A Comparison of the Rate of Central Line-Associated Bloodstream Infection (CLABSI) in a NICU Pre- and Post-Implementation of Sterile Tubing Change

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Problem
- CLABSI is a serious but preventable healthcare associated infection
- It can cause significant morbidity, mortality, and cost billions of dollars every year
- Neonates are at higher risk due to immature immune response, increased susceptibility, the need for invasive monitoring and invasive procedures, medication administration, and altered skin integrity (Putn, Denson & Brady, 2012; Wu & Mu, 2010).
- Methods that have been successful in decreasing CLABSI include
  - Implementation of care bundles
  - Quality improvement projects
  - Education

Methods
- Descriptive retrospective non-experimental study design
- Data collected by retrospective chart review of infants < 1500 grams at birth.
- CLABSI rates in this NICU were obtained quarterly from first quarter 2007 to fourth quarter 2012
- CLABSI rates were compared over this six year period to determine the effectiveness of the care bundle, specifically sterile tubing change

Literature Review
- Providing education to staff increases understanding of evidence behind practice change and increases compliance. Part of the educational process is assessing knowledge and compliance with guidelines (O’Grady, 2011a).
- Care bundles are defined as a group of interventions that when implemented together result in better outcomes. Nekhrin et al. (2011) found a 43% decrease in the incidence of CLABSI in their pediatric intensive care units that was most strongly associated with implementation of a care bundle.
- Many studies have been conducted to show the success of quality improvement projects in decreasing incidence of CLABSI (Curry et al., 2008; Kime et al., 2011; Witschafter et al., 2010).
- Four pathogens have been recognized as the most common pathogens to infect central lines. They are coagulase-negative staphylococci, Staphylococcus aureus, enterococci, and Candida (O’Grady et al., 2011a).

Care bundle components
- After comparing CLABSI rates to other facilities in the Vermont Oxford Network, it was determined a focus needed to be placed on reducing the incidence of CLABSI.
- A multidisciplinary team determined components of the care bundle to be implemented in 2010 and 2011:
  - Hand hygiene
  - Skin surface surveillance cultures
  - Use of chlorhexidine skin antiseptic for central line placement
  - Line maintenance team
  - Continuous medication infusion and bolus feature of infusion pump
  - Memory aid for addressing central line need
  - Sterile tubing change

Results
- CLABSI rates decreased from 9.4 bloodstream infections per 1,000 central line days in 2007 to 1.4 bloodstream infections per 1,000 central line days in 2012.
  - 2007: 9.4 per 1,000 central line days
  - 2008: 5.1 per 1,000 central line days
  - 2009: 7.1 per 1,000 central line days
  - 2010: 4.1 per 1,000 central line days
  - 2011: 2.3 per 1,000 central line days
  - 2012: 1.4 per 1,000 central line days
- 1,974 total NICU admissions during this time period
- 8,293 total central line days
- 41 patients diagnosed with CLABSI
- Most common pathogen: Coagulase Negative Staphylococcus (63%)
- Most common central line to be affected: Umbilical venous catheter
  - Umbilical venous catheter (67%)
  - Umbilical arterial catheter (17%)
  - Central venous catheter (11%)
  - Peripherally inserted central catheter (4%)

Discussion
- The need to decrease the incidence of CLABSI in this Midwestern NICU was recognized after comparing rates to other NICUs in the Vermont Oxford Network.
- By initiating a quality improvement project, developing a care bundle, and educating staff, this Midwestern NICU was able to decrease CLABSI by 86% during this six year period.
- With the initiation of the sterile tubing change component of the bundle came staff resistance and potential noncompliance. This was due to the amount of time sterile tubing change requires. The result of continued decreased CLABSI rate will help to maintain compliance and staff buy in.
- Continued diligence with central line care as well as adherence to guidelines will ensure a sustained low CLABSI rate.
- Coagulase negative staphylococcus was identified as the most common pathogen which is consistent with the literature.
- Umbilical catheters have been identified as higher risk for invasion by pathogens. Therefore it has been recommended that these lines be used only short term. Umbilical venous catheters were identified most commonly as the probable source of CLABSI in this NICU.

Implications for Practice
- The success of quality improvement projects depends on several factors. A sustained low incidence of CLABSI in response to the care bundle and sterile tubing change will increase staff buy in and promote compliance with guidelines.
- CLABSI rates declined as a result of evidence-based interventions and multidisciplinary collaboration. This provides incentive to continue to evaluate the evidence and implement best practices in caring for central lines. It also declares the importance of multidisciplinary collaboration in the NICU.
- APRNs are perfectly positioned to influence continued success. As experts in neonatal care, they research and weigh evidence to determine best practice to ensure positive outcomes in the neonatal population.

Pathogens Identified