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<td>Infection and/or contaminated blood cultures</td>
<td>Multiple Specialties</td>
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<td>Compliance and/or patient/staff satisfaction</td>
<td>Hospital Wide</td>
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<td>Staff time and/or length of stay</td>
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<td>Cost</td>
<td>Hospital Wide</td>
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### Antiseptic barrier cap effective in reducing central line-associated bloodstream infections: A systematic review and meta-analysis.


### A bundled approach to decrease primary bloodstream infections related to peripheral intravenous catheters.


### Strategies for the successful implementation of disinfecting port protectors to reduce CLABSI in a large tertiary care teaching hospital.


### Educational interventions alone and combined with port protector reduce the rate of central venous catheter infection and colonization in respiratory semi-intensive care unit.


### Impact of universal disinfectant cap implementation on central line-associated bloodstream infections.


### Port protectors in clinical practice: an audit.


### Central venous catheter protective connector caps reduce intraluminal catheter-related infection.

Successful decrease of central line-associated bloodstream infections in an urban neonatal intensive care unit using a pediatric-specific interdisciplinary approach.  

Impact of alcohol-impregnated port protectors and needleless connectors on central line-associated bloodstream infections and contamination of blood cultures in an inpatient oncology unit.  

Efforts of a unit practice council to implement practice change utilizing alcohol impregnated port protectors in a burn ICU.  

**ABSTRACTS**

**Use of a central catheter maintenance bundle in long-term acute care hospitals.**  

**Impact of alcohol-impregnated port protectors and needleless connectors on central line-associated bloodstream infections and contamination of blood cultures in an inpatient oncology unit.**  

**Efforts of a unit practice council to implement practice change utilizing alcohol impregnated port protectors in a burn ICU.**  
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<th>Population</th>
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<td>Alcohol-impregnated disinfectant caps reduce the rate of central-line associated bloodstream infections and nosocomial bacteremia.</td>
<td>Multiple Specialties</td>
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<td>The impact of 70% isopropyl alcohol port protection caps on catheter related bloodstream infection in patients on home parenteral nutrition.</td>
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<td>Small M. Presented at: World Congress Vascular Access; June 20, 2014; Berlin, Germany.</td>
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<td>Decreasing CLABSI rates and cost following implementation of a disinfectant cap in a tertiary care hospital.</td>
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<td>Impact of alcohol-impregnated protectors on incidence of catheter-associated blood stream infections.</td>
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<td>Reduction in central line associated bloodstream infection (CLABSI) in a neonatal intensive care unit with use of access site disinfection caps.</td>
<td>Neonatal Intensive Care</td>
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<table>
<thead>
<tr>
<th>ADDITIONAL RESOURCES</th>
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<tr>
<td>Abstracts / Articles</td>
</tr>
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</table>
“...use of the antiseptic barrier cap can lower the occurrence of CLABSI and is cost saving.”


**DESIGN**

Systematic review and meta-analysis

**METHODS**

Studies conducted in the hospital setting that compared 3M™ Curos™ Disinfecting Cap for Needleless Connectors and SwabCap® Disinfecting Caps to manual disinfection on the incidence of central line associated bloodstream infection (CLABSI) per 1000 catheter days were included.

**RESULTS**

Relative Pooled CLABSI Incidence (per 1000 catheter days)

- Manual Disinfection (Scrub the Hub): 1.0
- Antiseptic Barrier Caps*: 0.59

*(p<0.001)

There were 41% fewer CLABSI associated with use of the antiseptic barrier cap (IRR = 0.59, 95% CI = 0.45-0.77 p<0.001)

Overall median rate of compliance with barrier cap = 82.5%

Net cost savings ranged from $39,050-$3,268,990

9 studies were included in the systematic review and 7 within the meta-analysis.

* Curos Disinfecting Cap for Needleless Connectors and SwabCap Disinfecting Caps
“Using a PIV maintenance bundle including disinfecting caps and tips can effectively lower the rate of primary bloodstream infections attributable to PIV lines.”


