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Evaluation of Central Line Insertion Bundle Practices in a Trauma/ Surgical Intensive Care Unit

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The document mentioned above has been reviewed and accepted by the student's advisor, on behalf of the advisory committee, and by the Assistant Dean for MSN and DNP Studies, on behalf of the program; we verify that this is the final, approved version of the student's DNP Project including all changes required by the advisory committee. The undersigned agree to abide by the statements above.

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Final DNP Practice Inquiry Project Report

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University of Kentucky

College of Nursing

Spring 2016

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DNP Practice Inquiry Project Report Introduction

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Central venous catheters, also known as central lines, serve an essential role in critical care settings across the globe. However, these lines put patients at an increased risk for hospital-acquired infections (HAI's) in the form of central line-associated bloodstream infections (CLABSI's). In 2009, 18,000 CLABSI's occurred in American intensive care units (ICU's) with an average treatment cost of $16,550 per infection. In addition to the monetary cost, CLABSI's complicate the hospital course and can prolong the hospital stay for up to three weeks (Joint Commission, 2012). This equates to nearly $300 million of healthcare dollars spent on treating preventable infections.

National initiatives to reduce CLABSI rates have been undertaken over recent years in the form of chlorhexidine bathing, central line maintenance bundles, and central line insertion bundles (Joint Commission, 2012). Studies have shown that ICU's with multiple preventative measures such as those aforementioned have nearly eliminated CLABSI (Berenholtz et al., 2004). Despite these advances, CLABSI's remain a costly and harmful problem in the United States. This could be due to improper knowledge of bundles at both an institution level and nursing level and/or lack of bundles adherence within ICU's among physicians and nurses.

At the University of Kentucky, chlorhexidine bathing, central line maintenance bundles, and central line insertion bundles are all instituted in efforts to reduce CLABSI rates to a target standardized infection ratio (SIR) of 0.54. Currently, the institution has a SIR of 0.6 which means there is a higher rate of CLABSI's than the target in the past year (Roberts, 2016). While chlorhexidine

bathing and central line maintenance bundle have been under routine observation throughout the enterprise, central line insertion bundle adherence has not been routinely monitored. Studies have shown that routine monitoring and reporting of performance rates among nursing staff result in increased bundle adherence and decreased CLABSI rates (Furuya, Dick, Perencevich, Pogorzelska, Goldmann, 2011). The Joint Commission (2012) also recommends routine monitoring of adherence with best practices in an effort to decrease CLABSI rates.

It is the focus of this practice inquiry project to evaluate nurse adherence to central line insertion bundles before and after implementation of routine reporting of adherence rates within an ICU. The evaluation will provide insight to the degree of adherence to best practices during central line insertion, if routine monitoring and reporting of adherence rates affects adherence, and help guide future quality improvement projects for CLABSI prevention. This practice inquiry project includes three manuscripts which each discuss central line insertion bundle practices and their effect on CLABSI's as well as strategies to improve bundle adherence and decrease CLABSI rates.

- Manuscript one is a literature review that was conducted to assess (1) the effect that implementation of a central line insertion bundle has on CLABSI rates in adult inpatients, and (2) if bundle adherence rates had an effect on CLABSI rates.
- Manuscript two is an executive summary of a bundle adherence program which discussed needs assessment, planning, and logic model which was used to develop a program to monitor and improve central line insertion bundle adherence rates.

- Manuscript three discusses the development, implementation, results, and evaluation of a routine monitoring and reporting intervention, and its impact on central line insertion bundle adherence rates in a trauma./surgical intensive care unit.

Manuscript 1

Effect of Central Line Insertion Bundle Implementation on CLABSI Rates in Adult Inpatients: Literature Review

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Abstract

Central venous catheters (CVC) are a common part of healthcare today and nearly three million are used in the United States annually. Unfortunately, CVCs are the leading cause of health-care associated bloodstream infections (Joint Commission, 2012) and in 2009, 18,000 CLABSI's occurred in American ICU's with each infection costing approximately $16,550 to treat (Joint Commission, 2012). Evidence-based strategies to prevent these infections include hand hygiene, aseptic technique, insertion bundles, maintenance bundles, and daily review of line necessity. All of these evidence-based interventions individually and together help reduce the risk of CLABSI (Joint Commission, 2012). A literature review was conducted to summarize research findings related to the effect that implementation of a central line insertion bundle has on CLABSI rates in adult inpatients. The review results showed that, without argument, central line insertion bundles decreased CLABSI rates. This evidence can be used to encourage central line insertion bundle utilization in order to allow clinicians to practice the most cost-effective, safe, and efficient patient care.

Effect of Central Line Insertion Bundle Implementation on CLABSI Rates in Adult Inpatients: Literature Review

Clinical (PICOT) Question

Do central line insertion bundles decrease CLABSI rates in adult inpatients?

Background and Significance

Central venous catheters (CVC) or central lines are a common part of healthcare today and nearly three million are used in the United States annually (Joint Commission, 2012). CVC's are used to administer intravenous fluids, blood products, medications, and as dialysis access. Unlike peripheral IV's, a CVC is inserted directly into a large vein and threaded into a central vein near the heart (WebMD, 2014). The benefits associated with CVC use also come with risks; CVCs are the leading cause of health-care associated bloodstream infections (Joint Commission, 2012). Therefore, in recent years it has been a popular topic of research and evidence-based practice implementation to improve central line insertion practices to reduce these infection rates.

Central-line associated bloodstream infections (CLABSI) complicate patients' hospital courses and are associated with increased rates of morbidity and mortality along with increased costs for the patient and provider. In 2009, there were approximately 18,000 CLABSI's in American ICU's with each infection costing approximately $16,550 to treat. Evidence-based strategies to prevent these infections include hand hygiene, aseptic technique, insertion bundles, maintenance bundles, and daily review of line necessity. All of these evidence-based interventions individually and together help reduce the risk of CLABSI (Joint Commission, 2012).

The purpose of this literature review is to summarize research findings related to the effect that implementation of a central line insertion bundle has on CLABSI rates in adult inpatients. A literature review of the evidence and research currently existing on this topic can help change and/or strengthen policy in acute care settings where central venous catheters are utilized. Ensuring that central line insertion is evidence-based allows clinicians to practice the most cost-effective, safe, and efficient patient care.

Search Protocol

The goal of this search was to conduct a comprehensive review of the literature regarding the effect that implementation of a central line insertion bundle has on CLABSI rates in adult inpatients. An additional goal of this review was to examine the monetary savings effect of central line insertion bundles for hospitals. The key research question addressed was as follows: Do central line insertion bundles decrease CLABSI rates in adult inpatients? The population included in the investigation was adult hospital inpatients having a central line inserted during his/her admission. The primary intervention/independent variable of interest in this review was the utilization of a central line insertion bundle which includes hand hygiene before insertion, use of full barrier precautions, chlorhexidine skin preparation, avoidance of femoral sites, and daily review of line necessity (IHI, 2014). The primary outcome of interest/dependent variable was rate of CLABSI. Secondary outcomes of interest were cost containment associated with central line insertion bundle utilization.

List of search terms (for systematic review) included central line insertion bundle OR central venous catheter insertion bundle; AND central line-associated bloodstream

infection OR CLABSI OR central line associated bacteremia OR healthcare-associated infections; AND guideline adherence. The literature search covered studies published between 1995 and 2014. The literature search covered a range of study types, including randomized controlled trials (RCTs), case-control studies, interrupted time series, cohort studies, and cross sectional studies. The following studies were excluded: studies in a language other than English, literature reviews, and meta-analyses. The following studies were included: studies conducted in Western countries such as Canada, the USA, the UK and Australia, international studies, including those conducted in developing countries, studies published in English, and peer-reviewed. PubMed and CINAHL were the databases utilized in this search.

Methods

PubMed (National Library of Medicine and National Institute of Health) and CINAHL databases were searched using the following key words: central line insertion bundle OR central venous catheter insertion bundle; AND central line-associated bloodstream infection OR CLABSI OR healthcare-associated infections; AND guideline adherence. The literature search was limited to studies published between 1995 and 2014. Studies excluded from the search were quantitative studies in a language other than English, literature reviews, and meta-analyses. Studies included in the search were studies conducted in western countries such as Canada, the USA, the UK and Australia, international studies, including those conducted in developing countries, studies published in English, and peer-reviewed studies.

Results from the searches were compared to identify and eliminate duplicate results. The abstracts of included studies were then reviewed for relevance to the topic. The studies deemed relevant to the chosen topic were then reviewed in full and their reference lists were also reviewed for additional studies not captured in the search. Searches of both databases with all search terms yielded approximately 100 unique results, 12 of which were deemed appropriate for the review of literature. Those deemed inappropriate included those that did not have quantitative outcomes and instead focused of provider feedback and those that also included central line maintenance bundles.

The selected studies were then reviewed for validity to the study topic which included methodology and reporting of findings in detail that was relevant to the current review topic. Several studies which examined central lines in children were excluded as well as central line maintenance bundles as focus was on insertion. Data on sample characteristics, research purpose, study design, methods, and key findings were extracted from five of the most applicable studies. The findings are shown in Tables A and B. All studies reviewed were graded using Melnyk's grading scale for evidence synthesis. Melnyk's levels of evidence synthesis range from Level I to Level VII with Level I evidence being the strongest systematic review or meta-analysis and Level VII being an expert opinion (Melnyk, 2010). All studies in this literature review were a level IV, a case-control or cohort study.

Evidence and Appraisal

After performing the literature review, it is clear that there is an abundance of research regarding central line insertion bundle's positive effect on CLABSI rates. Five

articles were deemed as appropriate for this literature review. All five studies were quantitative with four of the five being cohort studies as unfortunately no randomized-controlled trials fit the inclusion criteria of the search. The final study was a cross-sectional study that looked at several hospitals over the United States. Two of the studies were conducted in the United States while the other studies were conducted in Taiwan, New South Wales, or Saudi Arabia.

