

Evidence-Based Practice Senior Paper

Alyssa Kleen

University of Wyoming

PICOT Question

In patients with central lines, how do central line care bundles compared to lack of care bundles, affect the occurrence of central line-associated bloodstream infections over the length of the patient's hospital stay?

Introduction

Central line-associated bloodstream infections are incredibly important to prevent for patient safety and healthcare costs. Central venous catheters are the most common cause of healthcare-associated bloodstream infections (Conley, 2016). Central line-associated bloodstream infections, commonly abbreviated as CLABSI, can be very dangerous to the patient. Many patients who have a central line are oncology patients, which means that they are more susceptible to infection. Therefore, a bloodstream infection could be deadly. In fact, CLABSI are fatal in 12 to 25% of cases (Harnage, 2012). CLABSI are not only hazardous to the patient, but also costly to the healthcare system. The average cost for a patient that has a central line infection is \$45,000. The length of hospital stay also increases when patients have central line-associated bloodstream infections, which increases healthcare cost. A CLABSI increases the ICU stay by an average of 2.4 days and increases the hospital stay by an average of 7.5 days (Hakko et al, 2015). Central line care bundles are one intervention that many healthcare facilities are implementing to reduce the rate of CLABSI. However, the implementation of central line care bundles must be supported by the nursing staff through compliance.

Definitions and Measurement

Before diving further into the research found, it is important to define two things: central line-associated bloodstream infections and care bundles. The Center for Disease Control and

Prevention defines CLABSI with two criteria. First, the patient must have a pathogen present in blood cultures which is not related from an infection at a different site. Second, the patient must exhibit one of the following symptoms: fever over 100.4, hypotension, chills, or a common skin contaminant from two or more blood cultures drawn on separate occasions (Hakko et al., 2015). CLABSI are most commonly measured as a rate of the number of confirmed infections per 1000 device days. This rate varies among different patient groups and healthcare settings (Hugill, 2017). Second, it is necessary to delineate a care bundle. A care bundle is defined as evidence-based interventions put into place for better quality care (Hakko et al., 2015).

Acquiring Research

All of the journal articles used for this paper were found through the Cumulative Index of Nursing and Allied Health Literature (CINAHL). Various combinations of keywords were used to find pertinent research. These keywords included central line-associated bloodstream infections, nursing interventions, and prevention. Filters were also applied to narrow the search based on year range, language, and peer-review. The articles included in the final research project are credible, clinically significant, and applicable. Credibility was assessed by peer review and type of journal. Clinical significance was evaluated in the articles through statistical data such as confidence intervals, p-values, and t-tests. Applicability was addressed with implications of how to decrease central line-associated bloodstream infections.

Literature Review- Central Line Care Bundles

Different hospitals have varying central line care bundles. While the form and structure may be different, most central line care bundles address the same common areas and themes. These include the decision to insert a central line, skin antisepsis, hand hygiene, dressing of the

device, decision of when to remove the central line, monitoring of the line, and overseeing staff compliance (Hugill, 2017). To best understand the research, one must look at each article's description of the central line care bundle and the outcomes associated with it.

Hakko et al. (2015) discussed a central line care bundle that was introduced in a medical-surgical ICU in Turkey. This particular care bundle included four elements and other infection control precautions. The first element was removal of lines placed in the emergency room within twenty-four hours. The second was the use of aseptic technique and maximum barrier precautions, such as sterile gown and gloves, surgical scrub, and masks. Third, total parental nutrition (TPN) must have a dedicated lumen. Lastly, the TPN infusion sets needed to be changed daily. Other infection control measures that were encouraged in this care bundle were hand hygiene, avoiding femoral site catheter placement, daily review of central lines, and covering the catheter insertion site with a transparent dressing. The outcomes of this study showed a statistically strong negative correlation between care bundle compliance rates and CLABSI rates over the course of three years as demonstrated by the graph below.

