



Case Study

High-Performing Health Care Organization • December 2011

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Commonwealth Fund pub. 1558
Vol. 20

Southern Ohio Medical Center: Eliminating Central Line Infections in the ICU

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Vital Signs

Hospital: Southern Ohio Medical Center

Location: Portsmouth, Ohio

Type: A 222-bed, private, nonprofit, community hospital with a 16-bed intensive care unit and a 12-bed cardiac care unit.

Distinction: Zero central line-associated bloodstream infections (CLABSIs) in the intensive care unit. See [Appendix](#) for full methodology.

Timeframe: January through December 2009

This case study describes the strategies and factors that appear to contribute to the low incidence of CLABSIs at Southern Ohio Medical Center. It is based on information obtained from interviews with key hospital personnel, publicly available information, and materials provided by the hospital from January to February 2011.



Southern Ohio Medical Center (Southern Ohio) launched its effort to eliminate central line-associated bloodstream infections (CLABSIs) in 2006, soon after joining the Institute for Healthcare Improvement (IHI) “100,000 Lives” campaign.¹ The IHI program helped Southern Ohio adopt the Centers for Disease Control and Prevention’s (CDC) evidence-based protocol for CLABSI prevention, which emphasizes the importance of maintaining a sterile field, among other preventive measures. Southern Ohio leaders say the IHI program also helped the hospital instill a practice of measurement that facilitated its efforts to monitor adherence to evidence-based guidelines.

Southern Ohio created a team comprising an intensive care unit (ICU) physician, an ICU nurse manager, an infection control professional, a unit educator, and other frontline staff to tailor and implement the CLABSI prevention

protocol in the hospital. Southern Ohio found that engaging frontline staff was more effective than top-down directives for adopting and maintaining new practices. Also, the hospital relies on a small number of critical care intensivists to conduct or oversee central line insertions, including those performed by residents. Because some central lines are inserted during surgery, surgeons are told that they must follow protocols if they want to insert lines at Southern Ohio.

The hospital's line insertion protocols, based on CDC guidelines, include the use of maximum barrier precautions. For clinicians, this means strict compliance with hand-washing, wearing a cap that covers all hair, ensuring a mask covers the nose and mouth tightly, and using sterile gown and gloves. The precautions also require covering the patient from head to toe with a sterile drape with a small opening for the site of insertion. The team uses chlorhexidine skin antiseptic to reduce the risk of infection, and the subclavian vein is the preferred site for insertion. And a recently implemented protocol involves accessing central lines by cleansing the port with two alcohol wipes and cleaning for a total of 15 seconds.

Southern Ohio uses various strategies to facilitate adherence to the protocols. These include:

- *The use of procedure carts:* the ICU keeps two central line carts fully ready, containing different kinds of central lines, gowns, and core prep materials. Staff report having all supplies in one place improves compliance with evidence-based practices.
- *Checklist:* a checklist with the steps in the protocol is taped on top of every set of central line supplies.
- *Site selection preference:* if the physician does not follow guidelines for selecting the site of line insertion, he or she must document the reason.

At one team member's recommendation, each of the three ICU intensivists has individualized protective equipment packs on the cart with their names on them. These kits contain the physician's preferred sterile gloves, gown, cap, and mask. This saves time, improves compliance, and provides each physician

WhyNotTheBest.org CLABSI Series

Between 4 percent and 5 percent of hospitalizations result in a health care–associated infection (HAI), at tremendous cost to individuals who become infected and those who fund health care. One of the most common and preventable HAIs is the central line–associated bloodstream infection (CLABSI), which can result when a central venous catheter is not inserted cleanly or maintained properly. An estimated 43,000 CLABSIs occurred in hospitals in 2009 and nearly one of five infected patients died as a result. This case study is part of a series that describes practices used by four leading hospitals that eliminated CLABSIs in their ICUs. The profiled hospitals are extending these strategies to other hospital units and to other HAIs. A synthesis report summarizing lessons from these high-performing institutions is available at <http://www.whynotthebest.org/contents/view/249>. Comparative performance data on CLABSIs and other measures of health care quality, safety, outcomes, and patient experience for these four hospitals is available at <http://www.whynotthebest.org/reports/view/null/4214>.

with the most comfortable and appropriate supplies for central line insertions.

