

# Use of an Antimicrobial Luer Activated Device on Peripherally Inserted Central Venous Catheters (PICCs) to Reduce CLABSI Rates

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## ABSTRACT

**Background:** Each year up to 80,000 central line-associated bloodstream infections (CLABSIs) occur in patients cared for in Intensive Care Units (ICUs) in the United States. These infections are associated with increased morbidity and mortality rates in adult ICU patients, thus hospitals are implementing interventions to reduce these preventable complications. In its 2002 Guidelines for the Prevention of Intravascular Catheter Related Infections, the Centers for Disease Control and Prevention recommends the use of an antimicrobial or antiseptic-impregnated central venous catheter if, after implementing a comprehensive strategy to reduce the rate of CLABSI, the CLABSI rate remains above the institution's goal.<sup>1</sup> Over a three year period, a 377 bed county regional medical center implemented specific strategies to reduce its CLABSI rate, including the addition of a dedicated PICC Team; the Institute for Hospital Improvement (IHI) central line bundle; a chlorhexidine impregnated protective disc and a clear, positive displacement, swabable connector. These interventions are associated with decreasing the Adult ICU PICC CLABSI rate from 15.0% to 0.29%.

**Objective:** To further decrease CLABSI rates, an antimicrobial version of the clear, positive displacement, swabable connector was trialed.

**Method:** In this prospective surveillance, CLABSI rates from April through July 2009 averaged 0.29% and analysis indicated these CLABSIs were attributable to catheter maintenance practices. In August, 2009 the facility initiated a trial of an antimicrobial version of the clear, positive displacement connector as an intervention to further reduce the CLABSI rate. Improper connector disinfection may lead to intraluminal microbial contamination of the connector. In laboratory testing, the antimicrobial connector exhibits a 4 to 5-log reduction of several pathogens known to cause bloodstream infections. Reducing microbial contamination of the connector may decrease the risk of bloodstream infection. No other interventions were implemented. Prospective BSI surveillance and case finding were the responsibility of the PICC and the infection control teams. Infection rates were tracked monthly using the National Healthcare Safety Network definitions. Pre-intervention data was collected from April to July 2009 and post-intervention data from August to October, 2009.

**Results:** Pre-intervention CLABSI rate was 0.29% in the Adult ICUs. During the intervention period, CLABSI rate decreased to an average of .003%.

**Conclusions:** Reduction in CLABSI rates can be achieved through implementation of interventions such as the IHI central line bundle, a PICC Team, as well as additional practices and devices. In this surveillance, an antimicrobial, positive displacement, clear swabable connector was associated with lowering Adult ICU CLABSI rates.

## BACKGROUND

In October 2008 the Center for Medicare and Medicaid Services discontinued reimbursement for costs associated with Central Line Associated Bloodstream Infections (CLABSIs), thus hospitals are implementing interventions, such as the Institute for Hospital Improvement (IHI) central line care bundle, to reduce these preventable complications.<sup>2</sup> In addition, the Joint Commission's 2008 National Patient Safety Goal NPSG.07.04.01 mandates the implementation of evidence-based practices to prevent central line-associated bloodstream infections.<sup>3</sup> These developments have resulted in a shift in hospital strategies to not just lowering CLABSI rates but setting goals to achieve a zero CLABSI rate.<sup>4</sup>

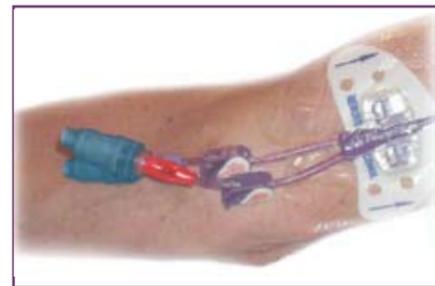
With Zero CLABSI rate now the goal of most hospitals, facilities are searching out additional interventions which may assist their efforts in further reducing their CLABSI rate. One intervention considered was the use of an antimicrobial device to aid in reducing microbial colonization and thus potentially infection.

Several types of antimicrobial catheters are available, including antibiotic coated or impregnated and silver coated or impregnated catheters. There is conflicting published evidence of the safety and efficacy of these antimicrobial catheters in reducing CLABSIs.<sup>5</sup> One concern is the potential of developing resistant strains of pathogens with antibiotic impregnated catheters.<sup>6</sup> Silver is a safe antimicrobial agent with no toxic affect on humans, and pathogens are not known to develop resistance to the antimicrobial effects of silver.<sup>7</sup> Most silver coated or impregnated catheters utilize silver ion technology. Silver ions are released from the antimicrobial device in the presence of moisture. The silver ions attack multiple targets within the microbes and prevent the pathogens from growing into harmful populations. A study comparing the efficacy of a standard polyurethane catheter with a silver impregnated catheter concluded that the silver impregnated catheter lead to a marked reduction of catheter associated bloodstream infections.<sup>8</sup>

Antimicrobial catheters represent a significant additional cost over non-impregnated catheters. Recently needleless connectors utilizing similar antimicrobial technology have become commercially available. Antimicrobial needleless connectors represent a significantly less costly alternative to antimicrobial catheters, however there is little published evidence as to their effectiveness in reducing microbial contamination and CLABSI rates.<sup>9</sup>

## OBJECTIVES

To determine if an antimicrobial needleless connector can assist in further decreasing an already low Adult ICU PICC CLABSI rate, an antimicrobial version of a clear, swabable positive displacement needleless connector was trialed.



