Central Line Associated Blood Infection (CLABSI) Prevention: Evidence-Based Interventions for Nursing Practice

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Introduction

Central lines are ideal for care of critically ill patients, as many medications can be caustic or damaging to peripheral vessels (Bell & O'Grady, 2017). Central lines are also efficacious in managing patients with shock (septic, cardiogenic) and cardiac conditions such as decompensated heart failure and pulmonary hypertension (Bell & O'Grady, 2017). Notwithstanding the obvious benefits of central line placement, they present a risk of bloodstream infection (Bell & O'Grady, 2017).

In the United states 28,000 deaths per year can be linked to central line-associated bloodstream infections (CLABSI) (Reynolds et al., 2021). A 2017 study reported 44% hub contamination in the ICU setting (Holroyd et al.). These preventable infections cost the U.S. health care system approximately $2.3 billion in added costs each year (Reynolds et al., 2021).

Population

Central lines are most commonly found in critical care settings such as ICUs however, central lines are also seen on medical-surgical floors. Populations of particular concern for a central line associated blood infection are bone marrow transplant patients and oncology patients.

Meta-analysis

- 4 randomized trials show daily CHG bathing reduces CLABSI by 40% (Frost et al., 2018).
- Proper use of 2% CHG bathing cloths reduces CLABSIs (Shah et al., 2016).
- ICU patients are not receiving daily CHG baths (Frost et al., 2018).
- Large studies have failed to support the hypothesis that daily CHG bathing of ICU patients may increase incidence of resistant bacterial infections (Frost, et al.).
- 'clinical equipoise' exists around this topic, future, robust studies should be conducted to address it (Frost et al., 2018).
- Cost associated with CHG impregnated wipes costs is justified as cost related to CLABSI is 10 times higher than the cost of using the wipes (Shah et al., 2016).

Results

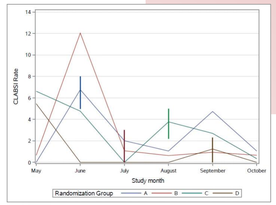
- Tailored education, with auditing and feedback show decrease in CLABSI incidence (Reynolds et al., 2021).
- Generalized education implementation is not effective in reducing CLABSI incidence (Alonso et al., 2019).
- Increase time scrubbing needless hubs (30-60 seconds) (Patel et al., 2019).

Study Synthesis

Results of CHG Bathing Implementation

"…using evidence-based implementation strategies tailored to local determinants can improve compliance with evidence-based practices" (Reynolds, 2021).

- **Purpose**
  - Evaluate effect of tailored, multifaceted implementation program on nursing staff compliance with CHG bathing and documentation
    - Effects of unit culture on primary objective
    - Intervention effect on nursing staff knowledge and perceptions of CHG bathing
    - Intervention effect on CLABSI rates
- **Variables**
  - 4 clusters: initiated intervention consecutively
  - Intervention: educational outreach visits, audits, feedback
- **Sample Size**
  - Two large hospitals in the southeastern US
    - Academic hospital (957 beds)
    - Community hospital (683 beds)
- **Design**
  - Stepped wedge cluster randomized trial (4 sequences)
- **Findings**
  - Significant improvement in CHG bathing process/compliance and perceptions of nursing staff
  - CHG bathing documentation did not improve significantly
  - Clinically significant decrease in CLABSI rates (27.4%)
- **Implication**
  - While CLABSI rates remained low after follow up, researchers are concerned about the Hawthorne effect (improvements related to the nurses understanding they are being observed). Future studies may be indicated to identify if the improvements are long-lasting, and if not, study ways to enact lasting change.



*Vertical line denotes when the randomization group entered the intervention month

Quantitative Results of a National Intervention to Prevent CLABSI

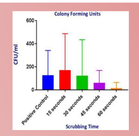
"…novel approaches including active engagement…and a "carrot" rather than "stick" approach…may be particularly important in low-performing sites" (Patel et al., 2019).

- **Purpose**
  - Evaluate impact of multimodal intervention in hospitals with elevated rates of HAI
- **Variables**
  - Pre-intervention
  - Post Intervention
    - Interventions: baseline assessment, tiered approach to CLABSI prevention, online and on-demand educational materials, guided facilitation for HAI reduction
- **Sample Size**
  - 462 hospitals (acute care, long-term acute care, critical access)
- **Design**
  - Pre-post observational evaluation of a prospective, national, clustered, non-randomized initiative of 3 cohorts of hospitals
- **Findings**
  - In hospitals with a higher HAI load, multimodal intervention did not decrease the rate of CLABSIs
- **Implications**
  - Study should be conducted where interventions are tailor-made for under-performing hospitals rather than a generalized program for a number of hospitals. Additionally, offering incentives for participation may decrease hospitals from falling out of studies

Scrubbing the Hub, How Long is Enough?

"Longer scrubbing time appears to decrease line contamination which can be translated into clinical practice" (Alonso et al., 2019).

- **Purpose**
  - Evaluate impact that length of mechanical friction has on needless connector (NS) disinfection
- **Variables**
  - Negative Control (10 NS) – Flushed after removed from packaging
  - Positive Control (10 NS) – inoculated and not scrubbed before flush
  - Experimental groups (4 x 10 NS each) – 15 second group, 30 second group, 45 second group, 60 second group
- **Sample Size**
  - 60 needleless connectors
  - 10 nurses scrubbing
- **Design**
  - Quantitative experimental study
- **Findings**
  - Results did not seem to vary in relation to which nurse was scrubbing
  - Statistically significant reduction of colony forming units (CFU) between the 15 and 60 second groups
  - No statistically significant reduction in CFU between the 30 and 60 second groups
- **Implications**
  - Subsequent studies should include a greater number of NS, differing disinfection solutions, and varying drying times.

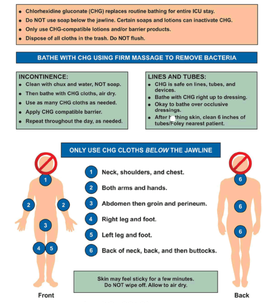


Current Recommendations

Central Line Installation Guidelines

1. Handwashing with soap and water
2. Sterile insertion with full barrier precautions
3. Use of 2% chlorohexidine solution with proper air drying before insertion
4. Avoiding femoral site for catheterization
5. Prompt removal of unnecessary catheters

(Bell & O'Grady, 2017)



(AHRQ, 2013)

Conclusion

Central line associated blood infections are highly preventable. Vigilant use of evidence-based practices can be effective in reducing CLABSI rates. Exposing nursing staff to the proper techniques and importantly, rationale behind the techniques has shown to increase compliance to guidelines. Incentivization for compliance rather than penalty for non-conformity is more effective in increasing nursing staff and institutions implementing and practicing recommended guidelines. As nursing staff implement proper CLABSI prevention interventions incidence decrease.

Future studies should include analysis of longevity of previously effective education to ensure long-term use of recommended guidelines. Additionally, efforts at tailored training and education should be identified and implemented in institutions with historically high CLABSI rates. Finally, efforts should be made to combat existing clinical equipoise that one form of cleansing is just as good as another, especially as it pertains to preventing CLABSIs.

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