CLABSI Rates Per 1,000 Catheter Days

Of the five studies reviewed, all five showed that central line insertion bundles significantly reduced CLABSI rates per 1,000 catheter days. All of the central line insertion bundles studied included the same components of use of hand hygiene, maximum sterile barrier, chlorhexidine skin preparation, avoidance of femoral sites, and daily review of line necessity. The most notable difference in CLABSI rates occurred over eight years in the study by Walz et al (2013). In 2004, 5.86 CLABSI's per 1000 catheter days before bundle introduction. In 2012, 0.33 per 1000 catheter days after bundle introduction.

Bundle Adherence Rates

While not all studies looked at adherence rates, the cross-sectional study by Furuya et al. (2011), showed interesting results that only when bundle adherence was greater than 95% did CLABSI rates significantly decrease. However, this differed with two of the other studies which measured adherence rate and CLABSI's. The studies showed significant reduction in CLABSI with 55.2% adherence (Tang et al, 2014) and 87.6% adherence (Bukhari, 2014). Bundle adherence was not thoroughly monitored

throughout many of the studies and this would be a suggestion for further studies and to see adherence rate's effect on CLABSI.

Safe Dwell Time

One study reviewed also researched the "safe dwell time" recommended before and after central line insertion bundle implementation. Safe dwell time was defined as a lower than one in 100 chance of a line having infection on that day post-insertion. The safe dwell time before bundle implementation was seven days and after implementation, it increased to nine (McClaws, 2012). Unfortunately, this study included PICC lines along with central lines in its sample.

Implications for Practice

The literature review yielded results that encouraged evidence-based practice change. Most of the studies were cohort studies, but both study types examined proved to provide the research topic with valuable knowledge and insight into the clinical problem. The studies also correlated closely with each other and had similar results from different researchers and different sample groups. All of the literature reviewed showed that central line insertion bundle education and implementation significantly reduced the risk of CLABSI rates. These studies combined evidence-based practice into a bundle which showed that when used all together, effectively reduce preventable risks of CLABSI.

Implementation of a central line insertion bundle decreases CLABSI. However, why is this important? Simply put, it improves patient outcomes while reducing risks of inpatient mortality and morbidity that are associated with a device that should only improve care. This can also help decrease healthcare costs which not only benefits

healthcare consumers, but also healthcare providers and organizations as well. This subject is particularly important in the United States today with healthcare reform and the growing number of healthcare recipients and provider shortages.

Evidence-based practice is the cornerstone of healthcare today as it improves patient outcomes and increases efficiency in health care delivery systems. While utilization of a central line insertion bundle is currently done in the author's institution, this literature review can be used in other institutions as strong evidence for implementation of central line insertion bundles. These bundles, when used consistently, reduce CLABSI rates. However, adherence rates are not readily measured in studies. Therefore, a suggestion for future research is to measure adherence rates and how this can affect CLABSI rates. Perhaps encouragement of the bundle's importance and educating staff nurses about the importance of bundle adherence could increase the benefit of these central line insertion bundles.

Table A: Integrative Review of Literature

Complete Citation	Tang, H., Lin, H., Leung, P., Chuang, Y., Lai, C.. (2014). The impact of central line insertion bundle on central-line associated bloodstream infection. *BioMed Central.* doi: 10.1186/1471-2334-14-356.	Bukhari, S., Banjar, A., Baghdadi, S.,Baltow, B., Ashshi, A., Hussain, W.. (2014). Central line associated blood stream infection rate after intervention and comparing outcome with national healthcare safety network and international nosocomial infection control consortium data. *Ann Med Health Sci Res.* 4(5): 682–686. doi: 10.4103/2141-9248.141499.	McClaws, M., Burrell, A.. (2012). Zero risk for central line-associated bloodstream infection: are we there yet?. *Critical Care Medicine 40*(2). doi: 10.1097/CCM.0b013e318232e4f3.	Walz, J., Ellison, R., Mack, D., Flaherty, H., Mcllwaine, J., White, K., Landry, K., Baker, S., Heard, S.. (2013). The bundle "plus": The effect of a multidisciplinary team approach to eradicate central line-associated bloodstream infections. *Anesthesia and Analgesia 119* (5). Retrieved from PubMed.	Furuya, Y.,Dick, A., Perencevich, E., Pogorzelska,M., Goldmann, D.. (2011). Central line bundle implementation in US intensive care units and impact on bloodstream infections. *PLoSONE 6*(1). Retrieved from PubMed.
Study design	Cohort Study	Cohort Study	Cohort Study	Cohort Study	Cross-sectional study
Independent and dependent variables	IV: Utilization of CVC insertion bundle DV: Central line infection rate	IV: Utilization of CVC insertion bundle DV: Central line infection rate	IV: Utilization of CVC insertion bundle DV: Central line infection rate	IV: Utilization of CVC insertion bundle DV: Central line infection rate	IV: Utilization of CVC insertion bundle, surveillance methods DV: Central line infection rate
Sample and setting	687 CVC insertions on 481 patients in five adult ICUs at a regional teaching hospital (63 ICU beds),	97 patients in a 20 bed ICU in Saudi Arabia	New South Wales teaching hospital's adult ICU's	Patients in 8 ICU's at UMass Med Center requiring CVC's	415 ICU's in 250 U.S. hospitals with at least 500 device days per hospital

Methods and measures	Introduction of education, CVC insertion bundle, process and outcome surveillance.CLABSI per 1,000 catheter-days, CLABSI per 1,000 inpatient-days were measured.	Introduction of education, CVC insertion bundle, process and outcome surveillance. CLABSI per 1,000 catheter-days and bundle adherence were measured.	Introduction of a CVC insertion bundle process and outcome surveillance. Measures were CLABSI rates per 1,000 catheter days.	Implementation of a catheter bundle. CLABSI, catheter use, and microbiology were tracked.	Introduction of a CVC insertion bundle process and outcome surveillance. Measures were CLABSI rates per 1,000 catheter days.
Key Findings	Rates of CLABSI significantly declined from 1.65 per 1000 catheter-day during the pre-intervention period to 0.65 per 1000 catheter-day post-intervention period ($P = 0.039$). adherence with bundle was 55.2%.	CLABSI rates before intervention were 10.1 per 1000 catheter days. After intervention, 6.5 per 1000 catheter days. Bundle adherence rate was 87.6%.	CLABSI rate was 1.8 per 1000 catheter days before intervention and 0.9 per 1000 catheter days after. Increased safe dwell time to the first 9 days from 7 days.	There was a 92% reduction in CLABSIs after intervention. In 2004, 5.86 CLABSI's per 1000 catheter days. In 2012, 0.33 per 1000 catheter days.	CLABSI rate was 2.1 per 1,000 catheter days. Only when an ICU had a policy, surveillance and greater than 95% adherence was there significant CLABSI decrease.
Level of Evidence	1B: Strong recommendation, moderate level of evidence. This applies to most patients. Clinicians should follow this recommendation unless there is strong reason not to do so.	1B Strong recommendation, moderate level of evidence. This applies to most patients. Clinicians should follow this recommendation unless there is strong reason not to do so.	1B Strong recommendation, moderate level of evidence. This applies to most patients. Clinicians should follow this recommendation unless there is strong reason not to do so.	1B Strong recommendation, moderate level of evidence. This applies to most patients. Clinicians should follow this recommendation unless there is strong reason not to do so.	1C Strong recommendation, low-quality of evidence as this was a cross-sectional study. However, it is strongly recommended and applies to most patients.
Quality of Evidence: Critical	Strength: Discussed importance of surveillance	Strengths: Looked at bundle adherence rates as well as causative	Strengths: Introduced idea of	Strengths: Showed causative bacterial organisms,	Strengths: National study that showed ways of

Worth to Practice	Weakness: Low bundle adherence rate in the sample, short study time (10 months)	organisms of infection Weakness: Small sample size	"safe dwell time" Weakness: Included PICC lines in sample	intervention timeline Weakness: Used antibiotic-impregnated catheters, monetary incentive for managers for decreased CLABSIs.	implementing and monitoring bundles. Discussed adherence rates Weaknesses: Did not discuss pre-intervention CLABSI rates.

Table B: Review of Literature Findings

↑↓	1	2	3	4	5
CLABSI rate per 1,000 catheter days	**↓**	**↓**	**↓**	**↓**	**↓**
Catheter Indwelling Time	**NE**	**NE**	**↑**	**NE**	**NE**
Bundle Adherence rate	**---**	**---**	**NE**	**NE**	**↑**

LEGEND

1= Tang et al. (2014). 2= Bukhari et al. (2014). 3= McClaws et al. (2010). 4= Walz et al. (2013). 5= Furuya et al. (2011)

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Tang, H., Lin, H., Leung, P., Chuang, Y., Lai, C.. (2014). The impact of central line insertion bundle on central-line associated bloodstream infection. *BioMed Central*. doi: 10.1186/1471-2334-14-356.

Walz, J., Ellison, R., Mack, D., Flaherty, H., Mcllwaine, J., White, K., Landry, K., Baker, S., Heard, S.. (2013). The bundle "plus": The effect of a multidisciplinary team approach to eradicate central line-associated bloodstream infections. *Anesthesia and Analgesia 119* (5). Retrieved from PubMed.

Manuscript 2

Executive Summary of the Bundle Adherence Program Plan

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Executive Summary of the Bundle Adherence Program Plan

Analysis of the Problem

In nearly every American ICU, central venous catheters (CVC's) or central lines are an essential tool used to deliver medications, as dialysis access, and/or to obtain blood specimens for testing (Joint Commission, 2012). Central lines can save patients the pain and anxiety of multiple sticks for blood draws or to change infiltrated peripheral IV's. They offer both the patient and provider a more secure form of access to a central vein for a variety of medical purposes. These benefits associated with central venous access also are associated with increased risk of hospital-acquired bloodstream infections (Joint Commission, 2012). It is essential to patient safety that healthcare providers take specific, evidence-based interventions to reduce the risk of these harmful and often preventable infections.

