[Erin Parrish Reade MD, MPH, FAAP] ISP Application 04/15/2025

Project Lead/Key Contact

- Erin Parrish Reade MD, MPH, FAAP, Clinical Associate Professor of Pediatrics, Division of Pediatric Critical Care Medicine, project lead
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Why are you interested in the Improvement Scholars Program?

As a practicing pediatric intensivist for 15 years, my involvement in quality improvement work was inspired by witnessing the effects of medical errors and complications of healthcare associated infections at the bedside. I have served as a physician champion for quality improvement projects at my prior institution (The University of Tennessee, Chattanooga) as well as here at UNC. However, I have never received formal training in quality improvement methodology, instead relying on education through the American Academy of Pediatrics and American Board of Pediatrics via the Maintenance of Certification program as well as guidance from nursing and administrative partners. I would like to further my knowledge of quality improvement in a more rigorous, structured manner and with a focused goal. I am passionate about preventing harm from central line associated bloodstream infection (CLABSI). We started a PICU-based QI project called "Fine Lines" in August 2022, and it has been successful in decreasing our CLABSI rate in the PICU. With the Improvement Scholars program, we plan to add additional initiatives to the UNC Children's CLABSI reduction efforts and reduce CLABSI rates even further. This will allow us to expand the scope of the work to multiple additional units in the entire Children's Hospital, outside my primary area of practice.

Problem Statement: What is the problem you are looking to solve?

Central line–associated bloodstream infections (CLABSIs) are preventable healthcare associated conditions that result in significant morbidity, mortality, and increased resource utilization in pediatric care.

In FY24 there were 14 non-mucosal barrier infection (non-MBI) CLABSIs at UNC Children's across 2 ICUs and 3 regular inpatient care units. This represented a nearly 50% decrease from FY23. This decrease was attributed to an effort throughout the Children's Hospital which focused on unit-based rounding and bundle adherence. However, there is still more work to be done to move toward zero CLABSIs. CLABSI remains a serious threat to children admitted to the hospital. As of March 2025, there have been 13 CLABSIs, putting us on pace for 17 in FY25, which will be a significant increase compared to FY24.

Importance Statement: Why is this project important?

In 2024 I was involved in a multidisciplinary effort to help clinicians make better decisions about what type of line to place when placing central venous access devices (CVADs). The culmination of this project was a product called UNC HEEL, or Holistic Evaluation of Every Line for line placement to provide the "right line, at the right time, for every patient, every time at UNC Children's." To find the appropriate CVAD for an individual patient, the clinician selects the specific (1) patient population, (2) indication, (3) duration of therapy. The goal of

vascular access standardization is to decrease complications such as CLABSI, thrombosis, stenosis, and extravasation injury.

Despite standardization of vascular access selection and placement and high adherence in the Children's Hospital to maintenance bundles designed to prevent CLABSI, these infections continue to occur. Therefore, we must focus on risk mitigation for CVADs to decrease the CLABSI rate in the Children's Hospital.

This project will develop a tool to identify high-risk vascular access devices placed in pediatric patients and create a CLABSI high risk bundle, beyond and in addition to the standardized CLABSI prevention bundle. All healthcare team members, including patients and their families, will be able to recognize and mitigate risk to decrease the likelihood of CLABSI.

This project not only has the potential to decrease the CLABSI rate locally at UNC Children's but also could contribute to lowering the CLABSI rate in children's hospitals nationally. We are surprised, as CLABSI is the hospital-acquired condition with which children's hospital struggle most, that there is not a nationally accepted CLABSI risk predictor. We hope to create such a predictive model for CLABSI like the Braden QD score which has been adopted nationally and incorporated into electronic health records to decrease hospital-acquired pressure injuries.

We plan to implement this tool in all Children's units: three acute-care floors, the Neonatal Critical Care Center, the Pediatric Intensive Care Unit, and the Pediatric Cardiac Intensive Care Unit when it opens in fall 2025. The primary outcome measures will be CLABSI rate (measured in infections per 1000 catheter days) and device utilization rate in those units. Our key process measures will be compliance with unit-based CVAD rounding, number of times we screen patients with the new tool, and the number of cases in which specific risk mitigation efforts were recommended . Secondary measures will be the determination of sensitivity, specificity, positive predictive value, and negative predictive value of the tool. We will also evaluate the CLABSI rate in the subpopulation of identified CLABSI high risk patients over time. We expect that our project will result in earlier CVAD removal in some patients. As a potential downside of removing lines is leaving patients without stable access when needed, we will measure the number of times a patient requires another CVAD during an admission once one has been removed. We will use the CAUTI (Catheter associated urinary tract infection) rate as another balancing measure to determine if focusing on CLABSI results in decreased attention to another quality improvement effort.

