

**CENTRAL LINE-ASSOCIATED BLOODSTREAM  
INFECTION REDUCTION: USING EVIDENCE TO  
INFORM PRACTICE**

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By

Christopher Cohen

Dr. Nancy Ebersole PhD, RN  
Faculty Advisor  
School of Nursing

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## **Abstract**

Central line-associated bloodstream infections or CLABSIs cause major life-threatening illnesses that have a high prevalence rate within our healthcare industry today. CLABSIs not only cause potentially fatal consequences for patients, but also cost hospitals a substantial amount of money to treat these infections. CLABSIs can result from not only the insertion of the central line from a healthcare provider, but also in the central line care by nursing staff. Therefore, hospitals have implemented standardized “bundles” for central lines to try to reduce the overall amount of CLABSIs. However, many hospitals are not seeing a significant decrease in the number of infections from the time that they adopted these practices.

A systematic review of literature was conducted using the CINAHL Plus database to investigate the efforts of trying to reduce the overall occurrence of CLABSIs and the success rates of these practices. Major themes include the implementation of bundles for central lines are not being consistently applied by those working at the bedside. Inconsistency with the implementation of bundles of care for central lines can be attributed to incomplete knowledge of what needs to be done; while the presence of written policies do not ensure policy compliance. Nurses are at the frontline to ensure patient safety and reducing patient risk for acquiring CLABSIs. It is important that nurses identify the barriers to compliance and collaborate to create effective strategies to promote patient safety and lower the overall occurrence of these life-threatening infections.

## Table of Contents

Abstract.....	i
Table of Contents.....	ii
Introduction.....	1
Background.....	2
Methods.....	3
Results.....	5
Discussion.....	9
Limitations.....	10
Conclusion.....	11
References.....	12



## **Central Line-Associated Bloodstream Infection Reduction: Using Evidence to Inform Practice**

Many patients that are hospitalized require intravenous infusions. Peripheral IVs allow healthcare providers to have access to and administer medication directly into a vein. A peripheral IV is a preferred access site than a central line because of the decreased risk of infection. Sometimes peripheral IVs can be contraindicated because of the high risk of infiltration of potentially damaging medications at the site. Sometimes the medication that needs to be infused can be damaging to the vein or the surrounding tissues so a central line would be more appropriate. A central line allows healthcare professionals to infuse multiple medications through one centrally accessed site which carries a minimal risk to damage to the surrounding tissues by high-risk medications. However, there are disadvantages to people having a central line than a peripheral IV. For example, peripheral IVs are easily changed at the sign of infection. Since central lines are intended to be used over a longer period, it is more complicated to treat them when infection is suspected. If an infection is present and the patient has a fever, the provider must “deline” the patient. This involves removing the central line and other access the patient may have. As a result, the patient will have to have another “clean” central line placed in order to be able to infuse these highly damaging medications.

It is the nurse’s duty to ensure patient safety and prevent future illness. It is the nurse’s responsibility when caring for a patient with a central line to monitor both for signs of infection as well as prevent infections from occurring. When central lines are infected, they present bacteria into central circulation which can result in more serious complications such as sepsis. Given that there is a risk for patients acquiring central line-

associated bloodstream infections, we need to use best practices that allow nurses to provide safe and effective care.

### **Background**

Many medications cannot be infused through peripheral veins such as high dose pressors or chemotherapy. These medications can destroy the small vein and can cause damage to the surrounding tissues. Therefore, a central line allows for access to infuse these high-risk medications to a large blood vessel. A central line is an extender catheter that is inserted into a major vein in a patient's body and ends in a large blood vessel near the heart. This allows healthcare professionals to infuse high-risk medications such as pressors, chemotherapy, or other vesicant medications to a centrally located access site. An example of a vesicant medication is chemotherapy or a vasopressor that can be damaging to the vein or surrounding tissues if infused peripherally.

Central line-associated bloodstream infections (CLABSIs) are the most prominent and deadly nosocomial infections in the United States. According to the CDC, there were approximately 30,000 CLABSIs reported in 2018 with a mortality rate between 12-25% (Powell, 2018). Not only do these infections pose a life-threatening danger to patients, but they also cost hospitals millions of dollars each year to treat. It is estimated that a single case of CLABSI costs hospitals around \$70,696 (Powell, 2018).