Central-line associated bloodstream infections (CLABSI's) are considered a nursing-sensitive indicator (NSI). Nursing-sensitive indicators are directly affected by nursing processes and structure (American Nurses Association, 2014). The nurse is responsible for CLABSI's in that he/she cares for the central line daily and also oversees the insertion and maintenance of the line. While CLABSI's are greatly influenced by central line maintenance bundles, the focus of this program is the central line insertion bundle. Evidence-based strategies during insertion that have proven to reduce the risk of CLABSI include hand hygiene, use of full barrier precautions, use of chlorhexidine skin preparation, and avoidance of femoral sites (IHI, 2014).

Assessment of Program Need

National

Research has shown that the utilization of central line insertion bundles is an effective strategy for reducing CLABSI rates in inpatient populations (Walz et al., 2013). Furthermore, studies have shown increased adherence and routine monitoring of insertion bundle adherence decreased CLABSI rates further in these populations (Bukhari et al, 2014). Central line insertion bundles are the standard of care currently within U.S. hospitals (Joint Commission, 2012).

Local

At University of Kentucky Hospital, there is currently a central line insertion bundle that is in effect. The bundle is both a physical item as well as a sequence of actions that are expected on units where central line insertions take place. The physical component is known as the “Wildcat Bundle” and consists of sterile attire and patient drape needed for central line insertion as well as instruments for the insertion and dressing of the line apart from the line itself. Behavioral components of the bundle are carried out during a “Time Out” which is expected to be called prior to insertion of the central line. Calling a “Time Out” consists of ensuring that the correct procedure is being performed on the correct patient with use of proper positioning, sterile attire and drape, chlorhexidine skin antisepsis, hand hygiene, and avoidance of femoral sites. All of these components are evidence-based strategies to prevent CLABSI (Joint Commission, 2012). However, adherence to this bundle is not monitored and therefore it is unknown if the

bundle is actually useful in the reduction of CLABSI's within this organization or is regularly being implemented during central line insertions.

Program Definition and Boundaries

The proposed program is monitoring of central line insertion bundle adherence before and after nurse education regarding central line insertion bundles. In addition, the effect that monthly reporting of adherence rates has on insertion bundle adherence rates of nurses in a trauma/surgical ICU will also be monitored. The purpose and boundaries, mission, and vision are outlined below.

Goal Statement

To ensure that evidence-based practice bundles are being implemented routinely when inserting central venous catheters in adult (ages 18 or greater) inpatients in Tower 1 7th Floor (7-100) ICU at the University of Kentucky Chandler Medical Center (UKCMC) and that all staff nurses are educated regarding bundle importance and components.

Mission

Ensuring the routine adherence to central line insertion bundles allows the healthcare team to provide evidence-based patient care. This will streamline the healthcare procedure while improving patient outcomes by decreasing CLABSI rates and increasing efficiency in healthcare delivery.

Vision

UKCMC will have CLABSI rates lower than the national average (2.1 CLABSI's per 1,000 catheter days) along with 100% central line insertion bundle adherence for every central line inserted on adult inpatients (Joint Commission, 2012).

Objectives consistent with the goal, mission, and vision statements were then developed.

Objectives and Activities

1.) Analyze nurse adherence to practice guidelines outlined in the central line insertion bundle over an eight-month period beginning in June 2015 (four months before intervention in October and four months after)

- Activity: Conduct literature review regarding central line insertion bundle influence over CLABSI, assemble capstone committee, get IRB approval by September 2015, disseminate monthly posters (Figure F) in unit along with e-mail about importance of central line insertion bundle and time-out documentation, contact UK Hospital IT Department to pull all charts of 7-100 ICU patients that have a "Procedure Note" entered for central line insertion, review these charts to determine if "Time Out Note" (See Figure C for "Time Out Note" documentation for central line insertion on SCM charting software) was documented for every central line inserted, determine if there was improved adherence to bundle after intervention, write findings paper along with clinical recommendations for future research and practice change.

- Summative evaluation: Retrospective chart review pre and post-intervention on 7-100 ICU. Chart review will consist of “Time Out Note” documentation for each “Procedure Note” entered regarding central line insertion.

2.) Examine the association between central line insertion bundle adherence and incidence of CLABSI in patients located in Tower 1 7th Floor Trauma/Surgical ICU at UK Chandler Hospital during an eight-month period beginning in June 2015.

- Activity: Conduct literature review concerning central line insertion bundle influence over CLABSI, assemble capstone committee, get IRB approval by September 2015, disseminate monthly posters (Figure F) around unit along with e-mail about importance of central line insertion bundle and time-out documentation, contact UK Hospital IT Department to pull all charts of 7-100 ICU patients that have a “Procedure Note” entered for central line insertion, review these charts to determine if “Time Out Note” (See Figure C for “Time Out Note” documentation for central line insertion on SCM charting software) was documented for every central line inserted, determine if there was improved adherence to bundle after intervention, review for correlation between central line insertion bundle adherence and CLABSI occurrence with help from Infectious Disease Department write findings paper along with clinical recommendations for future research and practice change.
- Summative evaluation: Retrospective chart review pre and post-intervention on 7-100 ICU. Chart review will consist of “Time Out Note” documentation for each “Procedure Note” entered regarding central line insertion as well as CLABSI rates

for eight-month period and correlation, if any, between guideline adherence and CLABSI incidence.

The projected timeline for activities during the program can be seen in Table E.

Budget

Resources and budget for the project proposed are minimal, if any. See Table D for the budget. Resources needed to plan and implement the program include: capstone committee consisting of graduate-prepared nurses, nurse education members, implementation, and completion by nurses, educational flyers, e-mail to be disseminated to staff.

Logic Model

W.K. Kellogg's Logic Model was utilized in the development of the central line insertion bundle education and surveillance plan. Kellogg's Logic Model provides a systematic and visual way to present and share a program planner's understanding of the relationships among the resources that one has to operate a program, the activities that are planned, and the changes that are hoped to be achieved (W.K. Kellogg Foundation, 2014). The program's logic model uses graphical illustrations to map out the program's development process. The elements include resources, activities, outputs, outcomes, and impact. The logic model forces the planner to look at the program in a conceptually different way in order to realize weaknesses during the developmental stages (Kaplan and Garrett, 2004). The program's logic model graphs can be found in Table A.

Change Theory

The Iowa Model of Evidence-Based Practice was used to develop the program plan. This theory helps guide and develop evidence-based practice, the cornerstone of healthcare presently. The Iowa Model first identifies a problem, in this case central line-associated bloodstream infections in healthcare settings. Then, literature is reviewed and it is determined if there is adequate evidence to implement a practice change. If evidence is deemed adequate, change is implemented and evaluated (Dontje, 2007). A diagram of the model can be reviewed in Figure B.

The literature was reviewed and deemed adequate for a practice change. Central line insertion bundles are shown to decrease CLABSI rates and these are already implemented (Joint Commission, 2012). However, adherence is not monitored and with increased adherence to the bundle, there is correlation of decreased CLABSI rates (Bukhari et al, 2014). Therefore, it was decided to implement an educational program and monitor adherence rates in order to evaluate if routine monitoring and reporting of results improved bundle adherence.

Facilitators and Barriers

Potential barriers to this project include that nurses may not properly document time outs. For example, for a failed central line insertion attempt, a time out needs to be called and documented for this as well as for each individual attempt after this. Many times, a single time out is called for multiple attempts until a central line is successfully inserted. Another potential barrier to proper review of bundle adherence is the lack of proper materials i.e. “Wildcat Bundle” for central line insertion or functioning computer

charting software (downtimes). The final foreseen barrier is that documentation of the "time out" may not mean that the bundle adherence was properly maintained. Facilitators to the project include educational e-mails and posters for the staff RN's, proper stocking of necessary equipment, and a resource being accessible for questions and concerns.

Summary

Central venous catheters are an integral part of critical care in America. While these catheters serve a valuable role in healthcare today, they also carry the risk of debilitating infection, CLABSI. CLABSI's can be prevented largely in part by nursing practice and education. These practice measures include central line maintenance as well as central line insertion bundles. Adherence to central line insertion bundles is crucial to decreasing CLABSI rates. Unfortunately, adherence rates are currently not measured at UKCMC and it is unknown if these evidence-based strategies are being undertaken. Education regarding the importance of adhering to these insertion guidelines will be disseminated to ICU staff nurses and regular updates on adherence rates will be posted on the unit. These actions will be carried out in an effort to increase central line insertion bundle adherence to 95% by the end of four months in hopes that evidence-based nursing practice will decrease patient harm and sentinel events.

Table A: Kellogg's Logic Model

Program Implementation Graph

Resources	Activities	Outputs	Short and Long Term Outcomes	Impact
• Central line insertion, "Wildcat" bundles • Web-Based Training (WBT) concerning central line insertion bundles • Trauma Service managers • Leader that monitors bundle adherence • Educational Flyers • Infection Control Staff • Clinical Nurse Specialist • Sunrise Clinical Manager (SCM) computer charting	• Meet with CNS and infection control staff regarding development of nurse education WBT and flyers • Include central line insertion bundle education in quarterly WBT "blitz" • Educate staff via WBT • Disseminate flyers on unit • Send monthly report of bundle adherence • Conduct retrospective chart review of bundle adherence for all central lines inserted in 7-100 ICU.	• Bundle adherence rates • CLABSI rates • Nurse WBT education accomplished	• Increased bundle adherence • Increased knowledge about bundle components and importance of guideline adherence • Decreased CLABSI rates	• Guideline adherence will be monitored hospital-wide in all adult ICU's • Incidence of CLABSI will be below national averages. • Adherence to central line insertion bundle will be 100%

Program Planning

EXECUTIVE SUMMARY OF THE BUNDLE

Problem Or Issue
UK Hospital currently uses an evidence-based central line insertion bundle. However, adherence to this bundle is not monitored and therefore it is unknown if the bundle is actually useful in the reduction of CLABSI's within this organization or is regularly being implemented during central line insertions.

Community Needs/ Assets
Currently, UK Hospital does not monitor central line insertion bundle adherence. CLABSI is a nurse-sensitive indicator that increases hospital costs, patient mortality, and length of stay. In 2009, roughly 18,000 CLABSI's in the United States. Three million central lines used annually.

