



**3M**

**cuROS™**

Disinfecting Port  
Protectors

# Clinical Evidence Summary

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# Table of Contents

## PEER REVIEWED

### Antiseptic barrier cap effective in reducing central line-associated bloodstream infections: A systematic review and meta-analysis.




Voor in 't holt AF, Helder OK, Vos MC, et al. *Int J Nurs Stud.* 2017; 69: 34-40.




5

Population: Multiple Specialties

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

Merrill KC, Sumner S, Linford L, Taylor C, Macintosh C. *Am J Infect Control.* 2014; 42: 1274-1277.





6

Population: Multiple Specialties

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

Cameron-Watson C. *Br J Nurs.* 2016; 25(8): S25-S31.








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Population: Multiple Specialties

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



Ramirez C, Lee AM, Welch K. *J Assoc Vasc Access.* 2012; 17(4): 210-213.




8

Population: Intensive Care

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

Grigonis AM, Dawson AM, Burkett M, et al. *Am J Crit Care.* 2016; 25(2): 165-172.



9

Population: Long Term Acute Care

### 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.

Sweet MA, Cumpston A, Briggs F, Craig M, Hamadani M. *Am J Infect Control.* 2012; 40(10): 931-934.





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Population: Hematology & Oncology

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

Martino A, Thompson L, Mitchell C, et al. *Burns.* 2017; 43: 956-964.



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Population: Burn Intensive Care

Outcomes Key	
↓	Infection and/or contaminated blood cultures
✓	Compliance and/or patient/staff satisfaction
⌚	Staff time and/or length of stay
\$	Cost

# Table of Contents, Continued

## ABSTRACTS

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

Duncan M, Warden P. *Am J Infect Control*. 2017; 45(6): S74.



12

Population: Hospital Wide

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

Karam-Howlin R, Fede A, Gibbs K, Bravo N, Wallach F, Patel G. *Am J Infect Control*. 2015; 43(6): S58.



13

Population: Neonatal Intensive Care

### Systematic review on impact of use of disinfectant caps protectors for intravenous access ports on central line-associated bloodstream infections (CLABSI).

Jimenez A, Barrera A, Madhivanan P. *Open Forum Infectious Diseases*. 2015; 2(1): 281.



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Categorized in Multiple Specialties

### A significant decline in central line-associated blood stream infections using alcohol-impregnated port protectors at a large non-profit acute care hospital.

Danielson B, Williamson S, Kaur G, Johnson N. *Am J Infect Control*. 2014; 42(6): S16.



15

Population: Hospital Wide

### Alcohol-impregnated disinfectant caps reduce the rate of central-line associated bloodstream infections and nosocomial bacteremia.

Shelly M, Greene L, Brown L, Romig S, Pettis AM. Presented at: IDWeek annual meeting; October 10, 2014; Philadelphia, PA.



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Population: Multiple Specialties

#### Outcomes Key



Infection and/or contaminated blood cultures



Compliance and/or patient/staff satisfaction



Staff time and/or length of stay



Cost

# Table of Contents, Continued

## ABSTRACTS

### The impact of 70% isopropyl alcohol port protection caps on catheter related bloodstream infection in patients on home parenteral nutrition.

Small M. Presented at: World Congress Vascular Access; June 20, 2014; Berlin, Germany.



17

Population: Home Care

### Decreasing the incidence of central line-associated blood stream infections using alcohol-impregnated port protectors (AIPPS) in a neonatal intensive care unit.

Danielson B, Williamson S, Kaur G, Brooks C, Scholl P, Baker A. *Am J Infect Control.* 2013; 41(6): S97-S98.



18

Population: Neonatal Intensive Care

### Decreasing CLABSI rates and cost following implementation of a disinfectant cap in a tertiary care hospital.

Sumner S, Merrill KC, Linford L, Taylor C. *Am J Infect Control.* 2013; 41(6): S37.



19

Population: Hospital Wide

### Impact of alcohol-impregnated protectors on incidence of catheter-associated blood stream infections.

Alasmari F, Kittur ND, Russo AJ, et al. Presented at: IDWeek annual meeting; October 18, 2012; San Diego, CA.



20

Population: Oncology and Stem Cell Transplant

### Reduction in central line associated bloodstream infection (CLABSI) in a neonatal intensive care unit with use of access site disinfection caps.

Pong A, Salgado C, Speziale M, Grimm P, Abe C. Presented at: Infectious Disease Society of America annual meeting; October 21, 2011; Boston, MA.



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Population: Neonatal Intensive Care

## ADDITIONAL RESOURCES

### Abstracts / Articles

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#### Outcomes Key



Infection and/or contaminated blood cultures



Compliance and/or patient/staff satisfaction



Staff time and/or length of stay



Cost

# “...use of the antiseptic barrier cap can lower the occurrence of CLABSI and is cost saving. ”

Voor in 't holt AF, Helder OK, Vos MC, et al. Antiseptic barrier cap effective in reducing central line-associated bloodstream infections: a systematic review and meta-analysis. *Int J Nurs Stud.* 2017; 69: 34-40.