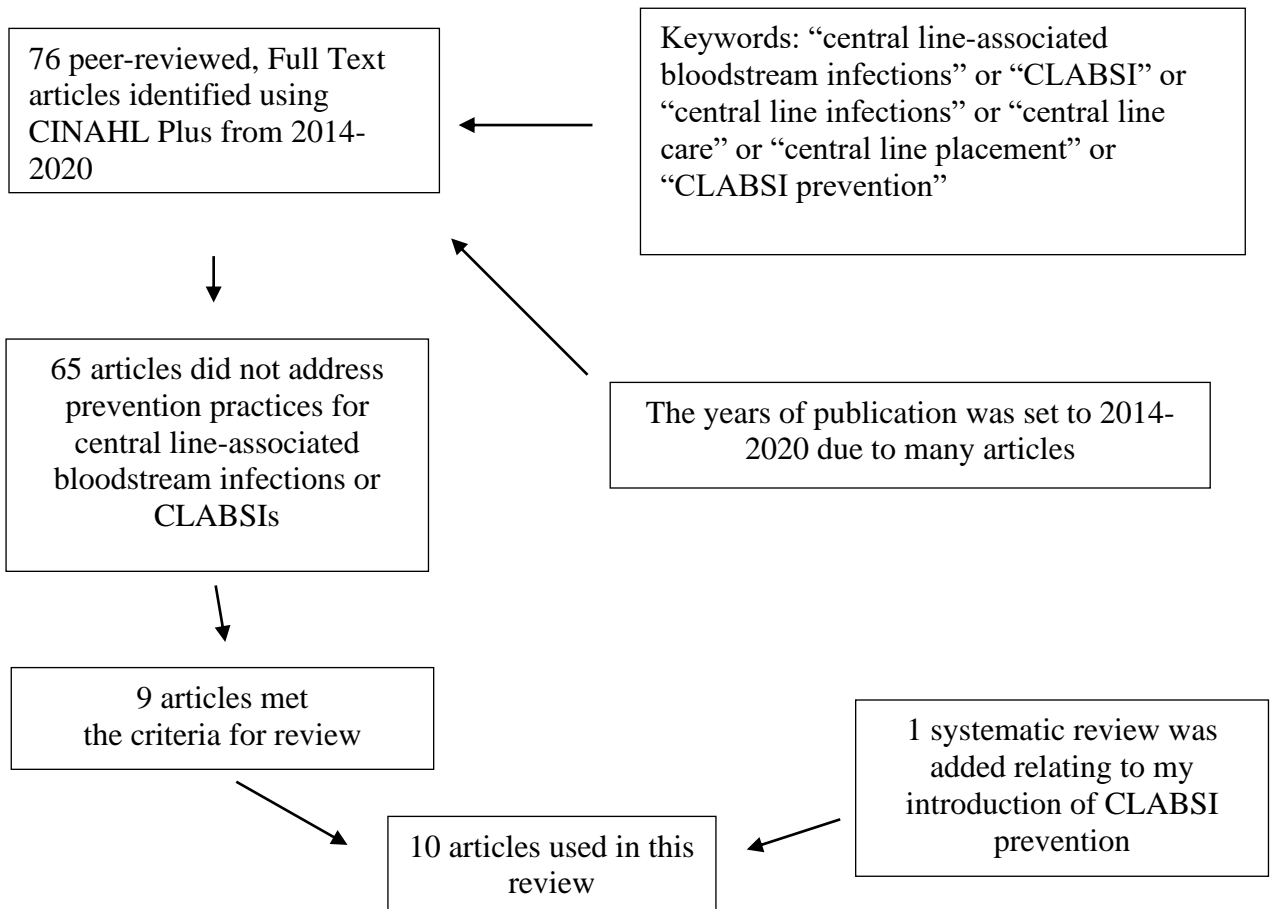
To combat this deadly infection, hospitals have been implementing bundles of care for central lines. Bundles of care for central lines include evidence-based protocols that are implemented by hospital administration to decrease the rate of CLABSIs in their hospital. Research has shown that there has been a significant decrease in the rate of infection with this implementation. Even though there are several other methods of

decreasing the rate of infection from central lines, bundles of care for central lines have been the most effective (Park et al., 2014). It is ultimately the nurse's responsibility caring for the central line to prevent CLABSIs from occurring. These bundles of care give nurses guidance with policies and procedures for central lines such as when central line dressings need to be changed, indication for a dressing change, and methods of how to properly clean the access site when doing a dressing change. Many nurses have different ways of caring for central lines that may not be the best practice. Therefore, by having bundles of care for central lines, nurses will have a standardized evidence-based protocol in order to prevent CLABSIs from occurring. Research has also shown that just because these protocols exist doesn't necessarily mean that every nurse knows of the protocol or are implementing these changes (Stone et al., 2014). The purpose of this literature review is to identify the barriers to why there is decreased staff compliance to bundles of care for central lines.

