

Best Practices: CAUTI Prevention

Reducing catheter-associated urinary tract infections

Brain T. Connor, PhD, RN

Catheter-associated urinary tract infections (CAUTIs) are the most frequent type of healthcare-acquired infection, accounting for up to 80% of hospital-acquired infections. CAUTIs can lengthen hospital stays, increase morbidity and mortality, and raise healthcare costs. The Centers for Medicare & Medicaid Services no longer reimburses hospitals for additional costs generated by CAUTIs. This article reports on a pilot study of an evidence-based intervention to reduce CAUTIs.

Guidelines for care

National and international guidelines on CAUTI prevention have existed for years. Various prevention strategies beyond the standard guidelines have been studied, with mixed results. Meanwhile, CAUTI incidence continues to climb. Recent recommendations from the Centers for Disease Control

and Prevention's Healthcare Infection Control Practices Advisory Committee (HICPAC) appropriate catheter use and maintenance.

The need for better documentation

Multiple studies have found prolonged catheterization greatly increases the CAUTI risk, with each catheter day raising the infection risk 3% to 10%. Yet catheter duration rarely is monitored daily. Most nursing documentation flow sheets feature a small area for genitourinary assessment, but accurate documentation of catheter assessment, duration of use and condition, and tubing securement methods commonly is missing.

Physician reminders

One study found a simple intervention to remind physicians to remove

unnecessary catheters can decrease CAUTI rates. Another revealed that prewritten stop orders involving six criteria are acceptable for continued catheter use; if none of the criteria are met, nurses are required to remove the catheter.

What nurses can do to reduce CAUTIs

To meet the Joint Commission's new patient safety goal on CAUTIs, which went into effect January 1, healthcare providers must follow evidence-based interventions. The evidence suggests a primary factor in CAUTI development is catheterization duration. In light of this, a colleague and I developed a UTI prevention (UTIP) bundled protocol of several preventive measures. The bundle protocol was adapted from a bladder bundle protocol developed by members of the Keystone Center for Patient Safety & Quality associated with the Michigan Health & Hospital Association.

The UTIP bundle consists of four nursing elements related to catheter use. Our pilot study evaluated the efficacy of combining these elements into a comprehensive bundled protocol and set of guidelines. The elements are:

- use of the smallest possible antimicrobial-impregnated catheter (#14 or #16 Fr)
- daily monitoring of the number of patients on the nursing unit who have catheters, as well as the type, size, and duration of each catheter
- use of a specified area in nurses' bedside charts or the electronic medical record for documenting daily assessment of catheter condition and securement method and potential for catheter removal
- development and use of a daily reminder system to alert physicians of the need to evaluate the patient's urinary status and consider catheter removal. The charge nurse can stamp a reminder message in the physician's progress-notes section of the chart; the reminder also can be discussed during daily rounds.

We also developed a list of appropriate reasons for continuing catheterization based on HICPAC guidelines. (See *Appropriate reasons for continuing catheterization*.) After providing education for nurses and physicians, we conducted this pilot study for 3 months. Results showed the UTIP



protocol reduced catheter days by nearly 1.5 patient days (from 5.3 to 3.8 days). Nurses' compliance with all protocol elements was nearly 100%.

Appropriate reasons for continuing catheterization

Indwelling urinary catheters should be used only when medically necessary. Inappropriate reasons for catheterization include urinary incontinence, protection of skin integrity, obesity, and perceived patient discomfort.

The categories of appropriate reasons below are based on the 2009 Guideline for Prevention of Catheter-Associated Urinary Tract Infections from the Healthcare Infection Control Practices Advisory Committee of the Centers for Disease Control and Prevention.