## DESIGN

Systematic review and meta-analysis

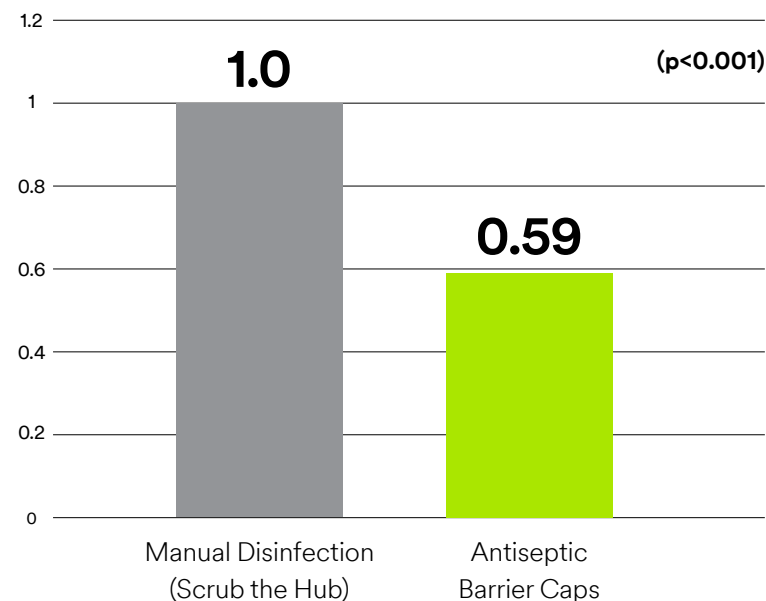
## METHODS

Studies conducted in the hospital setting that compared 3M™ Curoc™ 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)



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



There were  
**41% fewer**  
CLABSIs 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 =  
**82.5%**



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

# “Disinfectant cap use was associated with an estimated savings of almost \$300,000 per year in the hospital studied.”

Merrill KC, Sumner S, Linford L, Taylor C, Macintosh C. Impact of universal disinfectant cap implementation on central line-associated bloodstream infections. *Am J Infect Control.* 2014; 42: 1274-1277.

## 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

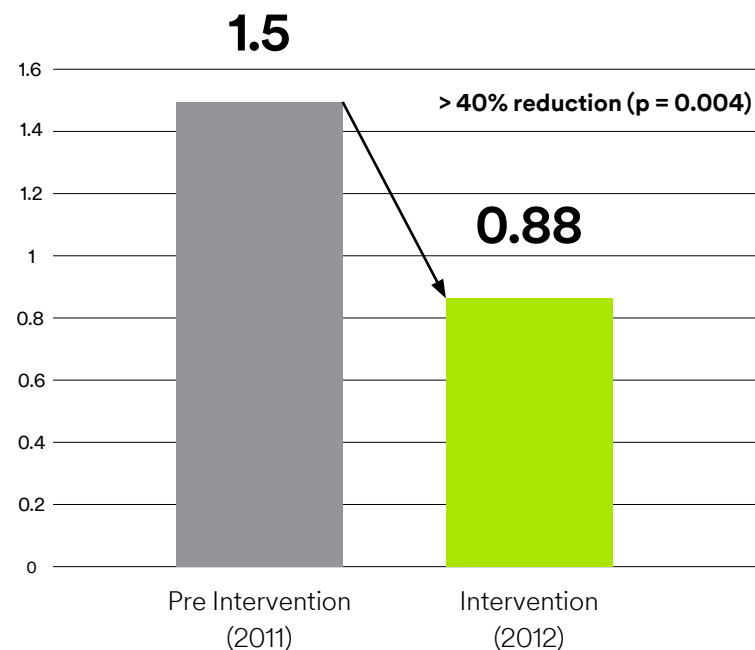
### Intervention:

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



## RESULTS

### Mean CLABSI Rate (per 1000 catheter days)



**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 Curoso™ cap placement was 80% or more.

Cameron-Watson C. Port protectors in clinical practice: an audit. *Br J Nurs*. 2016; 25(8): S25-S31.

## 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 protocol prior to IV access

### Intervention:

3M™ Curoso™ Disinfecting Cap for Needleless Connectors placed on all needleless devices

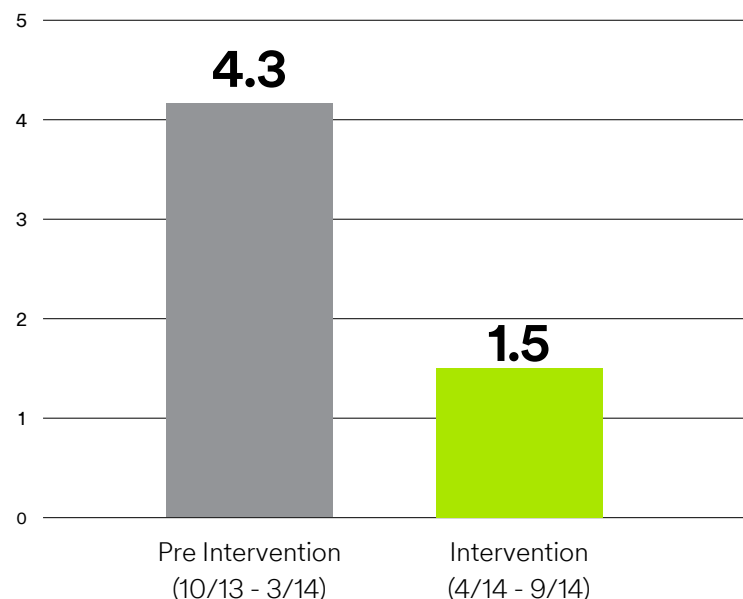
### Post intervention:

Scrub the hub protocol resumed



## RESULTS

### VAD Related Bacteraemia Rate



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

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



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 =

**£387366.22**



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

Ramirez C, Lee AM, Welch K. Central venous catheter protective connector caps reduce intraluminal catheter-related infection. *J Assoc Vasc Access.* 2012; 17(4): 210-213.