**DESIGN**

Before and after intervention study comparing hospital wide peripheral line-associated bloodstream infections (PLABSI) and intervention compliance.

**METHODS**

**Pre Intervention:** Primary bloodstream infection and IV catheter data collected

**Intervention:** PIV bundle implemented. 3M™ Curos Tips™ Disinfecting Cap for Male Luers added to existing Central Line-Associated Bloodstream Infection (CLABSI) bundle for all disconnected IV tubing. Compliance monitored for PIV and CLABSI bundles.

**PIV Bundle elements:**
- Prohibit disconnecting IV tubing for convenience
- 3M™ Curos™ Disinfecting Cap for Needleless Connectors on all ports for all patients
- 3M™ Curos™ Disinfecting Cap for Male Luers on all disconnected tubing
- Assessment of IV site, removing IV catheters with indication of phlebitis
- Assessment of dressing, changing if nonocculsive or blood is present

**RESULTS**

### Average BSI Rate for Peripheral and Central Lines (per 1000 patient days)

<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>PLABSI Infection Rate</td>
<td>0.57</td>
<td>0.11</td>
</tr>
<tr>
<td>CLABSI Infection Rate</td>
<td>0.01</td>
<td>0.10</td>
</tr>
</tbody>
</table>

*Because CLABSI bundle was implemented prior to study, no significant change to CLABSI rate was anticipated or observed during study time period.
“Inclusion of the alcohol impregnated disinfecting port protectors (AIDPP), as a component of the CLABSI bundle, hardwired adherence by audit accountability.”


**DESIGN**

Quasi-experimental study comparing hospital-wide central line-associated bloodstream infection (CLABSI) rates at a 1009-bed tertiary hospital using an evidence-based, multidisciplinary approach.

**METHODS**

**Pre Intervention:**
Standard central line bundle of care

**Intervention:**
- Standard central line bundle of care
- 3M™ Curos™ Disinfecting Port Protectors implementation plan
- 3M™ Curos™ Disinfecting Port Protectors 21-Day Challenge
- 3M™ Curos Jet™ Disinfecting Caps for Needleless Connectors
- 3M™ Curos Stopper Disinfecting Caps for Open Female Luers
- 3M™ Curos Tips™ Disinfecting Caps for Male Luers

**RESULTS**

<table>
<thead>
<tr>
<th>CLABSI per 1000 device days</th>
<th>Pre Intervention (7/17 - 10/17)</th>
<th>Intervention (11/17 - 3/18)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1.36</td>
<td>0.87</td>
</tr>
</tbody>
</table>

36% reduction trend*

*The authors did not statistically test if the reduction in CLABSI was significant between the periods.

**Reduction of 1.36 to 0.87 CLABSI per 1000 device days**

**Potential savings of$1.6M in 8 months, accounting for added cost of port protectors**

**Used 21-Day Challenge to increase adherence rate from 67% to 94%**

**REQUEST FULL CLINICAL STUDY**
3M™ Curos™ Disinfecting Caps for Needleless Connectors combined with educational interventions led to zero rate of CLABSIs.


**DESIGN**

Prospective randomized study, assessing the rate of CLABSIs, CVC colonizations and contaminated blood cultures before and after introduction of educational interventions alone and combined with Curos Disinfecting Caps.

**METHODS**

Pre Intervention:
Standard central line bundle of care (n=86)

Intervention:
Randomized patients into two groups:
- Group 1: Educational intervention (n=25)
- Group 2: Curos Disinfecting Caps plus educational intervention (n=21)

**RESULTS**

<table>
<thead>
<tr>
<th>Treatment Group</th>
<th>CLABSI Rate (per 1000 central line days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treatment Group 0 (Obs) (4/13 – 1/14)</td>
<td>8.6</td>
</tr>
<tr>
<td>Treatment Group 1 (Edu) (1/14 – 10/14)</td>
<td>70% reduction (p=0.0568)</td>
</tr>
<tr>
<td>Treatment Group 2 (Curos + Edu) (1/14 – 10/14)</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>100% reduction (p=0.096)</td>
</tr>
</tbody>
</table>

Contaminated blood cultures decreased to ZERO with Curos Disinfecting Caps plus educational interventions.

