Catheter Associated Urinary Tract Infections (CAUTI) Reduction

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Executive Summary

Since 1964, Children’s Hospital of Orange County (CHOC Children’s) has been steadfastly committed to providing the highest quality medical care to children. Affiliated with the University of California, Irvine, our regional pediatric healthcare network includes a state-of-the-art 279-bed main hospital facility in the City of Orange, and a 54-bed hospital-within-a-hospital in Mission Viejo. CHOC Children’s also offers many primary and specialty care clinics in Orange County and beyond; more than 100 additional programs and services; residency programs in Pediatrics, pharmacy and nursing; support for several fellowship programs; and four “Institutes” in cardiovascular care, neurosciences, orthopedics and pediatric cancer.

CHOC Children’s Hospital began its journey to a fully-implemented Cerner Millennium EHR in 2002. The Hospital’s dedication to patient safety was evident in the acronym chosen for the CHOC Children’s EHR, “CUBS,” which stands for Connecting Users and Building Safety. Today, CHOC Children’s dedication to safety, quality, and the patient experience is supported by over fourteen ensuing years of patient-centered Healthcare IT design. These efforts led to our recognition as a Stage 7 HIMSS Analytics Inpatient awardee in 2015 and support this case study.
Patient harm is the most tangible and dreaded result of medical error, which has become widely recognized in the last two decades as widespread, dangerous and costly.

CHOC Children’s developed a “Big Dot” high-level goal in 2010 on Reducing Serious Harm, utilizing a standardized scale (National Coordinating Council-Medication Error Reporting and Prevention, NCC-MERP). This effort morphed into an organizational strategic goal of the same name in 2012. Since inception, there has been a gratifying 900% reduction in serious harm events at CHOC Children’s (Figure 1). This translates into hundreds of avoided events of serious harm over the last six years.

**Figure 1.** Serious patient harm event rate (rate = events per 1,000 patient days)

MERP Serious Harm (Classes G, H, I) consists of errors that occur which cause permanent harm, life-threatening harm, and death, respectively. Due to the complexity of the medical environment, there are a wide variety of potential types of such adversity, including communication failures, handoff failures, medication management errors, and diagnostic errors, to name a few.

Another type of meaningful harm is due to Hospital-acquired Conditions (HACs), originating from the Department of Health and Human Services (DHHS) and the Center for Medicare and Medicaid Services (CMS), which are the largest medical insurers in the U.S.¹ These HACs are described as discreet conditions, generally if not always preventable, and important to the patient, the organization, and the industry.

CHOC Children’s initially, and then in collaboration with a network of national children’s hospitals, set out to reduce the occurrence of HACs utilizing, among other tools, the electronic health record (EHR) and information systems at large. One successful focus was on CAUTI, a well-known complication of
care in both adult and pediatric populations, particularly in the tertiary care environment of a large children’s hospital. Urinary tract infections can occur spontaneously as well, but either way are irritating, painful and can cause much worse complications such as kidney and bloodstream infections, including sepsis. They always require additional care including antibiotics and can lengthen hospitalization. Through education, a standardized care bundle, and efforts to minimize urinary catheter use and duration, meaningful improvements in CAUTIs occurred, including an overall reduction in CAUTI rate (one instance in 2016 to date) and an increase in months with zero cases of CAUTI, and a decrease in use of urinary catheters.

**Local Problem**

Urinary tract infection (UTI) is one of the most common hospital-acquired infections; 70-80% of these infections are attributable to an indwelling urethral catheter. The burden of catheter-associated urinary tract infection (CAUTI) in pediatric patients is not well defined. However, the Children’s Hospitals’ Solutions for Patient Safety (CHSPS), a CMS Health Engagement Network of more than 100 children’s hospitals, found that CAUTI is the sixth largest contributor to harm across the CHSPSN.²

In 2012 at CHOC Children’s, documentation of urinary catheter insertion and maintenance was completed in the EHR via IView – an embedded module that tracks and mirrors patient vital signs and key assessment items in paper charting. With this functionality, nurses only documented the existence and size of a catheter upon insertion, and only checked a box stating that catheter care and maintenance was completed.

CHOC Children’s recognized the need for a more comprehensive approach to documentation and education of urinary catheter care and CAUTI prevention. As such, they researched and developed recommendations for CAUTI prevention based on guidelines published jointly by the Society for Healthcare Epidemiology of America, Infectious Disease Society of America, American Hospital Association, Association for Professionals in Infection Control, and the Joint Commission.¹
These included:

- Indications for insertion of a urinary catheter
- Sterile techniques for insertion of a urinary catheter
- Maintenance of closed drainage system and unobstructed flow of urine
- Maintenance of regular catheter care (hygiene at area of insertion)

**Design and Implementation**

Guided by these recommendations, a multidisciplinary team formed to develop the catheter insertion and maintenance documentation tools and workflows. Nurses from the Clinical Informatics group lead the design of the overall workflow, as well as the technical configuration of the orders, documentation tools and alerts. The overarching focus on hospital-acquired infections led to the involvement of representatives from the Critical Care, Infectious Disease, Infection Prevention and Epidemiology, and Quality departments.