## DESIGN

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

## METHODS

### Pre Intervention:

Scrub the hub protocol

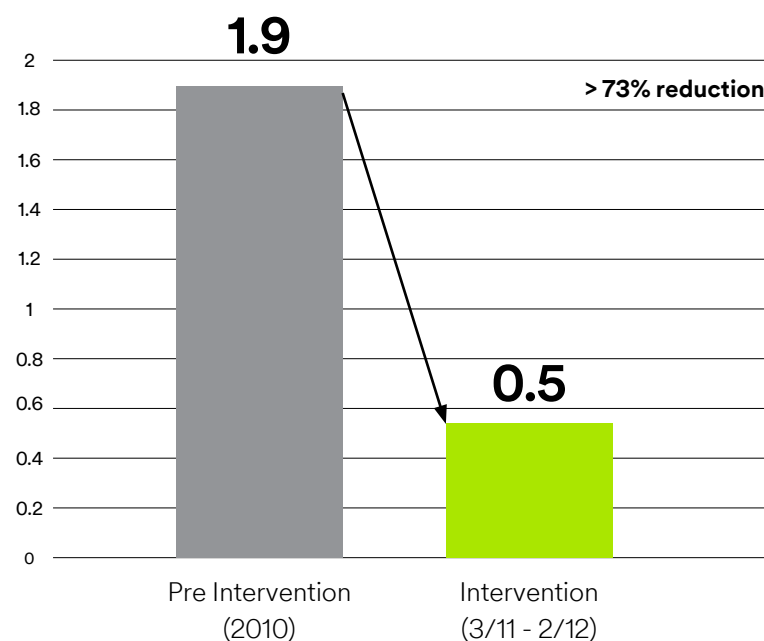
### Intervention:

3M™ Curox™ Disinfecting Cap for Needleless Connectors placed on all CVC and IV tubing needleless connectors



## RESULTS

### CLABSI Rate (per 1000 catheter days)



Compliance increased from

**63% – 80%**

after moving from single caps to multiple cap strips to hang on I.V. 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.”

Grigonis AM, Dawson AM, Burkett M, et al. Use of a central catheter maintenance bundle in long-term acute care hospitals. *Am J Crit Care*. 2016; 25(2): 165-172.

## 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

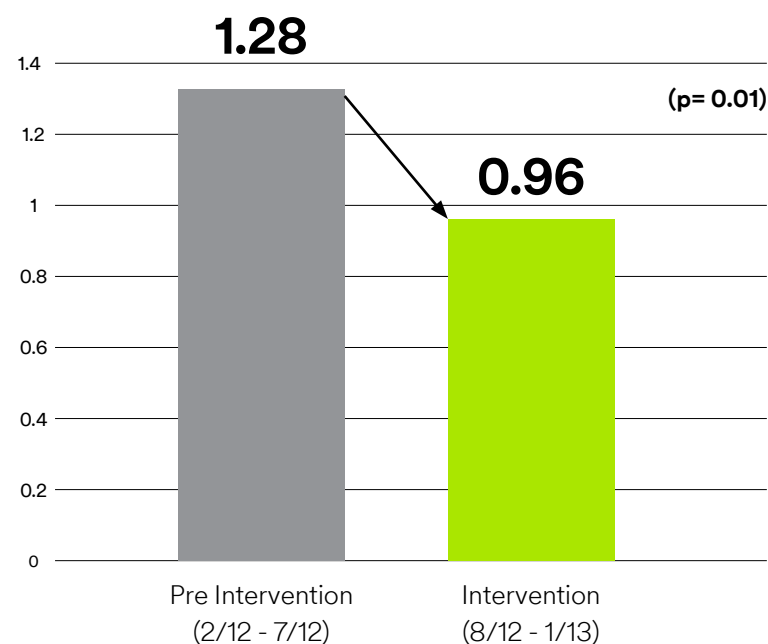
### CVC bundle:

- CDC guideline recommendations
- Mandatory use of 3M™ Curoc™ Disinfecting Cap for Needleless Connectors on all IV needleless connectors
- Chlorhexidine gluconate dressings



## RESULTS

### CLABSI Standardized Infection Ratio (SIR)



The number of central line days was 120,137 before and 119,412 after bundle implementation.

The study concluded that the mean number of CLABSIs 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.



# 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).

Sweet MA, Cumpston A, Briggs F, Craig M, Hamadani M. 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. *Am J Infect Control*. 2012; 40(10): 931-934.

## 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

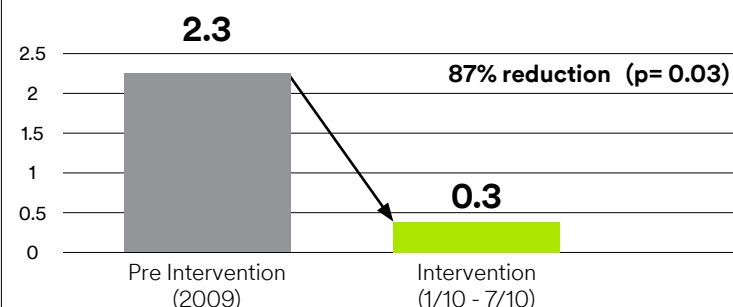
### Intervention:

Needleless neutral pressure connectors and 3M™ Curoc™ Disinfecting Cap for Needleless Connectors placed on CVC hubs

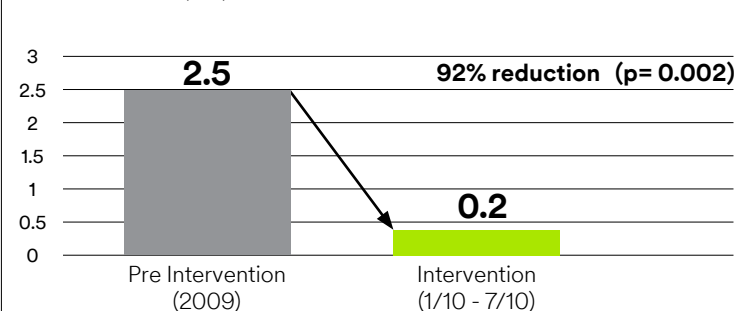


## RESULTS

### CLABSI Rate (per 1000 catheter days)



### CBC Rate (%)



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...”

