the health of the population. Experts would agree that health care should be assessed through comparative analysis of performance through benchmarking. Although current healthcare reform focuses mostly on extending insurance coverage, improving the health

of the population will require more than health insurance. Needleman, Kurtzman and Kizer (2007) discuss the fact that performance measurement of hospital nursing care is becoming increasingly important. Nurses play a pivotal role in patient safety and health care efficacy with a need to focus on elements of successful achievement of key outcomes.

Sustained reduction of central line-associated bloodstream infections remain elusive in many institutions despite a focus on clinical perspectives as they relate to strategies that contribute most to health efficacy. The key to achieving sustainable, actionable CLABSI reduction is to combine structure, process and outcome strategies through focused health services quality improvement.

Health services research focuses on improving the health of the population. As Aday et al. (2004) highlight, effectiveness research is invaluable in evaluating the outcomes of specific clinical practices. One must take into consideration the fact that measures of effective clinical practice are imprecise. That being said, it is important to make critical decisions regarding investment in health care strategies based on objective measures that health services research is poised to establish.

Description of Potential Outcome

The most obvious potential outcome of a process that focuses on CLABSI prevention is a reduction in these largely preventable complications. A project of larger magnitude would look at historical data comparing baseline rates to post-implementation rates. Additional measurable patient outcomes related to a reduction in CLABSI rates would depend on the maturity of the individual organization related to data collection and management. These might include a variety of data sets that might monitor length of stay

for a specific patient population or sepsis rates for patients on the unit related to CLABSI rates.

The Institute for Healthcare Improvement launched the 100,000 Lives Campaign in 2004. One of the targets of this work was to reduce the incidence of catheter-related bloodstream infections. These catheters are a vital link to treatment and management of treatment-related complications for LTACH patient. There are well-developed clinical practice guidelines to serve as the basis for a program aimed at CLABSI prevention. In addition, there is a wealth of literature to support implementation of a variety of practices associated with a successful reduction in central line-associated bloodstream infections. In many instances, lives depend on them. Hospital-acquired conditions such as CLABSI are largely preventable in the LTACH setting.

Design

The purpose of this project was to elucidate structure and process variables related to the care and maintenance of central lines in the LTACH setting and to ascertain gaps in knowledge and practice related to evidence based practices aimed at preventing central line-associated bloodstream infections. The results of this survey were then used to collaborate with key individuals to develop education focused on the results of the clinical practice survey. The additional work of this project was done to establish evidence-based practice standards and investigate other potential causes of CLABSI in this high risk population. It was the goal that the introduction of a standardized approach to quality improvement in the LTACH setting would provide a platform for future work.

Evidence-Based Practice Questions

1. Is there a gap between evidence-based practice guidelines for central venous catheter maintenance and actual nursing practice?
2. What are the gaps between evidence-based practice guidelines for central venous catheter maintenance and actual nursing practice?
3. What additional information/insight can staff provide on prevention of central line-associated bloodstream infections?

Selection of Participants

Potential participants were all registered nurses (RNs) working in the LTACH setting associated with a large metropolitan acute care facility. The inclusion criterion for the intervention was registered nurses employed in the LTACH setting who had completed their orientation to the unit. Registered nurses who had not completed their orientation period were excluded as they were still practicing as a mentored staff with an orientation that had not yet established a competency evaluation of the essential elements of central line maintenance and infection prevention.

Process

A convenience sample of study participants was recruited through unit leadership, flyers on the clinical unit and an announcement posted in the clinical setting (Appendix B). All eligible RN staff was given the opportunity to complete a survey related to current central line-associated maintenance and infection prevention practices. Additionally, there was a chance to provide open-ended feedback. As many participants as were willing to participate in the study were accepted.

The information obtained in the survey was collated through the use of the Survey Monkey™ tool with comments de-identified. Completion of the survey was considered to be informed consent. Data were collected using the survey tool presented in Appendix C.

Data Analysis

Data were entered into an Excel spreadsheet and analyzed using descriptive statistics with collation of comments related to open-ended questions. It was anticipated that important practice variables related to patient bathing, line use and catheter maintenance would be identified.

Budget Breakdown

There were no budget requests necessary for the use of the clinical practice survey. Expenses related to study development and implementation were managed within the role of the Project Coordinator. Survey data collection and aggregation was performed through SurveyMonkey™.

Institutional Review

A Waiver of Authorization was requested and this was submitted as an exempt protocol to Grand Valley State University Human Subject Committee and the Institutional Review Board of Spectrum Health. Data collection did not include any protected health information or patient identifiers. Staff data were collected by self-submission of a survey of current practices related to central line maintenance and infection protection strategies with the completion of the survey as consent.

The survey was administered electronically with de-identified data delivered in aggregate to the Project Coordinator through SurveyMonkey™. The Project Coordinator

had an account that was Secure Sockets Layer (SSL) enabled to ensure that the responses of survey participants were transmitted over a secure, encrypted connection. The email collection method chosen for this survey was configured so as to not to save the email addresses and not to collect the Internet Protocol (IP) addresses of respondents.

Data Analysis Approach

The data were reported out in the form of descriptive statistics. More specifically, the percentage of correct responses per question was tabulated (Appendix D). Common themes were identified in the responses to the open-ended questions.

Timeline

The timeline for this work was established dependent on the Dissertation Committee availability and IRB approvals with significant adjustments necessary. The original timeline involved the distribution of the clinical practice survey in May with analysis of results in June/July. The updated timeline highlights the fact that the clinical practice survey was not distributed until August with an analysis of the results in September (Appendix E).

CHAPTER 5

RESULTS

The purpose of this chapter is to share the results of the clinical practice survey. The clinical practice survey focused on process-related factors to caring for central lines while the open-ended questions revealed both process and structural barriers to the implementation of evidence-based practice through fidelity to policy/procedure. Findings from the clinical practice survey pointed to gaps in practice as compared to policy and inconsistent understanding of evidence-based practice strategies associated with CLABSI prevention.

