

Pediatric Critical Care Medicine
Eradicating Catheter-associated Blood Stream Infection – Phase II
A Proven Initiative for Sustainable Change

CLINICAL CHARTER – SUMMARY

BACKGROUND

Catheter-associated blood stream infections (CA-BSIs) are a significant source of morbidity, mortality and added medical costs for hospitalized adult and pediatric patients every year (1,2,3,4,5,6,7,8,9,10). According to the National Nosocomial Infection Surveillance System (NNIS) established by the Centers for Disease Control and Prevention, the pooled mean CA-BSI rate among 54 pediatric intensive care units (PICUs) was 6.6 CA-BSIs per 1,000 catheter days. This rate is higher than most adult intensive care units (11). Despite the magnitude of this problem in pediatrics, there has been limited effort to develop strategies to reduce the impact of CA-BSI, and little evidence-based medicine from which to draw.

In October of 2006, the National Association of Children’s Hospitals and Related Institutions (NACHRI) and a team of expert clinical faculty launched a three-year quality improvement project that focused on CA-BSI in the PICU. This project has decreased the number of infections at participating institutions from a pre-collaborative CA-BSI rate of 5.39 per 1,000 catheter days to a sustained rate of 3.19 per 1,000 catheter days. This reduction represents a 41 percent decrease in CA-BSI events. To date approximately 177 infections have been prevented across the 27 institutions, at a cost savings of approximately \$6 million. In addition, an estimated 20 deaths may have been prevented.

This project has been approved by the American Board of Pediatrics (ABP) to serve as a model for practitioner involvement in collaborative performance improvement activities which can be used as part of the ABP’s Maintenance of Certification (MOC) requirements.

This project is now being offered to additional PICUs that seek to improve the health care of children by eradicating CA-BSI events.

BSI INITIATIVE AIM

The mission of the project is to eliminate CA-BSI. The project is part of a broader effort to assist PICU teams in using quality improvement methods to develop and implement evidence-based medicine practices. In addition, the design of this project allows for targeted research that builds on high quality, ongoing data collection. Finally, the project, while focused on reducing or eliminating CA-BSIs, will also serve as a model for future PICU projects that could improve the quality of pediatric care and facilitate physician ABP certification.

PROJECT GOALS

The long-term goal of the initiative is to build the foundation of a sustainable collaborative network to improve the outcomes of children cared for in the more than 400 pediatric critical care units in the United States. The objectives of the project are to:

1. Engage pediatric critical care physicians, infectious disease physicians, infection control practitioners, and other physicians and clinicians implementing quality improvement efforts in own their institutions into this collaborative’s activities, especially as this project is expanded across the country.

2. Partner with the NACHRI CA-BSI Collaborative Phase I group of 29 ICU teams at 27 hospitals to test and implement changes that can significantly reduce or eliminate CA-BSIs in the PICU.
3. Develop and sustain a program that enables physicians involved in reducing CA-BSI rates to develop competencies in performance improvement and systems-based thinking thereby enabling them to meet the ABP Part IV MOC requirements. What is learned in this project about methods of ensuring that physicians become competent in performance improvement and systems based thinking may be applied to other pediatric sub-specialties.
4. Generate new knowledge and evidence-based clinical practice in the pediatric population by involving critical care physicians, physicians and clinicians in related specialties and disciplines, and their teams and families in a performance improvement collaborative that brings together clinical research and improvement methods.
 - o Central Venous Catheter Insertion: Build on existing successes from other aggregate efforts and upon the successes of Phase I of this Collaborative, using the improvement collaborative model and sufficiently broad sample sizes to define evidence-based “best central venous line insertion practices” for children.
 - o Maintenance of Care for Central Venous Catheters: Build upon the data gathered in Phase I of this collaborative to further refine and define best catheter care practices using improvement science methodologies to clearly codify an evidence-based catheter care maintenance bundle. This bundle will serve as evidence-based “best central venous catheter maintenance care practices” for children. This bundle can also serve as a platform for future evidence-based research in pediatrics.
5. Rely on and improve physician and nurse team functionality to implement changes needed to tackle CA-BSI and improve overall PICU Safety Culture and team function.
6. Identify strategies and methods to spread the new and most efficacious practice changes to all physicians and nurses involved in trying to reduce CA-BSI rates in PICUs in the United States.

