

## **APPLICATION FORM**

**Title of Entry:** Prevention of Central Line-Associated Bloodstream Infections in Long-Term Acute Care

**Division:** Small Organizations

**Award:** In Safe Hands

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# Preventing Central Line-Associated Bloodstream Infections in Long-Term Acute Care

## Executive Summary

Our facility is a long-term acute care hospital specializing in the care of chronically, critically ill patients. This population has a high incidence of healthcare-acquired infections, among which central line-associated bloodstream infections (CLABSIs) pose the greatest risk of morbidity and mortality.<sup>1</sup> Between fiscal years 2016 and 2018, a significant increase in the incidence of CLABSIs was noted, rising from 4 total infections (1.4 per 1000 CL-days) in FY 2016 to 12 total infections (2.7 per 1000 CL-days) in FY 2018.

A taskforce was convened in April 2018 with the goal of reducing the CLABSI rate by 25% by the end of the calendar year. After reviewing the literature for CLABSI prevention practices,<sup>2</sup> collecting feedback from bedside staff, and performing a retrospective chart review, a multifaceted intervention was implemented in July 2018. As the majority of our patients have their central lines inserted at outside facilities, our efforts focused on evidence based measures for CLABSI prevention after the point of insertion, with special attention paid to daily chlorhexidine bathing and blood culturing practices.<sup>3,4,5</sup>

Our intervention consisted of 3 components: (1) a recurring six-part educational series for bedside nurses focusing on central line care; (2) education to nurses and physicians on daily chlorhexidine bathing, and utilization of an electronic audit report to provide feedback regarding patients without active chlorhexidine orders; (3) change in practice to the use of venipuncture alone for evaluation of potential bloodstream infections in patients with central lines. The last component of the intervention focused specifically on preventing acquisition of potentially contaminated blood cultures from central lines, and utilized an electronic audit report to provide feedback on the site of blood culture acquisition.

Eight months of the intervention yielded a significant decline in the rate of CLABSIs. Specifically, there has been one CLABSI at a rate of 0.55 infections per 1000 CL-days in FY 2019 to date, representing an 80% reduction in the CLABSI rate from FY 2018. Secondary outcomes include a 50% decrease in the proportion of blood cultures drawn from central lines, and greater than 95% of patients ordered and receiving daily chlorhexidine bathing.

## Assessment

Our long-term acute care hospital (LTACH) consists of a 38 bed unit caring for a chronically, critically ill patients drawn largely from academic tertiary care centers across the city of Philadelphia. Patients frequently have central lines in place upon arrival for indications including hemodialysis, long-term antibiotics, or administration of total parenteral nutrition (TPN). Many of these patients are at high risk for central line-associated bloodstream infections (CLABSIs) due to age, chronic illness, malnutrition, administration of TPN, prior history of bloodstream infections, or immune deficiencies (eg, transplant). Ongoing surveillance at the hospital indicated that CLABSI rates had increased significantly between fiscal year 2016 and fiscal year 2018 as noted below:

- FY 2016: 4 CLABSIs (1.4 per 1000 CL-days)
- FY 2017: 8 CLABSIs (2.2 per 1000 CL-days)
- FY 2018: 12 CLABSIs (2.7 per 1000 CL-days)

The last quarter of FY 2018 alone generated four CLABSIs at a rate of 4.4 per 1000 CL-days. A CLABSI prevention taskforce was convened in April 2018 consisting of the infection preventionist, patient safety officer, PICC nurse specialist, volunteer staff nurse, and the infectious diseases physician. The taskforce reviewed national, evidence-based guidelines for CLABSI prevention<sup>1</sup>, shared observations on adherence to these practices, and conducted a retrospective chart review of all patients with reported CLABSIs (as defined by the National Healthcare Safety Network) from the prior 2 years. Data points collected including the following information:

- Nursing documentation of line maintenance practices and/or concerns
- type of line (HD line, PICC, small bore central catheter, double/triple lumen catheter, port; tunneled vs non-tunneled line)
- indication for line
- body site, facility, and date of line insertion
- Clinical diagnosis and treatment courses
- Organism identified on blood culture
- Source of blood cultures (peripheral vs line)
- Chlorhexidine bathing preceding CLABSI diagnosis
- Duration of catheterization
- Comorbidities (ventilator dependence, transplant, prior bloodstream infection, neurologic injury, etc)

The taskforce's work revealed three major findings:

1. Opportunities for improvement were noted in central line care, with particular focus on disinfection of catheter hubs prior to access, appropriate handling of syringes for flushing, identifying the need for line dressing changes, and indications for replacing alcohol-based connector caps.