Respondents

A total of 31surveys were returned from an eligible pool of 52 registered nurses. The survey was available for a total of three weeks with 16 respondents completing the survey in the first week, 10 in the second and 5 in the third. This represents a survey return rate of 59.6%. Of the surveys returned, 30 were completed in their entirety with one survey missing a response to one or more questions. Missing responses were discussed by the unit-based leadership group and it was decided that those questions that were missing a response appeared to be questions associated with practice with which the respondent may have been unsure. Answers to the remainder of these questions for this one incomplete survey were included. Results can be further categorized into three main topics: central line maintenance practices, central line assessment practices, and CLABSI prevention strategies.

Central Line Maintenance Practices

Of the questions that referred to central line maintenance practices, a majority of the respondents provided correct answers to the survey questions related to end cap access and tubing/end cap changes. Staff could clearly identify the appropriate preparative agent for accessing a central line through an end cap as well as changing the end caps at the appropriate time interval. That being said, there were two individuals that responded that he/she did not always either prep the end cap when administering a medication or flush the central venous catheter before and after medication administration. Nearly 30% of the survey respondents shared end cap preparation practices that, at times, fell significantly short of the fifteen seconds spelled out in unit-based policy.

Intravenous tubing and end caps were not always changed after administering blood or blood products. Staff could articulate the appropriate timeframe for tubing changes but shared the practice of documenting the change and change due only approximately 50% of the time.

Questions related to central line dressing changes were answered by all respondents, revealing a great deal of detail related to practice as well as some opportunities for improvement. Staff was able to clearly acknowledge the need to change a central line dressing when it was soiled or peeling and, despite the option, there were no respondents who acknowledged avoiding the task. All of the respondents use the central line dressing kit that is available on the unit with the appropriate cleansing agent and sterile field to promote sterile technique. Nearly 26% of the respondents acknowledged hand hygiene practices that were not aimed at infection prevention at the

point of dressing change. This included hand hygiene at the point of room entry only and hand hygiene prior to removal of the old central line dressing – disregarding hand hygiene prior to the application of sterile gloves for a dressing change.

Of interest, 50% of the staff who responded to the survey was able to provide a correct answer related to the technique used to cleanse the skin around the central line site with CHG. Over 46% responded with a technique used for prior preparative agents that have not been part of the standard of care for central line dressing changes for over five years in this setting. Additionally, 56% shared disinfection preparation time during the dressing change that fell short of the manufacturer recommended 30 seconds. Most concerning, the practice standard at the time of the survey called for the use of a securement device that was to be changed with each central line dressing. Only 45.2% of staff acknowledged changing per policy.

Questions related to labeling practices for central line dressings highlighted an adherence to the policy that the dressing must be labeled but highlighted some ambiguity regarding the content of the label. All of the respondents shared practices that documented the date of the dressing change while 19.4% of the respondents inaccurately labeled the dressing with the due date of the next dressing change. Most respondents included their initials while 45.2% of the RNs shared that they include the time of the dressing change which is not required in the unit policy. One-hundred percent of the staff surveyed reported documenting not only that the dressing was changed but the date that the next dressing change was due in the electronic medical record.

Central Line Assessment Practices

Central line assessment practice question results revealed a staff that was clearly unaware of standards for assessment and documentation. Nearly 50% shared practices of assessment every four hours with documentation of an assessment every eight hours by 58.1%. This was not at all consistent with unit policy that requires documentation of an assessment every eight hours and with every tubing and end cap change.

CLABSI Prevention Strategies

Questions associated with practices aimed at the prevention of central line associated bloodstream did not all line up with the unit-based policy but were considered to be a prudent means of preventing infections. Nearly 23% shared practices of disconnecting the patient from their central line tubing when needing to use the bathroom, change clothes or participate in therapy. Central line tubing was found on the floor sometimes or often by 47.4% of the nursing staff. More than 65% of staff supported incorrect responses related to flushing central lines that were not in use were incorrect while over 50% of the staff shared unclear practices related to capping off intravenous tubing when not in use. Staff described that they did not consistently obtain physician orders to restore patency to sluggish central lines. One staff person acknowledged asking a nursing technician to practice outside the scope of his/her practice by disconnecting the patient's central line IV tubing.

Staff was unable to provide correct answers to questions related to rationale for and bathing techniques involving the use of the CHG wipes. Over 48% of the respondents appeared to have an incorrect understanding of the appropriate use of the

wipes while 6.5% acknowledged not being sure of how the wipes were supposed to be used. One person stated that he/she never used the wipes for patients in their care.

Open-Ended Questions

There were seven responses to the first open-ended question that focused on practices RNs had personally adopted that he/she believed assisted in the prevention of central line associated bloodstream infections. One staff person felt that cleaning the end of the actual catheter after removing the old end cap, before applying the new one was best practice. Another shared a practice of always wearing gloves when manipulating a central line. Changing tubing and end caps with total parenteral nutrition and blood transfusions per policy were important to another respondent. One identified education as a personal prevention strategy.

Five individuals shared barriers to practices related to the care of the central line. Two identified the lack of a sterile "dead end" cap on the unit for capping off intravenous lines when not in use while three cited inconsistent practices associated with this task as well as the use of the stabilization device.

Six respondents shared practices that were consistently ignored related to appropriate central line maintenance; all involved following the policy related to end caps and central line dressing changes. It was felt that end caps were not changed and documented consistently and patients were not always asked to wear a mask for central line dressing changes. Respondents felt that both dressing and end cap changes were tasks that were handed off in shift to shift report versus being done.

Six individuals shared responses to the final open-ended survey question that was intended to solicit ideas for practice improvement. Two involved access to appropriate supplies while four asked for education and practice validation.

In summary, the clinical practice survey revealed opportunities for information/education and clarification related to both central line practices and CLABSI prevention. The survey proved to be a valuable part of the assessment of the environment of care that has the potential to lead to future work in order to improve the quality and safety of care for a vulnerable population.

CHAPTER 6

DISCUSSION

The purpose of this chapter is to provide a salient discussion of the clinical practice environment in which the survey was conducted as it relates to survey response and engagement of the clinical leadership team. In addition, this chapter will highlight the clinical practice survey as a part of a larger Clinical Process Improvement project highlighting the role of the DNP-prepared clinician. Lastly, sustainability of CLABSI prevention work will be addressed.

