The Impact of Two-Person Indwelling Urinary Catheter Insertion in the Emergency Department Using Technical and Socioadaptive Interventions

Chaz Rhone, MPH, CIC, Yonatan Breiter, MSN, RN, CNL, Linda Benson, DNP, ACNP-BC, CPHQ, Heather Petri, MOS, Peggy Thompson, RN, BSN, CIC, FAPIC, and Carmen Murphy, RN, BSN, CIC

ABSTRACT

- *Objective:* To decrease insertion-related catheter-associated urinary tract infections (CAUTIs) attributed to the emergency department (ED) as well as facility-wide within a large teaching hospital.
- *Methods:* Recommendations from the Agency for Healthcare Research and Quality (AHRQ) toolkit for reducing CAUTIs in hospital units were used to implement both technical and socioadaptive changes focused on prevention of insertion-related CAUTIs in the ED through a trial that required 2 licensed personnel for insertion of all urinary catheters. The process would include a safety time-out to confirm catheter appropriateness and review of the proper steps for insertion as a means to encompass and hardwire both the technical and socioadaptive aspects of the Comprehensive Unit-based Safety Project methodology into ED practice.
- *Results:* There was a 75% decrease in CAUTI rates following the intervention ($P = 0.05$). This reduction was sustained for at least 1 year following implementation.
- *Conclusion:* Using AHRQ recommendations to implement socioadaptive and technical changes through 2-person insertion of urinary catheters yielded a significant and sustainable decrease in insertion-related CAUTI rates and utilization of indwelling urinary catheters in the ED at Tampa General Hospital.

Key words: *catheter-associated urinary tract infections; infection prevention; quality improvement; change model.*

Each year an estimated 721,800 health care–associated infections occur in U.S. acute care hospitals, resulting in approximately 75,000 deaths [1]. Catheter-associated urinary tract infections (CAUTIs) account for an estimated 449,334 of health care–associated infections s annually [2]. The direct medical cost per CAUTI ranges from $749 to $1007, resulting in direct costs to U.S. facilities of over $340 million annually [2]. Although CAUTIs are one of the most common health care–associated infections, the literature has shown that following well established prevention guidelines can greatly reduce their incidence.

Since most health care–associated infections are preventable and cause unnecessary patient harm, there is pressure from regulatory bodies to prevent such events during a patient's hospitalization. Prevention of CAUTIs is a Joint Commission National Patient Safety Goal, and as of 2008 the Centers for Medicare and Medicaid Services (CMS) does not reimburse hospitals for the cost of additional care as a result of a CAUTI. Additionally, facility CAUTI data is included in the CMS value-based purchasing program, which can withhold payments to hospitals based on performance, as well as the inpatient quality reporting program, which requires public reporting of CAUTI to receive a higher annual payment.

Even before the external pressures of regulatory bodies, Tampa General Hospital has strived to protect patients by preventing infections through implementing best practices via multidisciplinary committees to maximize impact. Tampa General Hospital, a private not-for-

From Tampa General Hospital, Tampa, FL.

profit level 1 trauma center located in downtown Tampa, Florida, is a teaching facility affiliated with the University of South Florida Morsani College of Medicine. It is licensed for more than 1000 beds and serves 12 surrounding counties with a population in excess of 4 million.

Background

CAUTI data had been collected in all of the intensive care units at the hospital for several years, benchmarked against national unit-specific rates, with feedback provided to committees and the hospital board. However, in 2006, a multidisciplinary committee chaired by the chief operating officer known as Committee Targeting Zero (CTZ) was formed to review best practices and analyze all device-associated infection rates in an effort to reduce hospital-acquired infections. To target reduction of the CAUTI rate, a Foley stabilization device and renewed focus on hand hygiene were implemented, and CAUTI rates were reduced by over 50% by the end of 2007.

When CAUTI rates began to climb in 2008, additional interventions were implemented under the direction of CTZ, including a literature review for CAUTI prevention for any new or novel prevention strategies, reporting of each CAUTI to leadership of the attributed unit at the time of identification, ongoing surveillance of the appropriateness of indwelling urinary catheters at the unit level with feedback to CTZ, and mandatory education focused on infection of CAUTI and proper insertion for all staff inserting indwelling urinary catheters. Additionally, in 2009 an evaluation of an antibiotic-coated Foley catheter was implemented to further decrease rates, resulting in a statistically significant 42% reduction in the CAUTI rate as compared to 2008. Other prevention strategies instituted between 2010 and 2012 included increased availability of condom catheters, a closed system urine culture collection kit, and computer-based learning module for all staff inserting indwelling urinary catheters.