2. Gaps in chlorhexidine gluconate (CHG) bathing practices were observed due to absence of physician CHG orders or discrepancies between timing of physician's CHG order and nursing workflow (ie, orders placed for daytime while bathing performed at night). CHG bathing is recommended for all patients on our unit, as supported by a prior study indicating the efficacy of this practice specifically among LTACH patients.<sup>3</sup>
3. A significant number of NHSN-defined CLABSIs were not consistent with a clinical diagnosis of CLABSI (Appendix 1). These "non-CLABSIs" occasionally resulted in unnecessary antibiotic use and/or line removal, and appeared to be largely caused by bacterial colonization of central lines producing contaminated, false positive blood cultures. Prior reports have shown that obtaining blood cultures by venipuncture versus from central lines may impact blood culture contamination rates and have a potential effect on CLABSI rates.<sup>4,5</sup> Given the prolonged hospitalizations and extended durations of catheterization among LTACH patients, it is likely that the rate of bacterial line colonization is increased in this population.

### **Intervention**

The intervention began in July 2018 (beginning of FY 2019) and consisted of a three-pronged approach to address the three findings noted above.

1. **Central line huddles:** A six part educational "huddle" series was created to review central line care practices with nursing staff. Huddles were performed weekly with all nurses on the unit and consisted of a 15-minute interactive session focused on one aspect of central line care. The following topics were covered:
  - I. Guide to flushing IV lines
  - II. Central line assessment and dressing changes
  - III. Drawing blood cultures
  - IV. Care of implanted ports
  - V. Troubleshooting Central Line Complications
  - VI. Powerglide Care
2. **CHG reminders and audits:** Physicians were reminded, via weekly emails, to ensure that all patients on the unit had orders for topical CHG and that the orders were timed to reflect nighttime bathing. An audit report was then created via the electronic inpatient medical record (Epic Systems) to identify all patients on the unit without an active CHG bathing order. This report was run weekly by the infection preventionist and feedback was given to physicians to assure adherence.
3. **Blood culture practice change:** Given the presumably high rates of bacterial line colonization in the hospital, providers were advised to discontinue all practice of drawing blood cultures from central lines. Instead, potential bloodstream infections would be evaluated by two sets of blood cultures drawn via venipuncture. Physicians and nurses were provided recurring education regarding this practice change through huddles and weekly emails (as noted in [1] and [2] above). An audit report was then

created via the electronic inpatient medical record to review all blood cultures drawn in the hospital and provide feedback to physicians in cases where blood cultures were ordered from central lines. The audit report was run weekly by the infection preventionist.

## **Results**

The primary outcome for this project was the number and rate of CLABSIs at the hospital. **As of February 25, 2019, there has been one CLABSI at a rate of 0.6 per 1,000 CL-days for FY 2019 to date (Appendix 2). This is the lowest rate of CLABSIs that has been recorded for any fiscal year since surveillance began in the hospital, and represents an 80% reduction in the rate from the preceding year.** Quarter 1 of FY 2019 was the first quarter in more than 2 years in which no CLABSIs have occurred in the hospital.

Secondary outcomes included the proportion of blood cultures drawn from central lines, and the proportion of patients appropriately ordered for CHG bathing. Providers were first educated on the change in blood culturing practice on June 18, 2018. In the pre-intervention period extending from January 1, 2018 to June 17, 2018, there were 289 blood cultures drawn, out of which 19 (6.6%) were drawn from central lines. In the post-intervention period extending from June 18, 2018 to February 25, 2019, there were 307 blood cultures drawn, out of which 10 (3.3%) were drawn from central lines. This represents a 50% reduction in the proportion of blood cultures drawn from central lines.

Baseline data for CHG bathing was not accessible for measurement. However, since initiation of CHG bathing education and auditing in July 2018, >95% of patients in the hospital have been correctly ordered and receiving CHG bathing (excluding those with reported chlorhexidine allergies).