Clinical Environment and Respondents

Spectrum Health is a not-for-profit West Michigan-based health care system that was created in 1997 as an integrated health care system. The Spectrum Health Special Care Hospital (SHSCH or SCH) is geographically located within the Spectrum Health Kent Community Campus. This setting is comprised of five floors of Nursing and Rehabilitation Services with the Special Care Hospital occupying the top floor of the building. The "Special Care Hospital" is a long-term acute care setting – the type of care setting best known as an LTACH in the medical community. The Special Care Hospital is accredited by The Joint Commission, and, until recently, was the only long-term acute care hospital in the greater Grand Rapids area. With an advertised 76 licensed beds, SCH is the second-largest LTACH in Michigan (Who we are, n.d.).

Although the Spectrum Health Grand Rapids Hospitals have achieved Magnet designation, this does not include the Special Care Hospital which reports up through the systems post-acute service line. As a result, individuals in the clinical environment do not see the same benefits as those who work in the acute care environment. For example,

there is no impetus for hiring Bachelors of Nursing (BSN) prepared nurses and those who work in this setting do not qualify for the same level of tuition support should they be interested in returning to school as those who work in the acute care environment of the Grand Rapids hospital system.

As stated previously, 31 of a possible 52 surveys were returned with an overall participation rate of 59.6%. At the time of survey distribution, the unit was in the midst of transition. The clinical educator was acting as the interim director for the six month period preceding the survey with the new director of nursing beginning her role only three weeks prior to the planned survey distribution. New to this role and the organization, this individual was unable to be engaged as a champion of this work. As a result, the clinical educator and infection prevention nurse partnered to act as nursing leadership champions.

Additionally, the season presented vacation and low census challenges. Due to low census, many staff were forced to use vacation time to supplement their income when shifts were unavailable. Given the clinical environment at the time of the survey, the response rate was far greater than expected. This may relate to the fact that nursing staff on the Special Care Hospital, despite transitional leadership, exhibit a pride in their clinical practice.

Clinical Practice Survey Results

Central line maintenance practices.

Not surprising, the findings from the clinical practice survey pointed to gaps in practice as compared to policy (based on clinical practice guidelines) and inconsistent understanding of evidence-based practice strategies associated with CLABSI prevention.

Prior to this work, practices specifically related to CLABSI prevention were neither part of the orientation validation tool nor annual staff competencies. Staff was able to correctly identify the preparative agents associated with central line maintenance but not the appropriate time interval for the use of these agents. Although this information is readily available in policy/procedure format and included in nursing orientation to the clinical environment, this information may be forgotten for a variety of reasons.

Although 15 seconds for line access and 30 seconds for dressing change preparation may not seem to be a significant period of time, this could be perceived to be burdensome in a fast-paced clinical environment. Additionally, if staff on the clinical unit was taught this but this practice was either not reinforced by a preceptor or observed in the practice of others, staff might have been more likely to develop shortcuts and easily forget policy/procedure as a matter of practice.

Of interest, there were respondents who clearly acknowledged the correct understanding of appropriate practices but made conscious decisions not to do so. This related to a variety of topics ranging from line maintenance and tubing change to hand hygiene practices at the point of care. This was most likely related to the anonymous nature of the clinical practice survey and the fact that RNs were comfortable reporting deviations from policy without fear of reprisal. Despite this work, only 45.2% of staff acknowledged changing the security device per policy and one individual shared in the open-ended questions that one of the barriers to practice was the lack of availability of the securement device on the unit.

The securement device in question is not a product that is new to the system. It is used in many clinical practice settings as an alternative to suturing the central line in

place. It is a device that certainly works as designed but is considered by many to be cumbersome to apply and replace. As a result, the decision was made to include this question in the clinical practice survey in order to potentially identify this as a practice issue and develop a plan to mitigate this issue.

Central line assessment practices.

Additionally, according to the staff, they were clearly unaware of policy/procedure related to assessment standards for the central line. Curiously, close to half of the respondents shared that they believed that an assessment required every four hours. In discussing this with unit-based leadership, it has not been there experience that staff is documenting a central line assessment every four hours. Staff may have interpreted this timeframe as the most appropriate based on what they might have interpreted as the highest level of clinical practice without knowledge of policy/procedure.

CLABSI prevention strategies.

It was not surprising that staff answers to questions aimed at illuminating CLABSI prevention strategies were only intermittently correct. Staff reported disconnecting central line tubing for a variety of non-essential reasons (including delegating this task to a non-licensed professional), finding central line tubing on the floor, and intermittent attention to catheter flushing and catheter patency practices. Although the unit has benchmarked against National Association of Long Term Hospitals (NALTH) for over a year and has a rather engaged infection prevention nurse, data were not widely shared on the unit level. Sharing nursing quality indicators in the form of dashboards has not been a common practice of prior nursing leadership or a priority of

the transitional leadership. Attention to central line practices and CLABSI prevention strategies has not been a priority for the care setting.

Staff survey results related to CHG bathing practices were not surprising. Upon further discussion with unit-based leadership, the rationale for and strategies associated with this CLABSI prevention strategy are neither highlighted in new employee orientation nor are they are part of the orientation validation tool that a preceptor uses with an employee orienting to the clinical environment. As a result, any information related to CHG bathing would be passed on in an informal manner from employee to employee with little validation/verification.

Open ended questions.

This section of the survey provided information that, ultimately, led to a subsequent plan for an educational intervention regarding appropriate central line practices and CLABSI prevention strategies. Staff shared practices that were not necessarily evidence based but reflect a higher level of thinking regarding improving the quality and safety for the patient population at the Special Care Hospital.

Five individuals shared barriers to practices related to the care of the central line. Two identified the lack of a sterile “dead end” cap on the unit for capping off intravenous lines when not in use while three cited inconsistent practices associated with this task as well as the use of the stabilization device. Questions related to practices that were consistently ignored by their colleagues as well as ideas for practice improvement solicited feedback asking for more education. This included education not only related to the appropriate care of the central line but clarification for clinical practice questions.