SPECIFIC GOALS FOR PARTICIPATING ORGANIZATIONS:

1. Eliminate CA-BSI attributed to the PICU
2. Meet the following interim goals while working toward elimination:
 - o Decrease CA-BSI by 50 percent
 - o Have 90 percent of central venous line insertions completed using collaborative insertion bundle (how evidence based care is best practiced based upon Phase I data)
 - o Have 70 percent of all central venous line catheter maintenance care performed using collaborative maintenance care bundle (how evidence based care is best practiced based upon Phase I data)
3. Improve PICU team function between physicians, nurses and other team members that results in a 10-point increase in mean Safety Attitudes Questionnaire score

To accomplish these goals NACHRI has engaged the resources of:

- The American Board of Pediatrics to maintain MOC requirements
- The Center for Children’s Healthcare Quality (CHCQ) to provide consultation on improvement science
- Johns Hopkins Bloomberg School of Public Health to provide rigorous data analysis and design
- Johns Hopkins Quality and Safety Research Group to administer and interpret the Safety Attitudes Questionnaire that evaluates cultural change in the unit
- The VPS, LLC to standardized data sharing and benchmarking among PICUs with a focus on quality and comparative, multi-site data

BSI INITIATIVE CHANGE PACKAGE/BUNDLE

The collaborative improvement effort will have two areas of emphasis: insertion of central venous lines and maintenance care for central venous lines. These areas of focus further codify and define best care approaches which may lead to infection rate reduction.

Changes to be implemented related to ideal insertion of central lines include:

1. Implement an educational intervention for all PICU physician and nursing staff to increase awareness of a defined set of evidence-based infection control practices for inserting central venous catheters; including but not limited to an insertion video or slide show which describes best insertion practice
2. Create a dedicated catheter insertion/procedure cart to make it easier for providers to follow guidelines for sterile central venous catheter insertion
3. Teamwork building to have all central line insertions done with both physician and nursing input and development of an observer's checklist to ensure adherence to evidence-based guidelines for insertion and provide independent double-checking of adherence
4. Empower all clinical staff, including nurses, to stop the central line insertion if adopted insertion guidelines are not followed

Changes to be implemented related to ideal catheter care maintenance practices include:

1. Standardize maintenance practice across the unit – this will include training of all staff and revision of policies to reflect use of the collaborative maintenance bundle
2. Prepackaged cap change kit available on the unit with standardized procedures for each cap change
3. Prepackaged dressing change kit available on unit with standardized procedures for each dressing change
4. Standardized time intervals between dressing changes – not less than 7 days unless catheter site is soiled or contaminated (CDC recommendation)
5. Standardized methods to identify times to change caps, hubs, and catheter dressings

BSI INITIATIVE CORE MEASURES

The measures that follow are in the design and vetting phase and thus only serve as potential examples.

PATIENT OUTCOME MEASURES

- CA-BSI rate per 1,000 catheter days
- In-hospital mortality rate for patients who experience a CA-BSI
- Days between infections
- Days between infections due to insertion and maintenance

PROCESS MEASURES

- Measure percent of insertions for which all bundle components were implemented
- Measure percent compliance with each insertion bundle component
- Measure percent of patients for which all required maintenance bundle components were implemented
- Measure percent compliance with each maintenance bundle component
- Measure Safety Attitudes Questionnaire (SAQ) score at beginning of collaborative and again one year after the beginning of the collaborative

CLINICAL / DEMOGRAPHIC MEASURES

For risk stratification exploration, the following additional variables will be captured for all patients experiencing a CA-BSI:

- Age
- Primary and secondary diagnoses
- ICU admission PRISM II or III score, or PIM II score (severity of illness score) if available
- Use of ECMO
- Most recent white blood cell count prior to CA-BSI
- Whether patient at time of CA-BSI was receiving any chemotherapeutic or immunosuppressant agents
- Degree and extent of burns if applicable to the patient
- Whether patient required any body cavity to be left open while in the PICU
- Trips to the operating room within 72 hours of the development of CA-BSI
- In-hospital mortality for patients who experience a CA-BSI

PARTICIPANTS

All hospital PICUs are invited to participate in this project. Participants will include clinicians specializing in pediatric critical care, infectious diseases and quality improvement, and infection control professionals from across the country. PICUs of all sizes are encouraged to participate.