67% reduction of CVC colonizations with Curos Disinfecting Caps plus educational interventions.
“Disinfectant cap use was associated with an estimated savings of almost $300,000 per year in the hospital studied.”


**RESULTS**

<table>
<thead>
<tr>
<th>Mean CLABSI Rate (per 1000 catheter days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Intervention (2011)</td>
</tr>
<tr>
<td>Intervention (2012)</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>0.88</td>
</tr>
</tbody>
</table>

>40% reduction (p=0.004)

**DESIGN**

Before and after intervention study comparing CLABSI rates and estimated costs in patients (newborn to adult) with CVCs and PIVs from 13 units at a Level 1 Trauma Center.

**METHODS**

Pre Intervention:
Standard central line bundle of care

Intervention:
3M™ Curos™ Disinfecting Cap for Needleless Connectors placed on central, peripheral and IV tubing needleless connectors

| 10% Increase in compliance was associated with |
| 7% drop in infection rates |

Estimated decrease of 68 patient hospital days after cap implementation

Estimated annual savings = $282,840
The number of vascular access device (VAD) related bacteraemias was reduced by 69% when compliance with Curos™ cap placement was 80% or more.


**DESIGN**

Before and after intervention study comparing VAD related bacteraemia for CVCs, PIVs and arterial lines from four wards at two hospital sites.

**METHODS**

Pre Intervention:
Scrub the hub using CHG/IPA wipes prior to IV access

Intervention:  
3M™ Curos™ Disinfecting Cap for Needleless Connectors placed on all needleless devices

Post intervention:  
Scrub the hub protocol resumed

**RESULTS**

Catheter-related Bloodstream Infections (per 1000 line days)

<table>
<thead>
<tr>
<th></th>
<th>Pre Intervention (10/13 - 3/14)</th>
<th>Intervention (4/14 - 9/14)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Intervention</td>
<td>4.3</td>
<td>1.5</td>
</tr>
</tbody>
</table>

Infection rates began to increase when scrub the hub was resumed in the post intervention period (10/14 - 3/15).

Estimated potential time savings from passive disinfection compared to scrub the hub equated to 82.4 working days/yr.

Estimated cost savings with passive disinfection = £387,366.22

Compliance to protocol increased from 27% to 80% during the intervention period.

100% of staff surveyed preferred disinfecting caps.

92% of patients provided positive feedback.

REQUEST FULL CLINICAL STUDY
“The implementation of the port protector cap system resulted in lower infection rates compared with an alcohol swab technique.”


**DESIGN**

Before and after intervention study comparing CLABSI rates in patients with CVCs from 2 ICUs.

**METHODS**

**Pre Intervention:**
Scrub the hub protocol

**Intervention:**
3M™ Curos™ Disinfecting Cap for Needleless Connectors placed on all CVC and IV tubing needleless connectors

**RESULTS**

<table>
<thead>
<tr>
<th>CLABSI Rate (per 1000 catheter days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9</td>
</tr>
<tr>
<td>0.5</td>
</tr>
</tbody>
</table>

Compliance increased from 63% to 80% after moving from single caps to multiple cap strips to hang on IV pole for bedside access.

The trial resulted in a calculated net savings of $39,050.
"Application of the bundle resulted in a significant and sustained reduction in CLABSI rates in long-term acute care hospitals (LTACHs) for 14 months."


**DESIGN**

Before and after intervention study comparing CLABSI in patients with CVCs from 30 long-term acute care hospitals (LTACHs).