Nurses play a critical role in ensuring compliance with the CLABSI prevention checklist and are authorized to stop the procedure if protocols are not being followed. They have stopped the procedure only twice, both times when surgeons were inserting lines. In each case, an ICU intensivist or nurse manager approached the surgeon and reinforced the importance of following hospital protocol.

In addition, nurses are meticulous about managing the insertion site. They follow evidence-based practices for changing the dressings and keeping the area clean. Part of the daily nursing assessment is a review of line necessity; nurses must check off a box on their nursing notes indicating that they discussed the necessity for the line during rounding with the

critical care intensivist. The physicians’ progress notes also indicate whether the line is needed.

To further emphasize the importance of CLABSI prevention to staff, the hospital’s chief medical officer identified one physician champion—an ICU intensivist and senior director of critical care—to send a letter to all medical staff explaining the new IHI-based central line bundle and its importance. This was instrumental in achieving broader physician buy-in and limiting pushback, hospital leaders say.

PERFORMANCE MEASUREMENT

The hospital monitors its performance and reports data on a dashboard, which is presented to clinical and administrative managers, directors, and board members. In addition, every nursing unit receives monthly reports that include infection rates compared against national benchmarks. The intensivists, unit directors, and nurse managers are held accountable for results and bonuses are tied to their performance.

The hospital also makes its performance on hospital-acquired infections (HAIs), “never events,” and many other patient safety indicators publicly available on its Web site. This transparency promotes accountability and efforts to improve quality, according to hospital leaders.

RESULTS

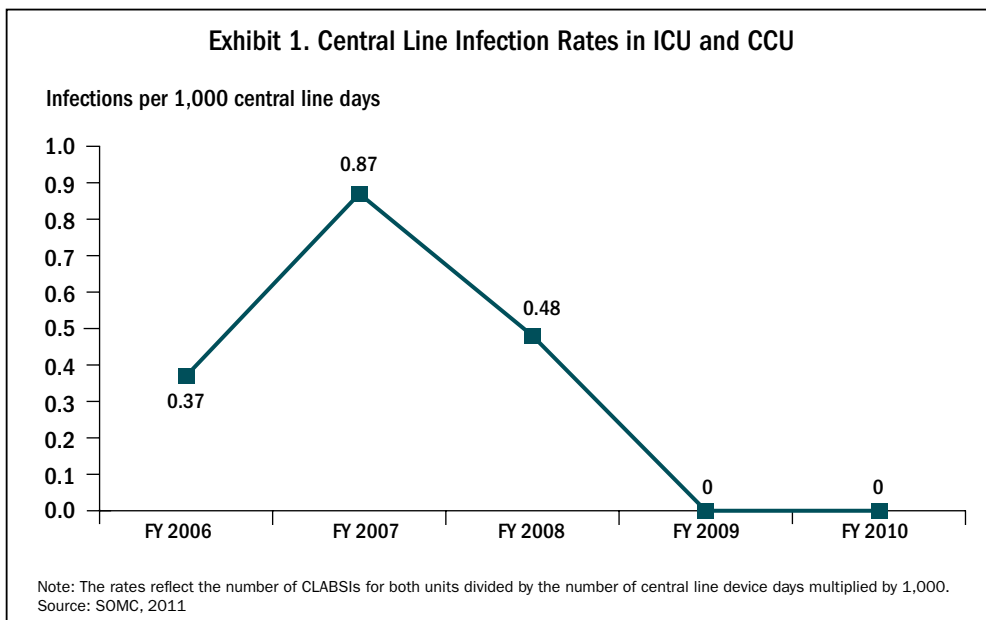
Southern Ohio Medical Center experienced no CLABSIs in the ICU and cardiac care unit (CCU) during 2009 and 2010 (Exhibit 1). The last CLABSI in the ICU occurred in November 2007. Outside of the ICU and CCU, the hospital had one CLABSI in mid-2009.

Spread Within the Hospital

In 2009, Southern Ohio required staff to use maximum barrier precautions hospitalwide.