Strengths

There were both strengths and limitations to the clinical practice survey and data collection methodology. One strength is that the survey focuses on a nursing quality indicator as identified by NDNQI. An additional strength of this evidence-based practice project is that the information obtained through the survey provided invaluable information and guidance to efforts aimed at CLABSI reduction. Still another strength is that the data elements of the survey linked clearly to current policy/procedure/practice standards with little/no room for misinterpretation. The topic, purpose and utility of the questionnaire and subsequent work was not difficult to explain to potential participants.

An additional strength was the focus on a population of RN's and a clinical practice setting about which very little is written. Although the Special Care Hospital is linked from an organizational perspective with the lower acuity of the post-acute care environment, the patients cared for in this setting have complex care needs most aligning with the acute care setting.

Finally, the nearly 60% response rate of RNs working in this clinical setting was a definite strength. Despite the challenges as previously outlined, the RNs in this setting were eager to participate as part of an initiative to focus on quality, safety and improved patient outcomes. The higher response rate allows for generalizability to clinical practice by non-participants at the Special Care Hospital.

Limitations

There were limitations to the clinical practice survey. The survey used a convenience sample. Access to staff was through an electronic survey tool. Staff was encouraged to complete the short survey during shift time. This may have been a barrier

for individuals whose workday, for a variety of reasons, did not support the access and response to email. Additionally, this sampling may have unintentionally solicited responses from only the more engaged staff.

An additional limitation to this study was the actual study questionnaire. The questionnaire was reviewed for both face and content validity by a Master of Science in Nursing (MSN) prepared Clinical Nurse Specialist with expertise in oncology and educational principles associated with health literacy. Additional review was performed by two other nursing colleagues with MSN degrees with a focus on education. Pilot testing with bedside practitioners who were quite familiar with the care of central lines in a different practice setting offered invaluable feedback related to survey flow and clarity. Despite these efforts, there was still a chance that participants found a question/questions unclear. An attempt was made to mitigate this issue by developing survey questions and answer options that were clear and concise with little room for ambiguity.

Due to a potential time commitment associated with survey, this may have attracted nurses who are less likely to work full time (assuming that this would need to be done on their own time) or nurses who are younger and thus newer to the profession (assuming that this subset of the population would have more time). Another potential bias is the Hawthorne effect. Simply by knowing that there is survey focusing on infection prevention related to central line-associated bloodstream infections may affect the behavior of staff in the clinical environment with greater attention to adherence to clinical practice guidelines.

No demographic data were collected from the RN population. Yet, adding demographic data to this data may have allowed for an identification of trends in practice

related to years of nursing experience, educational preparation or experience in the LTACH as a practice setting. The tool was created by the investigator and was designed specifically for the LTACH practice site. No attempt to generalize the project was made as the intention of the effort was specific to the site where practices are driven by unique hospital specific policies/procedures.

One of the major threats to the integrity of the survey was the fact that staff was potentially taking the survey with evidence-based practice resource materials available to guide answer choice. An additional risk was staff discussing the survey and its components with each other as comparison. Given that the purpose of the survey was clearly communicated with assured anonymity, staff might have been more likely to answer honestly and without the use of resources/references related to appropriate practice.

Implications for Nursing Practice

Personnel from most care settings would debate that clinical practice guidelines are incorporated in current policy/procedure that guide appropriate care of the central venous catheter. If these CPGs were followed, there would be fewer numbers of healthcare-associated CLABSIs that could be related directly to provider practice. The best method of learning about the environment of care is to ask the caregivers – providing them an opportunity to answer questions and provide feedback in a non-threatening manner. Through both survey answers and qualitative responses, one could more easily assess a practice environment in an effort to use focused interventions with nursing staff to protect patients from the development of central line-associated

bloodstream infections through the work of a quality improvement project. This is especially true for the LTACH setting about which little is written.

Quality Improvement Project

The purpose of the clinical practice survey was designed to analyze structure and process variables associated with CLABSI prevention. This was only a small part of the clinical improvement project initiated at the Special Care Hospital. The aim of the clinical improvement project was to perform a gap analysis between updated CDC guidelines for CLABSI prevention and unit-based policy/procedure, to identify opportunities for practice improvement through analysis of the care environment and providers as well as to consider interventions focused on improving clinical practice. The clinical improvement project also served to highlight the role of the Doctorate in Nursing Practice (DNP) role in a clinical environment lacking advanced practice nursing.

Improvement Interventions

Improvement interventions associated with the clinical improvement work are highlighted in a sample of the Clinical Improvement Team Status Report (Appendix F). This report format served as a guide for the work and was used to update the leadership and key stakeholders for the duration of the work. There were several elements of the clinical improvement work other than the clinical practice survey that were necessary to perform a thorough assessment of the care environment in order to provide for focused interventions aimed at CLABSI prevention.

A process for electronic harvesting of central line day data was necessary in order to establish consistently accurate tracking of central line-associated bloodstream

infection rates. Data for central line days was pulled from charting in the electronic medical record with a recognized opportunity for clarity for both charting options and data harvesting. It was necessary to coordinate with system resources to propose clarification for nursing charting options as well as to make sure that the system central line reports lined up with the charting options that reflected the use of a central venous access device.

Once there was assurance that there was accurate data upon which to base infection rate, a comprehensive review of CLABSIs from the prior year was conducted to confirm CLABSI as defined by NHSN criteria. In collaborating with the infection prevention nurse, it was identified that two of the infections from the prior 12 months did not actually meet the criteria for being described as unit-acquired and data were re-submitted for quality monitoring and benchmarking with NALTH that was reflective of that change.

In addition to investigating data and reporting fidelity, it was necessary to examine policies and procedures for the clinical setting and their alignment with evidence-based practice guidelines. The CDC had updated guidelines related to central line insertion and maintenance in April of 2011, yet the unit-based policies/procedures had not yet been updated. A gap analysis occurred with revisions of practice guidelines to be reflective of evidence-based practice. Significant changes included elements of tubing and endcap change intervals and clarification of prevention strategies such as use of the Biopatch® with occlusive dressings at the time of insertion.