In 2013, the hospital included CAUTI prevention as part of a facility-wide initiative to decrease patient harm. A CAUTI committee led by senior leadership was convened to address CAUTI rates that exceeded national benchmarks. The multidisciplinary team began as a subcommittee of CTZ and was chaired by the chief nursing officer with the support of the chief operations officer and included representation from the infection prevention department and nursing unit leadership. After reviewing the Healthcare Infection Control Practices Advisory Committee's (HICPAC) guideline for prevention of CAUTIs [3], the committee focused its efforts on appropriate indications for insertion and timely removal, aseptic insertion, and proper maintenance of indwelling urinary catheters.

The key accomplishments of the CAUTI committee during 2014 included development of a comprehensive genitourinary management policy, incorporation of CAUTI prevention into new employee orientation for all patient care staff, aseptic indwelling urinary catheter insertion competency check-off with return demonstration (teachback methodology) for all nursing staff, and reinforcement of insertion criteria and daily assessment for necessity with documentation of indications, and removal via nurse-driven protocol when necessary. Additionally, a requirement to document indications for ordering urine cultures and a pop-up reminder in the electronic medical record for patients with an indwelling urinary catheter requiring indications to continue, both targeted towards physicians and advanced practice providers, were implemented.

In conjunction with the technical changes, additional strategies were executed with the intent of facilitating a culture of patient safety and reinforcing the aforementioned technical changes. In 2014, the hospital implemented Franklin Covey's "The Speed of Trust" methodology [4] and its associated 13 behaviors hospital-wide. Additionally, several of the inpatient units participated in a quality improvement project with either the Florida Hospital Engagement Network (HEN) [5] or the Agency for Healthcare Research and Quality (AHRQ) Comprehensive Unit-based Safety Program (CUSP) [6] national project. Physician engagement and education was accomplished through a white paper written by the infection prevention department, summarizing the current state of CAUTI within the facility and highlighting strategies to reduce infection, including evidence-based guidelines on ordering urine cultures.

In an attempt to target ongoing improvement strategies, CAUTIs were categorized as either insertion-related, occurring within 7 days of insertion, or maintenance-related, occurring greater than 7 days of insertion; the date of insertion was considered day 1. A review of the facility CAUTI data demonstrated that an opportunity to reduce insertion-related CAUTIs existed and a high volume of urinary catheters were inserted in the emergency department (ED). Therefore, ED leadership agreed to participate in the CUSP initiative

for EDs beginning April 2014. The goals of the CUSP initiative include using best practices for CAUTI prevention through the implementation of both technical and socioadaptive changes.

Methods

CUSP Initiative

The CUSP initiative focuses specifically on improving processes for determining catheter appropriateness and promoting proper insertion techniques in addition to changes in culture to facilitate teamwork and communication amongst frontline staff and improve collaboration between the ED and inpatient units. To participate in the project, a multidisciplinary team that included ED leadership, infection prevention department, and nursing clinical quality and research specialists was established.

The team designed an intervention that required 2 licensed personnel for insertion of all urinary catheters. The process would include a safety time-out consisting of a pause before inserting the indwelling urinary catheter to confirm catheter appropriateness and review of the proper steps for insertion as a means to encompass and hardwire both the technical and socioadaptive aspects of the CUSP methodology into ED practice.

Rollout Using 4Es

January through March 2015 was the implementation period during which education and validation of practices were conducted. The 4Es model created by the Johns Hopkins University Quality and Safety Research Group was used to roll out the changes in practice to the ED staff; the 4Es are Engagement, Education, Execution, and Evaluation [7]. To engage staff, the scope of CAUTIs, including the implications to both patients and to the health care system as a whole, were presented from a local (hospital) and a national perspective. Education was achieved by outlining the new process in ED staff education sessions, as well as through handouts, emails, and during shift change huddles. The content included a checklist (**Figure 1**) staff would use to follow proper aseptic technique as well as reminders of the intent of the project.