Desired Results (Outputs, Outcomes, and Impact)
Increased adherence with central line insertion bundle and decreased CLABSI rates Increased knowledge of importance of central line insertion bundle

Influential Factors
Emphasis on evidence-based practice to improve patient outcomes and efficacy of care. Evidence supports with increased bundle adherence, CLABSI rates decrease. Nursing administration committed to improving nurse-sensitive indicators to improve outcomes and decrease healthcare costs.

Strategies
Nurse education regarding central line insertion bundles via WBT, e-mail, and poster signage in units Routine (monthly) monitoring of central line insertion bundle adherence and report to the nurses on the unit Evaluation of outcomes to document effectiveness of education

Assumptions
Other institutions and studies have documented decreased CLABSI rates in association with increased adherence rates. The management and nurse educators will approve the education program.

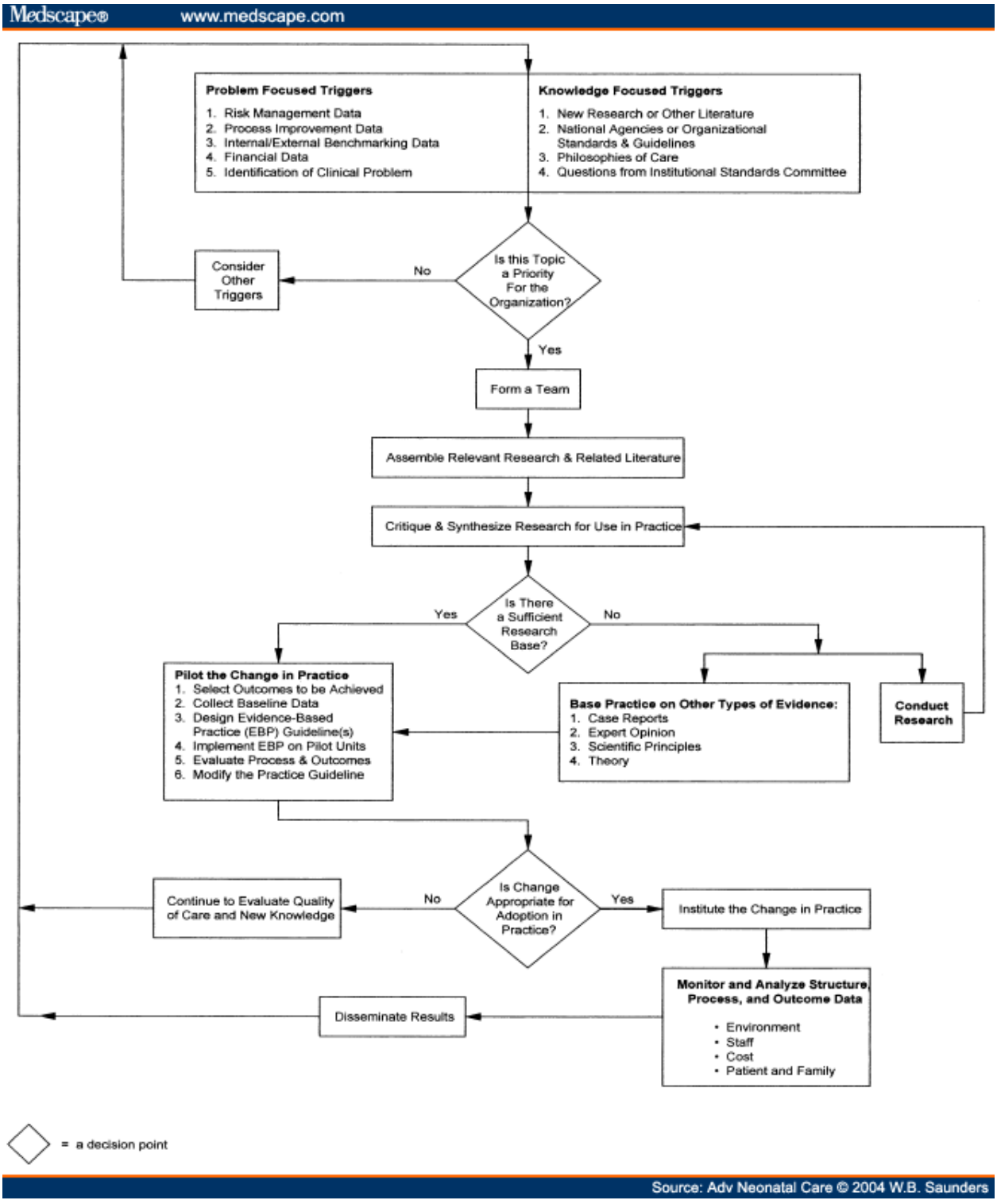
Evaluation Focus Area	**Audience**	**Question**	**Use**

Relationships • Who will make the decision regarding program initiation? • How will staff be educated on program/implementation? • How many instances of CLABSI were recorded before program implementation? After? • What is the average adherence rate before education implementation? After?	Administration	Are our participants satisfied with the program?	Measure the level of hospital support/satisfaction.
		How does the hospital undertake and support program evaluation?	Evaluation program promotion
	Patients	What is the program accomplishing?	Evaluation of patient satisfaction/program need
		How likely is a patient to get CLABSI in this hospital?	Evaluation of patient satisfaction/program need/ Quality assurance
	Doctors	Is the program reaching the target population?	Evaluation/program promotion
		Is this policy in fact needed at the hospital (avg. CLABSI rate, adherence rates)	Evaluation of program improvement, planning, and necessity
	Nurses	Are all of my coworkers educated about this?	Evaluation of program improvement and planning
		How can we improve the program?	Program improvements/staff training
Outcomes • Was there a reduction in CLABSI after the program was implemented? • Were there reduced costs in regards to CLABSI? • Were RNs pleased with the program implementation's effect on their knowledge?	Administration	Are the nurses satisfied with the education and monitoring?	Program evaluation/improvement
		Is this program increasing patient satisfaction?	Program improvement and evaluation
	Patients	Is this change decreasing my chance of getting CLABSI?	Program evaluation/quality assurance
		Is this change saving me money?	Cost/Saving benefit analysis for the patient
	Doctors	Is the program reducing CLABSI rates	Program evaluation/quality assurance
		Is this program saving the hospital money?	Cost/Saving benefit analysis for the provider
	Nurses	Does this policy decrease my workload?	Program evaluation/quality assurance

Indicators Development Table

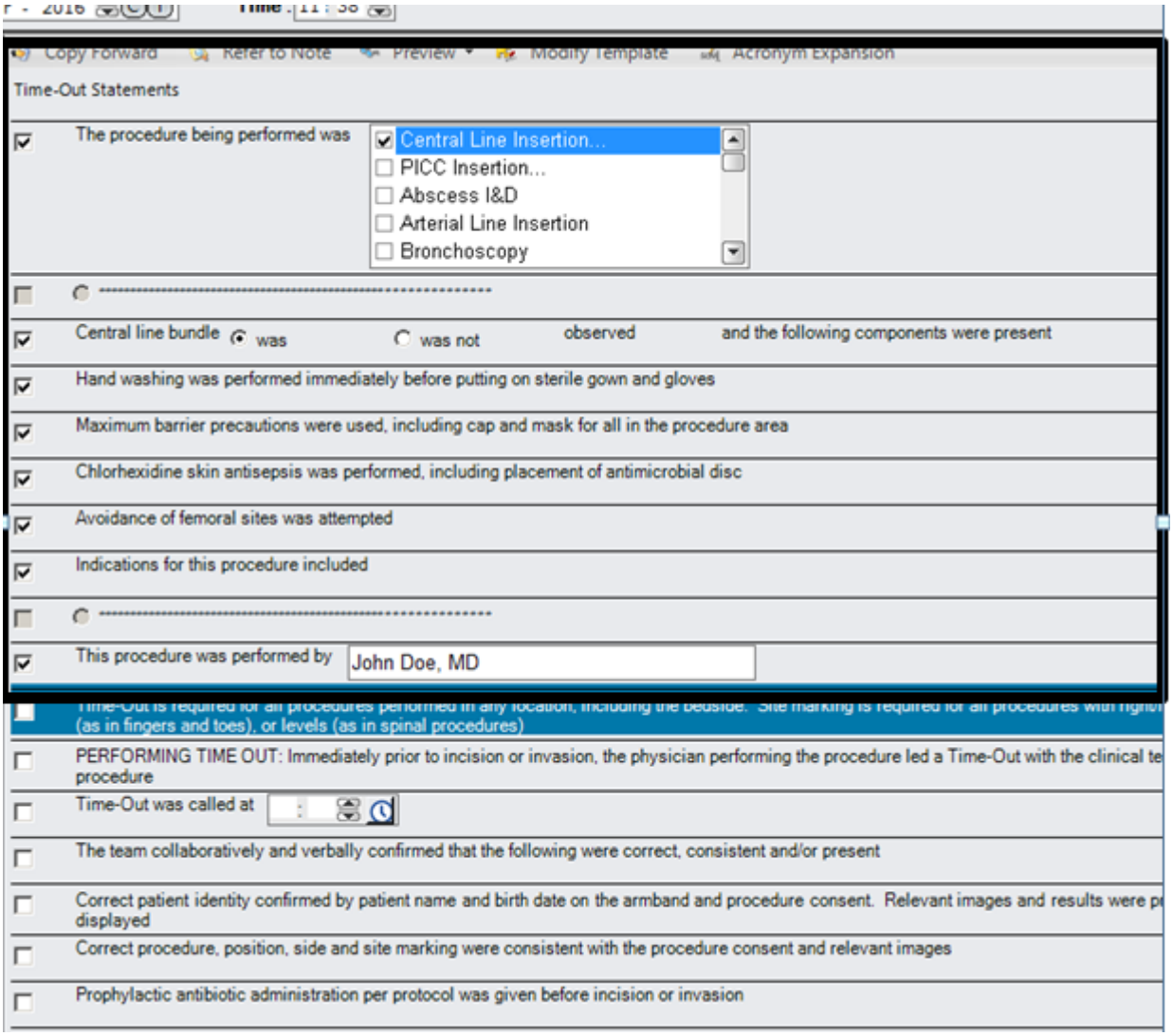
Focus Area	Question	Indicators	Technical Assistance Needed
Outcomes	Are clinicians satisfied with the program implementation?	• Clinician satisfaction surveys	Nurse satisfaction surveys via SurveyMonkey regarding central line insertion bundle practice
	How likely is a patient to get a CLABSI in this hospital?	• Inpatient CLABSI rates	Incident reporting of CLABSI in comparison to national rates
	Is this program in fact needed at the hospital?	• Average central line insertion bundle adherence • CLABSI rates	SCM charting of "time out note" for every "procedure note" entered for central lines inserted Incident reporting of CLABSI in comparison to national rates
Relationships	Is the program decreasing CLABSI rates?	• Inpatient CLABSI rates	SCM charting of "time out note" for every "procedure note" entered for central lines inserted Incident reporting of CLABSI in comparison to national rates
	Is this program increasing central line insertion bundle adherence?	• Average central line insertion bundle adherence	SCM charting of "time out note" for every "procedure note" entered for central lines inserted

Figure B: Iowa Model



(Titler et al. ,2001).