Potentially causative factors were also investigated. The powerplan in the electronic medical record associated with orders designed to maintain catheter patency

was reviewed for clarity as well as actual utilization. In addition to this, the use of Alteplase ® for the purposes of clearing sluggish or occluded catheters was reviewed. Both of these factors were considered as potential factors that may contribute to CLABSIs in this setting and were ultimately addressed in the focused education intervention.

Prior to this work, unit-based CLABSI rates were shared among nursing leadership with little connectivity to staff. As Leape (2010) notes, transparency is essential to motivate caregivers to improve care. This is best accomplished through accurate and timely reporting of unit-based central line-associated bloodstream infections and cumulative rates for the healthcare setting. Work was initiated through the nurse educator and infection prevention nurse to begin to share data on the unit level.

The core of this project was the distribution and analysis of a clinical practice survey for staff that focused on policy and procedure for central line maintenance as compared to evidence based practice guidelines (process) and the appropriate supplies available (structure) for CLABSI prevention (outcome). In addition to this, it was important to gauge staff understanding of policies, procedures and barriers to adherence to the guidelines. The thought was that this may range from physical barriers such as the availability of appropriate supplies to knowledge barriers such as staff roles in the prevention of central line-associated bloodstream infections.

The theory behind obtaining information from the clinical practice survey was that subsequent educational intervention could then be based on findings/conclusions of the gap analysis. This would then be used as a platform for engaging staff in sustainable

performance improvement processes in the future. The educational strategy was decided by the clinical educator in conjunction with the infection prevention nurse.

Through the work on this project, nursing leadership chose to adopt a process to support the analysis of central line infections as "defects". Scrutiny of individual infections down to the level of personnel as well as the type and origin of offending organism may provide insight into practices or system issues related to infections moving forward. To quote the Pennsylvania Patient Safety Advisor (2010, p. 8), "the key to achieving sustainable, actionable CLABSI reduction is to combine adaptive cultural changes with evidence-based practices and a renewed focus from hospital leaders and clinicians on a culture of safety".

Implications for Future Practice

This quality improvement project has definite implications for further investigation. Information regarding personal motivation for adherence to clinical practice guidelines deserves further investigation. Additionally, the length of time from initial education/orientation to evidence-based practice guidelines and the shifting of these practices to those that are not supported by policy should be further analyzed. Future questions might expand this work: Are there site–specific barriers that relate to the culture of the workforce and patient population? Are there gaps in knowledge related to the overall understanding of CLABSI and the risk for the complex patient population in the LTACH setting? Do gaps in knowledge regarding central line practices correlate with CLABSI prevention strategies?

From an educational perspective, the information gleaned from this clinical practice survey is important to use in educating current staff and incorporating into

nursing orientation. The opportunities as identified in the clinical practice survey and practice gap analysis were incorporated into a seminar on central line practices and CLABSI prevention at unit-based skills fair. Staff verbalized value for their practice and an appreciation for education focused on LTACH-specific practice gaps. Risk for CLABSI and prevention strategies should be an important part of an ongoing curriculum associated with central venous catheters as well as orientation for the nurse new to an acute care practice setting and plans among nursing leadership in this setting have been made to do so.

Doctorate in Nursing Practice (DNP) Roles

The DNP roles have been invaluable to the success of this project. The DNP as clinician has a distinct role in recognizing evidence-based practice guidelines as well as care in the clinical setting. It is through leadership that relationships with key site-specific nursing leaders are formed in order to make a clear case for a project of this magnitude. The DNP as advocate has a responsibility to improve the quality and safety of care for the vulnerable hospitalized population.

As a scholar, the DNP must not only consult the literature related to practice, practice gaps and potential interventions but seek out information as necessary. The clinical practice survey highlights the additional piece of information necessary to inform infection prevention interventions.

The DNP as innovator is responsible for approaching clinical practice improvement in a manner that is congruent with the practice environment. Due to the nature of the environment at the Special Care Hospital and the transition associated with nursing leadership, it was important to work with existing resources – engaging staff in

participating in survey completion and subsequent educational intervention in creative ways.

The role of the DNP as educator related to the development of the central line and CLABSI prevention education for the clinical staff in the LTACH setting. Education had to not only be interesting and compelling, it needed to be based on the results of the clinical practice survey and make the case for preventing harm and improving the quality of care that was provided for the patients.

Sustainability

It is through role modeling that this work will be sustainable in the LTACH setting. The practice environment and nursing leaders at the time of the clinical practice improvement work had not been involved in an improvement project of this magnitude in the past. In addition, interim nursing leadership proposed initial approach to a perceived problem with central line-associated bloodstream infections lacked depth in scope and clarity as well as a clear relationship to clinical practice guidelines. The use of the clinical practice improvement team status report as a guideline for practice improvement is one that can be easily translated to other clinical improvement work in this setting. Work with a DNP prepared nurse, has given nursing leadership an opportunity to see a systematic analysis of clinical practice with solution-focused intervention.

The use of a clinical practice survey as part of a clinical process improvement project easily translates to a variety of clinical settings. It is important to recognize structure and process variables that contribute to outcomes of patient care that is provided in any acute care setting. Although this practice setting does not have access to an advanced practice nurse, nursing leadership would be well-served to either advocate for

an advanced practice nurse in the post-acute care setting or advocate for access to advanced practice resources in the acute care setting.

