American Journal of Infection Control ■■ (2016) ■■-■■

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major article

Using the Comprehensive Unit-based Safety Program model for sustained reduction in hospital infections

Kristen Miller DrPh, MSPH [a,*], Carol Briody MT (ASCP), CIC [b], Donna Casey BSN, MA, RN, FABC, NE-BC [c], Jill K. Kane BSN, RN, CCRN [d], Dannette Mitchell MSN, APRN, ACNS-BC, CCRN [e], Badrish Patel MD [d], Carol Ritter MSN, RN, CCRN, CNML [d], Maureen Seckel APN, MSN, ACNS-BC, CCNS, FCCM [d], Sandy Wakai MSN, RN, CCRN [f], Marci Drees MD, MS [a,b]

[a] *Value Institute, Christiana Care Health System, Newark, DE*
[b] *Infection Prevention, Christiana Care Health System, Newark, DE*
[c] *Patient Care Services, Cardiovascular and Critical Care, Christiana Care Health System, Newark, DE*
[d] *Medical ICU, Christiana Care Health System, Newark, DE*
[e] *Medical ICU, Wilmington Hospital, Wilmington, DE*
[f] *Joint Replace Center, Wilmington Hospital, Wilmington, DE*

Key Words:
Comprehensive Unit–based Safety Program
catheter infections
bloodstream infections
safety culture

Background: Prompted by the high number of central line–associated bloodstream infections (CLABSIs), our institution joined the national On the CUSP: Stop BSI initiative. We not only report the significant impact that the Comprehensive Unit-based Safety Program (CUSP) had in reducing CLABSI, but also report catheter-associated urinary tract infections (CAUTIs) and ventilator-associated pneumonia (VAP) in 2 intensive care units (ICUs).

Methods: At our community-based academic health care system, 2 ICUs implemented CUSP tools and developed local interventions to reduce CLABSI and other safety problems. We measured CLABSI, CAUTI, and VAP during baseline, the CUSP period, and a post-CUSP period.

Results: CLABSIs decreased from 3.9 per 1,000 catheter days at baseline to 1.2 during the CUSP period to 0.6 during the post-CUSP period (rate ratio, 0.16; 95% confidence interval [CI], 0.07-0.35). CAUTIs decreased from 2.4 per 1,000 patient days to 1.2 during the post-CUSP period (rate ratio, 0.4; 95% CI, 0.24-0.65). VAP rate decreased from 2.7 per 1,000 ventilator days to 1.6 during the CUSP and post-CUSP periods (rate ratio, 0.58; 95% CI, 0.30-1.10). Device utilization decreased significantly in both ICUs.

Conclusions: Implementation of CUSP was associated with significant decreases in CLABSI, CAUTI, and VAP. The CUSP model, allowing for implementation of evidence-based practices and engagement of front-line staff, creates sustainable improvements that reach far beyond the initial targeted problem.

For over a decade, the Comprehensive Unit-based Safety Program (CUSP) model, a multifaceted approach to patient safety, has empowered units to take action by aligning culture change and quality improvement models.[1] Implementation of this model has resulted in a dramatic and sustained decrease in central line–associated bloodstream infection (CLABSI) rates, with sustained improvements.[2,3] Among health care–associated infections, CLABSI was initially the major focus of CUSP because of high morbidity and mortality,[4,5] excess cost,[6-8] and a greater understanding of evidence-based prevention measures compared with other types of infections. However, the CUSP model can, and is intended to, be applied to any patient safety issue. CUSP is sufficiently structured to provide a strategy for health care organizations to improve culture and learn from mistakes, but is flexible enough for units to focus on risks that they perceive as most important, given their context. Subsequent evaluations of CUSP demonstrate improved safety and teamwork climate,[9] decreased nursing turnover, and decreases in other health care–associated infections.[10-12]

Since the initial project describing CUSP success with CLABSI, the CUSP model has been applied in intensive care units (ICUs) to reduce

* Address correspondence to: Kristen Miller, DrPh, MSPH, Value Institute, Christiana Care Health System, John H. Ammon Medical Education Center, 4755 Ogletown-Stanton Rd, 2nd FL, Office 2E61C, Newark, DE 19718.
E-mail address: Krmiller@christianacare.org (K. Miller).
Conflicts of Interest: None to report.

0196-6553/
http://dx.doi.org/10.1016/j.ajic.2016.02.038

infections nationwide, initially focusing on CLABSI but then expanding to develop and implement interventions to reduce catheter-associated urinary tract infection (CAUTI)[13] and, most recently, ventilator-associated pneumonia (VAP) and other complications of mechanical ventilation.[14] In each of these initiatives, there is a well-described distinction between the technical work (ie, evidence-based practices to decrease infections) and adaptive work (ie, change in culture, communication, teamwork, and other practices necessary to sustain behavior change and infection reduction). Implementation of CUSP demonstrated that most CLABSI are preventable through consistent application of evidence-based practices, and these reductions can be sustained over extended periods of time.[3]

Based on the prior success of CUSP implementation, the Agency of Healthcare Research and Quality funded the On the CUSP: Stop BSI initiative and challenged state hospital associations nationally to reduce CLABSI rates to <1 per 1,000 central line days, and in 2009, the U.S. Department of Health and Human Services set a national goal for a 50% reduction in CLABSI by 2013.[3] The On the CUSP: Stop BSI initiative was implemented in sequential groups of state hospital associations who were tasked with enrolling at least 15 hospitals in their state to participate in the collaborative. In 2010, cohort 4 of CUSP was launched statewide in Delaware, with full participation in 100% of acute care hospitals (n = 8) and a total of 14 CUSP unit teams.[15]

