Letters to the editor

Sustained reduction of central line–associated bloodstream infections in an intensive care unit using a top-down and bottom-up approach

To the Editor:

The central line bundle is a group of evidence-based interventions that have been shown to reduce the risk of central line–associated bloodstream infection (CLABSI). However, a number of common obstacles, ranging from lack of administrative oversight to poor compliance with simple bundle components by care providers, prevent consistent application of these evidence-based practices. We sought to use a strategic process that leveraged the combined advantages of a bottom-up approach in which a multidisciplinary infection prevention team was formed to identify deficiencies in equipment, health care worker practice, and hospital processes relating to avoidance of CLABSI, along with a top-down approach that secured a buy-in from hospital administration to make CLABSI reduction a priority for the intensive care unit (ICU).

The study setting was a 19-bed medical-surgical ICU located in a 200-bed urban community university hospital. Standardized surveillance definitions for CLABSI in accordance with the Centers for Disease Control and Prevention through the National Health and Safety Network were strictly used throughout the study period. The baseline study period was January 2005 to September 2007. The early postintervention period was October 2007 to September 2008, during which random line insertion audits were performed for central line bundle elements and central line dressing audits were performed for clean, dry, occlusive dressings. The mid-postintervention period was October 2008 to September 2009, during which additional interventions were introduced, including implementation of vascular access selection criteria to ensure proper catheter insertion site selection, peripheral intravenous catheter placement with ultrasound guidance wherever possible to avoid central venous catheter (CVC) placement; availability of a second pair of hands to reduce complications during the procedure; daily review of the continued need for CVC during interdisciplinary ICU rounds as part of the daily goals checklist, with removal of the catheter wherever possible; removal of all CVCs placed without compliance with bundle elements in emergent situations within 24 hours; and attachment of a CVC insertion checklist listing bundle elements to all CVC kits. Nurses were empowered to stop the procedure in case of a breach in protocol, and to allow the procedure to be completed once the breach was corrected. The late postintervention period represented the final 2 years of the study (October 2009 to December 2011), during which active and visible involvement of hospital administration was implemented.

As in previous studies, here Poisson analysis was used to generate an incidence rate ratio (IRR) in comparison with baseline CLABSI rates. All analyses were performed using Stata version 10 (StataCorp, College Station, TX). In the 33 months before initiation of the intervention, the infection rate in the ICU was 3.35 infections per 1000 catheter-days (20 CLABSI in 5977 catheter-days) (Fig 1). The overall infection rate decreased by 75%, to 0.83 infections per 1000 catheter-days (11 CLABSI in 13,222 catheter-days), for an IRR of 0.25 (95% confidence interval [CI], 0.12–0.52; P < .001). In the 12-month early postintervention period, the CLABSI rate dropped to 1.59 per 1000 catheter-days (5 CLABSI in 3149 catheter-days), for an IRR of 0.47 (95% CI, 0.18–1.26; P = .136). During the mid-postintervention period (months 13–24 of the intervention), the CLABSI rate declined further to 1.39 per 1000 catheter-days (4 CLABSI in 2879 catheter-days), with an IRR of 0.42 (95% CI, 0.14–1.21; P = .109). Finally, in the late postintervention period (months 25–51 of the intervention), the CLABSI rate was only 0.28 per 1000 catheter-days (2 CLABSI in 7194 catheter days over 27 months), with an IRR of 0.08 (95% CI, 0.02–0.36; P = .001)—a 92% reduction from the preintervention period.

We repeated the analysis after removing the outlier month (September 2007) in which the CLABSI rate was disproportionately higher than during the rest of the study, and found the same results (data not shown). We detected no CLABSI over the last 18 months and only 1 CLABSI over the last 31 months. Compliance with CVC insertion and maintenance increased during the intervention and remained high during the postintervention period assessments (Fig 1).

Most of our strategies were based on established, evidence-based interventions; however, we enhanced best-practice initiatives with efforts to maintain compliance. We introduced positive reinforcement strategies in the form of active and visible involvement of hospital administration by including the leaders in hospital administration in the same e-mails sent to the unit leaders. Hospital leadership responded to the e-mails and encouraged unit leaders to work toward achieving best results. We believe that this combination of ownership of the process at the health care provider level and the administration’s visible involvement and support in the process explains the incremental reduction in CLABSI rates beginning 22 months after implementation of the intervention and extending through the late postintervention stage, and is critical for sustaining excellent results. Administrative recognition and mandate of the process helped eliminate any dissent, contributing to sustained and dramatic improvement in CLABSI rates. We believe this approach can be readily recapitulated in any motivated health system with similar results.

References


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