**METHODS**

**Pre Intervention:**
No formal standardized CVC maintenance protocol in place

**Intervention:**
Implementation of CVC maintenance bundle and care team trained on CVC care

**CVC bundle:**
- CDC guideline recommendations
- Mandatory use of 3M™ Curos™ Disinfecting Cap for Needleless Connectors on all IV needleless connectors
- Chlorhexidine gluconate dressings

**RESULTS**

CLABSI Standardized Infection Ratio (SIR)

<table>
<thead>
<tr>
<th></th>
<th>Pre Intervention (2/12 - 7/12)</th>
<th>Intervention (8/12 - 1/13)</th>
<th>(p=0.01)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLABSI SIR</td>
<td>1.28</td>
<td>0.96</td>
<td></td>
</tr>
</tbody>
</table>

The study concluded that the mean number of CLABSI per LTACH decreased by 4.5 in the 14 months after the intervention. The infection reduction could have potentially saved 20 patients’ lives.*

*assuming a 15% mortality rate

Estimated potential savings of approximately $3.7 million for the LTACHs studied

The number of central line days was 120,137 before and 119,412 after bundle implementation.
Implementation of port protectors and needleless neutral pressure connectors was associated with a significant reduction in the rate of CLABSI and contaminated blood cultures (CBCs).


**DESIGN**
Before and after intervention study comparing CLABSI and CBC rates in adult hematology and oncology patients with CVCs.

**METHODS**

**Pre Intervention:**
Scrub the hub protocol

**Intervention:**
Needleless neutral pressure connectors and 3M™ Curos™ Disinfecting Cap for Needleless Connectors placed on CVC hubs

**RESULTS**

**CLABSI Rate (per 1000 catheter days)**

- **Pre Intervention (2009):** 2.3
- **Intervention (1/10 - 7/10):** 0.3
- 87% reduction (p=0.03)

**CBC Rate (%)**

- **Pre Intervention (2009):** 2.5
- **Intervention (1/10 - 7/10):** 0.2
- 92% reduction (p=0.002)

The number of central line days was 6,851 in the pre intervention and 3,005 in the intervention period.

Compliance to the intervention = **85.2%**
“Following implementation of the caps, the rates of CLABSI within the burn ICU were significantly reduced...”


**BACKGROUND**

Despite >90% compliance to the CVC bundle, the CLABSI rate in the burn ICU was higher than benchmark.

**DESIGN**

Prospective before and after intervention study comparing CLABSI rates in burn patients with CVCs.

**METHODS**

**Pre Intervention:**
CDC recommended CVC bundle and scrub the hub protocol

**Intervention:**
3M™ Curos™ Disinfecting Cap for Needleless Connectors added to CVC bundle as a standard of care Jan 2012

**RESULTS**

<table>
<thead>
<tr>
<th>CLABSI Rate (per 1000 central line days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Intervention (7/11 - 12/11)</td>
</tr>
<tr>
<td>Intervention (1/12 - 6/12)</td>
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</tbody>
</table>

The number of central line days was 673 in the pre intervention and 1272 in the intervention period.

“... ease of use with the caps simplified daily tasks, leading to higher compliance.”
Post intervention CLABSI rate improved from 5.2 to 0.4 per 1000 line days in 2014 (p<0.05).


**Design**

Before and after intervention study comparing CLABSI in NICU patients.

**Intervention**

Implementation of an interdisciplinary pediatric CLABSI committee and multiple interventions including:

- Insertion checklist, placement of non-emergent lines in dedicated procedure room
- Daily assessment of line necessity
- Daily assessment of dressing, exit site and presence of 3M™ Curos™ Disinfecting Cap for Needleless Connectors

**Results**

CLABSI Infections (per 1000 line days)

- Pre Intervention (2012): 5.2
- Intervention (2013): 1.0
- Post Intervention (2014): 0.4

92% overall reduction (p<0.05)
By utilizing disinfecting caps compliance is more accurate and a significant reduction can be seen in the burden of CLABSIs.


RESULTS

CLABSI reduction ranged from 30% to 87% in the 9 studies included in the systematic review.

METHODS

A systematic review was conducted according to the MOOSE guidelines using MEDLINE, EMBASE, CINAHL, Scopus and the Cochrane Database without any limits. Searches were conducted to identify articles needing inclusion criteria and were independently screened by the authors.