- Urinary obstruction, as in patients admitted with voiding inability or difficulty due to physical obstruction involving the urethral passageway (such as prostatic hypertrophy, or inflammatory conditions causing swelling of the urethra or meatus)
- Urologic surgery, including postoperative patients on regular bladder irrigation and postoperative transurethral prostate resection or penile, urethral, or bladder surgery
- Open sacral wounds, such as stage 3 or stage 4 pressure ulcers or postoperative pelvic or sacral surgery where soiling can impair healing
- Palliative care or terminal illness to improve patient comfort

Recommendations

As a nurse, you're largely in control of your patients' catheterization duration. Even if your employer lacks a protocol for monitoring catheter use and reducing duration, you can follow the UTIP bundle protocol by:

- always using the smallest catheter possible and documenting its insertion date and time
- taking extreme care when securing the catheter, and never elevating the tubing or drainage bag above the insertion site
- monitoring and documenting catheterization duration and assessing the need for continuation daily
- reminding the physician of the catheter and discussing possible removal if no

appropriate reason for continuing catheter use exists.

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On the road to zero CAUTIs: Reducing urinary catheter device days

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Catheter-associated urinary tract infections (CAUTIs) are common health-care-associated infections that can prolong lengths of stay and increase morbidity and mortality. Despite their best efforts, many hospitals continue to struggle with climbing CAUTI rates. Recognizing inappropriate or prolonged urinary catheterization as a primary risk factor, our team decided to target urinary-catheter device days as a way to reduce CAUTIs.

The specific aim of this quality-improvement initiative was to decrease the number of urinary catheters inserted and reduce the time they stayed in place. Each additional day of indwelling catheterization further increases the risk of developing a CAUTI. We anticipated that by inserting fewer catheters and removing them earlier, we would decrease CAUTI incidence.

Targeted areas for improvement included all five of the noncritical care units at our 140-bed community medical center. At the start of this initiative, our critical care unit was exceeding at preventing device-associated infections, but our medical-surgical units were seeing a higher-than-expected CAUTI incidence. As we approached 2013, a system-wide task force was poised to introduce several evidence-based initiatives aimed at reducing CAUTIs.

In addition to the task-force solutions intended to standardize the evidence-based processes used with urinary catheters, our team added several other strategies to enhance our culture of safety and accountability around urinary catheters. To monitor our progress, we identified the urinary catheter device-utilization ratio (DUR) and actual number of CAUTIs as performance measures. Reported monthly, the DUR reflects the proportion of total patients with indwelling urinary catheters. Before our project began, validation studies were done to ensure the accuracy of DUR reporting. CAUTIs were identified and reported by the infection preventionist.

Electronic solutions

In January 2013, we implemented several electronic solutions to support our goal of reducing urinary catheter device days. We also implemented evidence-based indications for urinary catheter insertion and maintenance, based on guidelines from the Healthcare Infection Control Practices Advisory Committee (HICPAC) and the Association for Professionals in Infection Control and Epidemiology (APIC), recommended by the system-wide task force for CAUTI prevention. (See *Evidence-based indications for indwelling urinary catheters*).

Evidence-based indications for indwelling urinary catheters

The following indications for urinary catheters are examples based on the 2009 Guideline for Prevention of Catheter-Associated Urinary Tract Infections from the Healthcare Infection Control Practices Advisory Committee.

- Urologic surgery, urinary retention, or urinary outlet obstruction
- Perioperative management for patients undergoing select procedures
- To promote accurate measurement of output (recommended for critically ill patients only)
- To promote wound healing that may otherwise be delayed by incontinence
- To promote comfort at end of life

Time-limited catheterization orders and a nurse-driven protocol for catheter removal were the primary electronic solutions supporting this initiative. We also implemented:

- an algorithm for bladder scanning and intermittent catheterization for failure to void
- electronic alerts to remind physicians and nurses when a temporary catheter had been in place more than 48 hours
- revised nursing flowsheets to align our documentation with intervention-bundle recommendations from HICPAC and APIC.

These interventions reinforced our commitment to keeping each catheter in place only as long as medically indicated.

Clinician education and training

Recognizing the importance of clinician education and training to improve outcomes and prevent complications related to urinary catheters, we partnered with the manufacturer of our urinary catheters to develop and implement a training program aimed at expanding knowledge and improving catheter insertion and maintenance competencies. Each unit identified a nurse champion to attend this special training event. In addition to acquiring knowledge and skills, champions learned strategies for sharing the information at the unit level.

As part of the training program, skill stations were set up to review competencies and update techniques. Training emphasized the maintenance bundle and daily reevaluation of the continued need for a catheter.