Martino A, Thompson L, Mitchell C, et al. Efforts of a unit practice council to implement practice change utilizing alcohol impregnated port protectors in a burn ICU. *Burns*. 2017; 43: 956-964.

## 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.

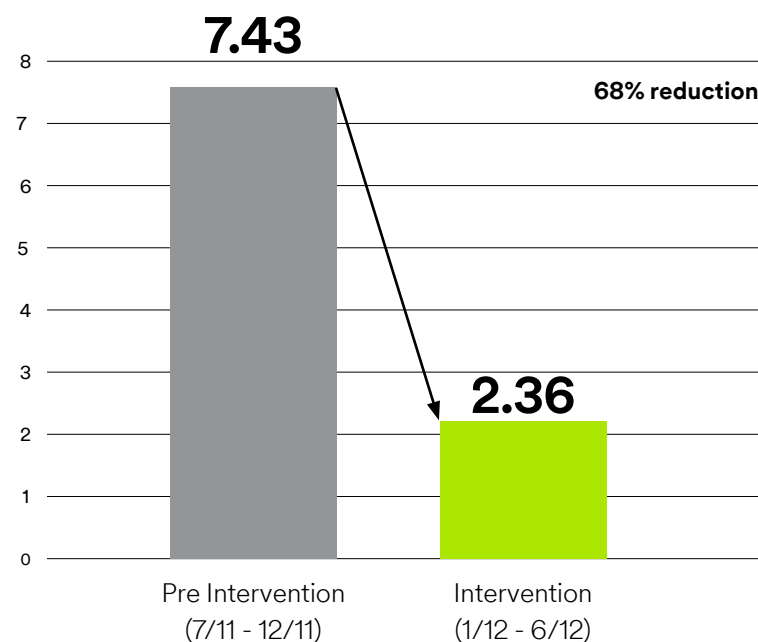
### Intervention:

3M™ Curores™ Disinfecting Cap for Needleless Connectors added to CVC bundle as a standard of care Jan 2012



## RESULTS

### CLABSI Rate (per 1000 central line days)



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

The overall trend of CLABSI rates decreased from 2009 to 2014 ( $p=0.0045$ ).



“... ease of use with the caps simplified daily tasks, leading to higher compliance.”



# “Using a peripheral line bundle including disinfecting caps and tips can effectively lower the rate of primary bloodstream infections attributable to peripheral IV lines and disconnected tubing.”

Duncan M, Warden P. A bundled approach to decrease primary bloodstream infections related to peripheral intravenous catheters. *Am J Infect Control.* 2017; 45(6): S74.

## DESIGN

Before and after intervention study comparing hospital wide primary bloodstream infections related to peripheral IVs (PLABSI) and intervention compliance.

## METHODS

**Pre Intervention:** PLABSI data collected

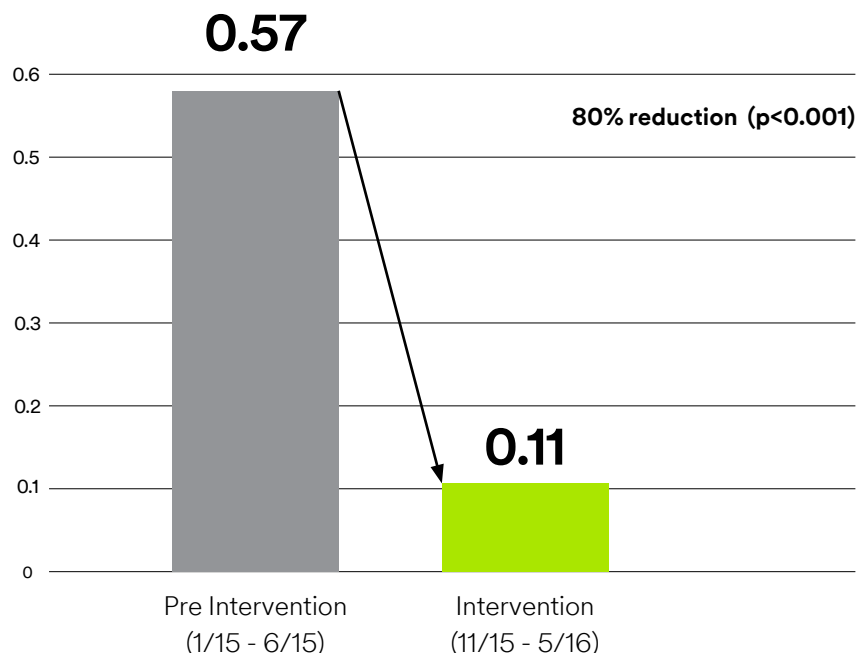
**Intervention:** PIV bundle implemented and compliance monitored