## **Adaptability**

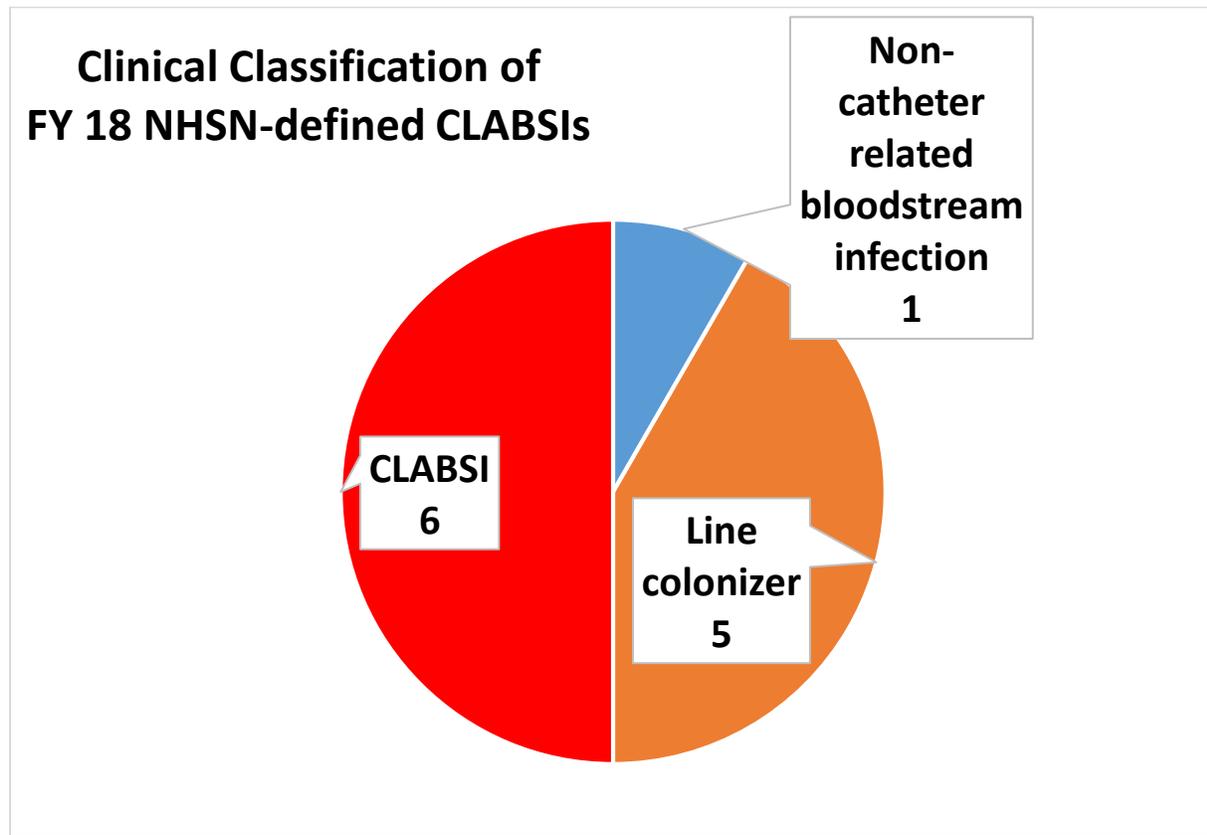
The success of our intervention hinged on three key components: (1) multidisciplinary collaboration between nurses and physicians, (2) problem recognition through a combination of feedback from bedside staff and retrospective chart review, and (3) the ability to efficiently audit clinical practice through the electronic medical record.

Each of these three components could be implemented across other organizations. One potential barrier is the availability of an electronic medical record with the capability of generating audit reports. In facilities where this resource is not available, audits could be performed manually on a prospective basis depending on the size of the hospital and time available to the infection preventionist. The latter two components of the intervention (CHG bathing and use of peripheral rather than line blood cultures) may be particularly relevant for long-term acute care and chronically catheterized populations, as these groups are more likely to have colonization of their skin and catheters with pathogenic organisms.

The requirement for a second venipuncture in some patients may be considered a negative outcome. However, the discomfort of an extra venipuncture is generally outweighed by the benefits of avoiding diagnostic confusion, potentially unnecessary antibiotic use, and/or line removal.