Nurses aren't the only clinicians who interact with catheterized patients, so a special session was held for non-nursing staff, such as physical therapists and transport personnel. This contributed to an overall increase in bundle compliance.

Improving our culture of safety

The final and most challenging aspect of this initiative was implementing interventions aimed at improving our culture of safety and accountability around urinary catheters. We recognized this as the most crucial step to sustaining the change. Our goal was to transform our culture from one where the urinary catheter is considered the norm for certain types of patients to one where it's seen as an exception.

Daily review of all catheters

The team implemented a daily review of all catheters, including the indication for the catheter and patient's length of stay, at unit-based shift huddles and the daily hospital-wide safety huddle. Sharing this information in as many forums as possible provides an opportunity for peer coaching and peer checking. It encourages nurses to challenge each other about the patient's ongoing need for a catheter and offers a forum to suggest alternatives.

Partnering with physicians also was crucial to the success of our project. To gain physicians' participation and input, we incorporated a review of urinary catheters

at daily interdisciplinary rounds. This promoted further collaboration and teamwork around this initiative.

Finally, we engaged patients and family members, explaining the risks associated with catheterization and setting the stage for early removal at the time of catheter insertion. One of our best strategies has been to educate patients so they request early catheter removal.

Redundant auditing processes

To monitor the effectiveness of our interventions, we established redundant auditing processes to determine compliance with evidence-based recommendations for insertion and care maintenance bundles. (See *Maintenance bundle audit elements*.) Clinical nurses on each unit, nurse leaders across the organization, and third-party auditors from the clinical effectiveness department participate in the audit process. Results are shared at the unit level and with relevant committees and workgroups. Trends are identified and analyzed to help determine solutions.

Maintenance bundle audit elements

The following interventions are examples of catheter maintenance practices recommended for preventing catheter-associated urinary tract infections by the Healthcare Infection Control Practices Advisory Committee. Redundant auditing processes and regular reporting of our compliance have led to improvements in practice.

- Intact securement device
- Maintenance of a closed system
- Unobstructed urine flow
- Drainage bag below the bladder
- Perineal care documented at least daily
- Patient meets an appropriate indication

Compliance with each bundle element as well as overall compliance has risen steadily since implementation. For October 2014, the overall urinary catheter bundle compliance rate was 94.7%. A true measure of success for this project has been the steady decline in urinary catheter device days and the actual number of CAUTIs. (See *Statistics tell the story*.)

Nurses at all levels can influence patient outcomes in a positive way. By focusing on evidence-based prevention strategies and promoting a culture of safety and accountability, we were able to exceed our goal for reducing urinary-catheter device days. We saw a shift in culture when our nurses began leading the way by advocating for fewer catheter insertions and promoting earlier removal. As a result, we are well on our way to zero CAUTIs—and your organization can be, too.

Editor's note: For more information about CAUTI, see "ANA CAUTI Reduction Tool" at nursingworld.org/MainMenuCategories/ThePracticeofProfessionalNursing/Improving-Your-Practice/ANA-CAUTI-Reduction-Tool.

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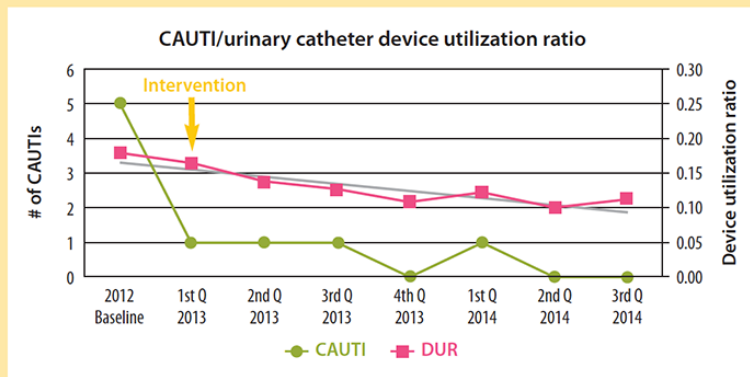
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Statistics tell the story

Our initial goal was to decrease urinary-catheter device days by 10% in 2013. During the baseline performance period in 2012, our hospital had a device utilization ratio (DUR) of 0.18 on noncritical care units. We surpassed this goal with a 22% reduction, achieving a year-to-date DUR of 0.14 in December 2013. As anticipated, we saw a corresponding decrease in catheter-associated urinary tract infections (CAUTIs) from five in 2012 to three in 2013.