### **Methods**

A systematic review of the literature was conducted for the best prevention strategies for patients acquiring central line-associated bloodstream infections (CLABSIs). The researched articles were within the years of 2014 to 2020 to identify the most recent findings. Inclusion criteria comprised of articles written in English, peer-reviewed, and in full text. The database that was utilized was CINHAL Plus with Full Text. A Boolean search was conducted using following terms: central line-associated bloodstream infections, CLABSI, central line infections, central line care, central line placement, and CLABSI prevention. See Figure 1.

**Figure 1 Journal Article Identification: Prevention Strategies for Patients Acquiring Central Line-Associated Bloodstream Infections (CLABSI)**





## Results

Ten studies met the criteria of identifying the best prevention strategies for patients acquiring central line-associated bloodstream infections. Within the ten articles, three major themes were identified; the implementation of bundles for central lines are not being consistently applied by those working at the bedside; inconsistency with the implementation of bundles of care for central lines can be attributed to incomplete knowledge of what needs to be done; and the presence of written policies does not ensure policy compliance.

### **The Implementation of Bundles for Central Lines Are Not Being Consistently Applied by Those Working at the Bedside.**

Researchers have found evidence of decreased nursing compliance to policies regarding the bundles of care for central lines. Decreased nursing compliance leads to an increased occurrence of CLABSIs in the hospital setting (Helder, 2020; McAlearney, 2014; Zachariah, 2014; Stone, 2014; Furuya, 2017; Ormsby, 2019; Paquet, 2019).

Bundles of care for central lines have been proven to be the most effective at preventing central line-associated bloodstream infections (Stone, 2014). Many hospitals have implemented bundles of care in their policies for bedside staff to implement when caring for a central line. Therefore, when there is lower compliance to these policies, increased occurrences of CLABSIs will occur. For hospitals that implemented policies for bundles of care for central lines, they only saw up to a 69% adherence to the policy (Furuya, 2017). This decreased level of compliance from nursing staff has resulted in CLABSI rates to stay at an equilibrium, not increasing or decreasing. However, this is not

the desired outcome for implementing these policies, it is the goal of the protocols to overall decrease the occurrences of CLABSIs.

Studies have shown that smaller hospitals and larger ICUs have greater compliance while ICUs that are in-between had decreased compliance. Studies have found that in a unit with a policy regarding the proper care for central lines, 84% of the central line dressings were soiled. (Paquet, 2019). One of the reasons why there is lowered staff compliance to policies regarding care for central lines is because many staff have reported being overworked or too busy to be able to correctly implement the policies and procedures (Furuya, 2017; McAlearney, 2014; Ormsby, 2019; Zachariah, 2014).

There are different ways that have been shown to increase nursing compliance. The first method to increase nursing compliance is to consult nursing staff on generating the policies regarding central line care (Paquet, 2019; Helder, 2020; Stone, 2014). This allows nurses to feel included in the conversation and that their voice is heard which makes them more aware of why the policy is being put in place. Having increased communication between leadership and the bedside staff has been an effective method to increase compliance and prevent CLABSIs from occurring.

### **Inconsistency With the Implementation of Bundles of Care for Central Lines Can Be Attributed to Incomplete Knowledge of What Needs to Be Done.**

Authors and researchers have stated in their work of the need for increased guidance from management with the implementation of policies related to central line care. Hospitals that have shown strong leadership, educational resources, and open

communication with staff had greater compliance to central line protocol guidelines (McAlearney, 2014; Zacharia, 2014; Park, 2017; Helder, 2020; Ormsby, 2019).

One of the main reasons of non-adherence to protocols related to central line care is nursing staff having incomplete knowledge of what is being asked of them. There are four facilitators to prevention initiatives include education, leadership, data/technology, and consistent clinical processes (Park, 2017). Therefore, a unit that is weak in one or all of these areas will have decreased nursing compliance and/or nurses not completing the entire protocol. Many staff are not using the correct equipment and care for central lines, due to insufficient education (Helder, 2020). Consequently, units that are assigned clinical nurse specialists have shown increased compliance and increased knowledge of what to do. In units with an assigned certified nurse specialist/educator they have increased nursing compliance because bedside staff are getting better guidance.

Communication between management and bedside staff is the most important strategy in giving nurses the sufficient knowledge of the proper protocols in the care for central lines. In cases where there is open communication with the interdisciplinary team there is increased nursing compliance (McAlearney, 2014; Zachariah, 2014; Ormsby, 2019). When bedside staff feels involved in the conversation regarding policies for the care of central lines, they feel like their voices are heard. Input from bedside nurses is the best feedback hospital administrators can get when creating protocols because nurses are the ones doing the actual central line care.