### PIV Bundle elements:

- Change all IV tubing every 96 hours
- Prohibit disconnecting IV tubing for convenience
- 3M™ Curoc™ Disinfecting Cap for Needleless Connectors on all ports
- 3M™ Curoc™ Disinfecting Cap for Male Luers on all disconnected tubing

## RESULTS

### PLABSI Infections (per 1000 patient days)



Compliance with protecting all needless connectors was near

90%



Compliance with protecting disconnected IV tubing was

90%



# Post intervention CLABSI rate improved from 5.2 to 0.4 per 1000 line days in 2014 ( $p<0.05$ ).

Karam-Howlin R, Fede A, Gibbs K, Bravo N, Wallach F, Patel G. Successful decrease of central line-associated bloodstream infections in an urban neonatal intensive care unit using a pediatric-specific interdisciplinary approach. *Am J Infect Control*. 2015; 43(6): S58.

## DESIGN

Before and after intervention study comparing CLABSI in NICU patients.

## INTERVENTION

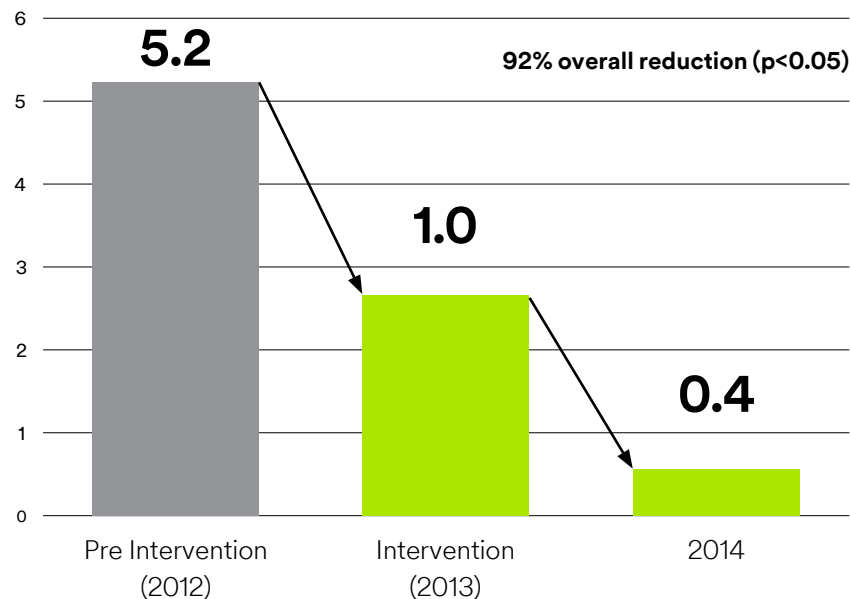
Implementation of an interdisciplinary pediatric CLABSI committee and multiple interventions including:

- 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™ Curosurf™ Disinfecting Cap for Needleless Connectors



## RESULTS

### CLABSI Infections (per 1000 line days)



# By utilizing disinfecting caps compliance is more accurate and a significant reduction can be seen in the burden of CLABSIs.

Jimenez A, Barrera A, Madhivanan P. Systematic review on impact of use of disinfectant caps protectors for intravenous access ports on central line-associated bloodstream infections (CLABSI). *Open Forum Infectious Diseases*. 2015; 2(1): 281.

## DESIGN

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.



## RESULTS

CLABSI reduction ranged

**30%**  **87%**

**in the 9 studies included in the systematic review.**

9 quasi-experimental studies examining the effect of 3M™ Curoc™ Disinfecting Cap 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.

Danielson B, Williamson S, Kaur G, Johnson N. A significant decline in central line-associated blood stream infections using alcohol-impregnated port protectors at a large non-profit acute care hospital. *Am J Infect Control*. 2014; 42(6): S16.

## DESIGN

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

## METHODS

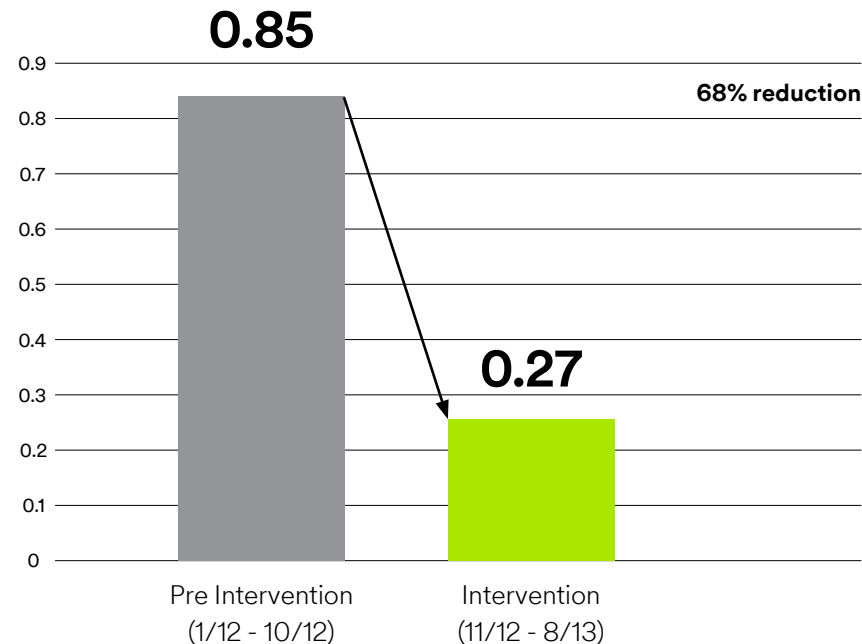
**Pre Intervention:** 15 second scrub the hub protocol

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



## RESULTS

### Adult CLABSI SIR



# “When disinfectant caps were used on all IV ports, the rate of both CLABSI and nosocomial BSI fell significantly.”

Shelly M, Greene L, Brown L, Romig S, Pettis AM. Alcohol-impregnated disinfectant caps reduce the rate of central-line associated bloodstream infections and nosocomial bacteremia. Presented at: IDWeek annual meeting; October 10, 2014; Philadelphia, PA.