Our efforts continued into 2014. We sustained the improvement during the first three quarters of 2014, with a DUR of 0.11 and only one CAUTI from August 2013 through January 2014. This constitutes a 39% reduction in device days and a 45% drop in the CAUTI rate from the 2012 baseline. One of our medical-surgical units surpassed even this accomplishment with a 49% reduction in DUR, and it hasn't had a CAUTI since April 2013.



Don't get 'caught' in the CAUTI trap

Terri Townsend, MA, RN, CCRN-CMC, CVRN-BC, and Pamela Anderson, MSN, RN, APRN-BC, CCRN

One nurse's story: My father died of a heart attack at age 39, and our mother raised my siblings and me. We were all close to mom; however, as the oldest she and I had a special bond. At age 46 she had undergone a mitral valve replacement and her aortic valve was replaced about 9 years later. She had survived a cardiac arrest and pulmonary artery rupture. When she was hospitalized with dehydration and acute kidney injury, we believed she would spend some time in the hospital and be discharged. Her kidney function improved with fluids, and her output was carefully monitored with a urinary catheter. She had a history of atrial fibrillation and her rate control medications were held. One day, her temperature soared to 102.8 F and her heart rate increased to 130 beats per minute. She developed sepsis, which placed further stress on her pulmonary and cardiovascular system. In June 2001 my mother died from complications related to a urinary tract infection. She was 61 years old and I still miss her.

"It's just a urinary tract infection. It happens sometimes." We've all heard those words, spoken by both physicians and nurses. On the surface, it's a seemingly simple problem, to be remedied with a few doses of an antibiotic, paling in comparison to life-threatening conditions such as respiratory failure or cardiac bypass surgery. However, catheter-associated urinary tract infections (CAUTI) can be just as deadly.

A widespread problem

Even though the morbidity and mortality of CAUTIs is low compared to other hospital-acquired infections, the high use of indwelling urinary catheters causes a large number of urinary tract infections and deaths. In fact, CAUTIs are the most frequent healthcare associated infection, accounting for 30% to 40% of infections in hospitalized patients according to data from the Centers for Disease Control and Prevention. It's estimated that more than 560,000 nosocomial urinary tract infections occur annually, causing significant morbidity, hospital expenditures, and increased length of stay. Mortality from CAUTIs is thought to exceed 13,000 deaths each year. Adherence to recommended infection control practices could prevent 380,000 infections and 9,000 deaths annually.

As a result of the morbidity and mortality linked with CAUTIs, the Joint Commission's Patient Safety Advisory Group recommended development of a National Patient Safety Goal (NPSG) to focus on the need to follow evidence-based practices to prevent the problem. NPSG.07.06.01 became effective in January 2013 and addresses insertion, maintenance, and surveillance of indwelling catheters. In addition, CAUTIs are deemed a preventable complication by the Centers for Medicare and Medicaid Services (CMS) and associated treatment costs are no longer reimbursable.

Pathophysiology of CAUTI

The act of inserting a catheter results in bacterial colonization in the bladder at a rate of 3% per day. By the end of 1 week the catheterized patient's risk of bacteriuria is 25%. After 30 days, 100% of indwelling catheters are colonized with bacteria. While not all bacteriuria causes symptoms to the patient, 10% to 24% of these patients will develop a symptomatic CAUTI.