Figure C: Time Out Documentation for Central Line Insertion Bundle



Note: Contents within the box are components of the central line insertion bundle.

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Table D: Program Budget

Item	Estimated Cost
Payment of nurses to complete WBT regarding central line insertion bundle	To be included in Summer Education Blitz which compensation has yet to be determined
Educational Flyers to be dispersed in 7-100 ICU	$5.00
Central Line Insertion Bundles	Previously Purchased

Table E: Gantt Chart

Task	2014		2015												2016		
	Nov	Dec	Jan	Feb	Mar	Ap	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar
Conduct literature review																	
Assemble capstone committee																	
Obtain IRB Approval																	
WBT disseminated to 7-100 ICU nurses																	
Disseminate posters in 7-100 ICU																	
Contact UK Hospital IT Department to pull charts																	
Review Chart and determine if intervention achieved goals																	
Write findings paper with clinical and practice recommendations																	

Figure F: Sample Nursing Staff Flyer for Monthly Monitoring Report

Are You Calling a Time Out?

Time Out Notes need to be entered for EVERY patient EVERY time a Central Line is inserted!

This month 7-100 ICU entered a Time Out Note for 85% of central lines inserted. Our goal is 100%!

For questions or comments please contact Maggie Moore, RN at mamoor7@uky.edu

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Manuscript 3

Evaluation of Central Line Insertion Bundle Practices in a Trauma/Surgical Intensive Care Unit: A Chart Review

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Abstract

Purpose: To assess the effect of routine monthly monitoring and reporting of central line insertion bundle adherence on adherence rates within a trauma/surgical intensive care unit. Secondly, to assess if there is a correlation between central line insertion bundle adherence rates and central line-associated bloodstream infection rates.

Setting: 7-100 Trauma/Surgical Intensive Care Unit (ICU) at University of Kentucky (UK) Hospital. This is a 12 bed intensive care unit for adult trauma and surgical inpatients. UK Hospital is a university teaching hospital and level-one trauma center located in central Kentucky with 569 inpatient beds.

Population: The study population was 7-100 ICU patients that have a "Procedure Note" entered for central line insertion over an eight month period beginning in June 2015 and ending January 2016. The sub-population of this study was staff nurses on 7-100 ICU that provide direct patient care.

Exclusion Criteria: Patients under 18 years of age.

Inclusion Criteria: Critically-ill trauma/surgical inpatients with central lines inserted while listed as an inpatient of 7-100 ICU and who are ages 18 and older between June 2015 and January 2016.

Design and Methods: A retrospective biphasic study using electronic health records was used with pre-post routine monitoring and reporting intervention design. During the four month pre-intervention phase, central line insertion bundle adherence was monitored in the 7-100 ICU. Nurses were not aware of their adherence rates on the unit. During the

four month “post-intervention” period, monthly updates about central line insertion bundle adherence for the prior month were posted in the unit and sent to nursing staff via e-mail. Analysis of CLABSI rates during pre and post-intervention periods were also analyzed to determine if there was correlation with bundle adherence and CLABSI rates. **Results:** The pre-intervention period had 83 central line insertions, 84.34% with bundle adherence. The post-intervention period had 92 central line insertions, 88.04% with bundle adherence. There was no statistically significant association between pre and post-intervention periods, with a chi-square value = .51 and p=.48. There was a positive association among the post-intervention period when compared to the pre-intervention period. CLABSI rates decreased in the post-intervention phase and no CLABSI’s occurring during the post-intervention phase were associated with bundle non-adherence. **Conclusion:** CLABSI’s are largely preventable by evidence-based interventions such as the central line insertion bundle. This project implemented rapid-cycle change in an effort to maximize bundle adherence by routinely monitoring and reporting bundle adherence rates in an ICU. The project showed a trend that routine monitoring and reporting of adherence rates increases bundle adherence rates while decreasing CLABSI rates. This project can be used to implement, evaluate, and improve future quality improvement projects.

Evaluation of Central Line Insertion Bundle Practices in a Trauma/Surgical Intensive Care Unit: A Chart Review

Internationally, central lines or central venous catheters are a common device used to aid in the management of critical illness. Central lines differ from peripheral intravenous lines in that they have a longer catheter that is threaded into a central vessel terminating near the heart. Central lines offer a more secure form of access for administration of fluids and medications for patients who are both acutely and chronically ill (ATI, 2016). With this benefit comes the consequence of an increased risk of healthcare-associated infection in the form of central line-associated bloodstream infection (CLABSI). CLABSI's complicate patient admissions by increasing length of stay, mortality risk, and number of healthcare dollars spent (The Joint Commission, 2012).

It is estimated that 48% of patients admitted to the ICU will have a central line inserted at some point during their stay (The Leap Frog Group, 2011). Like most invasive procedures, this puts a patient at an increased risk for infection; the current U.S. CLABSI rate is 5.3 infections per 1,000 catheter days and data has shown that 18% of these patients with a CLABSI will die. This number is shocking when it is known that these are often preventable infections. These preventable infections cost patients and hospitals an average of $16,550 per infection (The Joint Commission, 2012). In response to this shocking problem, much research has been conducted and evidence-based strategies have been published to reduce the incidence of CLABSI.

CLABSI's are directly related to medical staff practices including the insertion and maintenance procedures of the central line. In the U.S., the current standard of care during insertion is the implementation of central line insertion bundles (IHI, 2014). These bundles consist of evidence-based interventions that should be utilized when inserting any central line. Currently, this practice is implemented at the University of Kentucky Chandler Medical Center, but adherence rates to the insertion bundle are not widely reported to nursing staff. Research has shown a direct correlation between CLABSI rates and bundle adherence rates (Bukhari et al., 2014). Furthermore, studies show that routine surveillance and reporting of bundle adherence rates had a significant impact on reduction of healthcare-associated infections in patients due to increased bundle adherence (Mathur et al.,2015). This research led to the basis of this project: the hypothesis that if central line insertion bundle adherence rates were routinely monitored and reported to nursing staff, then there would be increased bundle adherence rates and associated decrease in CLABSI rates. By researching current adherence rates in an ICU, improvement initiatives can be focused if adherence rates are found to be low. In addition to this, increasing awareness of the importance of guideline adherence can improve patient safety by increasing guideline adherence.

Description of Practice Inquiry Project

The practice inquiry project evaluated central line insertion bundle adherence and central line-associated bloodstream infection rates in a 12-bed trauma/surgical intensive care unit at the University of Kentucky Medical Center. Both of the aforementioned variables were evaluated before and after implementation of routine adherence monitoring and reporting to nursing staff.

Goals and Objectives

This is a practice improvement project to evaluate the adherence to central line insertion bundles in patients that have a central line inserted while in the Tower 1 7th floor (7-100) Trauma/Surgical ICU at University of Kentucky (UK) Hospital. This project has two specific aims:

1. To analyze nurse adherence to practice guidelines outlined in the central line insertion bundle over an eight month period beginning in June 2015 (four months before intervention of routine monitoring and reporting of bundle adherence and CLABSI incidence at monthly intervals, and four months after) through examination of documentation in electronic health records.
2. To examine if an association exists between central line insertion bundle adherence and incidence of CLABSI in the same set of patients, those receiving a central line while located in 7-100 Trauma/Surgical ICU at UK Hospital during an eight month period beginning in June 2015 through examination of electronic health records.

Methods

Human Subject and Research Approval Procedures

A project proposal was developed and approval was obtained from the investigator's practice inquiry committee. An expedited proposal was then submitted and subsequently approved by the hospital's Institutional Review Board (IRB; Appendix A). Patient consent was waived in accordance with IRB regulations (Appendix B). After IRB

approval, the Trauma/Surgical Services director and ICU nurse manager were informed of the project and their approval was obtained (Appendix C).

Project Setting

The project was conducted in 7-100 Trauma/Surgical ICU at UK Hospital. This is a 12 bed intensive care unit for adult trauma and surgical inpatients. UK Hospital is a university teaching hospital and a level-one trauma center located in central Kentucky with 569 inpatient beds.

Study Design and Selection of Participants

A retrospective study using electronic health records was used with pre-post routine monitoring and reporting intervention design. The study population inclusion criteria was critically-ill trauma/surgical inpatients with a “Procedure Note” documented for central lines insertion while listed as an inpatient of 7-100 ICU and who are ages 18 and older between June 2015 and January 2016.

