INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

GUIDE TO INFECTION CONTROL IN THE HEALTHCARE SETTING

Central Line Associated Bloodstream Infections

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Topic Outline

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DEFINITION

A bloodstream infection (BSI) is defined as one or more positive blood cultures associated with systemic signs of infection such as fevers, chills, and/or hypotension. BSIs can be divided into primary and secondary. Primary BSIs occur without another defined nidus of infection. Secondary BSIs develop from a detectable area of infection as the source of the bacteremia. An example of such a secondary BSI is a urinary tract infection with subsequent bacteremia. Central line associated blood stream infection (CLABSI) is defined by the National Healthcare Safety Network (NHSN) of CDC as a primary BSI in a patient that had a central vascular catheter within the 48-hour period before the development of the BSI and is not bloodstream related to an infection at another site. Catheter related blood stream infection (CRBSI), in contrast, is a clinical definition, that requires specific laboratory testing that more thoroughly identifies the catheter as the source of the BSI such as time differential in growth or positive catheter tip culture.

KEY ISSUES

- BSI often are iatrogenic owing to invasive procedures or devices such as the placement of a central venous catheter.
- Vascular catheter-related BSIs are the most common cause of healthcare-associated bacteremia.
- In contrast, peripheral venous catheters less commonly cause BSI.
- Prevention of catheter-related BSIs is a high priority infection prevention initiative.
- Terminology used to identification of central venous catheters are variable across clinicians and researchers, which may lead to confusion.

KNOWN FACTS

- An estimated 250,000 cases of BSIs occur annually in the U.S.
- In 2019, more than 18,000 of these are CLABSI in acute care hospitals.
- BSIs greatly increase hospital cost and length of stay.
- The estimated BSI attributable mortality rate is between 12-25%.
- Central line associated bloodstream infections account for 11% of healthcare-associated infections. Most frequently isolated BSI organisms include coagulase-negative staphylococci (31%), Staphylococcus aureus — either methicillin sensitive or resistant (20%), enterococci (9%), Escherichia coli (6%), Klebsiella species (5%), and Candida species (9%).
- Independent risk factors for central line associated BSIs include:
    1. Prolonged hospitalization before catheterization.
    2. Prolonged duration of catheterization.
    3. Heavy microbial colonization at the insertion site and/or catheter hub.
    4. Femoral catheterization in adults.
    5. Neutropenia.
    6. Reduced nurse-to-patient ratio in the ICU.
    7. Total parenteral nutrition.
    8. Inexperienced staff performing insertion and maintenance of intravascular catheters. Cancer patients are at particular risk of infections including CVC-related infections (CRIs) due to disease- and treatment-related immunosuppression. The frequency of resulting central line–associated bloodstream infections (CLABSIs) in cancer patients is estimated at 0.5–10 per 1000 CVC-days
- Improvement in infection control measures and decreased central venous catheter utilization has resulted in a decrease of 31% in the incidence of CLABSI between 2015 and 2019 in the US

SUGGESTED PRACTICE

- Education and training of healthcare workers
- Hospital infection control policies with surveillance for intravascular device-related infection
- The placement and use of central line involve five key components:
  1. Appropriate hand hygiene involving the use of alcohol-based waterless hand cleaner or antibacterial soap and water with adequate rinsing.
  2. Use of maximal barrier precautions: strict adherence to hand hygiene; wearing surgical cap, mask, sterile gown, and sterile gloves; and use of sterile drapes.
  3. Skin preparation with 2% chlorhexidine in 70% isopropyl alcohol. Ensure skin prep is dry prior to insertion.
  4. Use of an optimal catheter site such as the subclavian area and avoidance of a femoral site.
  5. Ongoing daily reviews of central line necessity with removal as soon as possible.
- Disinfect injection ports prior to use and stopcocks should be capped when not in use.
- Data shows that catheters made of Teflon or polyurethane are less infection prone than catheters made of polyvinyl chloride or polyethylene catheters.
- Change semipermeable dressings every 7 days. Change sterile gauze dressings every 2 days. Semipermeable dressings are preferred over sterile gauze dressings unless insertion site is actively bleeding. Change dressing if becomes damp, loose, or visibly soiled
- Placing chlorhexidine-impregnated sponges (Biopatch) at catheter sites is associated with significant reduction in BSI rates.
- Daily skin cleansing with 2% chlorhexidine wash reduces BSI rates.
- Current guidelines for the prevention of CLABSI recommend the use of chlorhexidine/silver sulfadiazine or minocycline/rifampin -impregnated

CVC in patients whose CVC is expected to remain in place for more than 5 days if, the CLABSI rate is not decreasing after the implementation of a comprehensive strategy to reduce rates of CLABSI.

- Replace tubing used for blood products, lipid emulsions, and propofol infusions.
- Routine tubing to be changed no more frequently than 96 hours unless otherwise indicated
- Use sutureless securement devices.
- Use peripheral catheters as opposed to central venous catheters whenever possible, although peripheral catheters can also be associated with BSI.
- Tunneled central venous catheters should be preferentially employed for long term use (>7 days of catheterization).
- Routine blood draws and blood cultures to be drawn peripherally. Draw off central line if ruling out line infection.

PRACTICES CURRENTLY NOT RECOMMENDED

- Do not use topical antimicrobials at insertions sites except when with dialysis catheters.
- Do not use in-line filters for infection prevention.
- Do not use antibacterial lock solutions routinely. Antimicrobial locks should only be used under special circumstances such as patients with history of multiple catheter related bloodstream infections despite adequate precautions.
- Do not use guidewire catheter exchanges to change out suspected infected catheters.
- Do not routinely use anticoagulant therapy to reduce catheter-related infection risk.

SUGGESTED PRACTICE IN UNDER-RESOURCED SETTINGS

The hand-washing catheter insertion and care bundles outlined above can be used in under-resourced settings and have been shown to decrease catheter-associated bloodstream infections in South America and Asia as well as they have in the United States and Western Europe. These interventions not only are successful in regard to decreasing the number of bloodstream infections but are associated with substantial savings to the hospital.

The challenges in reducing CLASBI in low- and middle-income countries (LMICs) can, however, be substantial. Factors impacting the effectiveness of reduction strategies include inadequate microbiological laboratory capacities, the unavailability of skilled staff and resources for data collection and analysis and overall limitations of human resources in clinical and paraclinical patient care. Additionally, poor adherence to the guidelines and even the lack of written guidelines impact further on CLASBI prevention.

Implementation of these techniques in CLASBI prevention can clearly be challenging in the LMICs setting. The 4E approach as described by Alves and colleagues can be useful:

1. Engagement of hospital staff with a multidisciplinary group using peer networks and involvement of local champions;
2. Education with material and sessions;
3. Execution with standard care processes with redundancy;
4. Evaluation with measurement of performance with staff feedback

SUMMARY

The most common cause of healthcare-associated bacteremia is catheter-related bloodstream infection. These infections increase morbidity, mortality, length of stay, and hospital costs. Implementing the practices above has been shown to decrease these rates and improve quality of care for our patients.

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