9 quasi-experimental studies examining the effect of 3M™ Curos™ Disinfecting Caps for Needleless Connectors and Swabcap™ Disinfecting Caps on CLABSI were included.
Implementation of disinfecting caps was associated with a reduced rate of hospital wide CLABSI, cost savings and increased nursing satisfaction.


**DESIGN**

Before and after intervention study comparing hospital wide CLABSI standardized infection ratios (SIR).

**METHODS**

*Pre Intervention:* 15 second scrub the hub protocol

*Intervention:* Implemented 3M™ Curos™ Disinfecting Cap for Needleless Connectors hospital wide

**RESULTS**

**Adult CLABSI SIR**

<table>
<thead>
<tr>
<th>SIR</th>
<th>Pre Intervention (1/12 - 10/12)</th>
<th>Intervention (11/12 - 8/13)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.85</td>
<td>0.27</td>
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</table>

68% reduction (p=0.003)
“When disinfectant caps were used on all IV ports, the rate of both CLABSI and nosocomial BSI fell significantly.”


**RESULTS**

<table>
<thead>
<tr>
<th>CLABSI Rate (per 1000 line days)</th>
<th>Nosocomial BSI Rate (per 1000 patient days)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Intervention (04/12 - 03/13)</td>
<td>Pre Intervention (04/12 - 03/13)</td>
</tr>
<tr>
<td>Intervention (04/13 - 03/14)</td>
<td>Intervention (04/13 - 03/14)</td>
</tr>
</tbody>
</table>

**CLABSI Rate**

- Pre Intervention: 1.5
- Intervention: 0.4

73% reduction (p=0.013)

**Nosocomial BSI Rate**

- Pre Intervention: 0.73
- Intervention: 0.47

35% reduction (p=0.005)

The number of line days was 10,441 in the baseline and 9,536 in the intervention period.

In units that did not implement disinfectant caps, there was no significant difference in CLABSI or nosocomial BSI rates.
99.3% of patients were compliant with the intervention and 99.6% were extremely happy with in-home use of disinfecting caps.

Small M. The impact of 70% isopropyl alcohol port protection caps on catheter related bloodstream infection in patients on home parenteral nutrition. Presented at: World Congress Vascular Access; June 20, 2014; Berlin, Germany.

**DESIGN**

Before and after intervention study comparing CRBSI in-home care patients on parenteral nutrition.

**INTERVENTION**

3M™ Curos™ Disinfecting Cap for Needleless Connectors placed on needleless connectors and patients instructed to continue to actively disinfect the hub after cap removal, immediately before access.

**RESULTS**

Mean CRBSI Rate (per 1000 catheter days)

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<tbody>
<tr>
<td>CRBSI Rate</td>
<td>1.36</td>
<td>0.47</td>
</tr>
<tr>
<td>65% reduction</td>
<td></td>
<td>(p&lt;0.001)</td>
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</tbody>
</table>

99.3% of patients were compliant

99.6% of patients were extremely happy with the product.
A significant decline in the incidence of CLABSIs was observed after the addition of Curos™ disinfecting caps to an existing central line bundle.


**DESIGN**
Before and after intervention study comparing CLABSI standardized infection ratios (SIR) in level 3 NICU patients.

**METHODS**

*Pre Intervention:* Evidence-based central line bundle including 15 second scrub the hub protocol

*Intervention:* Implemented 3M™ Curos™ Disinfecting Cap for Needleless Connectors on IV access ports

**RESULTS**

<table>
<thead>
<tr>
<th>Year</th>
<th>CLABSI SIR</th>
<th>Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre Intervention (2010)</td>
<td>1.723</td>
<td></td>
</tr>
<tr>
<td>2011</td>
<td>1.013*</td>
<td>58% overall reduction (p=0.04)***</td>
</tr>
<tr>
<td>2012</td>
<td>0.722**</td>
<td></td>
</tr>
</tbody>
</table>

*Intervention began Q1 2011; Results included Q4 2011 when Curos disinfecting caps not in use

**Use of Curos disinfecting caps resumed Jan 2012

***Comparison is between 2010 and 2012
“The use of a disinfectant cap is effective in reducing the rate of CLABSI and contaminated blood cultures and provides a substantial cost savings.”