The landmark 2021 Mini MAGIC study provided pediatric providers with guidance for balancing risks and benefits for specific vascular access devices, and Mini MAGIC will provide the framework for defining risks based on device characteristics, length of time the device is required, and type of medication/treatment being provided through the device. We will also utilize data for specific patient populations (hematology/oncology, intestinal failure, cardiac, chronic illness/technology dependence, and critical care) to define patient risk factors. A QI team at Johns Hopkins recently published their successful experience designing a nurse-

driven tool to identify high-risk CVADs and mitigate high-risk conditions. By adapting these screening and risk-mitigation methods for UNC Children's, we believe we can reduce the risk of CLABSI in our highest-risk patients. Based on our analysis of the current state of CLABSI prevention in UNC Children's and recently published QI literature, we have concluded that this project is a crucial next step in decreasing our Children's Hospital CLABSI rate. By identifying risk factors, stratifying patients according to risk, alerting healthcare team members of the risk, and pinpointing appropriate interventions to reduce risk, all members of the healthcare team will be able to contribute to further CLABSI prevention.

Project Scope

In Scope:

- *What is the specific patient population your project will impact?* All hospitalized pediatric patients with a central venous access device (CVAD)
- *How many patients are in the population? TBD (waiting for this data)* For FY 2022-24 this was 8574 patients throughout the Children's Hospital

- *In what setting(s) would this problem be addressed? (e.g., hospital unit, outpatient practice setting, non-clinical setting, etc.)?* All inpatient hospital units at UNC Children's Hospital (NICU, PICU/PCICU, and regular inpatient care units)

Out of Scope: Outpatients, including patients in the emergency department and outpatient surgery patients

Measures: (Process, Balancing, Structure)

Please describe the anticipated outcome measure(s), 2-3 process measures, and one balancing measure. Please do not include more than 5 measures total.

Measure Name	Measure Type	Measure Calculation	Measure Exclusion	Data Source	Baseline	Goal	Collection Frequency
CLABSI Rate	Outcome	CLABSI/ 1000 line days	Mucus barrier infection CLABSIs	UNC Tableau data	1.68 (aggregate for FY 23 and 24)	< 1/1000 line days	Monthly
CVAD utilization rate	Outcome	Device days/ patient days	None	UNC tableau data	0.33 (aggregate for FY 23 and 24)	<0.3	Monthly
CVAD Rounding/use of tool/mitigation strategies	Process	% weeks rounds take place in each unit	None	UNC Infection prevention data	currently unknown	100%	weekly
CAUTI Rate	Balancing	CAUTIs/ 1000 catheter days	None	UNC tableau data	1.73	1.73	monthly
Number of CVADs placed after initial CVAD removed	Balancing	Number or percentage	PIVs	Internal	Currently unknown	0	monthly

Root Cause Analysis

- *What do you think are the underlying causes of the problem?* While we have established a goal of removing non-tunneled/non peripherally inserted CVADs by 10 days (maximum whenever possible), we have high rates of compliance with CHG baths (where applicable), and we have high compliance with insertion and maintenance bundles for CVADs, we continue to have CLABSIs. To make CLABSI a "never" event, it will be necessary to look deeper at characteristics of patients and the CVADs to determine what risk factors may be contributing to the residual CLABSI rate. I think CLABSIs continue to occur due to multiple factors, but we need confirmation of this. Based on our findings from weekly CVAD rounding and analyzing CLABSIs, I think the underlying causes include (1) Non-tunneled and non-peripherally inserted CVADs remaining in place for > 5 days, (2) Lines contaminated by secretions and bodily fluids due to the presence of devices such as tracheostomies, gastrostomy tubes, and surgical drains (3) Some patient groups with allergies or contraindications to CHG and (4) Excessive entries into CVADs for lab draws and IV medications.
- *Why do you think the problem is happening? I* think non-tunneled CVADs remain in place for > 5 days due to a lack of resources to place alternative CVADs, or, if the patient no longer requires central access, stable peripheral access. Some patients absolutely require a non-tunneled CVAD for < 5 days at times, due to severity of illness, ECMO, or other factors. Contamination of lines with stool, oral secretions, and gastric secretions is a difficult problem due to the patient population, but we can examine novel mitigation strategies such as barriers, etc. We should also look at alternatives to CHG for populations unable to receive CHG baths. Finally, it is possible that line entries could be reduced by bundling lab draws and converting IV medications to enteral when possible. As we review our CLABSIs and identify risk factors, we may identify other root causes.