Conclusion

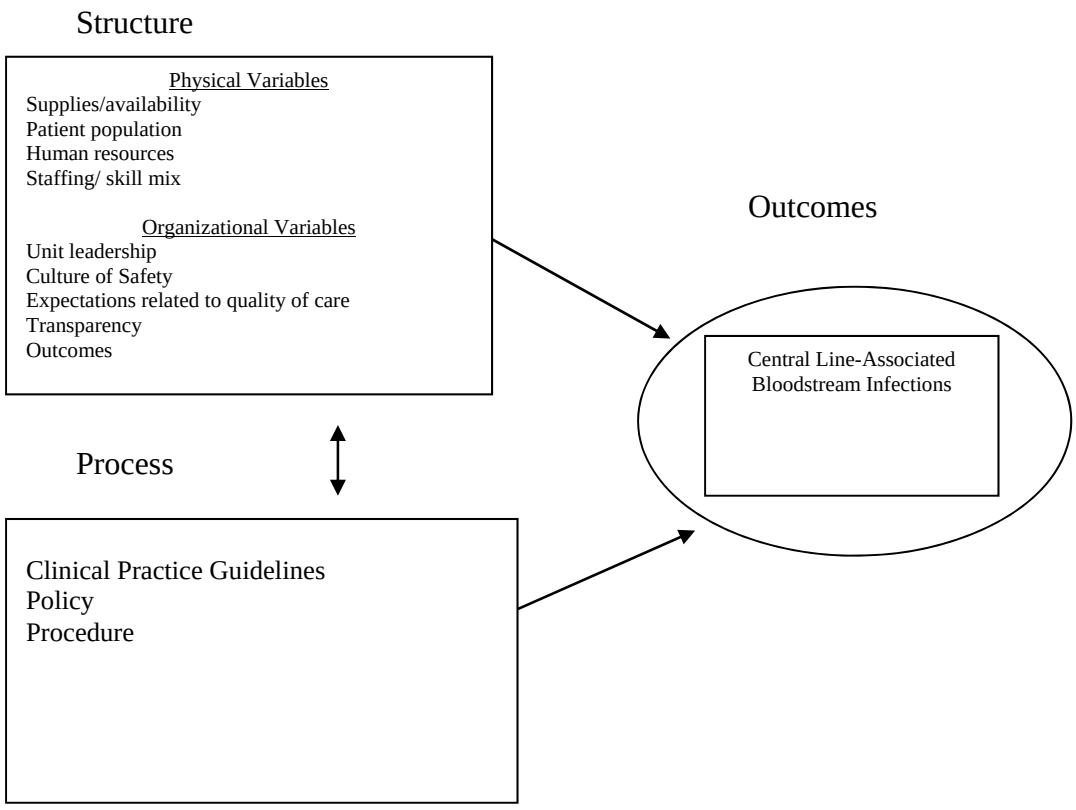
In 2009, the United States Department of Health and Human Services called upon hospitals in the United States to reduce central line-associated bloodstream infections by 75%. The Joint Commission established an annual patient safety goal aimed at CLABSI prevention in 2011. CMMS no longer provides reimbursement for care of hospital-acquired conditions. The time to act is now. CLABSI prevention is not just about complying with the JCAHO national patient safety goal or reducing the financial burden of caring for non-reimbursable conditions. It is about doing the right thing.

As the number of older Americans continues to rise, caring for this population will challenge the healthcare system to focus on quality. The LTACH setting is poised to provide excellent care to a subset of medically complex patients, many of them elderly. The DNP-prepared nurse is prepared to lead clinical practice improvement in the acute care setting. Clinical practice improvement work involves the skills of the nurse as clinician, leader, advocate, scholar, innovator and educator.

APPENDICES

APPENDIX A

Donabedian Model and Central Line-Associated Bloodstream Infections



APPENDIX B

Central Line Care and Maintenance Practice Survey Announcement

You are invited to participate in a voluntary survey about current practice related to care for and use of central lines.

This survey is part of a quality improvement project that aims to:

- assess current practice in LTACH related to central line care and maintenance
- evaluate if there are any issues that may be contributing to central line-associated bloodstream infections

Who: Registered Nurses who work on the LTACH unit

What: Take a 5 minute survey

When:You may access the link via email from this time until _____.

How: Access your email and "click" on the survey link.

Fill out the survey and submit.

APPENDIX C

Central Line Survey

The purpose of this survey is to:

- assess current practice related to central line care and maintenance
- seek feedback regarding specific issues that may be contributing to our current rate of central line associated blood stream infections (CLABSI)
- develop an action plan to reduce our current rate of central line associated blood stream infections.

Directions:

Thank you for agreeing to complete this survey. Please read each question carefully and answer each question to reflect your own practice. Yet, please respond in reference to your own practice and not that of your peers. Your answers are completely anonymous and cannot be traced back to you. At times, there may be system issues that prevent you from doing what you know or think is correct, but these cannot be addressed without vital information.

For the purpose of this survey, "central lines" include: peripherally inserted central catheters (PICCs), implanted ports, and tunneled catheters (i.e. Hickman or Groshong catheter) only. (This does not include subclavian, jugular, dialysis or other central catheters).

The following questions apply to PICC lines, implanted ports, and tunneled catheters.

1. In which of the following situations do you prep the end cap of a central line? (check **all** that apply).
    a. Before administering any intravenous push medication
    b. Before attaching intravenous piggyback tubing to "line B"
    c. Before drawing blood
    d. Before re-attaching the intravenous tubing after disconnecting it for any reason (e.g., after a blood draw)
    e. Other (please describe):
    _____
2. There are times when I do **not** prep the end cap, even though I know I should.
    a. True
    b. False

3. When prepping the end cap, what agent do you use?
    _____
4. For how many seconds do you prep the end cap?
    _____

5. When diluting medications for intravenous push administration via a central line, I use pre-filled normal saline syringes.
    a. True
    b. False
6. How often do you change intravenous tubing on central lines?
    a. Every 24 hours
    b. Every 48 hours
    c. Every 72 hours
7. How often do you change end caps on central lines?
    a. Every 24 hours
    b. Every 48 hours
    c. Every 72 hours
    d. When I change the tubing
8. I always change intravenous tubing and end caps after administering blood or blood products.
    a. True
    b. False
9. How often do you assess a central line site?
    a. Every shift
    b. Every day
    c. Every other shift
    d. Every 4 hours
10. I change central line dressings (select all that apply)
    a. weekly when it is due
    b. when it is soiled or peeling
    c. whenever I notice it is overdue
    d. I tend to avoid it
11. Which of the following most accurately represents your practice regarding hand hygiene prior to a central line dressing change:
    a. I wash my hands upon entering the patient's room **only**
    b. I wash my hands after removing the old dressing and prior to applying the new dressing
    c. I do not consistently wash my hands prior to changing a central line dressing
    d. I wash my hands upon entering the patient's room but do not re-wash my hands prior to changing a central line dressing
12. I use a central line dressing change kit to change a dressing on a central line:
    a. Always
    b. Sometimes
    c. Never

13. If you answered “sometimes” or “never” to question 12, please indicate why.

    _____

14. I use sterile technique, using a sterile field, when performing dressing changes on all central lines.
    a. True
    b. False
15. When disinfecting the skin around a central line site, what agent do you use?