The process was executed through the use of a safety time-out completed by the 2 personnel (nurses) involved in the procedure prior to insertion of an indwelling urinary catheter. The time-out consisted of reviewing the insertion criteria to determine appropriateness for placement and the proper steps for insertion per hospital policy. The catheter was then inserted by one person while the second was solely responsible to assure compliance with proper aseptic technique. The procedure was stopped if aseptic technique was compromised. The indications for insertion and/or maintaining the urinary catheter are based on the HICPAC guidelines [3] and include the following:

- Acute urinary retention/obstruction
- Urologic, urethral or extensive abdominal surgical procedure
- Critically ill patient with unstable vital signs and requires close urine output monitoring (ICU patient receiving aggressive diuretic therapy, vasopressor/inotropic therapy, paralytic therapy, aggressive fluid management or titrated vasoactive medications)
- Stage 3 or 4 sacral or perineal pressure ulcer in a patient with incontinence
- End of life comfort
- Prevention of further trauma due to a difficult insertion
- Prolonged immobility due to unstable spinal fracture or pelvic fracture and inability to use bedpan.

During the implementation period, a process measure was used to evaluate the rollout. The compliance rate of returned insertion checklists versus the total number of insertions was calculated weekly and tracked over time. Although compliance was low at first, through several Plan-Do-Study-Act (PDSA) cycles conducted on a weekly basis, compliance steadily increased during the implementation period. Staff were also kept abreast of the compliance rates and progress of the project with weekly email updates and periodically in daily huddles during shift change.

Creating a High-Trust Culture

In parallel to the CUSP framework, the ED leadership team discretely used 6 of "The Speed of Trust" behaviors most relevant to the project to help drive the new process including get better, practice accountability, keep commitments, clarify expectations, deliver results, and create transparency. Get better was used to motivate staff to action in order to deliver the highest quality of care to our patients. Practice accountability was exercised by having the staff sign the checklist used in the

Dual RN Urinary Catheter Insertion Procedure

Patient Sticker MRN _____

Preparation:

- ☐ 1. Places underpad beneath patient, plastic shiny side down.
- ☐ 2. Uses the provided Castile soap cleansing wipes to cleanse patient's peri-urethral area (used to decrease bacterial load).
- ☐ 3. Removes gloves and performs hand hygiene with provided alcohol hand sanitizer gel.
- ☐ 4. Dons gloves provided in the kit.
- ☐ 5. Positions fenestrated drape on patient maintaining sterility.

Insertion:

- ☐ 6. Prepares patient with packet of pre-saturated antiseptic swab. **Use each swab stick for one swipe only.**

7. Female patient:

- ☐ Places patient in supine position with legs spread.
- ☐ Separates labia using non-dominant hand.
- ☐ With a downward stroke, cleanse the right labia minora and discard the swab. Do the same for the left labia minora. With the last swab cleanse the middle area between the labia minora.
- ☐ Keep labia spread with non-dominant hand.
- ☐ Using dominant and still sterile hand-insert urinary catheter gently-When the tip has entered the bladder urine will be visible in the drainage tube. Insert catheter to the Y and inflate catheter balloon. If no urine is visible, give 1-2 minutes and apply gentle pressure to the lower abdomen if not contraindicated. If still no urine remove catheter and start over.
- ☐ IF NOT SUCCESSFUL IN INSERTING THE CATHETER, DO NOT REINSERT AGAIN. GET A NEW CATHETER AND START OVER.

8. Male patient:

- ☐ Places patient in supine position.
- ☐ Holds the penis with the non-dominant hand.
- ☐ Retract foreskin if present.
- ☐ Cleanses the penis in a circular motion starting at the urethral meatus and working outward with each swab.
- ☐ Lift the penis to a position perpendicular to patient's body and apply light traction (with non-dominant hand).
- ☐ Using dominant and still sterile hand-insert urinary catheter gently-When the tip has entered the bladder, urine will be visible in the drainage tube. Insert catheter to the Y and inflate balloon. If no urine is visible, give 1-2 minutes and apply gentle pressure to the lower abdomen if not contraindicated. If still no urine remove catheter and start over. Do not inflate balloon until urine is seen in the tube.
- ☐ If foreskin was retracted, replace it.
- ☐ IF NOT SUCCESSFUL IN INSERTING THE CATHETER, DO NOT REINSERT AGAIN. GET A NEW CATHETER AND START OVER.