The most common bacteria are from the gastrointestinal tract or skin and include:

- *Enterococcus* species
- *Escherichia coli*
- *Staphylococcus aureus*
- *Enterobacter* species
- Coagulase-negative staphylococci
- *Pseudomonas aeruginosa*
- *Proteus mirabilis*
- *Serratia* species
- *Klebsiella pneumonia*
- *Candida* species

In the hospital, pathogens can enter the urinary tract due to environmental contact or contact with hospital personnel. Hospital-acquired bacteria tend to be more virulent compared to community-acquired bacteria and are more often resistant to at least one antimicrobial agent. Bacteria enter the urinary tract during insertion, through the catheter lumen itself, or via contact between the outside of the catheter and the urethra. Sixty-six percent of CAUTI's are due to bacterial entrance via the catheter-urethral interface. The remainder of CAUTI's is associated with bacterial contamination due to manipulation of the catheter and drainage system.

The indwelling catheter provides a surface for microbial adhesion. Bacteria that enter the urinary tract produce various adhesions, such as hair-like projections to allow them to become firmly attached to the catheter wall. Once attached, the bacteria form biofilm by following the sequence of maturation, production of polysaccharides, and dispersion into the local environment. Biofilm promotes bacterial growth and reproduction and shelters the bacteria from destruction by antiseptics, antibiotics, and the host's immune system. Bacteria in this protected environment communicate genetic information with one another, promoting antibiotic resistance and spread of biofilm to other surfaces of the catheter and urinary epithelium. Biofilm can be composed of one or multiple species of bacteria, depending on the duration of the catheter. These bacteria that live in the biofilm bind to the catheter's surface, and are virtually impossible to destroy while the catheter is still in place.

The presence of a catheter also causes inflammation and trauma to the urethral and bladder neck mucosa. Both latex and silicone catheters promote the inflammatory response. If that isn't enough to cause a CAUTI, inflammation and trauma to the urinary epithelium compromises the patient's own ability to effectively fight bacteria in the bladder.

These physiologic changes result in signs and symptoms such as fever, suprapubic pain, changes in urine characteristics (for example, cloudiness), urgency, and elevated white blood cell count.

Treatment and management

In patients with bacteriuria, removing the catheter (and hence, the source of the bacteria) solves the problem. Antibiotic treatment for asymptomatic bacteriuria is not recommended, unless the bacteriuria persists at least 48 hours after catheter removal. Before initiating any antibiotic therapy, a urine culture must be obtained to identify the infecting organism and decrease the likelihood of antimicrobial resistance. The Infectious Diseases Society of America recommends the following evidence-based treatments:

- For symptomatic patients without bacteremia, 7 days of antibiotic treatment may be considered if symptoms resolve promptly.
- For patients with delayed response or with bacteremia, 10 to 14 days of treatment are recommended.
- Patients who are not severely ill may benefit from a 5-day course of levofloxacin.
- Elderly female patients who develop CAUTI without upper urinary tract symptoms may benefit from a 3-day antibiotic regimen after the catheter is removed.
- Treatment regimens for complicated CAUTI range from 7 to 21 days of antimicrobial therapy.

Only YOU can prevent CAUTI!

The Joint Commission and CMS have developed guidelines for prevention of CAUTIs. CMS identified seven evidence-based guidelines for preventing CAUTI:

Insert catheters only for appropriate indications. According to the CDC, as many as 25% of hospitalized patients have catheters, and not all of them are necessary. The CDC's Healthcare Infection Control Practices Advisory Committee (HICPAC) recommends indwelling catheters be used for the following conditions:

- acute urinary retention or bladder obstruction
- accurate intake and output measurements in critically ill patients
- perioperative use—urologic procedures, prolonged surgical duration (should be removed in postanesthesia care unit), patients receiving large volume infusions or diuretics during surgery, need for intraoperative urinary output monitoring
- assist healing of open sacral or perineal wounds in incontinent patients
- prolonged immobilization (eg, unstable spine, multiple traumatic injuries)
- end of life comfort care.

The HICPAC guidelines state that catheters should not be used as a method of managing incontinence or for patient or nurse convenience.

Remove catheter as soon as possible. The Surgical Care Improvement Project was initiated in 2006 as a collaboration between The Joint Commission, CMS, Institute for Healthcare Improvement, and the American Hospital Association. One of the core measures is to remove urinary catheters on postoperative day 1 or 2. Length of indwelling time is the single most significant contributing factor in developing a CAUTI. The sooner the catheter is removed, the less chance of developing biofilm and bacterial colonization. Development of a nurse-driven protocol to remind physicians when catheters are no longer necessary has proven to decrease catheter prevalence.