Proper catheter care and maintenance plus the addition of antimicrobial connector resulted in lower PICC CLABSI rates.



It is critical to sustain Best Nursing Practices even with antimicrobial needleless connectors.

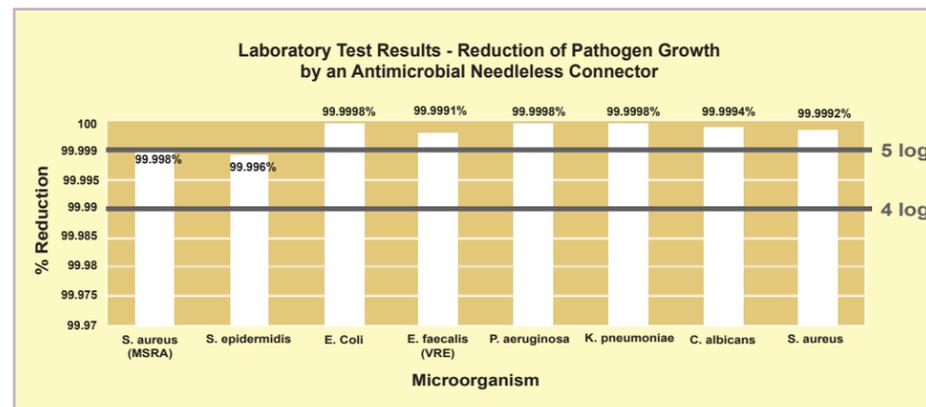
## METHOD

This study was conducted as a prospective time series surveillance. A three hundred seventy-seven bed county medical center facility implemented several interventions over a three year period to lower CLABSI rates. These interventions included:

- Implementation of a dedicated PICC Team which has now grown to 4 RN and 1 LVN
- Implementation and enforcement of strict adherence to the Institute for Hospital Improvement (IHI) Central Line Bundle (CLB)
- Use of ultrasound to place central lines
- PICC Team required to perform central line dressing changes
- Use of a chlorhexidine impregnated disk to protect the insertion site
- Use of a swabable, clear, positive displacement needleless connector to assist with reducing microbial ingress and encourage clinicians to practice proper swabbing and flushing technique.

These interventions resulted in a reduction of the Adult ICU PICC CLABSI rate to an average of .29% between January and July 2009. Analysis indicated the few CLABSIs documented during this period were attributed to catheter maintenance practices rather than insertion practices. The PICC Team's analysis concluded that breaks in nursing techniques occurred during maintenance of the catheter.

In July, 2009, the PICC Team decided to trial the silver impregnated version of the clear, swabable, positive displacement needleless connector currently in use at the facility. Thus, in August, 2009 the trial of this device began. A benefit of this intervention was that no new education and training was necessary since the basic device was already in use by the clinicians in this facility. Improper connector disinfection may lead to intraluminal microbial contamination of the connector. In laboratory testing, the antimicrobial connector exhibited a 4 to 5-log reduction in microbial contamination for eight of the most common pathogens known to cause bloodstream infections. Reducing microbial contamination of the connector may lead to a decreased risk of bloodstream infection. No additional interventions were implemented. Prospective BSI surveillance and case finding were the responsibility of the PICC and the infection control teams. Infection rates were tracked monthly using the National Healthcare Safety Network definitions. Pre-intervention data was collected from April to July 2009 and post-intervention data was collected from August to October, 2009.



Antimicrobial log reduction courtesy of www.maximusmedical.com

## RESULTS

The pre-intervention CLABSI rate from April to July 2009 was 0.29% for PICC lines in the three Adult ICUs. During the intervention period of August to October 2009, the CLABSI rate decreased to an average of .003%. This represents a 90% decrease in the CLABSI rate. In measuring the total CLABSI rate data for these Adult ICUs, including CVCs which did not utilize the antimicrobial device, the total CLABSI rate experienced in Q1 and Q2 2009 decreased in Q3 and Q4 2009 by 30%, when the antimicrobial device was utilized on PICCs.

	Pre-Intervention Period April - July 2009	Post-Intervention Period August - Oct 2009	% Reduction
CLABSI Rates	.29	.03	90%

## CONCLUSIONS

Reduction in CLABSI rates can be achieved through implementation of interventions such as the IHI central line bundle, a dedicated PICC Team, as well as additional innovative and effective practices and devices. In this surveillance, an antimicrobial, positive displacement, clear swabable connector was associated with lowering an already low Adult ICU PICC CLABSI rate. An antimicrobial device is not a replacement for proper nursing technique. It is critical for improved patient outcomes and reducing nosocomial infections that evidence based nursing practices are continually enforced and sustained. The results of this small study suggest an antimicrobial, swabable, positive displacement needleless connector may assist in reducing microbial contamination and thus the occurrence of CLABSI, however additional research is necessary in this area.

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