Figure. Indwelling urinary catheter insertion checklist.

new process. Deliver results was supported by the timely feedback of data to frontline staff to show whether the goal was being met. Clarifying expectations was demonstrated through feedback from weekly PDSA rapid cycles and constant reinforcement that all insertions must involve 2 personnel. Keeping commitments was established with an agreement amongst the staff and leadership to keep patients safe and deliver high quality care. Creating transparency was exemplified by explaining the initiative clearly to each patient and their family and allowing for any questions.

Outcomes Measurement

During the post-intervention period, progress was evaluated using 2 outcome measures: the insertion-related CAUTI rate and the catheter utilization ratio. National Healthcare Safety Network (NHSN) 2014 and 2015 criteria was used to identify any CAUTI [8] and for the purposes of this project, the insertion-related CAUTI rate was defined as the number of CAUTIs occurring ≤ 7 days after insertion, with the date of insertion being day 1, per 1000 catheters inserted in the ED. The utilization ratio was calculated from the number of catheters

Table 1. Insertion-Related CAUTI Rate

	Insertion-Related CAUTI Rate		
	Pre-Intervention (Apr – Dec 2014)	Post-Intervention (Apr – Dec 2015)	Sustainability (2016)
Infections	10	2	3
Catheters	1,450	1,180	1,530
Infections/1000 catheters	6.9	1.7	2.0

Table 2. Utilization Ratio

	Utilization Ratio		
	2014	2015	2016
Catheters	1971	1632	1530
ED visits	91,585	93,427	97,004
Utilization ratio	2.2	1.7	1.6

inserted per patient ED visits. The insertion-related CAUTI rates for the pre- and post-intervention periods were compared after excluding 2014 yeast CAUTIs to adjust for changes in the 2015 National Healthcare Safety Network CAUTI criteria, which removed yeast as an organism for CAUTI. The utilization ratio was also calculated and compared between pre- and post-intervention periods. All statistical analysis was done using the NHSN statistics calculator.

Results

During the pre-intervention period (April–December 2014) there were 10 infections and 1450 catheters inserted, which equates to an insertion-related CAUTI rate of 6.9/1,000 catheters. In the post-intervention period (April–December 2015), there were 2 infections and 1180 catheters placed, or an insertion-related CAUTI rate of 1.7/1000 catheters (**Table 1**)—a 75% decrease from the pre-intervention rate ($P = 0.05$).

Additionally, the utilization ratio was calculated for 2014 and 2015 based on the number of catheter insertions per total patient ED visits in each year (**Table 2**). In 2014 the utilization ratio was 2.2 and in 2015 the utilization ratio was 1.7, representing a 23% reduction ($P < 0.01$).

Following the post-intervention period, insertion-related rates and device utilization were also monitored in 2016. There were a total of 97,004 patient visits to the ED in 2016 with 1530 catheters inserted and 3 insertion-related CAUTIs attributed to the ED. The insertion-related CAUTI rate was 2.0/1000 catheters, which is statistically no different from the post-intervention period rate. The utilization ratio was 1.6, which is less than the post-intervention period ($P < 0.01$).

Discussion

As highlighted in the AHRQ toolkit [5], the project confirmed that using both technical and socioadaptive methodologies yielded a significant and sustainable impact on CAUTIs and utilization of indwelling urinary catheters. Prior to initiating the project, a review of the literature did not show any previous studies involving the insertion of urinary catheters by 2 licensed personnel. Since then, an acute care facility published data demonstrating a sustainable 39% reduction of CAUTI rates in an inpatient post-surgical unit within 6 months after the implementation of 2-person urinary catheter insertion [9]. The facility had also done extensive education and training on the CAUTI prevention best-practices prior to implementing the new insertion practices.

A key measure of success in regards to implementing cultural and technical changes is the sustainability of the results yielded after implementation. According to the AHRQ CAUTI toolkit, several specific strategies are necessary to successfully sustain prevention efforts. Implementing changes in the ED at our hospital in alignment with the goal of creating a culture of safety, incorporating the changes into daily work flow, employing both technical and socioadaptive interventions, empowering staff to stop the procedure if there are any concerns, and monitoring and communicating outcomes all ensure

that the changes in practice will be sustained. Additionally, there is an engaged interdisciplinary CAUTI committee that continues to meet regularly as well as required yearly computer-based education for all frontline staff, and a "Safety Day" education session for all newly hired nurses where competency is assessed and validated for proper insertion and maintenance of a urinary catheter.

