Peer-Reviewed Articles

American Journal of Infection Control: Volume 40 Number 10; December 2012

Impact of Alcohol-Impregnated Port Protectors and Needleless Neutral Pressure Connectors on Central Line-Associated Bloodstream Infections and Contamination of Blood Cultures in an Inpatient Oncology Unit

Michael A. Sweet, PharmD; Aaron Cumpston, PharmD; Frank Briggs, PharmD; MPH, Michael Craig MD and Mehdi Hamadani, MD

- A total of 6,851 central line-days and 16 CLABSI (2.3 infections/1,000 central line days) were documented during the control period, compared with 3,005 central line days and one CLABSI (a rate of 0.3 infections/1,000 central line days) during the intervention period (relative risk, 0.14; 95% confidence interval [CI], 0.02-1.07; P = .03).
- The rate of contaminated blood cultures from central lines was 2.5% (17 of 692) during the control period, but only 0.2% (1 of 470) during the intervention period (relative risk, 0.09; 95% CI, 0.01-0.65; P = .002).
- The rate of adherence to the intervention was 85.2% (228 of 269 patients with catheter protectors).
- This 32-bed study showed $500,000 in annualized savings (Sweet MA, et al. SHEA Product Evaluation 2011).

The Journal of the Association for Vascular Access: Volume 17 Number 4; December 2012

Central Venous Catheter Protective Connector Caps Reduce Intraluminal Catheter-Related Infection

Chuck Ramirez, BA, RRT, VA-BC; Antonina M. Lee, MEd, MPH, RN, CIC; Ken Welch, MD

- During 2010, the CLABSI rate reduced from 1.9 in 2010 to 0.5 during the one-year trial period.
- The implementation of 3M™ Curos™ Disinfecting Cap Strips for Needleless Connectors during month five of the trial increased compliance rates from 63% to 80%.

American Journal of Infection Control: Volume 40 Number 12; December 2014

Impact of Universal Disinfectant Cap Implementation on Central Line-Associated Bloodstream Infections

Katreena Collette Merrill RN, PhD; Sharon Sumner RN, BS, Lorraine Linford RN, BS, CNSC, Carrie Taylor RN, MS, CIC, Christopher Macintosh RN, BS

- The rate of CLABSI infections decreased by >40% following implementation of the 3M™ Curos™ Disinfecting Strip for Needleless Connectors (IRR = .557, P = .004).
- Weekly audits of compliance demonstrated that a 10% increase in nurse compliance resulted in a statistically significant 7% drop in infection rate.
- Curos cap use was associated with an estimated savings of almost $300,000 per year in the hospital studied.
Use of a Central Catheter Maintenance Bundle in Long-term Care Hospitals

Antony M. Grigonis, PhD, Amanda M. Dawson, PhD, Mary Burkett, DNP, CNS, Arthur Dylag, MA, MBA, Matthew Sears, BS, Betty Helber, RN, MS, ANE-BC, and Lisa K. Snyder, MD, MPH

- A central catheter maintenance bundle was implemented in 30 LTACHs. CLABSI rates were reported for 14 months before and 14 months after the bundle was implemented.
- In addition to the CDC guidelines, the bundle protocol included education on the protocol, mandatory use of alcohol-based central catheter caps, chlorhexidine gluconate dressings, and formation of a central catheter team of nurses.
- A mean reduction of 4.5 CLABSIs per LTACH occurred for the LTACHs studied for 14 months after the bundle was implemented.
- This infection reduction could translate to a savings of approximately $3.7 million annually for the 30 LTACHs studied and could have potentially saved 20 patients’ lives, assuming a 15% mortality rate from CLABSIs.

Port Protectors in Clinical Practice: An Audit


- The study measured the effect on compliance and incidence of vascular access device (VAD)-related bacteremia following the introduction of a passive disinfection device (Curos cap) for 6 months.
- As compared to data collected in a benchmark “scrub the hub” audit, data post Curos cap implementation showed VAD-related bacteraemia rates reduced by 69% when staff compliance with Curos cap placement onto VADs was 80% or more.
- The use of Curos caps was estimated to provide a potential clinical-time saving of 659.4 hours per year, which equates to 82.4 working days per year (based on an 8-hour day).
- Of the 86 staff trained to use the port protector, 70% returned completed questionnaires, and of these 100% preferred the port protectors to manual scrubbing.