During the four month pre-intervention phase, central line insertion bundle adherence was monitored in the 7-100 ICU. Nurses were not aware of their adherence rates on the unit. The hospital’s Information Technology Business Intelligence Department (IT) Department provided a generated Excel spreadsheet report of patient medical record numbers that met inclusion criteria. The audit yielded 70 unique central line insertions that met the inclusion criteria during this pre-intervention period. Some medical record numbers were repeated due to multiple central line insertions on the same patient. The medical record numbers associated with the 70 insertions were then assigned study numbers which were kept on a master list. The study numbers were used on data

collection tool spreadsheets and kept separately from the master list. For each study number provided by the IT Department, the presence of a “Time Out Note” for each “Procedure Note” for central line insertion was reviewed and documented on the data collection tool worksheets (Appendix D). The data collection tool consisted of study number, date of central line insertion, if the “Time Out Note” was completed in full, and any omissions from the “Time Out Note.”

During the four month “post-intervention” period, similar data collection was performed at monthly intervals. However, monthly updates about central line insertion bundle adherence for the prior month were posted in the unit (Appendix E) and sent to nursing staff via e-mail.

After all data was collected during the eight month study, medical record numbers of all CLABSI’s occurring during this study period were provided by the Infectious Disease Department. The medical records numbers of the CLABSI’s occurring on 7-100 ICU that were provided were then found on the master list for the corresponding study number. All medical record numbers provided had a “Procedure Note” for central line insertion and were able to be located on the master list. The investigator then reviewed the data collection tool worksheets to evaluate if a “Time Out Note” was documented for the central line insertion and mark this study number as resulting in a CLABSI. Analysis of CLABSI rates during pre and post-intervention periods were also analyzed to determine if there was correlation with bundle adherence and CLABSI rates.

Measures

Guideline adherence for the purpose of this project is considered documentation of a “Time Out Note” in its entirety in the presence of a “Procedure Note” for central line

insertion. The “Time Out Note” documentation includes all elements of central line insertion bundle which is as follows: ensuring that the correct procedure is being performed on the correct patient with use of proper positioning, sterile attire and drape, chlorhexidine skin antisepsis, hand hygiene, and avoidance of femoral sites. CLABSI was identified using the CDC algorithm by the Infectious Disease Department at UK. The CDC algorithm classifies a CLABSI as a lab-confirmed bloodstream infection where a central line was in place greater than two days prior to the blood draw and was in place on the day or day before the blood draw (CDC, 2015).

Data Analysis

Data analysis was performed using SPSS ® version 22.0 (SPSS Inc., Chicago, IL). Data were analyzed using descriptive and inferential statistics. The percentage of charts with complete “Time Out Note” documentation was compared between the pre and post-intervention time periods using the chi-square test of association. This study considered p- values less than 0.05 to be statistically significant for analysis.

Results

Guideline Adherence

Central line insertion bundle adherence was measured using the percentage central line insertion “Procedure Notes” that had a corresponding “Time Out Note” completed in its entirety. The pre-intervention period lasted from June 2015-September 2015 and the post-intervention period lasted from October 2015-January 2016. Central line insertion bundle adherence rates were measured monthly and can be seen in Figure A and Table A. The pre-intervention period had 83 central line insertions, 70 of which had a corresponding “Time Out Note.” For this period, guideline adherence was 84.34%. The

post-intervention period had 92 central line insertions, 81 of which had a corresponding "Time Out Note." For this period, guideline adherence was 88.04%.

CLABSI Rates

CLABSI's were also recorded during pre and post-intervention periods. During the pre-intervention period, three CLABSI's occurred from lines inserted in 7-100ICU. For these three CLABSI's, two were inserted with documented guideline adherence and one had no documented guideline adherence. During the post-intervention period, one CLABSI occurred from a line inserted in 7-100ICU. This CLABSI resulted from a central line that had documented guideline adherence (Table B). Due to small sample size of CLABSI's no statistical analysis could be performed, but descriptive analysis shows trends between the two periods.

Analysis

A chi-square test of association was performed to determine if an association existed between guideline adherence rates in the pre and post-intervention periods (Table C). The chi-square test revealed that the percentage of bundle adherence did not significantly differ between the pre and post- intervention periods. This was determined by a chi-square test statistic of .51 with an associated p-value of .48 which is greater than .05, making the analysis of association not statistically significant.

Analysis showed a positive association between the post-intervention period when compared to the pre-intervention period with an overall higher post-intervention bundle compliance score (88.04%) when compared to the pre-intervention period (84.34%). After data analysis it was found that when a bundle was documented as being used for

central line insertion, all bundle components were documented as being utilized 100% of the time.

Discussion

This project was designed to evaluate adherence to an evidence-based central line insertion bundle guideline which is aimed at preventing CLABSI. This was done in hopes to identify gaps in current practice while increasing guideline adherence and decreasing CLABSI rates. In previous studies, several risk factors for CLABSI have been identified during both the insertion phase and maintenance phase of central lines. During both of these phases, lack of adherence to evidence-based interventions can put the patient at an increased risk for CLABSI. Utilization of check-lists, like the "Time Out Note" in this project, has been shown to increase bundle adherence and reduce incidence of CLABSI (Simpson, Hawes, James, and Lee, 2014).

Much like previous research, this project showed a trend of increased bundle adherence when adherence rates were routinely monitored and reported to nurses in a trauma/surgical ICU. During the pre-intervention period, the average bundle adherence rate was 84.34% with monthly averages ranging from 77.27% to 92.31%. During the post-intervention period, the average bundle adherence rate was 88.04% with monthly averages ranging from 85.71% to 92%.

It can be seen that monthly averages were consistently higher during the post-intervention period, but an unusually high adherence rate in September during the pre-intervention period of 92.31% increased the pre-intervention period average. While it is unsure the exact reason as to why bundle adherence was higher during the month of

September as rates were looked at retrospectively, the only known factor to change monthly is the residents that rotate through the ICU. For the month of September, the residents on the ICU service may have been knowledgeable about “Time Out Note” expectations and reminded Registered Nurses (RN’s) to document them when they were inserting a central line. Lack of physician knowledge regarding the RN’s role in central line insertion and that bundle adherence was to be documented during insertion was noted by RN’s to the principal investigator during the study via email. Without intervention by the principal investigator, this issue was brought to the attention of physicians by the ICU management during the post- intervention phase in an effort to improve bundle adherence rates. This factor of physician knowledge regarding bundle insertion guidelines may be a possible gap in current practice and could be a contributing factor to lower bundle adherence. Increased awareness of bundle adherence expectations during the post-intervention phase addressed this practice gap.

The posters that were hung on the unit informing nursing of current bundle adherence rates also included a note to contact the principal investigator by e-mail with questions or concerns (Appendix E). RN’s contacted the principal investigator during the post-intervention phase with concerns such as lack of physician interaction as previously discussed as well as questions regarding if a particular time of day or shift was not calling “Time Out Notes” consistently. While this was not part of the data that was gathered, the RN’s voiced concern that “Time Out Notes” may not be documented during busy change-of-shift times. The RN’s that contacted the principal investigator voiced great concern over not being 100% adherent with bundle guidelines and stated that the routine reporting of their adherence rates on the unit helped to identify a need for improvement in

their current practice that they had been previously been unaware. This feedback from RN's in addition to the improved bundle adherence during the post-intervention phase showed that a current gap may have been a staff that was unaware of a need to improve in this area of practice.

The findings of this project show that the percentage of bundle adherence increased after the implementation of routine monitoring and reporting of bundle adherence rates on the unit. CLABSI rates were also analyzed during both periods and were shown to decrease after the implementation of routine monitoring and reporting. Three CLABSI's occurred from lines inserted in 7-100ICU during the pre-intervention phase and only one CLABSI occurred during the post-intervention phase. Of the CLABSI's occurring during the pre-intervention phase, one was from a central line that was inserted without documented guideline adherence. The single CLABSI occurring in the post-intervention phase did have documented insertion bundle guideline adherence. These numbers suggest that with increased bundle adherence rates there is a trend of reduction in CLABSI incidence. Decreasing the incidence of CLABSI saves healthcare dollars while avoiding mortality and increased lengths of stay (The Joint Commission, 2012).

Limitations

Limitations of this project include its small sample size and limited duration. A larger sample size over a longer time period may yield more accurate representation of bundle adherence practices within the unit. It would also be useful to gauge the association between bundle adherence rates and CLABSI rates within this population.

This project's retrospective chart review design represents self-reported documentation of tasks completed by nursing staff and must be considered when reviewing results. Actual central line insertions and bundle adherence observations were not conducted. This may have affected the project result's validity. Furthermore, the population included only patients in a single trauma/surgical ICU and may not be representative of bundle adherence practices within other units or other institutions.

Another limitation of the project was lack of physician communication and physician knowledge deficit regarding "Time Out" practices. While RN staff training includes education regarding the importance of "Time Out Note" documentation to document bundle adherence, physician residents do not always inform the RN that they are inserting a central line and therefore the RN is not present to document bundle adherence. It must also be noted that the principal investigator of this project was employed on this unit at the time of the project. Her affiliations with the nursing staff could have indirectly influenced nurses' willingness to enter bundle adherence documentation.

Implications for Practice

Implications for practice from this project include that communication among administrative staff and bedside caretakers is crucial in maintaining evidence-based patient initiatives. This communication involves several factors: bedside staff needs to be informed of the evidence and importance of guideline adherence, what their role is in maintaining the guideline, and their rate of guideline adherence or ways to improve for patients' best outcomes. Communication regarding the importance and if there is a gap in

the delivery or documentation of this evidence-based practice is critical for staff and ultimately patients. If the staff is unaware that they are falling short of patient safety goals, they may not make an effort to improve their practices.

Currently on the 7-100 ICU, clinical nurse experts and clinical nurse specialists are employed and utilized to monitor nurse-sensitive indicators and prevent hospital-acquired infections such as CLABSI and catheter-associated urinary tract infections (CAUTI). They routinely monitor and report central line maintenance bundle adherence within the unit and with knowledge from this study, could consider routinely monitoring and reporting the adherence of central line insertion bundle guidelines. The investigator spent approximately one hour per month reviewing charts to ensure that guideline adherence was documented for each central line inserted. This one extra hour of work, if employed by current hospital staff, could save the unit thousands of dollars in treating often preventable CLABSI's and prevent patient harm. It is suggested that this be implemented on the unit to increase staff performance and improve patient safety.