The combined efforts of the clinical and technical groups resulted in the development of two PowerForms within the EHR to more comprehensively capture documentation for catheter insertion and maintenance. These forms guide nurses to indicate the catheter insertion aseptic techniques, as well as catheter function and care for every shift. Additionally, the team created and administered a staff education module which provided didactic knowledge around evidence-based practices for CAUTI prevention. The two PowerForms, branded Care Bundles, and staff education modules were implemented house-wide in 2013.

On-line learning modules are assigned to educate staff on standard best practices for insertion, bundle compliance, etc. EHR reports identify bundle non-compliance and staff are re-educated one-on-one. In addition to the training modules, there are several educational alerts and reminders embedded within the EHR. Signified by red text, the clinician may simply right-click the text and bring up information such as indications for a urinary catheter (Figure 2) or CAUTI education to provide the patient and family (Figure 3).
In 2014, the team expanded its efforts to improve catheter care and maintenance by updating the entire catheter process and associated workflows. A comprehensive process model was designed to embed catheter insertion and care tasks assigned to nursing staff that are triggered once a provider orders a urinary catheter. The insertion and maintenance documentation Care Bundles are launched within the nursing tasks, which are assigned to the nurse every 12 hours.

The clinical goals of this project were two-fold:
1. Decrease the number of catheter-associated urinary tract infections (CAUTIs)
2. Improve the process and documentation of catheter insertion techniques and routine catheter care (hygiene) and function

The CAUTI rate and adherence to the clinical workflow is tracked in order to measure the effectiveness of our collective efforts toward meeting these goals.
How Health IT Was Utilized

In February of 2014, the catheter insertion and maintenance processes were revised to reflect steps in evidence-based practices. Figure 4 depicts the comprehensive catheter decision tree and the associated care process map.

1. The provider assesses the need for urinary catheterization. If an existing catheter is no longer needed, the provider places an order to discontinue and the catheter is removed.
2. If the provider determines that an existing or new catheterization is needed, the provider chooses either “Insert” or “Continue” on the Foley (i.e., Urinary) Catheter order (Figure 5).

Figure 4. Urinary catheter decision tree and associated clinical workflows

When a patient arrives in a new unit from either another unit in the hospital or outside the hospital:
Figure 5. Provider view of Foley Catheter order

3. If the provider chooses “Insert,” two tasks are added to the nurse’s Task List:
   a. Document the Urinary Catheter Insertion Care Bundle (Figure 6). The Insertion task prompts the nurse to explore and document the following evidence-based practices:
      i. Use aseptic technique for insertion
      ii. Educate the family

Figure 6. Urinary Catheter Insertion Care Bundle

b. The Urinary Catheter Care Bundle (Figure 5) is assigned every 12 hours (each nursing shift) for documentation (Figure 6).

4. If the provider chooses to continue the catheter order, the Urinary Catheter Care (Maintenance) Bundle (Figure 7) is assigned to the nurse’s Task List every 12 hours for documentation (Figure 8). The task prompts the nurse to explore and document the following evidence-based practices:
   a. Review catheter necessity daily
   b. Maintain closed drainage system
   c. Maintain hygiene
   d. Keep bag below level of bladder
   e. Maintain unobstructed flow of urine
Note: If the nurse selects “Family Not Available” within the CAUTI Education section, that particular education module remains unselected on the patient’s larger Education List (separate form).

Figure 7. Urinary Catheter Care (Maintenance) Bundle

Figure 8. Urinary catheter care on nurse’s Task List
Daily inpatient culture results are reviewed by the Infection Prevention staff. If positive cultures are identified, the chart is reviewed for CDC NHSN criteria to determine if it is a CAUTI. When a CAUTI or other HAC is identified, it is manually entered into the organizational electronic safety reporting system (SRS).

**Lessons Learned**

The strategic focus on reduction and prevention of HACs at CHOC Children’s was key to stakeholder engagement. Buy-in from the top-down from leaders at all levels fostered a shared commitment to the CAUTI Reduction project goals.

The addition of anything to a clinician’s already lengthy list of protocols and action items is most frequently viewed as a negative, even unwarranted change. Leadership mitigated that negativity by focusing on “the power of zero.” Transitioning the focus from the additional work to the challenge of hitting zero, partnered with the impact of improving patient care, provided a great deal of motivation for end-users to embrace the training, technology and associated workflows in hopes of achieving zero harm events.