This infection reduction could translate to an annual savings of approximately $3.7 MILLION
Hospital Studies

2015

Successful Decrease of Central Line-Associated Bloodstream Infections in an Urban Neonatal Intensive Care Unit Using a Pediatric-specific Interdisciplinary Approach

Mount Sinai Hospital, New York City, NY: Ramona Karam-Howlin, Andrea Fede, Kathleen Gibbs, Nathaniel Bravo, Fran Wallach and Gopi Patel.

- An interdisciplinary committee implemented multiple interventions including a daily nursing assessment of dressing integrity, exit site, and presence of port protectors.
- Post intervention results showed an improvement from baseline CLABSI rate of 5.2 per 1000 line days in 2012 to 1.0 per 1000 line days in 2013 to our current rate of 0.4 per 1000 line days (p <0.05) through November 2014.

An Interdisciplinary Approach to Reduce Intensive Care Unit (ICU) Central Line-Associated Bloodstream Infections (CLABSIs) Using LEAN Six Sigma

Texas Health Presbyterian Hospital Dallas: Gurminder Kaur

- The goal was to have no CLABSIs in November & December, 2013, and to sustain this improvement.
- An interdisciplinary team of ICU RNs, Infection Prevention, and Vascular Access representative used Lean Six Sigma (LSS) methodology to evaluate current line maintenance “best practices” including the use of disinfecting port protectors.
- In the first 10 months post implementation of the project, the Standardized Infection Ratio (SIR) decreased from 0.58 to 0.07 (42% below the national benchmark to 93% below the national benchmark) compared to the prior 10 months.
- LSS methodology was significant in reducing ICU CLABSIs through collaborative team work, involvement of local champions, and frontline staff ownership and engagement.

2014

Alcohol-Impregnated Disinfectant Caps Reduce the Rate of Central Line-Associated Bloodstream Infections and Nosocomial Bacteremia

Highland Hospital and University of Rochester Medicine, Rochester, NY, Mark Shelly, Linda Greene, Lynne Brown, Sherry Romig, Ann Marie Pettis.

- This study evaluated the effect of two disinfection caps (Curos cap and SwabCap) on rates of nosocomial bacteremia.
- CLABSI data from a period of 12 months of cap usage was compared to data from the previous 12 months.
- On units using caps, the rate of CLABSI fell significantly from 1.5/1000 line days to 0.5/1000 line days, while the control units saw no significant change.
- Both types of caps were associated with a decrease in nosocomial BSI.

The Standardized Infection Ratio decreased below the national benchmark by 93%
## Reducing Central Line-Associated Bloodstream Infections through the Addition of Disinfecting Port Protector Caps to the Central Line Bundle

Ochsner Medical Center, Jean Shiber, MN, RN-BC, OCN, Gina Jolicoeur, RN, OCN, Tere Crouchet, MSN, RNBC,CCTN

- Curos disinfecting caps were implemented as part of the central line bundle to prevent CLABSI on an Acute Inpatient Oncology Unit.
- Audits were conducted to track cap compliance which rose steadily to over 90%.
- CLABSI rates decreased on both units.

## The Effect of 70% Isopropyl Alcohol Port Protection on Central Venous Catheter-Related Infection in Patients on Home Parenteral Nutrition

St. Mark’s Hospital, Harrow, UK: Mia Small, MSc, BSc (Hons), RGN, DipNutr, RNutr

- This study aimed to assess the effect of Curos caps on CRBSI rates and organisms responsible for infection in HPN patients, and evaluate patient acceptability and compliance with the product.
- After the implementation of Curos caps, the monthly infection rate declined significantly from a mean of 1.36/1000 catheter days to a mean of 0.47/1000 catheter days (p<0.001).
- 99.6% of the patients who agreed to use Curos caps were extremely happy with the product and only 2 (0.7%) patients were non-compliant.

## A Significant Decline in Central Line-Associated Bloodstream Infections Using Alcohol-Impregnated Port Protectors at a Large Non-Profit Acute Care Hospital

Texas Health Presbyterian Hospital Dallas: Barbara Danielson, BSN, RN, CIC, Texas Health; Sharon Williamson, MT(ASCP)SM, CIC, Texas Health Resources; Gurminder Kaur, MSN, RN, CIC and Texas Health: Noreen Johnson, BSN, RN, CIC

- In the first 10 months of hospital wide use of Alcohol-Impregnated Port Protectors (AIPPs), CLABSI rates decreased by 68% compared to the 10 months prior to AIPPs use.
- This process improvement step was significant in reducing house wide CLABSIs, as well as increasing satisfaction on and impacting cost.