In addition to the implementation of routine monitoring and reporting of guideline adherence, routine competencies describing the importance of these guidelines should be regularly implemented. Both physicians and nursing staff need to be aware of bundle guidelines, their importance, and the staff's expectations in implementing these bundles. It should also be noted that central line bundles are not the only evidence-based bundles that are implemented within hospitals. Other bundles such as urinary catheter bundles and ventilator-associated pneumonia prevention bundles should also be routinely monitored and reported to nurses as this study and those similar have shown. Healthcare-associated infections can be prevented if evidence-based guidelines are routinely undertaken.

However, if guideline adherence is not known, then this is not a gap that can be identified and improved upon to ensure patient safety.

Implications for Future Quality Improvement Projects

Future projects could include a study designed over a longer period to evaluate bundle adherence. Real-time observation of bundle utilization may be beneficial in the identification of gaps in practice as well as receiving more provider input about their current knowledge regarding bundle guidelines and perceptions regarding current practice gaps. This could be implemented by staff that is currently employed on the unit such as charge nurses or clinical nurse specialists. The staff could perform checks of bundle utilization to ensure that all bundle components are being utilized as well as the nurse documenting a "Time Out Note." The staff needed for this is currently employed by the unit and implementation of this quality improvement project would have minimal time-expenditure.

Careful analysis of facilitators and barriers to adherence would be of benefit to future practice. Rapid-cycle change or the "Plan-Do-Study-Act" (PDSA) Model is commonly used in quality improvement to achieve this goal. The first step of this model is identification of the problem-in this case, non-adherence to central line insertion bundles and lack of routine monitoring of adherence rates. From this, the process is analyzed for weaknesses. A plan is then developed and implemented to target and improve a certain weakness. The quality improvement team will then analyze if their plan helped solve the identified problem or if further steps need to be taken to correct the problem (Minnesota Department of Health, 2016).

Using this model, an Ishikawa diagram was developed discussing possible factors in the utilization process that affect bundle adherence (Figure B). For example, collection of demographic data of patients and nursing staff associated with central line insertion bundle non-adherence may yield possible gaps in practice. An analysis of times of day and times in relation to when a patient is admitted to the unit where central line insertion bundles are missed could also aid in identifying gaps in practice. Furthermore, physician intervention could be included in future studies as they are team members involved in proper documentation of bundle adherence. All of these factors could be analyzed separately to see their effect on bundle utilization rates in a rapid-cycle change approach.

There are several widely varying factors that attribute to a CLABSI diagnosis. Each of these factors could be analyzed using the PDSA model. A suggestion for future projects would be to analyze the catheter dwell time on date of CLABSI diagnosis perhaps in addition to site, type, and lumen number of the central line involved. Specifically in the trauma patient population, gastrointestinal flora translocation is thought to be a causative factor in the diagnosis of CLABSI that could not be prevented by evidence-based bundles. A project that analyzed patient diagnosis and causative organism of CLABSI may yield how often this translocation occurs (Steinberg and Coffin, 2013). Furthermore, it is important to note that this approach to quality improvement can be applied to analyze the utilization of several other patient care bundles as it has been in this quality improvement project.

Conclusion

CLABSI's are an often preventable infection that carry serious consequences including increased length of stay, increased medical costs, and increased mortality rates. CLABSI's are largely preventable by nurse and physician-led interventions such as the central line insertion bundle that is recommended by the CDC, the Joint Commission, and the Institute for Healthcare Improvement. This evidence-based bundle is documented by nurses during central line insertions, but as this project and research suggests, adherence rates of evidence-based guidelines are not routinely monitored. This project implemented rapid-cycle change in an effort to maximize bundle adherence by routinely monitoring and reporting bundle adherence rates in an ICU. The project showed a trend that routine monitoring and reporting of adherence rates increases bundle adherence rates while decreasing CLABSI rates. This project can be used to implement, evaluate, and improve future quality improvement projects which aim to promote a healthcare environment that fosters patient safety while minimizing preventable complications.

7-100 ICU Central Line Insertion Guideline Adherence Rates (Table A)

Month	Bundle Used	Bundle NOT Used	Percent Adherence
June	16	4	80%
July	17	5	77.27%
August	13	2	86.67%
September	24	2	92.31%
Pre-Intervention	**70**	**13**	**84.34%**
October	25	4	86.21%
November	12	2	85.71%
December	21	3	87.5%
January	23	2	92%
Post-Intervention	**81**	**11**	**88.04%**

CLABSI Rates from 7-100ICU Central Lines (Table B)

Pre-Intervention	
Bundle Used	**Bundle Not Used**
2	1
Post-Intervention	
Bundle Used	**Bundle Not Used**
1	-

Chi-Square Analysis (Table C)

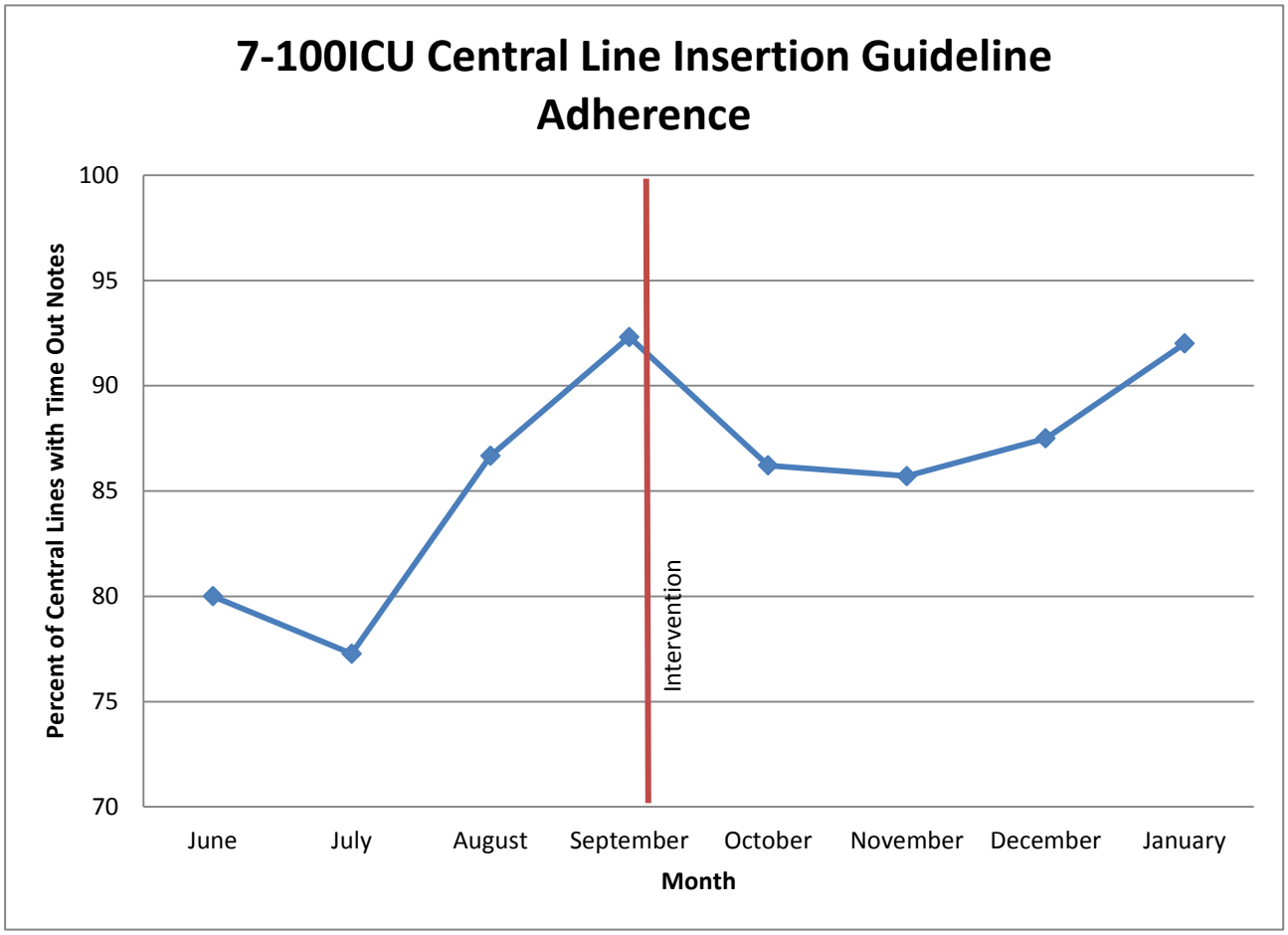
Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	.506[a]	1	.477		
Continuity Correction[b]	.242	1	.623		
Likelihood Ratio	.506	1	.477		
Fisher's Exact Test				.515	.311
N of Valid Cases	175				