## DESIGN

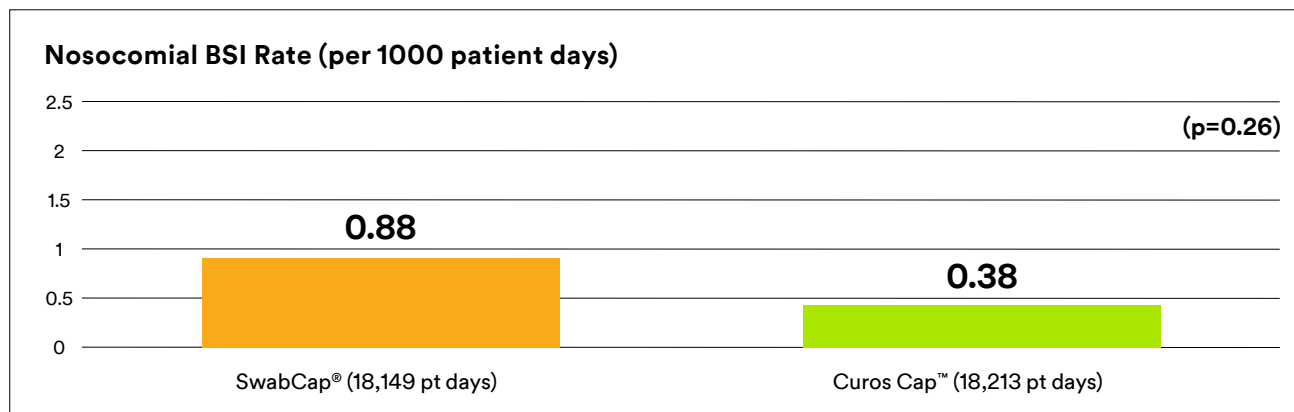
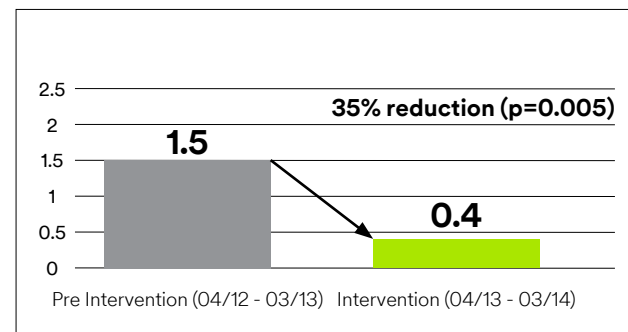
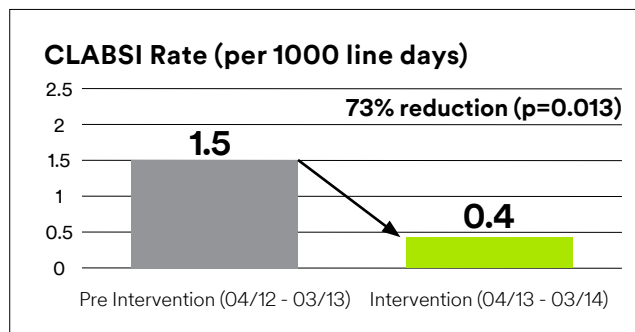
Before and after intervention study comparing CLABSI and nosocomial bloodstream infections (BSI) in 4 hospital units (ICU, step down, 2 med/surg units).

## INTERVENTION

3M™ CuroS™ Disinfecting Cap for Needleless Connectors or Swabcap® Disinfecting Caps placed on all needleless IV access ports of peripheral and central lines.



## RESULTS



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.

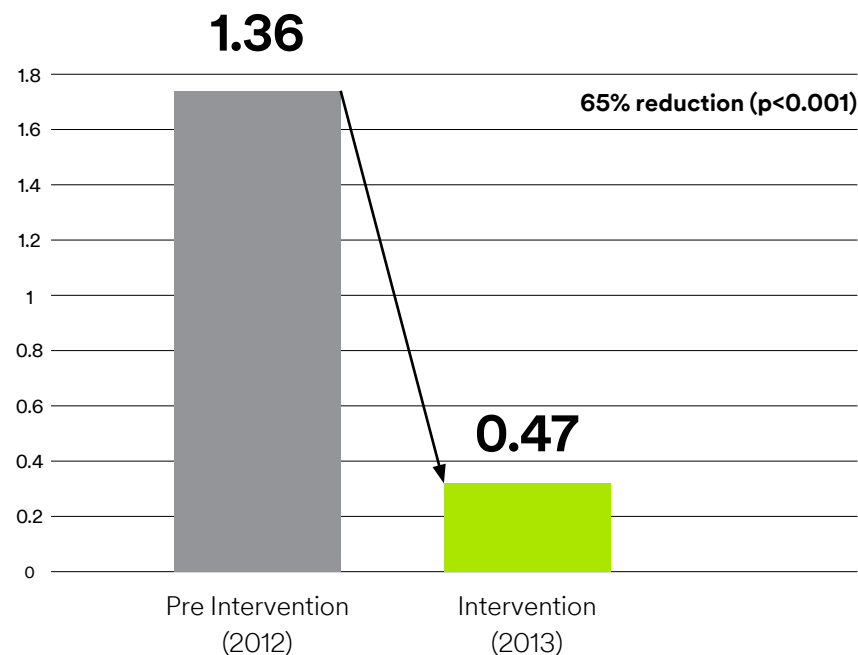
## INTERVENTION

3M™ Curo™ 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)



