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Major article

Quality improvement intervention reduces episodes of long-term acute care hospital central line–associated infections

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Background: Reducing central line–associated bloodstream infections (CLABSIs) poses a set of unique challenges in long-term acute care hospitals (LTACHS). Patients are often admitted to LTACHs with central lines in place from the previous hospitalization; thus, LTACHs lack control over insertion techniques and respective central line care and maintenance. This study aimed to demonstrate the impact of a methodical bathing approach with 2% chlorhexidine gluconate (CHG) cloths and a correlation with a reduced prevalence of CLABSIs in our LTACH population.

Methods: This retrospective observational quality initiative conducted in a 105-bed LTACH used plan-do-study-act methodology to assess the effects of a revised bathing approach using 2% CHG.

Results: Statistical significance demonstrated a 65% reduction in CLABSI on the pilot unit after the 6-month initial trial. The results of the quality initiative were evaluated through the end of 2012.

Conclusions: The decision was made to implement the revised bathing protocol throughout the entire LTACH hospital stay.

The burden of central line–associated bloodstream infections (CLABSIs) in long-term acute care hospitals (LTACHs) is substantial. CLABSIs are considered "never events" and are associated with increased patient morbidity and risk for mortality, ranging from 15% to 25% per incident.[1] The incidence of CLABSI in the LTACH setting is comparable to the top 10% incidence rates reported in intensive care units (ICUs).[2] The economic impact of each CLABSI episode is significant, with the Centers for Disease Control and Prevention (CDC) estimating direct costs ranging from $7288 to $29,156 per episode.[3]

Patients in LTACHs are susceptible to CLABSI because they require greater levels of acute care, are at increased risk for mortality, and require multiple interventions, similar to patients in standard acute care hospitals.[4-9] It is not uncommon for patients in an LTACH to require frequent antibiotic administration via a central line,[2] with a large percentage having multidrug-resistant organisms and an average length of stay exceeding 25 days.[2]

Prevention guidelines have been published by the Society for Healthcare Epidemiology of America and the CDC, providing evidence-based recommendations for CLABSI prevention.[10,11] These guidelines include the use of chlorhexidine gluconate (CHG)-impregnated dressings and skin preparation to ensure that the microbial burden is reduced as much as possible.

In a meta-analysis conducted to assess the effectiveness of CHG bathing and its impact on CLABSI prevention, O'Horo et al[12] described CHG bathing for CLABSI prevention as "biologically plausible" based on the "premise that CHG bathing will reduce healthcare-associated infections…because heavy skin bacterial colonization on patients facilitates transmission by healthcare workers to other susceptible patients and reducing bacterial skin bioburden would be expected to interrupt or minimize healthcare-associated transmission, [as well as] reduce contamination of the hands of healthcare workers." O'Horo et al found that the existing evidence supported the concept that CHG bathing is effective for CLABSI prevention; however, they recommended additional research to determine its effectiveness in CLABSI prevention in non-ICU clinical settings. (The majority of the studies that they evaluated were conducted in the ICU.) Only 1 LTACH was included in the meta-analysis, and that study found that CHG bathing was effective in CLABSI prevention in the LTACH population.[13]

A quality improvement (QI) initiative was conducted at a 105-bed LTACH in Illinois to ensure that best practices in CLABSI prevention were implemented by standardizing patient bathing

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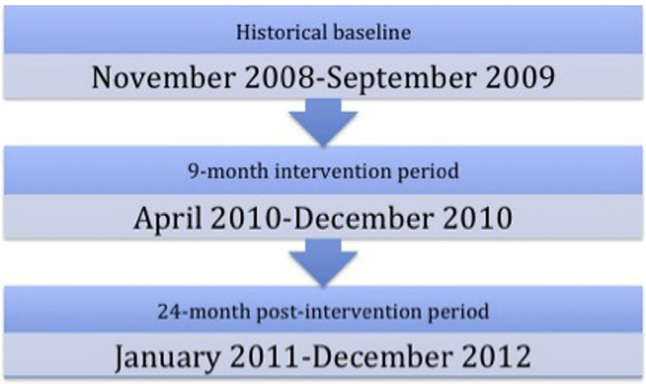

Fig 1. QI initiative time line.

methods to reduce the risk for CLABSIs and keep CLABSI rates below national benchmarks in a high-risk patient population.