Christiana Care Health System (CCHS) joined the On the CUSP: Stop BSI initiative, prompted in part by high CLABSI rates in one ICU in particular, in addition to implementing other complementary systemwide initiatives. Despite significant improvement compared with 2004-2005, CLABSI rates at CCHS had increased beginning in mid-2009. This study describes the impact of CUSP implementation in 2 CCHS ICUs, the Wilmington intensive care unit (WICU) and the Christiana Hospital medical intensive care unit (MICU), that participated in the On the CUSP: Stop BSI initiative.

METHODS

Setting

CCHS, headquartered in Wilmington, Delaware, is one of the country's largest health care providers, ranking 22nd in the nation for hospital admissions with >53,000 annually. A not-for-profit, nonsectarian community-based academic health system, CCHS includes 2 major teaching hospitals with >1,100 patient beds and 5 adult ICUs. CCHS is the major health care provider in Delaware, with approximately 50% of the hospitalizations statewide and 90% of the adult non–Veterans Affairs hospitalizations in the county. CCHS is 1 of 8 Delaware hospitals that participated in the On the CUSP: Stop BSI initiative.

The WICU, a 9-bed closed unit at the smaller Wilmington Hospital, provides services to a diverse mix of adult medical and surgical patients. The WICU is unique as the only ICU on the Wilmington Hospital campus. The MICU, a 22-bed closed unit located at Christiana Hospital, cares for medical critical care patients. Case mix data for 2015 (MICU: 2.698, WICU: 2.389) and top diagnoses (eg, septicemia or severe sepsis; respiratory system diagnosis with ventilator support) indicate the 2 units are similar in patient acuity. The health care provider team for both units consists of intensivists on site, resident coverage, and critical care physician assistants, along with a tele-ICU model allowing remote critical care nursing and physician supervision. The WICU and MICU share intensivists that rotate on a weekly basis, 2 of which are medical directors for the units, and physician assistants that rotate on a regular basis. There is no crossover for nursing management and staff. In addition to the delivery of expert patient care, critical care coverage extends outside the boundaries of these units, including response to code blues and rapid responses throughout the campus. The units participate in a medical critical care leadership group which is a collaborative of the 2 units to work on major goals that would be the same for each unit.

CUSP development

Leadership and physician engagement were key components in CUSP development. Enrollment in the On the CUSP: Stop BSI initiative required CCHS leadership support and stakeholder engagement, including support from the chief executive officer. The infection prevention department oversaw program participation and worked with senior leadership to identify an executive champion for each participating ICU. At the onset of the project, each unit formed their CUSP team, including a team leader, physician champion, executive champion, nurse manager, infection preventionist, and a multidisciplinary team of nurses, nurse educators, respiratory therapists, and vascular access nurses. As needed, team members from other departments (eg, emergency department, hemodialysis, respiratory) were invited to be members. To take full advantage of the transdisciplinary nature of CUSP, CCHS engaged a variety of stakeholders to implement evidence-based practices, including information technology, the virtual education and simulation training center, clinical engineering, logistics, and environmental services.

CCHS participated in the On the CUSP: Stop BSI initiative from July 2010-June 2012. The CUSP framework is comprised of 5 steps: train staff in the science of safety; engage staff to identify defects; senior executive partnership and patient safety rounds; continue to learn from defects; and implement tools to improve teamwork and communication. The specific goals of CUSP implementation at CCHS were to work toward eliminating CLABSI, aiming for a target of zero CLABSI per 1,000 central line days, to improve the culture of safety by 50% based on the Agency of Healthcare Research and Quality Hospital Survey on Patient Safety Culture, and to learn from all defects. The CUSP teams underwent the initial On the CUSP: Stop BSI Web-based immersion program to learn the science of safety, CUSP principles and tools, and CLABSI prevention and conducted a baseline culture of safety survey and staff safety assessment.

Interventions

The CUSP teams implemented many efforts to help set the expectation of zero CLABSI, including but not limited to, CUSP training and the technical strategies endorsed by On the CUSP: Stop BSI. These initiatives may be grouped into distinct categories: culture change, learning from experience, observation, evidence-based practice, and education (Fig 1). Units participated in monthly meetings to review current practice, discuss evidence-based practice for infection prevention and strategies for implementation, and perform gap analysis at a unit level. This interdisciplinary gathering provided opportunities to investigate each defect using an internally developed CLABSI investigation tool to conduct a root cause analysis of any identified CLABSI. All infections were reported at CUSP monthly meetings, and each defect was thoroughly investigated. The resulting actions were foundational (actions that depend on staff to remember their training or remember what is written in policy), including education, training, and demonstration; intermediate (actions somewhat dependent on staff remembering to do the right thing, but they provide tools to help staff to remember or to promote clear communication), including electronic checklists; and strong (actions that do not depend on staff to remember to do the right thing; the action may not totally eliminate the vulnerability but provide very strong controls), including a central line cart and nurse in room for every line insertion and executive unit rounding. Unit-level gap analysis and investigations of any CLABSIs revealed line maintenance as the primary opportunity for eliminating CLABSI. The team undertook