    _____

16. When cleansing the skin around a central line site, which technique do you use?
    a. Cleanse from the site outward in a circular fashion
    b. Cleanse starting from the outer perimeter of the line sit moving inward in a circular fashion
    c. Cleanse using a back and forth “scrubbing” motion
    d. I don’t really have a technique
17. For how many seconds do you cleanse the skin during site care?

    _____

18. Which of the following most closely describes your practice related to labeling a central line dressing?
    a. I always place a label on the dressing
    b. I place a label on the dressing sometimes/when I think of it
    c. I rarely/never place a label on the dressing
19. If/when you do label the dressing after application, which of the following information do you include on the label (choose all that apply)?
    a. Date of dressing change
    b. Time of dressing change
    c. My initials
    d. Date when next change is due
20. I always document dressing changes in Cerner.
    a. True
    b. False
21. When do you **document** assessment of a central line site?
    a. Only when the dressing is changed
    b. At least every 12 hours
    c. At least every 8 hours
22. I always document the date the next dressing change is due in Cerner.
    a. True
    b. False
23. I always document end cap changes in Cerner.
    a. True
    b. False

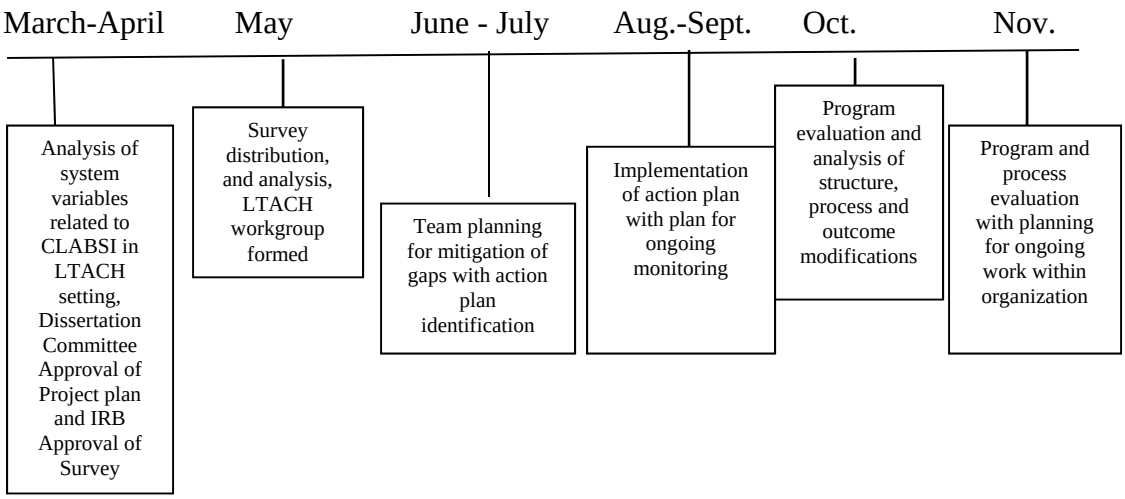
24. I always document tubing changes in Cerner.
    a. True
    b. False
25. I always document the date the next tubing change is due in Cerner.
    a. True
    b. False
26. I always document the date the next end cap change is due in Cerner.
    a. True
    b. False
27. I find central line IV tubing on the floor
    a. Often
    b. Sometimes
    c. Never

28. I always change the STAT lock device with each dressing change.
    a. True
    b. False
29. Which of the following describes your practice best?
    a. I disconnect the tubing to a central line when a patient needs to go to therapy, use the bathroom, or needs to change clothes.
    b. I rarely disconnect the central line other than to change tubing or medications.
    c. I have asked a Nursing Tech to disconnect tubing on an IV
30. I flush unused ports of central lines (check **all** that apply)
    a. Every 8 hours
    b. Every 12 hours
    c. Only if ordered
31. I always flush the central line before and after administering medications
    a. True
    b. False
32. I always obtain an order for Alteplase® whenever the central line flushes sluggishly, or does not have a blood return.
    a. True
    b. False
33. I use/delegate the use of Chlorhexadine (CHG) bath wipes for my patients bath daily
    a. Always
    b. Sometimes
    c. Never
34. When I use Chlorhexadine (CHG) bath wipes for patient bathing I:
    a. Perform an initial bath with soap and water if the patient is extremely soiled, followed by CHG wipes
    b. Use CHG wipes only
    c. I am not really sure of how I am supposed to be using CHG wipes
    d. I use whatever is most convenient

