

# Putting a Cap on Catheter-Related Bloodstream Infections

Catheter-related bloodstream infections (CRBSIs) have been the target of a high-stakes national effort to reduce or even eliminate potentially deadly infections. St. Francis Hospital in Columbus, Georgia, USA, developed a simple, effective way to supplement the usual practices employed to prevent CRBSI.

Cases of CRBSI have a 12% to 25% mortality rate and often are responsible for increased hospital stays and costs. A national campaign to minimize these infections has been under way for years, with strong support from respected entities, such as the Institute for Healthcare Improvement (IHI), the Society for Healthcare Epidemiology of America (SHEA) and The Johns Hopkins Hospital. The Centers for Medicare & Medicaid Services (CMS) and many private insurers have incentivized CRBSI prevention by deeming them “never events,” which are not reimbursed for treatment in most health-care settings. Many institutions have faithfully revised their procedures in an attempt to bring down CRBSI rates, but infections have dropped only 18%, according to the Centers for Disease Control and Prevention. CRBSIs still kill 30,000 U.S. patients each year.

St. Francis Hospital was among those institutions fiercely dedicated to reducing CRBSI. In January 2009, it implemented IHI’s central line bundle. Later that year, it joined The Johns Hopkins Hospital’s Culture of Safety initiative and Stop BSI Project, established a new protocol for bathing critically ill patients with chlorhexidine gluconate, and mandated that all its CRBSIs be investigated with root-cause analysis.

This multifaceted approach paid off in an infection rate that dropped far below the national average for peripherally inserted central catheters (PICCs) and central venous catheters (CVCs). Based on this success, the hospital pushed to decrease rates even further and save lives.

## Identifying the Problem

To identify the weak link in the prevention approach, St. Francis’s infection control team focused first on the various aspects of bedside care, such as the post-insertion or maintenance phase of catheter care.

As they thought further about bedside care, the team honed in on the hospital’s disinfection protocol for intravenous (IV) needleless connectors. The protocol indicated that connectors should be disinfected every time the IV line is accessed to deliver medication or nutrients. However, there was reason to believe that not every team member was following this standard consistently.

Before each saline flush or line access, the protocol called for practitioners to scrub the connector top and threads with an alcohol wipe for at least 15 seconds while exerting twisting, downward pressure, as if juicing an orange. This was to be followed by an additional 30-second wait for the connector to dry.

The protocol, an evidence-based procedure widely recommended by infection control experts, was based on



The St. Francis Stop BSI team. From left to right: Julia Downey, CPHO, quality improvement team coordinator; Maggie Monahan, RN, MSN, CCRN, nurse educator; Angie King, BSN, CPHO, CPHRM, administrative director of quality and risk management; Pam Stokes, BSN, MSM, CIC, director of epidemiology, employee health and Op infusion/PICC services; Victor Anderson, BSN, epidemiology surveillance; Bruce Carr, MD; Bobby Landrum, APRN, Teresa Davila, RN, BSN; Kelli Koelsch, RN, CCRN, nurse manager; Cindy Kinney, BSN, CCRN, CSC, CMC, nursing director ICU/CCU and medical surgical telemetry.

published *in vitro* studies. Although it worked in the laboratory, that didn’t mean it was a good fit for the everyday realities of hospital nursing. In fact, the team felt strongly that it wasn’t.

“When nurses have emergency patients to deal with, or when they’re busy with something else – and nurses are always busy – there may not be enough time to scrub long enough or wait for the alcohol to dry,” said Pam Stokes, BSN, MSM, the hospital’s director of epidemiology. “Then there’s the issue of work variability. A protocol such as this depends on perfect execution. It’s inevitable that some personnel will do it incorrectly. If the protocol isn’t performed thoroughly and precisely, bacteria can enter the connector’s intraluminal pathway and cause an infection.”

## An Alternative to Manual Disinfection

St. Francis’s infection control team found a tool to supplement or replace the manual technique and implemented a trial to test its effectiveness.

The device is a brightly colored plastic cap containing a sponge saturated with 70% isopropyl alcohol. It is placed on the needleless connector as soon as the catheter is inserted; it is used after medication or nutrition has been administered and after the last saline flush.

When the cap is gently twisted onto the threads of the connector, the interior sponge is depressed, releasing the alcohol over the connector top and threads. The thread design of the cap retains the alcohol where it is needed. A recent *in vitro* study showed that the connector is disinfected after the cap has been attached for five minutes. There’s no variability issue with this device; it is just a matter of threading it onto the port.

The cap has two additional benefits. First, it is normally used after the final flush of a line access and then left in place to protect the line from contamination (airborne or touch). Second, the cap’s bright color makes it easy to confirm compliance with the facility’s protocol. If the cap is on the port, compliance has occurred. With the manual

disinfection method, compliance cannot be confirmed unless a supervisor follows every nurse on rounds.

## Results

The cap’s effectiveness was evaluated during a two-week trial in St. Francis’ coronary care and intensive care units. During the trial, the device was shown to work properly and was well accepted by staff. Hospital-wide implementation occurred in April 2010.

Just as the infection control team hoped, use of the cap has helped reduce CRBSI dramatically. Infection rates have dropped 42% between pre-implementation (January 2009 to March 2010) and post-implementation (April 2010 to February 2011, the most current data available). This reduction can be attributed to the cap directly, as no other preventive changes have been made since its introduction.

Disinfecting caps are a developing technology and another potential strategy for reducing CRBSI. It should be noted that the cap in use at St. Francis is just one of several available. One of the alternatives assists the nurse in cleaning the needleless connector by employing isopropyl alcohol, small foam “fingers” and a twisting motion. A second available alternative is another kind of disinfecting cap that stays in place between line accesses; its bright color also helps verify compliance.

## Conclusion

St. Francis’ manual disinfection problem is hardly unique. Although a manual technique is used widely throughout U.S. hospitals, its deficiencies are much decried in the field. St. Francis’ solution may be applied at other institutions in pursuit of the long-sought goal to minimize CRBSI. ▲

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