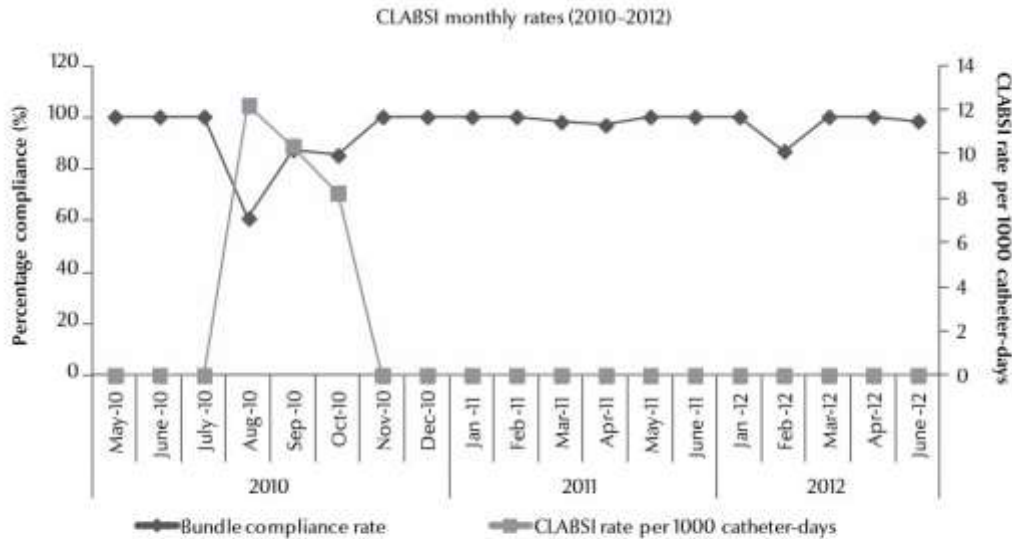


Figure 3 Correlation between central-line-associated bloodstream infection rates and compliance rates with the central-line bundle of care at Anadolu medical centre, monthly in the post-intervention period (Spearman correlation, $P < 0.001$)

(Hakko et al, 2015 pg.295)

The second study that researches the effectiveness of care bundles in preventing CLABSI was done by Susanne Conley (2016). The Institute for Healthcare Improvement (IHI) first introduced central line care bundles in 2001. This has shown a 58% reduction in CLABSI rates. The Center for Disease Control created a guideline for central line care bundles. These guidelines emphasize complying with hand hygiene, scrubbing the access port with an antiseptic, accessing catheters only with sterile devices, replacing wet dressings, and using aseptic technique to perform dressing changes. This study concluded that these guidelines are associated with measurable improvement in patient outcomes. Furthermore, the rate of CLABSI went down from 1.39 (out of 1,000 central lines) to 0.88 in one year.

The third study that focuses on CLABSI prevention introduces the “I-CARE” bundle developed in Australia. This care bundle is an acronym which helps staff remember it, increasing the compliance of the bundle. “I-CARE” stands for IV device management, Cleaning of hands, Accessing the device, Reviewing the need for the device, and Education of the staff

and patients about preventing infection. In a meta-analysis of 59 studies, CLABSI rates were reduced by 56% using a central line care bundle (Hugill, 2017).

The last study that focuses on specific central line care bundles was done by Sophie Harnage at Sutter Roseville Medical Center (SRMC) in California. Out of all central line care bundles, SRMC's was most extensive and consists of seven primary elements. The first element is a maximum barrier precaution kit that contains a cap, mask, gown, and chlorhexidine gluconate (CHG) skin preparation. Second, central lines must be placed by using ultrasound. Third, is a central line dressing change kit which includes CHG skin prep, securement device, and the BIOPATCH protective disc. Fourth, a zero-displacement IV connector must be used. Previously, SRMC used a positive pressure connector which requires a different clamping sequence than a negative pressure connector. This can be confusing to many nurses, so the zero-displacement connector is more effective because it doesn't require a clamping sequence. Fifth, is consistent IV connector disinfection or "scrub the hub". Sixth, is a standardized catheter flushing protocol. The PICC team flushes central lines with 10ml of normal saline every eight hours and 20 ml after a blood draw. This is done to prevent clotting and establish regular periods of evaluating central line patency. Lastly, the SRMC care bundle requires daily monitoring of all central lines. Since SRMC implemented this specific central line care bundle, there have been zero patients who have had a CLABSI attributable to a peripherally inserted central catheter in seven years (Harnage, 2012).

Literature Review- Registered Nurse Compliance

While researching the implementation and outcomes of central line care bundles, there was a common theme in the literature. This theme was that nurses must be educated and comply with these care bundles, otherwise the rates of CLABSI will not decrease as significantly. In the

Clinical Journal of Oncology Nursing, Susanne Conley describes the implementation of nurse education for central line care bundles. This was a mandatory 90-minute training session for the nursing staff which included a before and after test, skill stations, and a question and answer session. Furthermore, peer-to-peer audits were conducted monthly to assess staff compliance with the care bundle (Conley, 2016).