## Implementing Alcohol-Impregnated Port Protectors as a Means to Decrease CLABSI’s

Carolinas HealthCare System: Morgan Miskill, RN, BSN, OCN and Emily Bellard, RN, MSN, OCN

- Excluding mucosal barrier injury related laboratory-confirmed bloodstream infections (MBI-LCBIs), the adjusted CLABSI rate on a 36-bed medical oncology unit fell from 1.8 infections per 1,000 central line days in 2012 to 0.6 infections per 1,000 central line days in 2013 (66.7% reduction).

## Decreasing CLABSI Rates and Cost Following Implementation of a Disinfectant Cap in a Tertiary Care Hospital

Intermountain Medical Center: Sharon Sumner, RN, BSN, IP; Lorraine Linford, RN, BS, CNSC; Carrie Taylor, RN, MSN, CIC; BYU College of Nursing: Kateena Merrill, RN, PhD

- Significant decrease in the rate of CLABSI and contaminated blood cultures from 2011 to 2012.
- The facility estimated an annual cost savings of $732,840 using Curos cap.

### Cost Savings

- **$732,840** estimated annual cost savings using Curos cap

### Patient Satisfaction

- **99.6%** of the patients who agreed to use Curos cap were extremely happy with the product
Decreasing the Incidence of Central Line-Associated Bloodstream Infections using Alcohol-Impregnated Port Protectors (AIPPS) in a Neonatal Intensive Care Unit

Texas Health Presbyterian Hospital: Barbara Danielson, BSN, RN, CIC; Sharon Williamson, MT (ASCP) SM, CIC; Gurminder Kaur, MSN, RN, CIC; Christine Brooks, MSN, RNC-NIC, NE-BC; Phyllis Scholl, BSN, RNC; Andrea Baker, BSN, RNC

- In the 1st quarter of 2011, a 47-bed, level III NICU switched from a traditional 15-second catheter scrub using alcohol wipes to using Curos 70% isopropyl alcohol-impregnated port protectors.
- By the end of 2011, the CLABSI Standardized Infection ratio (SIR) had fallen from the 2010 calculation of 1.723 to 1.013 (or 1% above the expected). The 2011 results included a 4th quarter SIR of 1.656 when Curos caps were NOT in use. When the hospital resumed Curos cap use in January 2012, the annual SIR was calculated to be 0.722 (28% below expected).

Achieving Zero Coagulase-Negative Staphylococci CLBSI in the NICU

Providence Sacred Heart Medical Center and Children’s Hospital: Jean Kelleher, Roy Almeida, Heidi Cooper, Susan Stauffer

- Five coagulase-negative staphylococci (CoN) positive cultures were documented in the pre-intervention period (July – March 2012), for a rate of 1.6 CoN infections per 1,000 line days as compared to two CoN positive cultures during the Curos cap trial conducted from April-December 2012.
- The trial resulted in an estimated nine-month cost savings of $87,468.
- Zero CoN central line-associated bloodstream Infections were reported in the first quarter of 2013.

Impact of Port Protectors on Incidence of Central Line Infections

Providence Sacred Heart Medical Center: Mary Jo Moore, RN MA; Kim Gripp, RN; Heidi Cooper, RN MS; Roy Almeida PhD

- During a three-month trial on all patients, all lines in the adult ICU, the CLABSI rate fell from 2.6/1000 device days for the previous quarter to 0/1000 device days during the pilot period. The CLABSI rate for the control unit (CICU) for the same pilot period was 3.9/1000 device days.
- In the six months since the product was implemented across all critical care units at PSHMC, there have been zero CLABSI in the CICU and two CLABSI events in the ICU – both were determined to be unrelated to the use of Curos caps.

Forcing the Function: Implementation and Evaluation of an IV Port Protector to Decrease CLABSI

Legacy Health, Portland, Oregon: Mary Davis, BSN, RN, CCRN

- From September 2011 to February 2012 all four nursing units using Curos caps decreased the incidence of CLABSI by 50% or greater and contaminated blood cultures by 30% or greater.
- The facility estimated that the trial units saved Legacy Health $103,524 over six months.
Increasing Central Line-Associated Bloodstream Infections (CLABSI) in Adult ICUs through Teamwork and Ownership

Grady Health System, Atlanta, GA: M Cole, BSN, CIC; K Kennedy, MN, RN, NEA-BC

- Following Curos caps implementation, average rate of CLABSI in the SICU decreased from 12.8 CLABSI/1000 central line days to 4.4 CLABSI/1000 central line days from 2010 to 2012 — a 68% decrease.
- In the same timeframe, the average rate of CLABSI in the MICU decreased from 14.6 CLABSI/1000 central line days prior to Curos cap implementation on to 4.2 CLABSI/1000 central line days with the use of Curos caps — a 71.2% decrease.