**DESIGN**

Before and after intervention study comparing CLABSI and nursing compliance in a Level I Trauma Center.

**METHODS**

**Pre Intervention:** Baseline data found that 55% of nurses scrub the needleless connector for < 5 seconds

**Intervention:** 3M™ Curos™ Disinfecting Cap for Needleless Connectors implemented on all central and peripheral needleless connectors in all inpatient departments (excluding womens services)

**RESULTS**

<table>
<thead>
<tr>
<th>CLABSI Rate (per 1000 line days)</th>
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<tbody>
<tr>
<td>3</td>
</tr>
<tr>
<td>2.5</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1.5</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>0.5</td>
</tr>
<tr>
<td>0</td>
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</tbody>
</table>


There was a non-significant decrease in contaminated blood cultures from 2.5% before to 1.4% after intervention.

Nursing compliance to the disinfecting cap increased significantly from 73% to 88% during the study (p=0.01).

Total estimated cost savings per month $95,000
Following discontinuation of disinfecting caps, the CABS1 rate returned to the pre intervention rate.


**DESIGN**
Before and after intervention study comparing catheter-associated bloodstream infection (CABSI) between a control and intervention unit caring for acute leukemia and stem cell transplant patients.

**INTERVENTION**
Implementation of 3M™ Curos™ Disinfecting Cap for Needleless Connectors on CVC needleless connectors

**RESULTS**
Median CABSI Rate (per 1000 central line days)

<table>
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<tbody>
<tr>
<td>Median CABSI Rate</td>
<td>5.3</td>
<td>3.7</td>
</tr>
</tbody>
</table>

30% reduction

The number of central line days was 20,126 in the pre intervention and 20,206 in the intervention period.

Analysis of CABSI rate in a control unit during the same time periods were 5.6 (2010) and 5.4 (2011) per 1000 central line days.
The CLABSI rate decreased 68% the first year after implementation of Curos™ disinfecting cap, used in conjunction with other CLABSI prevention measures.

Pong A, Salgado C, Speziale M, Grimm P, Abe C. Reduction in central line associated bloodstream infection (CLABSI) in a neonatal intensive care unit with use of access site disinfection caps. Presented at: Infectious Disease Society of America annual meeting; October 21, 2011; Boston, MA.

**DESIGN**

Before and after intervention study comparing CLABSI and blood culture contaminants in level 4 NICU patients.

**METHODS**

Pre Intervention: CLABSI prevention measures in place:
- Sterile insertion technique
- Hand hygiene
- Hub cleansing with access
- Standards for dressing and tubing changes
- Prompt catheter removal

Intervention: 3M™ Curos™ Disinfecting Cap for Needleless Connectors added to all CVC needleless connectors

**RESULTS**

<table>
<thead>
<tr>
<th>CLABSI Rate (per 1000 line days)</th>
<th>Pre Intervention (10/08 - 9/09)</th>
<th>Intervention (10/09 - 9/10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.93</td>
<td>0.3</td>
</tr>
</tbody>
</table>

68% reduction

<table>
<thead>
<tr>
<th>Contaminated Blood Culture Isolates (per 1000 line days)</th>
<th>Pre Intervention (10/08 - 9/09)</th>
<th>Intervention (10/09 - 9/10)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.6</td>
<td>2.7</td>
</tr>
</tbody>
</table>

25% reduction

The number of central line days was 7,533 in the pre intervention and 6,782 in the intervention period.
ABSTRACTS


Kelleher J, Almeida R, Cooper H, Stauffer S. Achieving Zero CoN CLBSI in the NICU. Providence Sacred Heart Medical Center and Children’s Hospital, Spokane, WA, 2013.


Davis M. Forcing the function: implementation and evaluation of an IV port protector to decrease CLABSI. Legacy Health, Portland, OR, 2013.


ARTICLES


Doherty M, Heys P. Clinical support for all patients, all lines, all the time (AAA). Temple University Hospital case study, Philadelphia, PA, 2013.