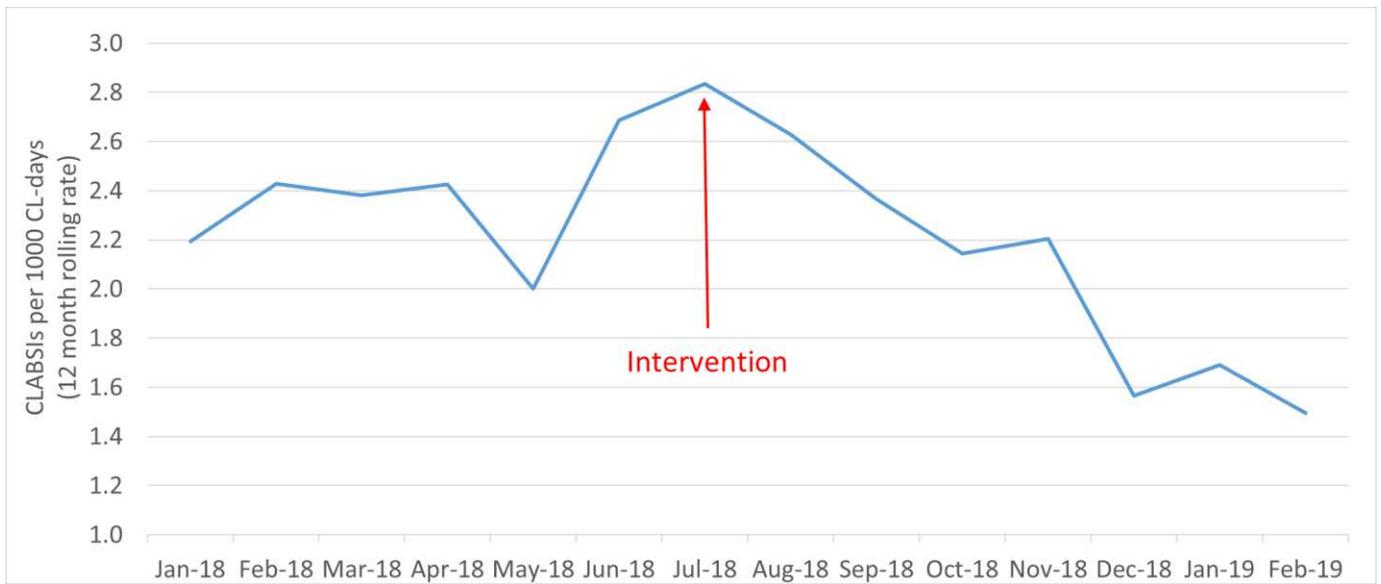
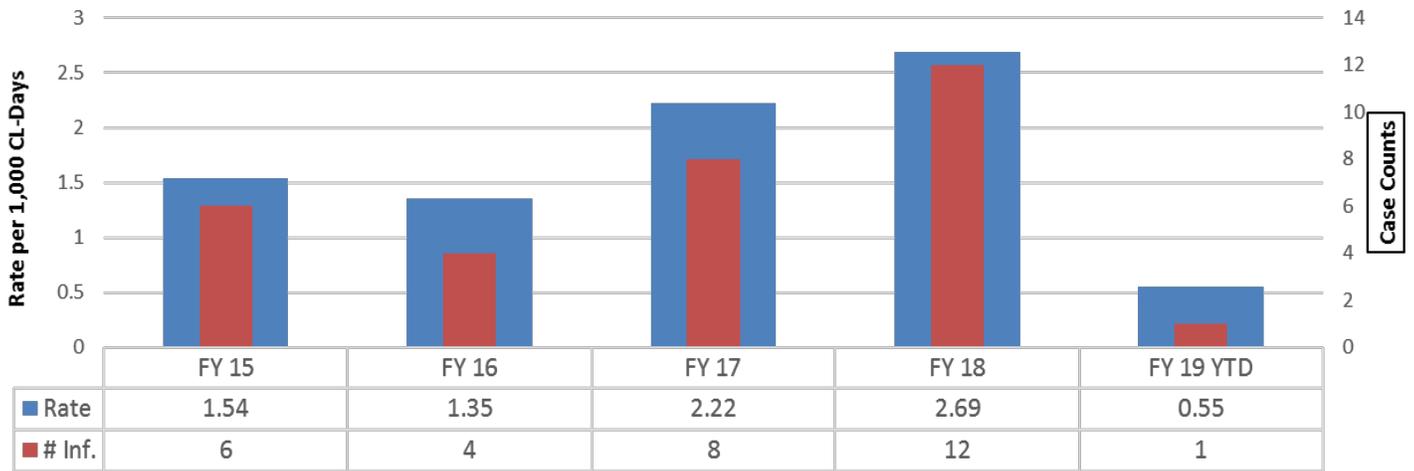
Lastly, the importance of repeated education and audit/feedback at the beginning of the intervention should be emphasized. As a cultural shift begins to develop and general awareness of best practices improves, the frequency of the education → audit → feedback cycle can be reduced. Some regular occurrence of continued education will likely be necessary over the long term, however, as the turnover of staff may cause learned practices to fall away over time.

### Appendix 1



## Appendix 2

\*Data updated as of February 25, 2019



## **References:**

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