Initially, barriers for implementation included limited staff to ensure the presence of 2 licensed personnel for every urinary catheter insertion, lack of ability to collect checklist data in the electronic medical record and run compliance reports, and availability of the checklists at the onset of implementation. The staffing limitation seemed to work in favor of meeting the goals of the project, as staff were less likely to insert indwelling urinary catheters for inappropriate indications. In regards to the checklists, the barriers identified via the PDSA rapid cycles included inadequate locations to obtain checklists for use during insertion and drop-off locations for checklists after use. To increase availability and convenience, brightly colored folders labeled "FOLEY!" containing the checklists were placed both on the outside of the supply management stations and on the doors exiting the supply rooms where indwelling urinary catheter kits were located. Rounds were made on these folders approximately 1 to 2 times per week to be sure they remained full. In addition, more locations for dropping off completed forms were placed at all nursing stations as opposed to a single drop off location.

A limitation of the project is that there are not established metrics for infection rates in any outpatient setting nor are there established criteria to differentiate between insertion- and maintenance-related infections. While the metrics were created for the purposes of the project, they are easily reproducible within other health care facilities to track infection rates associated with outpatient areas. Additionally, by ensuring indications are met and proper insertion occurs in ED patients, the overall hospital's CAUTI infection rate and standardized infection ratio are impacted, which are comparable across facilities. The criteria for differentiating between insertion and maintenance related infections was established in an attempt to define where the biggest vulnerabilities were with insertion versus maintenance. Days from insertion to infection were tracked for all infections, and arbitrarily a 7-day cutoff was used to consider the infection potentially insertion-related, as no evidence has been published to define this previously.

The lessons learned both during implementation of the changes in practice and the impact it can have on infection rates are valuable. Moving forward, Tampa General Hospital plans to spread dual personnel indwelling urinary catheter insertion as a best practice, first targeting inpatient units identified with the highest number of insertion-related infections as well as high device utilization ratios.

Acknowledgements: The authors thank Reyah Pineda-Occasion, RN, BSN, CEN, Mary Kutash, PhD, ARNP, Melissa Cole, ARNP, MSN, ANP-BC, and Colton Miller, RN, BSN, for their role as advisors to the project.

Corresponding author: Chaz Rhone, MPH, CIC, 1 Tampa General Circle, Room G322, Tampa, FL 33606, crhone@tgh.org.

Financial disclosures: None.

References

1. Magill SS, Edwards JR, Bamberg W, et al. Multistate point-prevalence survey of health care–associated infections. N Engl J Med 2014;370:1198–208.
2. Scott, RD. Center for Disease Control and Prevention. The direct medical costs of healthcare-associated infections in U.S. hospitals and the benefits of prevention. 2009. Accessed at https://www.cdc.gov/HAI/pdfs/hai/Scott_CostPaper.pdf.
3. Gould CV, Umscheid CA, Agarwal RK, et al. The Healthcare Infection Control Practices Advisory Committee (HICPAC). Guidelines for prevention of catheter-associated urinary tract infections. 2009. Accessed at http://www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf.
4. Covey SMR, Merrill RR. The speed of trust: the one thing that changes everything. New York: Free Press; 2008.
5. Florida Hospital Association Hospital Engagement Network. Update, March 2015. Florida Hospital Association, Orlando, FL. Accessed at www.fha.org/showDocument.aspx?f=2015HEN-Brief-Web.pdf.
6. Agency for Healthcare Research and Quality (AHRQ). Toolkit for reducing catheter-associated urinary tract infections in hospital units: implementation guide. 2014. Accessed at https://www.ahrq.gov/professionals/quality-patient-safety/hais/tools/cauti-hospitals/index.html.
7. Pronovost PJ, Berenholtz SM, Goeschel CA, et al. Creating high reliability in health care organizations. Health Serv Res 2006;41(4 Pt 2):1599–617.
8. Centers for Disease Control National Healthcare Safety Network. Urinary tract infection (catheter-associated urinary tract infection [CAUTI] and non-catheter-associated urinary tract infection [UTI]) and other urinary system infection [USI]) events. 2014. Accessed at https://www.cdc.gov/nhsn/pdfs/pscmanual/7psccauticurrent.pdf.
9. Belizario SM, Preventing urinary tract infections with a two-person catheter insertion procedure. Nursing 2015;45:67–9.