Journey to Zero Central Line-Associated Bloodstream Infections: An Intensive Care Unit's Story of Sustained Success and Quality Improvement

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Abstract

Background: *Patients who have a central line (CL) are at increased risk for developing a CL-associated bloodstream infection (CLABSI), which increases morbidity, length of stay, and cost. Our goal is zero CLABSI infections.*

Methodology: *In 2009 our organization implemented a CL bundle to prevent CLABSIs, and staff education was introduced in 2012. In 2013 a 2% chlorhexidine gluconate (CHG) wipe was introduced and used to clean around CL dressings. In 2014 a new CL dressing was adopted and during 2015 the organization began using a 3.15% CHG/70% alcohol swab for disinfection of needleless connectors. A final intervention was put into place in 2015 called "nose to toes" in which a patient is bathed from nose to toes (excluding the face) using 2% CHG wipes.*

Results: *Before implementation of the above methods, our intensive care unit had an average infection rate of 1.9/1000 CL-days in 2009. Incidence of CLABSIs continued to decrease as the organization implemented the additional products and practices. In the 15 months following implementation, the ICU has been able to consistently maintain a zero CLABSI rate.*

Conclusions: *The implementation of these changes in practice along with bringing in new products has made it possible to achieve the goal of reaching and maintaining zero infections. Due to the successful results in our intensive care unit, we have implemented these changes to all patient care areas in the hospital for use on all CLs.*

Keywords: *central line, central line-associated bloodstream infection, chlorhexidine gluconate, decrease CLABSI*

Background

Bloodstream infections are a significant cause of health care-associated infections and overall mortality and morbidity. Bloodstream infections can lead to significant additional costs of care delivery, the need for antibiotics, and increased length of stay.[1] Due to the significant costs and effects on health care quality, the US Department of Health and Human Services has included the reduction of central line-associated bloodstream infections (CLABSIs) as part of its national Healthcare Associated Infection Action Plan.[2] This plan is utilized across the various federal agencies within the Department of Health and Human Services to prepare evidence-based clinical resources for prevention of CLABSI, to monitor and report infections across the continuum of care, and to guide quality improvement initiatives. This collaboration is necessary to standardize clinical care variation and improve adherence to both vascular access insertion and maintenance practices.[3]

CLABSI can develop as a result of numerous points of contamination and the risk for infection can also be higher in patients with other major comorbidities and previous histories of CLABSI or colonization.[4] Recent estimates show that

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CLABSIs can cause up to a 35% mortality rate and an excess length of stay up to 24 additional days.[5] Major sources of potential contamination of the catheter site include improper hand hygiene of health care staff; contamination of the insertion site (ie, palpating the site after skin antisepsis has been performed); extraluminal contamination; hematogenous spread from another distant site of infection; catheter hub and needleless access site contamination; and more rarely, contamination of the actual infusate.[1]

Memorial Hospital (MH) is part of University of Colorado Health and supports 2 hospital locations in Colorado Springs, with a total of 671 licensed beds. MH provides care for the people of Colorado Springs, as well as being a critical access hospital to the surrounding areas of southern Colorado and southwest Kansas. Critical care services for this hospital include 3 intensive care units (ICUs)—2 at the Central Hospital and 1 at the North Hospital—for a total of 45 critical care beds and 85 critical care-trained registered nurses. This ICU cares for patients with conditions that include medical, general surgery, trauma, neurosurgery, cardiac, and cardiothoracic surgery. Colorado Springs is also home to a large indigent population, which poses special nursing and social concerns.

In 2009, MH ICU reported 10 CLABSIs, or a rate of 1.9 (infection rate is calculated as number of infections per 1000 catheter-days). Although below the national mean, 10 CLABSIs were too many. A task force was formed to evaluate current practice within our facility, as well as best practice interventions that had not currently been implemented. The task force consisted of members from infection prevention (IP), quality management, nursing directors and managers, bedside staff, and care management. This article reviews the ICU CLABSI data from 2009 to 2015 along with initiatives to decrease infection rates in our unit.

Methods

Insertion Bundle and Checklist

The task force began to research best practices for insertion and care of central lines (CLs). Facility protocol dictated that these projects were deemed quality improvement per internal research guidelines, and as such were exempt from institutional review board review. At this time, the CL Bundle for Insertion was instituted that included hand hygiene, maximal barrier precautions, chlorhexidine gluconate (CHG) skin antisepsis, optimal catheter site selection, and use of a CHG-impregnated sponge covering the insertion site.[6] A CL insertion checklist was also instituted. The checklist was intended to ensure that the bundle was used and that sterile technique was maintained during line insertion. There were some barriers to getting staff and physicians to use the bundle and checklist in the beginning. Some physicians did not want to change the way they had been inserting lines and did not believe that maximum barrier was necessary. Some insisted that their patients had never gotten an infection; therefore, they did not need to change practice. Most physicians refused to change the method used to secure their CLs. Although peripherally inserted central catheters (PICCs) were being secured using an adhesive-backed securement device, physicians continued to suture in all other CLs. To this day we do not use securement devices on CLs inserted into the internal jugular vein, the subclavian vein, or the femoral vein. These lines are all sutured in place. During this transition, most nurses were not comfortable speaking up and stopping the insertion process when something was not right. Coaching, support, and scripting were used to overcome this barrier. Staff members were given examples of what to say if a physician did not perform hand hygiene, disinfect the insertion site properly, use full barrier precautions, or if there was a breach in sterility. The scripting provided a nonthreatening statement to use to relay care concerns. For example, "Can I help you with your sterile gown?" if a physician skipped that step. The scripting served as a gentle reminder of what the physician should be doing. The task force also continued intermittent education with staff on current processes.

In 2012 and 2013 MH maintained a low rate of infection, 0.4 per 1000 CL-days, for both years. Although this was an improvement from past years, the team was still not satisfied. As an organization, we believed that even 1 infection was too many. Not only did a CLABSI lead to an increase in hospital length of stay and cost, but patients were also placed at risk for dying from these infections. As an organization concerned about the safety of our patients, our goal was to reach and maintain zero infections.

Scrub the Hub Campaign

In 2012, the IP department sponsored the Rubber Ducky Scrub the Hub campaign. Flyers were created as a reminder to staff of the 15-second scrub time before every access of a CL. IP nurses set up a table in the cafeteria during lunchtimes and provided education to staff members. They handed out little rubber ducks with the slogan "Scrub the Hub" for staff to take back to their units as a reminder of this practice.

Continued CLABSI Prevention Efforts

By 2013 the initial task force had dissolved due to other priorities. However, a smaller team remained, consisting of 2 IP nurses, a vascular access nurse, a critical care clinical nurse specialist (CNS), and a quality specialist. The IP nurses reported infections in real time to the CNS, who then reviewed the involved patient's chart to look at comorbidities, possible reasons for the infection, and any deviations in care. A spreadsheet was created to compare and contrast data points from every patient who developed a CLABSI. This included a retrospective review of all patients with a CLABSI since 2009. The only commonality we found was that all the CLs were in place longer than 7 days. Our quality specialist took this information to our chief medical officer. He wanted to start engaging the physicians with infection prevention and focus on core interventions to reduce CLABSI, including early removal of lines. He sent letters to attending physicians to inform them of each CL infection. He asked the physician for his or her thoughts regarding insertion and maintenance of CLs and what role they could play in preventing infections. Vascular access nurses were vital in providing feedback on the nursing practices taking place on the different units, as well as providing