California Children’s Services (CCS) Neonatal Infection Prevention Project in Association with California Perinatal Quality Care Collaborative (CPQCC): 2006-2012 Update

- CLABSI rates continued to fall significantly for the “All Birth Weights” category.

Impact of Alcohol-Impregnated Protectors on Incidence of Catheter-Associated Bloodstream Infections

Washington University in St. Louis School of Medicine: F Alasmari, MD, MSc; ND Kittur PhD, MPH; ER Dubberke, MD, MSPH; Barnes Jewish Hospital: AJ Russo, MPH; KM McMullen, MPH, CIC; K Rensing, RN, MSN, ANP-BC, CRNI; JL Mayfield, BSN, MPH, CIC

- Intervention Ward: There were 22,662 line days (11,213 pre- and 11,449 post-intervention). The monthly median CABSI rate was 5.3 (range: 3.1–7.2) pre- and 3.7 (range: 1.0–7.2) post-intervention period. The pre-intervention CABSI rate linear trend was 0.21 (95% CI: 0.05, 0.37) and the post-intervention trend was – 0.19 (95%CI:-0.35,-.02).
- Control Ward: There were 17,670 line days (8,913 pre- and 8,757 post-intervention). The monthly median CABSI rate was 5.6 (range: 2.6 – 10.3) pre and 5.4 (range: 2.7 – 11.3) post-intervention. The pre-intervention CABSI rate linear trend was 0.06 (95% CI: – 0.19, 0.32) and the post-intervention trend was – 0.04 (95%CI:-0.29, 0.22).

Reduction of Central Line-Associated Bloodstream Infection (CLABSI) in a Neonatal Intensive Care Unit with Use of Access Site Disinfection Caps

Rady Children’s Hospital San Diego, San Diego, CA: Alice Pong, MD; Cindy Salgado, BSN, PHN, MBA, CIC; Mark Speziale, MD, PhD; Peggy Grimm, MS, RNC-NIC; Chris Abe, BSN, CIC

- Implementation of ASDCs started in October 2009. Results of CLABSI rates, contaminant rates and blood culture collection are presented for the 12 months preceding and from initiation of cap use.
- Compared to the pre-intervention period, during the 12 months the Access Site Disinfection Caps (ASDC) were in use the CLABSI rate decreased from 0.93 infections per 1000 line days to 0.30 per 1000 line days (68%).

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<th>Year</th>
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<td>2012</td>
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<td>0.65/1000 line days</td>
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<tr>
<td>2011</td>
<td>68%</td>
<td>Compared to the pre-intervention period</td>
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OTHER ARTICLES

Patient Safety & Quality Healthcare (2014)

Making It Easy for Nurses to Reduce the Risk of CLABSI
Wendy Kaler, CLS, MPH, CIC, director of infection prevention at Saint Francis Memorial Hospital in San Francisco, California

This article describes the lack of attention paid to hub disinfection over the years and introduces the use of disinfecting port protectors as an effective and nurse-accepted protocol. Kaler emphasizes the importance of an all lines, all patients approach in sustaining high levels of nurse compliance.

Temple University Hospital Case Study (2013)

Clinical Support for All Patients, All Lines, All the Time (AAA)
Temple University Hospital: M Doherty, RN, MBA, CIC; P Heys, BS

- In the three-month period, there were four CLABSI cases reported on the units trialing Curos caps as compared to 11 cases that were reported in the same timeframe the previous year – a 63.6% reduction.
- An All patients, All lines, All the time (AAA) policy created greater compliance than did a central line-only approach due to less confusion for the staff.

Hartford Hospital White Paper (2012)

REACHING ZERO: Strategies and Tools Utilized to Eliminate Preventable Bloodstream Infections
Hartford Hospital: Lee Steere, RN, CRNI, Joyce Sauve, RN, CTC

Hospitals across the country are leveraging a wide range of clinical-best practices and implementing new tools to demonstrate that achieving the goal of zero hospital-acquired bloodstream infections should be the standard of care. This paper describes the journey of one such inner city medical center, Hartford Hospital (Hartford, CT) in chasing zero.

Infection Control Today (2010)

Disinfecting Needleless Access Valves - Improve Practice and Decrease CRBSIs: Three Hospitals’ Experience with a New Technology.
Jack Soladow

This article explores luer-activated valve disinfection technology advances. Clinical experience with disinfection caps is described at three medical centers: Sharp Chula Vista Medical Center, Chula Vista, Calif., Rady Children's Hospital, San Diego, Calif., and Miller Children's Hospital, Long Beach, Calif.