Evanovich et al. (2015) also described the importance of nurse compliance when implementing central care line bundles on oncology floors. In order to increase nurse compliance with implementation of a central care line bundle, a checklist was created by the nursing staff. The oncology central line management checklist was created to use during nurse-to-nurse bedside report. This checklist, shown below, was a great way to increase compliance of central line care bundles because it was staff driven and created. The results of the care bundle and central line management checklist combined showed a 50% reduction in CLABSI from 2011 to 2013, improvement in patient outcomes, and increased staff satisfaction.

Patient name: _____ Room #: _____

Month:								
TLC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
PICC	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Mediport	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Date of insertion								
Is it still needed? Y/N								
Date of last dressing change								
Condition (see key below)								
Line sutured in place? Y/N								
Green Curosa® port protectors on all ports? Y/N								
Blood at the hub? Y/N								
Did the patient shower today? Y/N								
Did the patient have a complete bath today? Y/N								
Site wet after hygiene? Y/N								
Linen changed? Y/N								
Neutropenic? Y/N								
Fever? Y/N								
Date of last blood culture								
Antibiotics? Y/N								

1—Red	3—Wet	5—Pus	7—Leaking	9—Irritated
2—Swollen	4—Bloody	6—Clot	8—Skin tears	10—N/A

PICC—peripherally inserted central catheter, TLC—triple-lumen catheter

FIGURE 2. Oncology Central Line Infection Prevention Checklist
 Note: Courtesy of the Robert Wood Johnson University Hospital. Reprinted with permission.

(Evanovich et al., 2015 pg.657)

It is important to recognize that there can be barriers to compliance of a central line care bundle. Some of these barriers include staff’s lack of awareness or lack of agreement with the implementation. Therefore, it is incredibly important that all staff is educated and observed for compliance of a central line care bundle (Hakko et al., 2015).

Limitations in Evidence

As with all research, there are some limitations in the evidence provided. Research about individual interventions to reduce the rate of CLABSI is diverse. It can be very situational to particular settings or patient groups, which makes the broader interpretation of evidence difficult. One study looked at the reported incidence of CLABSI in three intensive care units. The study found that the rate of CLABSI could be reduced by 19 to 45% by aligning definitions and ways to confirm infection. This shows a limitation in evidence regarding reported rates of CLABSI (Hugill, 2017).

One study included in the literature review focuses on central line care bundles, but also largely emphasizes the use of a PICC team. The PICC team assists physicians to place central lines, does weekly dressing changes, monitors the central lines, and discontinues the line. This helps ensure compliance with the central line care bundle specifically related to pre-insertion preparation, dressings, BIOPATCH, and accurate documentation. Some healthcare facilities have discontinued PICC teams in an effort to decrease cost (Harnage, 2012). Therefore, this study may not be as applicable to those locations. However, it does show that the PICC team increases compliance of the central line care bundle which decreases CLABSI rates.

Clinical Applicability

This research is incredibly applicable to the clinical setting. For my senior nursing capstone, I was placed on the oncology unit at Cheyenne Regional Medical Center (CRMC). On this unit, many of the patients have central lines. Therefore, I became interested in how to best prevent central line-associated bloodstream infections. Although this is not necessarily a problem on the oncology unit at CRMC, it is something that the nurses are constantly aware of.

In fact, the oncology nurse manager is also the lead for the CLABSI work group at CRMC. As mentioned earlier, we need to be especially cautious on the oncology unit due to the high number of patients there with a central line and depressed immune system. CRMC does do some of the interventions addressed in the central line care bundles. Examples of this include using the BIOPATCH, securing the device, and employing a PICC team. However, CRMC could implement other aspects of central line care bundles such as a central line management checklist and increased use of the PICC team in monitoring and changing the dressings of central lines. The oncology nurse manager thought she might teach the “I-CARE” bundle to the oncology nursing staff as part of their education to decrease CLABSI.

Nurses need to be the most aware of interventions to prevent CLABSI, because they will likely be the ones implementing these interventions. Therefore, this research is incredibly applicable to the nursing profession. As the medical field changes, so will the evidence-based interventions present in a central line care bundle. It is necessary for nurses to be aware of the most current research regarding this topic. This literature review shows how important it is to effectively educate the nursing staff to most significantly decrease CLABSI rates.

Conclusion

In conclusion, central line care bundles decrease the occurrence of central line-associated bloodstream infections over the length of a patient’s hospital stay. Furthermore, nursing staff compliance with central line care bundles is critical to decrease the rate of CLABSI. Nursing staff education is necessary to promote compliance of central line care bundles, especially as components of the care bundles change over time. Central line-associated bloodstream infections can be fatal and are costly to the healthcare system. All healthcare professionals need to be aware of interventions to decrease the rate of CLABSIs.

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