Ideas for Improvement

- *What ideas do you have for changes that will result in improvement?* For this project, we hope to develop a risk stratification tool with risk mitigation strategies that will identify and guide clinicians and bedside nurses to decrease the patient's CLABSI risk. This strategy will lead the bedside nurses and clinicians to take a "if x, then y" approach of recognizing the risks and then providing recommendations for practice change for each specific patient. Ultimately, we feel that this approach combined with a comprehensive vascular access team to ensure the placement of the "right line, at the right time, for every patient, every time" will lower the CLABSI rate toward zero.

Risks and Opportunities

- *What factors do you anticipate will foster improvement?* We have an existing stable structure of unit-based CVAD rounding that we can utilize to test the risk stratification tool and risk mitigation strategies, we have a great deal of diverse multidisciplinary expertise, and there is a culture of curiosity and willingness to be open to change,
- *What are the major challenges you anticipate?* We realize that moving the tool to Epic may be challenging, but we think the ability to develop and test the tool thoroughly

outside of the Epic setting will be important. Another challenge is the diverse nature of the pediatric patient population, from very-low birth weight premature neonates to oncology patients to critically ill patients who can be neonates up to late adolescents. Finally, the most difficult challenge is the limited resources we must place alternative lines due to lack of a vascular access team and lack of vascular interventional radiology to place lower-risk peripheral and central lines.

Stakeholders and Project Team Members

- *Who are the key stakeholders in your system and processes?*
- *Who are the key project team leaders to design and implement change?*

Name	Role
Lane Avery MD	*Sponsor(s)*
Erin Parrish Reade MD, MPH, FAAP	*Team Lead*
Amber Kirkley (Children's Nursing Quality Coordinator), Tara Sotak (infections prevention), Joy Hazard (PICU Nurse manager), Wayne Price (neonatology), Sue Meier (neonatology), Zachary Willis (pediatric infectious disease), Kim Kasow (pediatric hematology/oncology), Heidi Troxler(Children's Director of Quality and Safety), Eve Hammett (Children's Hospital Director of Nursing)	*Subject Matter Experts*
TBD	*Data Lead*

Impact on the Quintuple Aim

- ***Improved health – due to decreased CLABSI, lessening other complications from CVADs such as thrombosis and vessel stenosis***
- ***Enhanced patient experience – decreased length of ICU stays, decreased length of hospitalization, decreased complications due to CLABSI, thrombosis, or vessel stenosis***
- ***Enhanced clinician and staff experience – clinicians and staff empowered to help decrease the CLABSI rate due to ability to risk stratify patients and better advocate for patient care***
- *Health equity*
- ***Reduced costs – decreased length of stay leads to decreased hospital costs***

Sustainment Plan

- *What ideas do you have for sustaining the improvement?* We will first make risk screening and assessment part of weekly CVAD rounding in each hospital area. We will initiate risk mitigation strategies and solicit and utilize feedback from clinicians

and bedside nurses. Ultimately, after it is fully tested, putting the risk tool in Epic would be ideal.

- *How do you see the work you start with IHQI's support continuing?* As we already have established CVAD rounding throughout the Children's Hospital, this tool will strengthen our ability to recognize high risk patients and mitigate risks associated with CVADs. It will become the cornerstone of CVAD rounding and provide the basic structure for identifying and mitigating risks associated with CVADs.

Carolina Quality Tools

How will Carolina Quality tools (Just Culture, SAFE reporting, TeamSTEPPS, huddles, and visual management boards) be used to support the work? Although use of these tools is not required, applications including them will be strengthened.

SAFE reports will help identify risk factors, and we plan to retrospectively review all CLABSI "deep dives" for the last 2 years to help identify risk factors specific to our patient population. TeamSTEPPS, specifically SBAR, check-back and teach-back will be helpful for risk mitigation strategies. Huddles are a version of weekly CVAD rounding. There are visual management boards in all the areas of Children's.