Clinicians who participate will:

- Receive the most current pediatric recommendations for the management of CA-BSI in children (pediatric specific vs. extrapolated from adult data)
- Receive materials for use in clinical practice
- Learn early the results of collaborative studies and quality improvement projects
- Establish and implement best practices
- Contribute to the advancement of science and clinical practice
- Learn improvement science methods that can be applied to other topics
- Become a member of an esteemed collaborative
- Satisfy a requirement for Part IV maintenance of certification by the American Board of Pediatrics

The project requires PICU clinical leadership and principal investigator roles that will gain experience in BSI reduction and elimination; a passion for achieving results; the ability to communicate with and engage physicians across the country; and the willingness to be visible and/or vocal at project related workshops and meetings. The Clinical Faculty Steering Committee that follows has been crucial in the development of the proposal and charter and are the key leaders in moving this national collaborative forward.

Clinical Faculty Steering Committee

Richard Brill, MD, Co-chair Professor, Pediatrics Associate Chief of Staff Clinical Director, PICU Cincinnati Children's Medical Center	Marlene Miller, MD, MSc, Co-chair Vice President, Quality NACHRI Associate Professor, Pediatrics Johns Hopkins University
Deborah Campbell, RNC, BSN, CCRN Clinical Manager	W. Charles Huskins, MD Consultant, Pediatric Infectious Diseases

Just for Kids Critical Care Center Kosair Children’s Hospital	Assistant Professor of Pediatrics Mayo Clinic College of Medicine
Michele Moss, MD Professor, Pediatrics Pediatric Critical Care Physician University of Arkansas for Medical Sciences	Matthew Niedner, MD C.S. Mott Children’s Hospital University of Michigan Health System
Thomas Rice, MD Chief Medical Officer, VPS, LLC Chief, Pediatric Pulm Critical Care Director Children’s Hospital of Wisconsin	Debra Ridling, RN, MS, CCRN PICU Clinical Nurse Specialist Children's Hospital & Regional Medical Center, Seattle

Serving as Collaborative Executive Director:

Marlene R. Miller, MD, MSc
Vice President, Quality
NACHRI

Serving as the liaison to VPS, LLC:

Dr. Ramesh Sachdeva
Chief Scientific Officer, VPS, LLC
VP, Quality and Outcomes
EVP and COO, National Outcomes Center
Children’s Hospital of Wisconsin

EXPECTATIONS AND BOUNDARIES

For the length of time of this project, the CA-BSI Clinical Faculty Steering committee; NACHRI; the VPS, LLC; and The Center for Children’s Healthcare Quality (CHCQ) will:

1. Provide an opportunity to participate in a collaborative that we believe can substantially reduce CA-BSI rates in your unit
2. Provide evidence-based information on BSI
3. Teach participating centers how to apply a care model for reducing BSI
4. Teach the Model for Improvement
5. Offer coaching to PICUs on implementing and evaluating changes
6. Coordinate communication activities to keep participants connected to the steering committee and to colleagues during the improvement collaborative
7. Develop a framework for testing changes in care delivery
8. Provide tools, forms, and other aids to help with implementation of key areas of care for reducing BSI

Participating organizations and teams are expected to:

1. Commit a senior leader – this may be the same person as the physician champion – to support and promote the team working on the collaborative improvement project
2. Send two (required) or three (recommended) team members who have the authority to drive change, including the physician champion and, ideally, a nurse and/or infection control professional, to three one-and-one-half-day learning workshops (travel costs to be covered by participating hospital)
3. Provide resources and support to the hospital’s team (includes attending workshops, devoting time to data entry, testing and implementing changes in the PICU, and promoting active senior leadership)
4. Collect and submit data every month to the collaborative database
5. Provide staff to accommodate the approximately 40 hours of data collection required per month

6. Be aware that if your line days are “high,” data collection time may increase – especially regarding those elements specific to CA-BSI events
7. Implement the standardized database collection tool to track patients and their care and submit monthly
8. Agree to implement the central line insertion bundle in a uniform approach and test changes in at least two areas related to catheter care maintenance practices for central venous lines
9. Commit to be transparent with data within the collaborative group
10. Work to involve all hospital staff as appropriate with the aim of helping the multidisciplinary clinical team become competent in safety and quality improvement
11. Perform pre-work activities to prepare for workshops
12. Connect project goals to the broader patient safety work in the hospital
13. Participate in collaborative group phone calls and a collaborative discussion list to share with and learn from others
14. Make well-defined measurements at least monthly, plot them over time for the duration of the collaborative improvement project and share them with the other teams in the collaborative
15. Maintain responsibility for IRB requirements for a quality improvement project (with option to publish aggregate data)

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