The emergency department (ED) and floor units received prepackaged central line kits containing sterile drape, cleaner, central lines, gown, mask, and gloves. In the ED, a designated nurse is responsible for restocking the cart every evening and ensuring that the protocol is followed.

To reinforce the importance of the CLABSI prevention protocol, the infection control nurse and patient safety coordinator worked with unit educators to extend the protocols throughout the hospital. The unit educator—a nurse or other staff person designated for each unit—trains staff and helps ensure that a new process is sustained. This has been especially important when introducing infection protocols in the ED, where there are many residents inserting central lines. The ICU and ED educators attended medical staff



meetings to describe infection protocols. In addition, the initial nurse orientation covers central line protocols.

WORK ON OTHER HEALTH CARE-ASSOCIATED INFECTIONS

To reduce catheter-associated urinary tract infections (CAUTIs), the hospital conducts a urinalysis and urine culture on all patients who come to the hospital with a urinary catheter. The cost of the tests (\$2,000) is significantly less than the cost of services that Medicare would not reimburse if the infection were attributed to the hospital (approximately \$6,000 for antibiotics and the increased length of stay). The tests identify the infection earlier, which leads to earlier catheter removal and reduced length of stay. Since this process was implemented in 2008, the incidence of CAUTIs has declined significantly.

Southern Ohio also participated in an IHI campaign to reduce the incidence of ventilator-associated pneumonia (VAP), which introduced a bundle of interventions to prevent cases of VAP that was incorporated into the hospital's mechanical ventilation order sheet. In addition to the order sheet, Southern Ohio created teams consisting of senior leaders, physician champions, and frontline staff from the intensive care unit to adapt and implement the protocol. An ICU Education Team developed a "Keys to Saving Lives" program to educate nurses, respiratory therapists, critical care physicians, nurse technicians, and monitor technicians on all of the components of the bundles. A large, colorful bulletin board in the break room illustrated how each component was a "key" to saving the patient's life and emphasized the need to apply all of the components of the bundle.

Dashboards are used to monitor the teams' performance on VAP prevention and monthly meetings are held to provide feedback, evaluate outcomes, and provide staff education. The hospital also has instituted monthly meetings to provide feedback on implementation progress and to reevaluate outcomes and enhanced staff education on the topic. In addition:

- Oral care kits are kept at the bedside.
- Chlorhexidine is scheduled as a medication on the patient's electronic medication record.
- Daily sedative interruption and daily assessment of readiness to extubate are included in the daily interdisciplinary rounding.
- Therapists, intensivists, and the nurse manager monitor the bed position multiple times per day.
- In addition to the ventilator bundle, epiglottal suctioning was added in 2007; respiratory therapists follow a protocol and complete the suctioning with their ventilator checks.
- A critical care intensivist is assigned to the cardiac care unit to ensure ventilator patients are managed in the same manner as in the intensive care unit; Southern Ohio established a goal of having open-heart surgery patients extubated in the operating room or within six hours of surgery to reduce the risk of VAP.

As a result of these efforts, there were zero cases of VAP in the ICU and CCU for 16 consecutive months as of April 2011. Southern Ohio's rates of extubation in the operating room after coronary artery bypass graft procedures far exceed national averages, as does the hospital's rate of extubation in less than six hours after the procedure. Almost half (49.5%) of Southern Ohio's patients were extubated in the operating room in 2010, compared with 2.6 percent of patients included in the Society of Thoracic Surgery's (STS) database. Nearly three-quarters (74.5%) of patients were extubated less than six hours after the procedure in 2010, compared with 38.9 percent of patients included in the STS database.

The hospital has also turned its attention to *Methicillin-resistant Staphylococcus aureus* (MRSA), a strain of staph bacteria that has become resistant to antibiotics. Triggered by an increase in the infections in surgery, Southern Ohio created an infection prevention task force in 2010. The team consists of the infection control nurse, the chief medical officer, the vice

president of safety and health, the patient safety director, and the directors of the nursing areas, all of whom have authority to make changes in staff, products, and processes. The group reviews infections monthly, discusses each case, and asks, “What could we have done differently?”

