



## IHI Interventions Prevent Catheter Bloodstream Infections



Bloodstream infections related to the use of central venous catheters (CVCs) are a significant cause of morbidity and mortality for patients in surgical intensive care units, where nearly half rely on a CVC for the administration of treatment. To reduce the incidence of catheter-related bloodstream infections, the Institute for Healthcare Improvement (IHI) introduced its Central Line Bundle, a set of interventions designed to standardise care procedures. A study conducted at the Los Angeles County/University of Southern California Medical Center found that implementation of the IHI interventions reduced the rate of central line associated bloodstream infections (CLABSIs) in its SICU by 68 percent.

### The High Cost of CLABSIs

Of the 80,000 annual cases of catheter-related bloodstream infections reported in ICUs, nearly 24,000 deaths occur. In addition to the devastating human costs, the financial toll on hospitals is considerable. CRBSIs extend hospital stays by 7.5 days per patient, on average, with an associated average expense of \$16,550 per infection. Annually, the price paid for management of these preventable bloodstream infections approaches \$414 million.

### High Infection Incidence is Preventable

Since October 2008, government agencies, including the Centers for Medicare and Medicaid Services, have declined to reimburse hospitals for conditions which are clearly defined as being hospital-acquired; catheter-related bloodstream infections are on that list. The preventability of CLABSIs is supported by many studies, which cite the importance of compliance with established infection control practices. The goal of the California-based study was to demonstrate the effectiveness of the IHI Central Line Bundle and a related checklist on performance improvement in a county hospital, as measured by a reduction in CLABSI incidence.

### The Central Line Bundle and Checklist

Data were collected from two ICUs and a before-after comparison was made to determine the efficacy of the Central Line Bundle in the intervention SICU; a control ICU did not implement the intervention. Five interventional components were enforced: proper hand hygiene (soap and water method and alcohol-based scrubs); chlorhexidine skin antisepsis; preferential use of the subclavian over the internal jugular vein; maximal barrier cautions upon insertion; and a daily assessment of catheter necessity with removal of lines no longer needed. All interventions were implemented simultaneously, since the IHI considers compliance an “all or nothing” indicator.

An awareness program educated nurses and physicians at the hospital about the evidence regarding CLABSI, and a catheter insertion checklist was part of each patient’s file for quality improvement and standardisation of care. Previous research from many industries points to the usefulness of checklists to encourage best practices and reduce human error, including a landmark study in Michigan which showed their ability to almost eliminate central line infection morbidity. The checklist used in the Southern California study included several items related to the catheter insertion site to emphasise the preferred use of a subclavian vein instead of internal jugular or femoral veins.

### Intervention Prevents Infections

The researchers designated CLABSIs per 1,000 catheter days as the primary outcome variable, with infection diagnoses made by hospital epidemiologists according to National Nosocomial Infection Surveillance System definitions. In the 12-month pre-intervention period, there were 3,784 catheter days accrued by 1,141 patients. During the six months which followed the implementation of the Central Line Bundle and checklist intervention, 535 patients experienced a total of 1,870 line days. Demographic data including age, Apache II scores and average catheter utilisation rate (CUR) did not differ across the pre- and post-intervention groups.

CLABSI incidence was found to be reduced by 68 percent after the introduction of the Central Line Bundle intervention. Whereas 19 CLABSIs occurred in the year-long pre-intervention phase, just three occurred in the shorter post-intervention phase. These figures generated rates of 5.02 infections per 1,000 catheter days for the pre-intervention group, compared to 1.60 infections per 1,000 catheter days for the post-intervention group. The 68 percent reduction in CLABSI incidence translates into 12 fewer CLABSIs, 2.5 fewer deaths and a savings of at least \$198,600 per year.

### Study Limitations

A mid-intervention assessment of physician compliance with the checklist items revealed an overall compliance rate of 58 percent, with most of the noncompliance associated with daily assessment of catheter need (70 percent completion rate). Furthermore, the simultaneous enforcement of all Central Line Bundle measures complicates the determination of which mechanism(s) most strongly contributed to the effectiveness of the intervention. Nonetheless, the significant reduction of CLABSIs through a relatively basic intervention of education and a standardised enforcement of practices reveals the powerful infection control potential of the IHI’s Central Line Bundle.

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