Ensure only properly trained personnel insert and maintain catheters. Understanding the causes of UTI can help eliminate urethral trauma and bacterial transmission during insertion and bacterial colonization while the catheter is in place.

Use strict aseptic technique when inserting the catheter. Hand hygiene, sterile supplies, and proper technique all contribute to a decrease in CAUTI. Use of a catheter securement device prevents movement of the catheter in and out of the urethra, which keeps bacteria from being deposited in the bladder. Choosing the smallest effective catheter size decreases the incidence of urethral trauma during insertion.

Maintain closed drainage system. Use drainage systems with sealed catheter-drainage tubing junctions. Obtain urine specimens aseptically. If the system becomes disconnected or leaks, replace the catheter and collecting system using sterile equipment and aseptic technique. If the catheter must be irrigated to prevent obstruction (ie, postoperative prostate or bladder surgery), consider using a closed continuous irrigation system.

Maintain unobstructed urine flow. Ensure the tubing is not kinked and

the collection bag remains below the bladder at all times. Do not place the collection bag on top of the patient while transporting. Empty the bag regularly using a clean container for each patient.

Use strict hand hygiene and standard precautions. Wear gloves as appropriate during manipulation of catheter or collection system. Do not use complex drainage systems (for example, antiseptic cartridges in drainage port). Clean the urinary meatus with soap and water during daily bath. Prevent contact of the drainage port with the floor or collecting container.

CAUTI Prevention Initiatives

The Hospital Research and Education Trust (HRET) developed 26 Hospital Engagement Networks (HEN) in 2011 to reduce hospital acquired conditions. Their mission was to develop learning collaboratives for hospitals, provide incentives and activities to promote patient safety, conduct training programs, provide technical assistance to help hospitals achieve quality goals, develop a system to monitor hospital progress, and identify high-performing hospitals. CMS awarded \$218 million to begin the HEN, applying the Comprehensive Unit-based Safety Program (CUSP) model to disseminate the information and tools to hospitals.

Goals of On the CUSP: Stop CAUTI are to reduce mean CAUTI rates by 25% over 18 months, improve patient safety by sharing project tools, and promote statewide efforts to eliminate healthcare acquired infections. The benefits of participating in the state, regional, and national initiatives include ongoing coaching and training, access to tools that other organizations have found successful, and sharing of information and data. The ongoing coaching and required data submission helps maintain focus on the project, which is essential with the myriad of other initiatives in process.

One hospital's success story

Community Hospital Anderson is a 207-bed hospital located in east central Indiana. The medical-surgical management team attended the HEN leadership conference in May 2012 and joined the On the CUSP: Stop CAUTI initiative through the Indiana Hospital Association in June of 2012. The team formed a multidisciplinary project committee with representation from all nursing units, quality management, and information technology. All nursing staff was educated on the CAUTI prevention bundle and the importance of reducing healthcare acquired infections. In addition, CAUTI prevention was incorporated into the medical-surgical department annual competency fair. Physicians are also required to document the appropriate reason for the catheter when it is ordered.

Another initiative was to have unit charge nurses complete an audit sheet every day that summarizes the results of the daily assessments that registered nurses (RNs) perform for each patient with a urinary catheter.

Daily Urinary Catheter Assessment Tool

If a patient receives an assessment score that indicates the catheter is no longer necessary the order set authorizes the RN to remove the catheter. If the patient is being transferred from the ICU or emergency department, the RN taking report asks the transferring nurse if the catheter can be removed before transfer.

As a result of these initiatives, prevalence of CAUTIs in our two medical-surgical units has been reduced by one-half, and we have not experienced a CAUTI in more than 500 days.

It's up to you

Catheter-associated urinary tract infections, while traditionally appearing benign, can have devastating consequences for our patients. CAUTI prevention requires diligence, perseverance, and assertiveness in providing the best patient care. With teamwork, collaboration, and effective communication, we can avoid being "caught" in the CAUTI trap and save patients like the mother at the start of this article.

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