**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 Curoso™ disinfecting caps to an existing central line bundle.

Danielson B, Williamson S, Kaur G, Brooks C, Scholl P, Baker A. Decreasing the incidence of central line-associated blood stream infections using alcohol-impregnated port protectors (AIPPS) in a neonatal intensive care unit. *Am J Infect Control.* 2013; 41(6): S97-S98.

## DESIGN

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

## METHODS

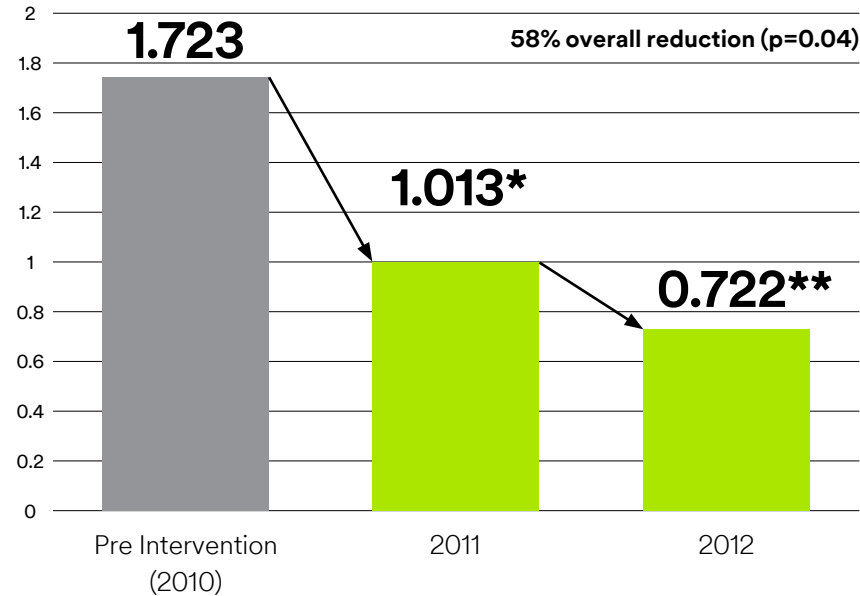
**Pre Intervention:** Evidence-based central line bundle including 15 second scrub the hub protocol

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



## RESULTS

### CLABSI SIR



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

\*\*Use of Curoso disinfecting caps resumed Jan 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.”

Sumner S, Merrill KC, Linford L, Taylor C. Decreasing CLABSI rates and cost following implementation of a disinfectant cap in a tertiary care hospital. *Am J Infect Control.* 2013; 41(6): S37.

## DESIGN

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

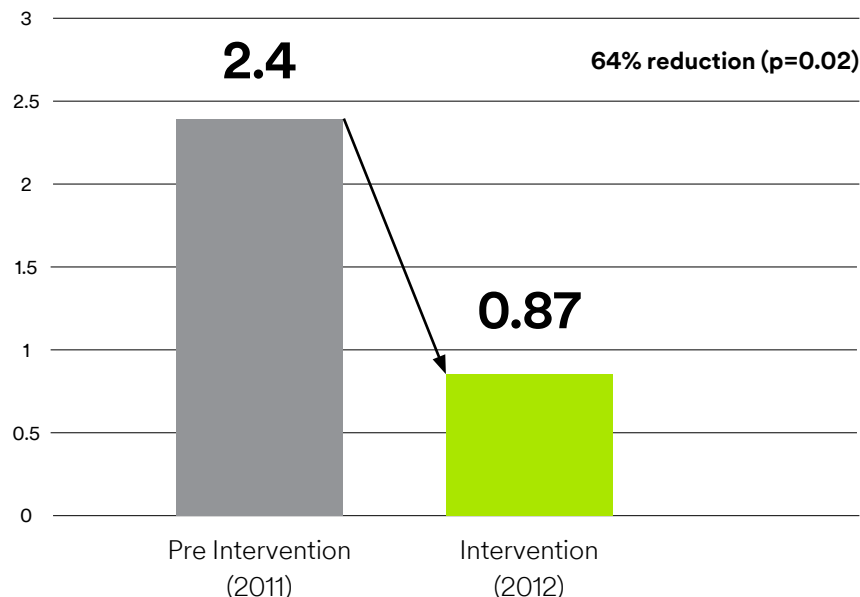
## METHODS

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

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

## RESULTS

### CLABSI Rate (per 1000 line days)



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 CABSIs rate returned to the pre intervention rate.

Alasmari F, Kittur ND, Russo AJ, et al. Impact of alcohol-impregnated protectors on incidence of catheter-associated blood stream infections. Presented at: IDWeek annual meeting; October 18, 2012; San Diego, CA.