The task force has implemented the following process changes:

- The preregistration process now includes a checklist asking if the patient was screened for MRSA, and whether he/she was treated if found positive. If the patient was not screened, Southern Ohio conducts a MRSA screening and treats with the appropriate antibiotic if found positive.
- Southern Ohio began providing surgeons’ offices with chlorhexidine wipes to be used before surgery. It also added to a question to a checklist used when a patient registers for surgery to ascertain whether the patient received a chlorhexidine sponge bath that morning.

Southern Ohio’s infection rate has declined since the task force was formed.

The task force reviews each instance of a MRSA or other type of hospital-acquired infection, and nurse managers drill down to identify the root cause. In the process, they discovered that CAUTIs were frequently associated with patients who had fallen once or were at high risk of falling and for whom catheters were being used to prevent them from getting out of bed. The hospital’s infection preventionist, a registered nurse certified in infection control, conducts surveillance. She monitors infections including surgical site infections, CAUTIs, CLABSIs, ventilator-associated pneumonia, MRSA, and others hospitalwide.

The infection preventionist is now beginning to closely monitor CLABSIs throughout the hospital. This is a challenge outside of the small, controlled ICU units, but so far Southern Ohio has been doing well, with only one CLABSI on the medical–surgical floors in the 18 months prior to the interviews for this case study.

LESSONS

Hospitals trying to reduce CLABSIs and other infections may benefit from lessons from Southern Ohio’s experience. These include the importance of engaging frontline teams and physicians to adopt, tailor, and maintain practice changes necessary to prevent CLABSIs.

Southern Ohio Medical Center’s experience also demonstrates the importance of staff education to spread practices throughout a hospital, even when conducting and overseeing line insertion are limited to a small group of specially trained clinicians. The hospital employs a nurse educator on each unit to introduce and teach staff about new tools, medications, and processes. This policy is viewed as an investment that pays off in ensuring that the hospital keeps up with the latest research and evidence on best practices.

Public reporting and financial incentives also validate and reinforce efforts to reduce health care–acquired infections. Southern Ohio’s senior leaders are well aware Medicare increasingly is refusing to reimburse for services needed to treat HAIs. This is not the key motivating factor at Southern Ohio, but does seem to validate to management and staff why it is important to continue to monitor and reduce HAIs.

Finally, Southern Ohio’s success shows that even hospitals such as this that are geographically isolated and not part of larger health systems can take advantage of opportunities to partner with other hospitals and learn from experts. The hospital participated in all six IHI 100,000 Lives campaigns and continues to closely track evidence and adopt clinical practices from the Veterans Health Administration, CDC, IHI, and others.

FOR FURTHER INFORMATION

For further information about Southern Ohio’s infection prevention initiatives, contact Christine Aeh, R.N., director of patient safety, aehc@somc.org.

NOTES

¹ For more information on IHI campaign, see: <http://www.ihl.org/IHI/Programs/Campaign/100kCampaignOverviewArchive.htm>.

Appendix. Purpose and Methodology for CLABSI Case Study Series

To better understand how some hospitals have succeeded in eliminating CLABSI in their ICUs, The Commonwealth Fund supported Health Management Associates in conducting an analysis of high-performing hospitals. The authors examined:

- how CLABSI prevention techniques were implemented and sustained;
- whether and how CLABSI prevention practices were extended beyond the ICU to other units and hospital floors;
- whether the infection prevention framework was extended to other health care—associated infections;
- what challenges hospitals faced in implementing and/or extending infection control interventions; and
- what organizational and cultural factors supported the successful adoption and continuation of best infection control practices.

To select the hospitals for study, the authors reviewed data made available to The Commonwealth Fund by a special arrangement with Consumer Reports Health, which integrated data from 15 states that require hospitals to report CLABSIs, and the Leapfrog Group, which collects infection data voluntarily reported by hospitals in 45 states. In all, the authors examined data from some 964 hospitals. These hospital-specific data are available on The Commonwealth Fund's WhyNotTheBest.org Web site.