References

- Sponsor letters – see attached

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Med Wing B, Room 109, CB# 8005
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Dear Mr. Huemmer,

I am writing in support of Dr. Erin Reade's application for an IHQI grant for her quality improvement project focused on reducing central line-associated bloodstream infections (CLABSIs) at UNC Children's Hospital. This work is of critical importance to our institution, and I have every confidence that, under Dr. Reade's leadership and with strong support from IHQI and hospital administration, this initiative will be both impactful and sustainable.

CLABSIs are preventable infections that significantly increase hospital mortality, prolong the length of stay, and contribute to higher healthcare costs. As such, reducing CLABSI rates has been a long-standing institutional priority at UNC Hospitals.

Dr. Reade has already demonstrated tremendous leadership in this area. In 2022, she and her team launched the Fine Lines initiative in the Pediatric Intensive Care Unit (PICU), which led to a meaningful reduction in our CLABSI rate—a reduction that contributed directly to improvements in our hospital-wide performance. Building on this success, she then spearheaded the UNC HEEL project (Holistic Evaluation of Every Line), a decision-support tool designed to standardize venous access selection across the institution. These efforts reflect her deep commitment to patient safety and her ability to lead complex, interdisciplinary quality improvement efforts.

With more than 15 years of experience in pediatric critical care medicine, Dr. Reade brings a wealth of clinical insight, tireless dedication, and a collaborative approach to her work. Her team's ambitious goal of zero CLABSIs will undoubtedly require continued innovation, rigorous data analysis, and broad engagement—all areas in which Dr. Reade excels.

Partnering with IHQI would provide Dr. Reade with the infrastructure and mentorship needed to take this vital work to the next level. I strongly support her application and encourage your full consideration. Please don't hesitate to reach out if I can provide additional information.

Sincerely,
Matt Pizzuto, MD
Associate Professor, Pediatrics & Cardiology
Interim Division Chief, Pediatric Critical Care Medicine
Medical Director -Pediatric Cardiac ICU
Service Line Leader - Inpatient Pediatric Cardiology (PMC)
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April 3, 2025

Matt Huemmer, MBA, MHA, LSSMBB | Senior Quality/Org Excellence Leader
UNC Institute for Healthcare Quality Improvement
UNC School of Medicine and UNC Health Care
Med Wing B Room 109, CB# 8005 | Chapel Hill, NC 27599

I am writing this letter in strong support of Dr. Erin Reade's Improvement Scholars Program application for the creation of a CLABSI risk stratification tool with risk mitigation strategies.

Throughout FY2024 and FY2025, Children's has focused on reducing the rate of central line-associated bloodstream infections (CLABSIs) in our patients. This interprofessional work has included standardization of line maintenance practices, unit-based central line rounding, and standardization of criteria for central line placement and selection. Dr. Reade has been heavily involved in this work and has been an extremely engaged leader of the work to standardize criteria for central line placement and determination of line type in hospitalized pediatric patients. This QI initiative culminated in the UNC HEEL algorithm, which provides guidance in line selection for the pediatric population.

As we have addressed much of the "low-hanging fruit" in CLABSI prevention, our next steps need to focus on preventing CLABSI in our most at-risk patients. In unit-based central line rounding as well as in CLABSI deep dives, we have noted multiple reccurring factors that impede safe central line care, such as nearby contamination sources such as an ostomy or altered skin integrity. It is these risk factors, found in our sickest and most complex pediatric patients, that pose some of our biggest challenges to CLABSI prevention. A review of the literature revealed current work at other children's hospitals to identify and address these risk factors, and we know that we can contribute to these emerging efforts.

Tools to identify patients at risk for certain other hospital-acquired conditions, such as falls and pressure injury, currently exist and are widely used. We believe that an analagous tool for CLABSI risk stratification, combined with standardized, evidence-based interventions for common risk factors, is the natural next step in our CLABSI prevention efforts. Effective implementation of such a tool at the bedside can take us to the next level in CLABSI prevention. There is already strong support from Children's leadership and bedside staff for this work. I am excited that Dr. Erin Reade wants to continue to use her passion for quality improvement and excellent clinical care to contribute to these efforts. Please reach out to me with any questions.

Sincerely,

Heidi Troxler, MSN, RN, CPN | Children's Director for Quality, Safety, and Programs
UNC Children's, UNC Hospitals