

Most Effective Nursing Interventions to Prevent Central Line-Associated Bloodstream Infections: A Critical Review of the Literature



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Introduction

Central Line-Associated Bloodstream Infections (CLABSI) are defined by The Joint Commission as: A primary bloodstream infection (that is, there is no apparent infection at another site) that develops in a patient with a central line in place within the 48-hour period before onset of the bloodstream infection that is not related to infection at another site (The Joint Commission, 2012).

CLABSI is a significant risk factor for increased morbidity, mortality, cost of care, and length of stay for hospitalized patients. Of the various kinds of hospital acquired infections, CLABSIs are one of the most deadly with an estimated mortality rate of 12-25% for each infection (CDC, 2002).

Costs associated with CLABSI have varied from \$3,700 to \$56,000 per infection, and the annual cost of care ranges from \$296 million to \$2.3 billion (CDC, 2002).

Though there has been a 46% decrease in CLABSI occurrence in hospitals across the United States from 2008-2013, it is estimated that 30,100 CLABSIs still occur in intensive care units and acute care facilities each year (CDC, 2020).

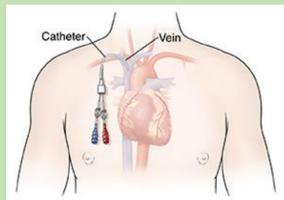


Fig. 1

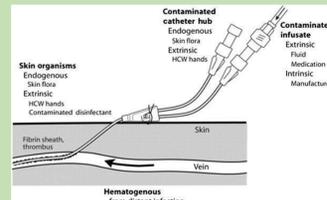


Fig. 2

Significance in Nursing

Nurses serve an essential role in the proper maintenance of central lines and thusly the prevention, or development, of CLABSIs. By implementing effective evidence-based interventions into nursing care CLABSI occurrence will reduce, thusly decreasing cost of care and length of stay for hospitalized patients in addition to enhancing patient outcomes.

Interventions Analyzed

- Daily Chlorhexidine Bathing
- Central Line Dressing Maintenance
- Disinfection of Catheter Hubs
- Educational Interventions
- CLABSI Prevention Bundles

Methods

Inclusion Criteria

- Articles must be peer-reviewed.
- Articles must be either primary research studies or literature reviews.
- Articles that are research studies must be approved by IRB or equivalent hospital administration.
- Articles must be primarily focused on adult populations (18 years and older).
- Articles are aimed at reducing CLABSI incidence during the maintenance portion of central line care.

A literature review was performed to identify the most effective evidence-based nursing interventions to prevent the development of CLABSI, as well as evaluation of interventions.

Electronic Database Search

Medline, CINAHL, PubMed, and Cochrane

Key Research Questions

- What are the most effective interventions that nursing staff can implement into routine care that reduces instances of CLABSIs?
- What makes an intervention effective?
- How easily can these interventions be implemented into practice?
- What should future maintenance protocols look like for CLABSI prevention?

Final Articles

- This literature review identified twenty five articles to be reviewed
- Three literature reviews (12%)
- Twenty two primary research articles (88%)
- Published between 2010-2020
- 18 primary studies were conducted in the United States
- Remaining primary studies were conducted in Saudi Arabia (1), Italy (1), Korea (1), and Switzerland (1)

Results

Primary Studies

- 22 primary research articles
- 4 examined the effects of chlorhexidine bathing on CLABSI prevention
- 4 analyzed the effectiveness of educational interventions for hospital staff
- 1 assessed nursing knowledge and behaviors regarding central line procedures
- 5 examined the effect of catheter hub disinfection on reducing CLABSI incidence
- 2 analyzed the effectiveness of standardized central line dressing changes
- 1 assessed the impact of a central line insertion assessment score on CLABSI prevention
- 4 examined the effects of a central line maintenance bundle on CLABSI incidence
- 1 investigated the effect of adopting a unit-based quality nurse dedicated to prevention of CLABSI

Literature Reviews

- 3 literature reviews
- 1 discussed the effectiveness of chlorhexidine bathing among adult intensive care patients in reducing various infections in an intensive care unit
- 1 assessed the effectiveness of the implementation of central-line bundles to prevent CLABSIs in adult, pediatric, and neonatal patients in intensive care units
- 1 one analyzed the effect of antiseptic barrier caps compared to manual disinfection on the incidence of CLABSIs

Findings

- Daily Chlorhexidine Bathing**
 - All articles investigating the effect of chlorhexidine bathing on CLABSI incidence found that daily bathing with chlorhexidine-impregnated washcloths significantly reduces the development of bloodstream infections
 - Effective at reducing incidence of other HAIs as well, including MDROs
 - Cost effective

2. Central Line Dressing Maintenance

- 1 study examined the effect of standardized dressing kits
- Implementation of standardized kits significantly reduced the time needed for nurses to gather dressing supplies and led to a sustained decrease in CLABSI rates by more than 65%
- Potential to be cost effective
- 1 study investigated the effects of a simulation-based mastery CVC dress rehearsal program
- Improved nurse's knowledge, self confidence, and psychomotor skill performance on mannequins. Improvements were associated with improved procedural competence on real patients in clinical practice and were temporally associated with decreased hospital CLABSI rates
- 1 study assessed the impact of a daily monitoring and scoring Central-Line Insertion Site Assessment score on the incidence of local inflammation or infection for CLABSI prevention
- Improved interprofessional communication
- Improved attention to line-site care and enhanced discussions related to central line removal

3. Disinfection of Catheter Hubs

- All articles investigating the effect of implementing an antimicrobial cap into central line care found that consistent use of the antiseptic barrier cap, in addition to routine utilization compliance, can lower the occurrence of CLABSI
- Cost effective
- Easy to monitor compliance rates
- "Scrub-the-Hub" techniques can be problematic and contribute to elevated CLABSI rates

4. Educational Interventions

- 1 study examined nursing student knowledge
- 1 study investigated bedside nursing knowledge
- Lecture-based learning, e-learning, and simulation-based learning enhances knowledge of CLABSI prevention guidelines and central line maintenance

5. CLABSI Prevention Bundles

- All studies assessing the effectiveness of CLABSI bundles found that there is a significant association between implementation of central-line insertion and maintenance bundles and sustained reduction of CLABSIs
- 1 study assessed a peer tutoring approach to implementing CLABSI bundles
- Reduced resistance to the introduction of a new job pattern
- Adherence to each component in the insertion/maintenance bundles reached 100% within 5 months
- CLABSI incidence decreased
- 1 study implemented a unit-based quality nurse dedicated to prevention of CLABSI
- Presence of a unit-based quality nurse was highly correlated with CLABSI reduction

Discussion

Overall, all interventions analyzed in this literature review were proven to be effective in reducing CLABSI incidence.

Many interventions were determined to be cost effective.

Nursing knowledge in regards to CLABSI prevention and line-site care varies. Lecture-based, simulation-based, and e-learning have proven to be effective measures in enhancing knowledge of these topics. All hospitals should provide routine CLABSI education on a yearly basis.

Incorporating a unit-based quality nurse to all hospitals could lead to sustained CLABSI reduction, particularly in areas with high-risk patients.

Including an insertion site assessment score in routine nursing documentation enforces attention to line-site care, improves interprofessional communication, and can prevent CLABSI.

Implementation of standardized CLABSI bundles which incorporate all of the evaluated interventions in addition to routine education for healthcare staff would be most effective in reducing CLABSIs.

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