Other factors responsible for lack of compliance due to incomplete knowledge include high staff turnover, new staff not being educated in the same way, and lack of dedicated unit leadership (Park, 2014). On units where there are high turnover rates,

nurses that are trained on the proper protocols are leaving. As a result, the new nurses that start on that unit are not trained in the proper protocols which leads to decreased nursing compliance. Also, many of these nurses that are coming onto the unit are not being taught in the same way that the previous nurses were trained. This factor leads to incomplete knowledge of what is being asked of them. When there isn't proper dedicated unit leadership constantly educating the new nurses on the proper protocols, this leads to ultimate decreased compliance.

### **The Presence of Written Policies Do Not Ensure Policy Compliance**

The presence of written policies does not necessarily yield higher nursing compliance. Increased nursing compliance to written policies regarding central line care is pivotal for preventing these infections from occurring (Zachariah, 2014; Theodoro, 2015; Woodward, 2016; Stone, 2014).

Written policies are put in place by hospitals to increase patient safety and promote health. When these policies are not followed, this reduces patient safety and increases patient risk to developing a CLABSI. Studies have shown that some of the best ways of preventing CLABSIs from occurring is through the use of written policies related to the use of bundles. These bundles include checklists and other aids of infection prevention. However, studies have shown the overall bedside nursing compliance with bundles and checklist was 88%. There was only 65% staff compliance for implementing one aspect of the bundle of care for central lines. Only 28% of staff were compliant with all prevention practices with the bundle (Zachariah, 2014). As a result of decreased compliance of the written policies, there was an increase in the amount of CLABSIs

reported. It is essential that bedside staff follow the proper written policies and procedures to prevent these potentially life-threatening infections from occurring.

Having conversations with nursing staff in addition to the written policies have shown increased engagement in the policies (Stone, 2014; Woodward, 2016; Theodoro, 2015). If management explains the written policies and the need for implementation, staff are more likely to understand what is being asked of them. Therefore, this allows hospitals to have greater nursing compliance and have better prevention strategies for patients developing CLABSIs. Also, having interdisciplinary discussions regarding the patient need for a central line with nursing staff in addition to the written policies has increased compliance (Theodoro, 2015). By having interdisciplinary conversations with all members of the healthcare team, this allows everyone to have a greater understanding of why the patient has the need for the central line. Many hospitals already implemented this strategy. For example, during bedside rounds, the healthcare team will discuss the current need for the patient to have a central line. If the risk for an infection is greater than patient need, then the central line will be removed. This method of communication has yielded great results as it relates to greater nursing compliance to written policies.

### **Discussion**

The research has shown that when policies and procedures are followed by staff at the bedside, it significantly decreases the occurrence of CLABSIs. The implementation of these policies and procedures has shown to be low due to decreased nursing compliance. Compliance to policies regarding bundles of care for central lines needs to be increased in order to prevent these deadly infections from occurring. In many cases, decreased nursing compliance is due to nurses simply not knowing what is being asked of them. Therefore,

having open communication and great educational resources to staff has led to increased staff compliance. Through proper leadership and education, it obligates nurses to have the skills necessary to increase compliance and overall prevent CLABSIs from occurring. The fact that there are written policies regarding the care for central lines does not necessarily mean the nurses at the bedside are implementing these changes. Written policies need to be discussed with bedside nursing staff in order to have a conversation regarding the impact that these policies will have on reducing infections. Discussing and collaborating with nurses working at the bedside when making these policies and procedures has led to increased nursing compliance. Using interdisciplinary discussions will help staff realize the overall importance of preventing these potentially fatal infections. These conversations have shown overall to increase nursing compliance. Communication is the best tool to increase nursing compliance and equip nurses with the skills necessary to meet this goal of preventing central line infections from occurring.

### **Limitations**

There are several limitations throughout the systematic review that was conducted. There was only one database that was used to acquire articles, CINAHL Plus with Full Text. A portion of the data found was from pediatric and/or neonatal ICUs in addition to adult ICUs so the age difference of patient population may impact findings. Much of the data was from years where there were no safe staffing ratios for ICUs in states that have them now. Therefore, this may impact findings due to the fact there is now mandated nurse-to-patient ratios in some states.

## **Conclusion**

The risk of patient's developing a central line-associated bloodstream infection is increased due to decreased nursing compliance to infection prevention policies and procedures. It is ultimately up to nursing staff to be able reduce infection rates. Hospitals can use many different strategies such as education and proper leadership to increase nursing compliance to these policies regarding infection prevention. Proper communication from leadership to bedside staff is ultimately the best practice in order to increase compliance and prevent these infections from occurring. In the future to prevent going back to outdated methods of treating central lines, hospitals need to find new and additional ways of preventing these infections.

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