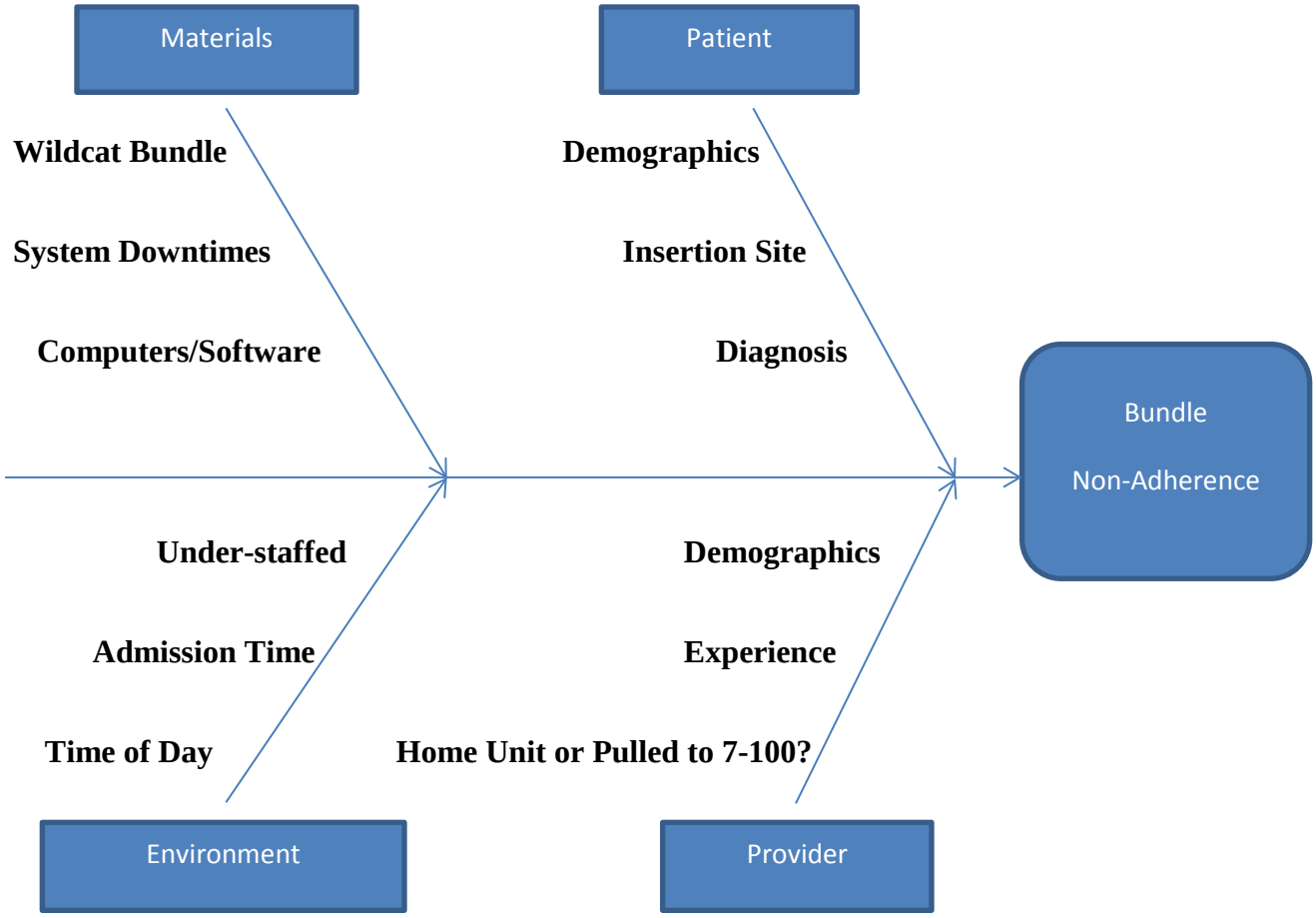
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.38.

b. Computed only for a 2x2 table

Monthly Central Line Insertion Guideline Adherence Rates (Figure A)



Bundle Utilization Process Ishikawa Diagram (Figure B)



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Practice Inquiry Project Report Conclusion

Margaret A. Moore BSN, RN

University of Kentucky

College of Nursing

Spring 2016

Practice Inquiry Project Report Conclusion

With American healthcare delivery models changing, it is now more important than ever to deliver quality healthcare as it affects reimbursement. Healthcare-associated infections, such as CLABSI, will not be reimbursed and are costly to healthcare providers. Luckily, these infections are often preventable and evidence-based practices are implemented as the standard of care to avoid these infections. Ensuring that staff is adhering to these evidence-based practices and identifying gaps in the execution of these guidelines can drive practice improvement initiatives as well as evaluate processes within healthcare systems. This practice improvement project was a focused analysis of methods to prevent CLABSI via central line insertion bundle utilization and identifying possible gaps in bundle utilization within a single trauma/surgical ICU.

Manuscript one reviewed the literature regarding central line insertion bundle utilization and its association with decreasing CLABSI rates. Healthcare regulatory agencies identify central line insertion bundles as the standard of care when inserting central lines in an effort to prevent CLABSI (IHI, 2012). Manuscript two discussed the development and planning of a practice improvement project evaluating central line insertion bundle adherence rates and an intervention aimed at improving these adherence rates in an effort to decrease CLABSI incidence. Finally, manuscript three outlined the project and results of evaluating central line insertion bundle practices within a trauma/surgical ICU before and after the intervention of routine monitoring and reporting of guideline adherence rates. The project showed a trend that routine monitoring and reporting of adherence rates increases bundle adherence rates while decreasing CLABSI

rates. This project can be used to implement, evaluate, and improve future quality improvement projects in an effort to improve healthcare delivery.

Appendix A: IRB Approval Letter

UK
UNIVERSITY OF
KENTUCKY

Office of Research Integrity
IRB, IACUC, RDRC
315 Kinkead Hall
Lexington, KY 40506-0057
859 257-9428
fax 859 257-8995
www.research.uky.edu/ori/

Initial Review

Approval Ends
September 9, 2016

IRB Number
15-0692-P6H

TO: Margaret Anne Moore, RN, BSN
Unassigned
College of Nursing
1114 Collins Lane
Frankfort, Kentucky 40601
PI phone #: (502)330-9356

FROM: Chairperson/Vice Chairperson
Medical Institutional Review Board (IRB)

SUBJECT: Approval of Protocol Number 15-0692-P6H

DATE: September 14, 2015

On September 11, 2015, the Medical Institutional Review Board approved your protocol entitled:

Evaluation of Central Line Insertion Bundle Practices in a Trauma/Surgical Intensive Care Unit: A Chart Review

Approval is effective from September 11, 2015 until September 9, 2016 and extends to any consent/assent form, cover letter, and/or phone script. If applicable, attached is the IRB approved consent/assent document(s) to be used when enrolling subjects. **[Note, subjects can only be enrolled using consent/assent forms which have a valid "IRB Approval" stamp unless special waiver has been obtained from the IRB.]** Prior to the end of this period, you will be sent a Continuation Review Report Form which must be completed and returned to the Office of Research Integrity so that the protocol can be reviewed and approved for the next period.

In implementing the research activities, you are responsible for complying with IRB decisions, conditions and requirements. The research procedures should be implemented as approved in the IRB protocol. It is the principal investigators responsibility to ensure any changes planned for the research are submitted for review and approval by the IRB prior to implementation. Protocol changes made without prior IRB approval to eliminate apparent hazards to the subject(s) should be reported in writing immediately to the IRB. Furthermore, discontinuing a study or completion of a study is considered a change in the protocol's status and therefore the IRB should be promptly notified in writing.

For information describing investigator responsibilities after obtaining IRB approval, download and read the document "PI Guidance to Responsibilities, Qualifications, Records and Documentation of Human Subjects Research" from the Office of Research Integrity's IRB Survival Handbook web page [http://www.research.uky.edu/ori/IRB-Survival-Handbook.html#PIresponsibilities]. Additional information regarding IRB review, federal regulations, and institutional policies may be found through ORI's web site [http://www.research.uky.edu/ori]. If you have questions, need additional information, or would like a paper copy of the above mentioned document, contact the Office of Research Integrity at (859) 257-9428.

Kristin Ashford, PhD, RN, APRN/jar
Chairperson/Vice Chairperson

Appendix B: IRB Waiver of Authorization

UK
UNIVERSITY OF
KENTUCKY

Office of Research Integrity
IRB, IACUC, RDRC
315 Kinkead Hall
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859 257-9428
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WAIVER OF AUTHORIZATION APPROVAL LETTER

In Compliance with section 164.512(i)(2)(iv)(C) of the HIPAA privacy rules, a representative from Medical IRB# ie has reviewed the use of Protected Health Information (PHI) by expedited review.

The expedited review was conducted in accordance with 45CFR 46.110 (b)(2), the minor changes provision.

The IRB protocol# 15-0692-P6H meets the criteria for the waiver of authorization according to 164.512(i)(2)(ii), which are as follows:

The use or disclosure of protected health information involves no more than a minimal risk to the privacy of the individual based on:

-An adequate plan to protect the identifiers from improper use/disclosure

-An adequate plan to destroy the identifiers at the earliest opportunity consistent with the research justification unless health, research or legal justifications to retain the identifiers.

-An adequate written assurance that the PHI will not be reused or disclosed to any other person unless required by law, authorized oversight or as permitted by the following subpart:

-the research could not practicably be conducted without the waiver or alteration;
and
-the research could not practicably be conducted without access to and use of the PHI.

IRB Chairman or Designee — Date: 9/11/15

An Equal Opportunity University

Appendix C: Approval Letter from Trauma/Surgical Services Director

UKHealthCare

July 6, 2015

To whom it may concern:

As the nursing director of the Trauma/Surgical Serviceline at the University of Kentucky HealthCare, I am happy to give my approval for Margaret Moore to complete her project on the bundle compliance adherence following a brief educational intervention in the Trauma ICU. My clinical partner Dr. Andrew Bernard is aware of and supports this project. We look forward to Margaret's work and are happy to assist any way we can. We feel confident this work will yield important clinical information. Please feel free to contact me with any further information you may need.

Sincerely

Lisa Fryman

Lisa Fryman, DNP, RN
Nursing Director Trauma/Surgical Services

Trauma/Surgical Services

University of Kentucky • Albert B. Chandler Hospital • 1000 South Limestone, A.07.251
Lexington, Kentucky 40536-0293 • Office: 859-323-2060 • Fax: 859-323-3867 • ukhealthcare.uky.edu

Appendix D: Data Collection Tool

Patient Study #_____

Date of Insertion: _____

Time Out Note Completed in Full: Yes No

Bundle Components Not Completed (if applicable):
_____
_____
_____

CLABSI Identified? Yes No

Appendix E: Sample Nursing Staff Flyer for Monthly Monitoring Report

Are You Calling a Time Out?

Time Out Notes need to be entered for EVERY patient EVERY time a Central Line is inserted!

This month 7-100 ICU entered a Time Out Note for 85% of central lines inserted. Our goal is 100%!

For questions or comments please contact Maggie Moore, RN at mamoor7@uky.edu

Practice Inquiry Project Report References

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