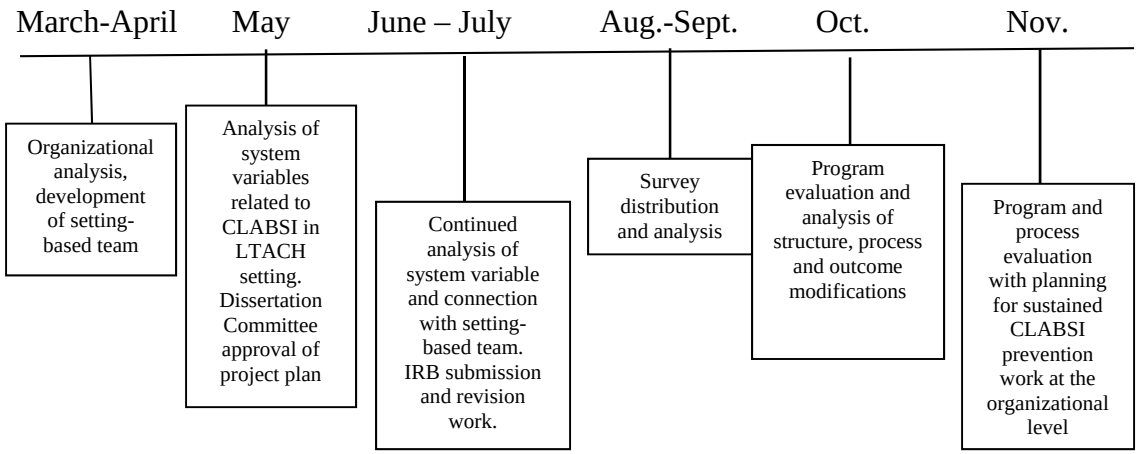
35. When not in use, I use the following practices when capping off intravenous tubing so it can be used again (check **all** that apply):
    a. Use the original cap
    b. Use the cap from a saline flush
    c. Insert the end into the MicroClave on the IV tubing
    d. Use a new sterile “dead end cap”
36. Is there anything else that you regularly do that you believe helps prevent central line associated bloodstream infections?
37. Are there barriers to your practice related to the care of the central line? If yes, please describe.
38. What would help you/your colleagues to practice better?

APPENDIX D

Timeline



Updated Timeline



APPENDIX E

Summary of Survey Responses

Question	Percent Response Correct
1. In which of the following situations do you prep the end cap of a central line?	83.9%
2.There are times when I do **not** prep the end cap, even though I know I should:	93.5%
3. When prepping the end cap, what agent do you use?	100%
4. For how many seconds do you prep the end cap?	70.97%
5. When diluting medications for intravenous push administration via a central line, I use pre-filled normal saline syringes.	96.7%
6. How often do you change intravenous tubing on central lines?	100%
8. How often do you change end caps on central lines?	100%
8. I always change intravenous tubing and end caps after administering blood or blood products.	87.1%
9. How often do you assess a central line site?	58.1%
10.I change central line dressings (select all that apply)	100%
11.Which of the following most accurately represents your practice regarding hand hygiene prior to a central line dressing change:	74.2%
12.I use a central line dressing change kit to change a dressing on a central line:	100%
13. Barriers to the use of a central line dressing change kit	None identified
14. I use sterile technique, using a sterile field, when performing dressing changes on all central lines.	100%
15. When disinfecting the skin around a central line site, what agent do you use?	100%
16. When cleansing the skin around a central line site, which technique do you use?	50%
17. For how many seconds do you cleanse the skin during site care?	43.4%
18. Which of the following most closely describes your practice related to labeling a central line dressing	100%
19. If/when you do label the dressing after application, which of the following information do you include on the label (choose all that apply)?	19.4%
20. I always document dressing changes in Cerner	100%
21. When do you document assessment of a central line site?	41.9%
22. I always document the date the next dressing change is due in Cerner	100%
23. I always document end cap changes in Cerner	96.8%
24. I always document tubing changes in Cerner	48.4%
25.I always document the date the next tubing change is due in Cerner	45.2%

26.I always document the date the next end cap change is due in Cerner	96.7%
27. I find central line IV tubing on the floor	51.6%
28. I always change the STAT lock device with each dressing change.	45.2%
29. Which of the following describes your practice best? (check all that apply)	80.6%
30. I flush unused ports of central lines (check all that apply)	32.3%
31. I always flush the central line before and after administering medications.	96.8%
32. I always obtain an order for Alteplase® whenever the central line flushes sluggishly, or does not have a blood return.	80%
33. I use/delegate the use of Chlorhexidine (CHG) bath wipes for my patients bath daily	74.2%
34.When I use Chlorhexidine (CHG) bath wipes for patient bathing:	45.2%
35.When not in use, I use the following practices when capping off intravenous tubing so it can be used again (check **all** that apply):	6.5%

APPENDIX F

Clinical Improvement Team Status Report Example

Aim Statement(s):
1) To perform a gap analysis between EBP , JCAHO National Patient Safety Goals and SH policy/procedure to align SCH policy/procedure with EBP guidelines
3) To identify structure/process issues related to central line maintenance from a nursing perspective
4) To establish unit-based work on Clinical Process Improvement Strategies to:
- implement quality and safety initiatives aimed at CLABSI reduction related to maintenance techniques
- establish unit-level accountability for ongoing monitoring and reporting of CLABSI-related issues

Maintenance Measures	Maintenance Target(s) Current	Target
	1.66 (though July)	

Improvement Measures	SCH Current (SPC Mean) (Date)	SCH Target(s) (Date)
CLABSI rates per 1,000 catheter days	0.44 (NALTH Benchmark)	0%

Improvement Interventions	March 12	April	May 12	June 12	July 12	Aug 12	Sept 12	Oct 12	Nov 12	Dec 12	Jan 13	Feb 13
Establish process for electronic harvesting of CL day data		S	S									
Staff survey development related to adherence to/understanding of and potential barriers to basic elements of CL maintenance based on current policy	S	M										
Evaluate Access RN practice related to central line insertion bundle and dressing standards	S	M										
Evaluate current policy/procedure related to central line maintenance? align with GR hospitals?	S	S	M									

Establish a central line maintenance bundle based on policy/procedure		S										
Review Alteplase utilization for LTACH	S	M										
Investigate powerplan functionality as it relates to catheter patency order set in LTACH		S	M									
Development and utilization of deep-dive tool for each CLABSI			M									
Review EBP related for additional risk-reduction strategies in the LTACH setting		S		M								
Review current CHG bathing product utilization and EBP		S	S	M								
Distribute and promote staff practice survey												
Staff survey analysis: healthcare practice versus policy/procedure					S							
Develop staff education content based on central line maintenance bundle and staff survey gap analysis						S						
Develop plan and timeline for staff education • RN • NT role					S							
Staff education							S					
Monitor post-intervention CLABSI rates							S					

S = Project Started	**M** = Milestone/Targeted Completion Date	On Schedule/Target	Behind Schedule	Need Assistance/ Intervention	Completed

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