METHODS

Clinical setting and study design

This was a retrospective data analysis conducted in a 105-bed LTACH using before-and-after comparisons.

Ethics

Institutional Review Board approval was obtained for the retrospective data analysis, deidentified data collection from infection control records, and peer-reviewed dissemination.

Retrospective study timelines

The timelines for this before-and-after study are shown in Figure 1. A 6-month pilot study was conducted before the intervention period from October 2009 through the end of March 2010.

Study participants

Study participants were all LTACH patients with a central line in place during the baseline and intervention periods. The hospital's Institutional Review Board deemed that informed consent was not necessary, given that all data were collected in a deidentified manner as part of infection surveillance monitoring for the facility.

Interventions

Historical baseline data were obtained using traditional bathing methods with a bath basin, soap, and water. The bathing protocol was modified to use 2% CHG-impregnated disposable cloths instead of traditional bathing. A "bath-by-numbers" intervention was introduced to all nurses and support staff who performed bathing. This numerical concept described the appropriate order in which to bathe the patient from an infection prevention perspective, beginning with the neck, shoulders, and chest and ending with the back and buttocks. Patient bath basins were removed from patient rooms to ensure compliance with the intervention. The step-by-step bathing method was designed to eliminate product and technique variability, and to ensure that the patients were bathed with 2% CHG with a sustained antiseptic effect after application. The CHG was not rinsed off after application.

Table 1
Pilot study cost savings

Category	Change
Annual laboratory cost savings	−$30,000
Annual net revenue increase	+$30,160
Annual labor cost savings	−$83,000
Annual medication cost savings	−$144,000

Definitions

The definition of CLABSI used in this study was based on the CDC's National Health Safety Network (NHSN) definition, as follows: "CLABSI is a primary (ie, no apparent infection at another site) bloodstream infection (BSI) in a patient that had a central line within the 48-hour period before the development of the BSI. BSI is defined using either laboratory-confirmed bloodstream infection or clinical sepsis definitions."[14] The term CLABSI was adopted by the CDC in 2011 (no change in definition). The CLABSI rate is calculated by dividing the number of CLABSI infections by the total catheter-days and multiplying by 1000, resulting in a pooled mean rate per 1000 catheter-days. All benchmarks were based on data published by the NHSN.

Benchmarks for comparison

CLABSI rates per 1000 catheter-days were calculated and compared with NHSN-based national benchmarks. The following historical benchmarks were used for comparison (note that benchmark CLABSI rates for LTACH units were not available until July 2011):

- Historical baseline: medical ICU, 2.4 per 1000 central line-days
- 2010 intervention: medical ICU, 1.9 per 1000 central line-days
- 2011 postintervention: LTACH, 1.7 per 1000 central line-days
- 2012 postintervention: LTACH, 1.3 per 1000 central line-days.

Statistical analysis

Statistical methods were used to analyze the before and after periods using descriptive statistics, mean, and standard deviation. Labor cost savings were estimated by analyzing the salary and labor hours required for patient bathing. Labor-related cost savings are presented in Table 1. These were calculated via an internal cost analysis, and data are site-specific.

RESULTS

Pilot study

In the pilot study, the mean infection rate dropped from 4.47 CLABSIs per 1000 catheter-days to 2.9 CLABSIs per 1000 catheter-days.

Before-and-after comparisons by year

Table 2 shows the decrease in the number and rate of hospital-wide CLABSIs from the beginning of 2009 through December 2012.

Cost-benefit analysis

A cost-benefit analysis was conducted using actual direct costs, based on a 2009 retrospective financial analysis (n = 14 patients), summing the total costs of laboratory assays, tests, prescriptions,