## DESIGN

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

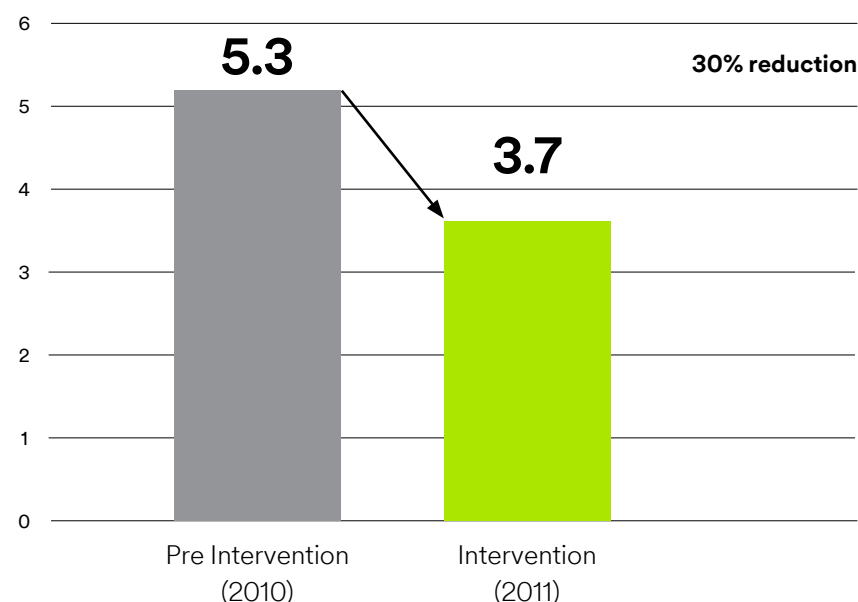
## INTERVENTION

Implementation of 3M™ Curosurf™ Disinfecting Cap for Needleless Connectors on CVC needleless connectors



## RESULTS

### Median CABSIs Rate (per 1000 central line days)



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

Analysis of CABSIs 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 Curoso™ 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

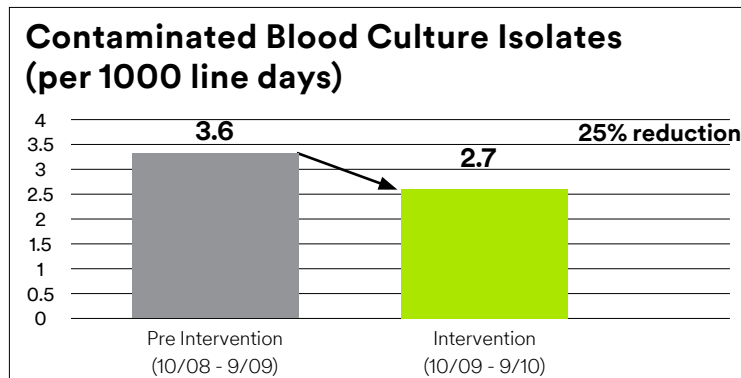
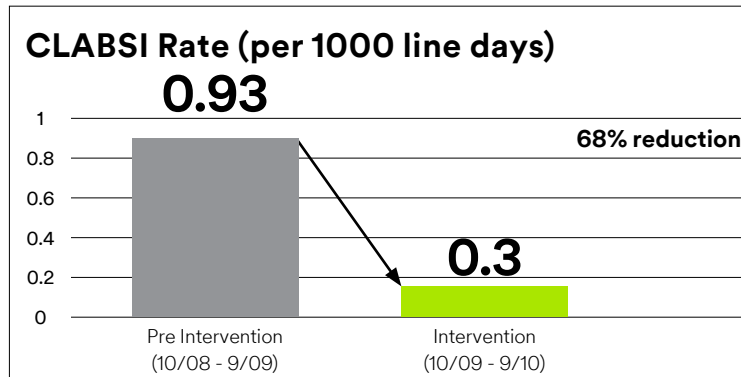
**Pre Intervention:** CLABSI prevention measures in place:

- Sterile insertion technique
- Hand hygiene
- Hub cleansing with access
- Standards for dressing and tubing changes
- Prompt catheter removal

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



## RESULTS



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

# Additional Resources

## ABSTRACTS

Hignell P. Improving customer quality experience and outcomes with use of alcohol-impregnated disinfection caps. Presented at: Fraser Health Canada Patient Experience Conference; November 2017; Surrey, British Columbia.

Levy ZD, Ledoux DE, Lesser ML, White T, Rosenthal JM. Rates of iatrogenic ventriculitis before and after the use of an alcohol-impregnated external ventricular drain port cap. *Am J Infect Control*. 2017; 45: 92-93.

Kaur G. An interdisciplinary approach to reduce intensive care unit (ICU) central line associated bloodstream infections (CLABSIs) using LEAN Six Sigma. *Am J Infect Control*. 2015; 43(6): S64.

Shiber J, Jolicoeur G, Crouchet T. Reducing central line-associated bloodstream infections through the addition of disinfecting port protectors. Presented at: Ochsner Research Day; May 20, 2014; New Orleans, LA.

Miskill M, Bellard E. Implementing alcohol impregnated port protectors as a means to decrease CLABSI's. Carolinas HealthCare System, Charlotte, NC, 2014.

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.

Cole M, Kennedy K. Decreasing central line associated blood stream infections (CLABSI) in adult ICUs through teamwork and ownership. Grady Health System, Atlanta, GA, 2013.

Moore MJ, Gripp K, Cooper H, Almeida R. Impact of port protectors on incidence of central line infections. Providence Sacred Heart Medical Center, Spokane, WA, 2013.

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

Beauman S, Chance K, Dalsey M, et al. California Children's Services (CCS) neonatal infection prevention project phase 3: 2009 (Oct)-2011 (June) in association with California Perinatal Quality Care Collaborative (CPQCC).

## ARTICLES

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