The authors selected four hospitals from approximately 100 with zero CLABSIs and a standardized infection ratio of zero in calendar year 2009. The standardized infection ratio (SIR) represents total reported infections divided by total predicted infections. For CLABSI data, a SIR of 1.0 indicates that a hospital is performing just as would be predicted from national rates. A SIR greater than 1.0 indicates the hospital had more infections than predicted from national rates, and a SIR of less than 1.0 indicates it had fewer infections than predicted. Individual hospitals tend to report CLABSI rates (i.e., number of infections per 1,000 central line days), rather than SIRs.

The final selection was based on preferences for: hospitals with the highest number of central line days (indicating more opportunities for infections); those that are not well below average in mortality or readmission rates; and those with scores around the national average or better on measures of patient experiences and adherence to recommended care processes for pneumonia, heart attack, heart failure, and surgery as reported on WhyNotTheBest.org. The selected hospitals also reflect a diversity of facilities, in terms of size and type of operating environment.

The authors gathered information through semistructured interviews (by telephone and through site visits) with key hospital leaders and staff knowledgeable about the hospital's infection control methods and history, and through reviews of hospital data, reports, and other materials made available by the hospital or obtained through Internet searches.

This methodology has some limitations. First, it is based on self-reporting, with a mix of unaudited and audited data. There is variation in self-reported CLABSI data, which means the findings may overreport success. Second, other unmeasured factors may affect CLABSI rates. Third, the sample is small and it is inadvisable to generalize to all hospitals based on such a small sample, or assume that hospitals in different circumstances have the capacity to adopt similar strategies. However, by [synthesizing findings](#) across the four hospitals and identifying common themes, challenges, innovations, and lessons, the authors offer other hospitals insights and options for reducing health care—associated infections.

ABOUT THE AUTHOR

Sharon Silow-Carroll, M.B.A., M.S.W., is a managing principal at Health Management Associates. She has more than 20 years of experience conducting research and analysis of local, state, and national health system reforms; strategies by hospitals to improve quality and patient-centered care; public–private partnerships to improve the performance of the health care system; and efforts to meet the needs of underserved populations. Prior to joining Health Management Associates, she was senior vice president at the Economic and Social Research Institute, where she directed and conducted policy analysis and authored reports and articles on a range of health care issues. Ms. Silow-Carroll earned a master of business administration degree at the Wharton School and a master of social work degree at the University of Pennsylvania.

ACKNOWLEDGMENTS

The author would like to thank the following individuals at Southern Ohio Medical Center who so generously shared their time, data, and insights about infection control efforts: Christine Aeh, R.N., director of patient safety, and Kathy Mullens, R.N., infection preventionist.

Editorial support was provided by Sarah Klein.

Health Management Associates (HMA) is an independent health care research and consulting firm. In May 2010, HMA established a division, HMA Investment Services, to provide generalized information, analysis, and business consultation services to its clients, which principally include investment professionals. Neither HMA nor HMA Investment Services is a registered broker-dealer or investment adviser firm. Research and analysis prepared by HMA on behalf of The Commonwealth Fund is independent of and not influenced by personnel or clients of HMA Investment Services. In particular, the selection of subjects and content for HMA case studies published by The Commonwealth Fund is based solely on objective criteria and is in no way influenced by HMA Investment Services.

This study was based on publicly available information and self-reported data provided by the case study institution(s). The Commonwealth Fund is not an accreditor of health care organizations or systems, and the inclusion of an institution in the Fund's case studies series is not an endorsement by the Fund for receipt of health care from the institution.

The aim of Commonwealth Fund–sponsored case studies of this type is to identify institutions that have achieved results indicating high performance in a particular area of interest, have undertaken innovations designed to reach higher performance, or exemplify attributes that can foster high performance. The studies are intended to enable other institutions to draw lessons from the studied institutions' experience that will be helpful in their own efforts to become high performers. It is important to note, however, that even the best-performing organizations may fall short in some areas; doing well in one dimension of quality does not necessarily mean that the same level of quality will be achieved in other dimensions. Similarly, performance may vary from one year to the next. Thus, it is critical to adopt systematic approaches for improving quality and preventing harm to patients and staff.