The build process proved to be both challenging and enlightening. In early 2014, an issue was identified in which the appropriate care tasks were not triggering to the nurse’s Task List when the patient had a catheter. Upon further investigation, the Design and Implementation Team discovered that the Task List integration was only tied to one type of Foley catheter order, but there happened to be multiple orders and orders embedded within Order Sets (a group of standard orders) within the CHOC Children’s EHR. As such, the team performed a comprehensive audit of all orders and Order Sets, removing those that were duplicate or outdated, and made sure that those remaining orders were integrated into the standardized catheter care process.

An incredibly impactful change resulting from this project spans change to culture because of technology. Having descriptive follow up for catheter necessity embedded within the workflow via the catheter care (maintenance) bundle prompts a daily clinical discussion about the device. This conversation has been adopted as not only a task to complete within the EHR, but also as a necessary part of patient care. That shift has had a significant impact on decreasing the time a patient has a urinary catheter, and the same influence has spread to other invasive devices and technologies within the organization.

In Jan. 2016, the aggregation of catheter care and maintenance bundles compliance data was discontinued due to high bundle compliance (reliability). In hindsight, this was not the right approach,
as there have been lapses identified in bundle compliance. Regular compilation and review of bundle compliance have been reinstated so all instances of noncompliance are addressed with staff in a timely manner.

**Value Derived**

The implementation of Care Bundles and their integration into the nursing Task List over the past four years produced significant progress toward meeting the project goals. The comprehensive documentation, as well as the embedded best practices within the appropriate tasks and alerts generated by the Catheter Insertion and Catheter Care Bundles, were all essential to the decline in the overall CAUTI rate (Figure 9). As such, there have been several significant time periods with a total of zero CAUTIs; there has only been one instance of CAUTI to date in 2016.

![Hospital CAUTIs per 1000 Catheter Days](image)

**Figure 9.** CHOC Children’s Hospital CAUTIs per 1,000 catheter days

In addition to the overarching, organization-wide decrease in CAUTIs, the CHOC Children’s Pediatric Intensive Care Unit (PICU), which was the pilot unit for this project, has seen a significant decline of 35% in catheter usage (Figure 10) and has had zero CAUTIs in almost two years in this high risk population (Figure 11).
Hospital department and unit leaders meet at 8:30 a.m. every morning for Daily Safety Briefing. During those meetings, leaders provide the days between infections, including CAUTIs and other HACs. This allows for visibility of infection rates and highlights immediate supplementary actions. This is currently a manual update. As part of process improvement there is a dashboard under development that will automatically update this. The “days since last serious safety event” (i.e. serious harm) are shared at daily safety briefing as well as posted on the intranet home page.
As part of the larger effort to reduce HACs, CHOC Children’s closely monitors clinician compliance with the established workflows and adoption to the health IT components for catheterizations and CAUTI reduction. Figure 12 displays hospital-wide compliance of documentation with the Catheter Insertion and / or Care (maintenance) Bundles since the integration of associated catheter insertion and maintenance tasks into nurses’ Task Lists in 2014.

Figure 12. CHOC Children’s Foley Catheter care bundle compliance

The Quality Committee runs quarterly reports detailing clinical incidents and staff compliance as it pertains to reducing and preventing HACs, including CAUTI. Reports detailing clinical statistics are posted within each unit of the hospital to provide visibility across the organization. Reports detailing staff adoption of health IT solutions are provided to unit managers to establish accountability and provide visibility to strengths and opportunities for improvement.
The HAC occurrence and technology adoption data is also presented to a number of quality-focused leadership meetings across CHOC Children’s, including the following:

- **CHOC CHSPS STEERING COMMITTEE:** Physician, nursing, ancillary and quality leaders
- **JOINT LEADERSHIP COMMITTEE:** President-elect of Medical Staff and COO (Co-chairs), CQO, CNO, CFO, physician committee chairs
- **BOARD QUALITY COMMITTEE:** Board of Directors; facilitated by Chief Quality Officer

The visibility of clinical and adoption data from the top down reinforces an organizational commitment to reducing serious patient harm and preventing HACs, including CAUTIs. Hospital-wide, CAUTI rates dropped from a mean pre-project rate of 1.86 per 1000 catheter days to 0.9 per 1000 catheter days in 2015, a 51.2% reduction.

### Financial Considerations

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### References


3. Anthony Goudie, PhDa, Linda Dynan, PhDb,c, Patrick W. Brady, MD, MScb,d, Evan Fieldston, MD, MBA, MSe, Richard J. Brilli, MD, FAAP, MCCMf,g, Kathleen E. Walsh, MD, MSb, “Costs of Venous Thromboembolism, Catheter-Associated Urinary Tract Infection, and Pressure Ulcer.” *PEDIATRICS*. Volume 136, Number 3, (September 2015): 436.