

Health Care–Acquired Urinary Tract Infection: The Problem and Solutions

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Perspective

Urinary tract infection (UTI) is the most common hospital-acquired infection, accounting for 40% of all hospital-acquired infections. More than 80% of these infections are attributable to use of an indwelling urethral catheter.⁽¹⁾ Catheter-acquired urinary infections (cUTIs) have received significantly less attention than other health care–acquired infections, such as surgical site infections, ventilator-associated pneumonia, and bacteremia. This neglect is partially explained by the substantially lower morbidity and mortality observed with cUTIs compared with other infections ⁽²⁾, as well as the limited financial impact.⁽³⁾ However, because they are so common, the cumulative impact of health care–acquired urinary infections is large. Moreover, this particular safety problem is largely attributable to an invasive health care intervention, which makes the case for prevention even more compelling. This commentary will focus on strategies to minimize cUTIs—including strategies that focus on UTI itself and other strategies that should be incorporated into a broader safety program directed at preventing all health care–acquired infections.

The Indwelling Urethral Catheter

The indwelling urethral catheter is an essential tool for patient care. Indications for catheter use include output monitoring of unstable patients, voiding management for patients with urethral obstruction, and perioperative use for selected surgical procedures.⁽⁴⁾ Urinary incontinence is not generally an indication for catheterization, but rarely an indwelling catheter may be considered for patient comfort at the request of the patient or family.

The use of an indwelling urethral catheter, however, carries a predictable and unavoidable risk of UTI, averaging 5% of catheterized patients/day (range 3%–7%). Fortunately, most cUTIs are asymptomatic and do not require antimicrobial treatment.⁽²⁾ However, symptomatic cUTIs may occur, often in the setting of catheter obstruction or trauma to the genitourinary tract with bleeding. Severe presentations with sepsis syndrome occasionally occur.⁽⁵⁾ Indwelling urethral catheters are also associated with adverse outcomes

other than infections—genitourinary trauma, urethral strictures, and patient immobility and discomfort are all potential problems.

If a catheter remains in place long enough, cUTI is inevitable because biofilm formation occurs along the external and internal catheter surfaces. Biofilm is a complex material comprised of bacterial exopolysaccharides and urine constituents such as protein, Mg⁺⁺, or Ca⁺⁺ ions. Bacteria and yeast that colonize the drainage bag or periurethral area initially adhere to the catheter surface, and subsequently grow along the catheter in relatively protected colonies within the biofilm. Antimicrobials and host defenses cannot prevent biofilm formation or the ascension of organisms into the bladder within the biofilm.

Thus, cUTI is a technological problem attributed to the ability of microorganisms to produce biofilm. Accordingly, a technological solution might seem to be the desired approach to prevention. Most health care–acquired urinary infections could be prevented if catheter materials resistant to biofilm formation were developed. Despite intensive, continuing research directed toward this goal, results have been disappointing. (6-8) Efforts to date have primarily seen the development and evaluation of antimicrobial coated catheters, which might prevent bacteria growing along the catheter. Several of these devices have been introduced to the market. While some trials report a modest delay in onset of bacteriuria, no catheter has yet been shown to decrease morbidity of symptomatic cUTI. Unfortunately, the development of biofilm-inhibiting catheters is unlikely in the near term.

How Can cUTIs Be Prevented?

Given the absence of a technological solution, the two most important strategies to prevent cUTI are not to use a urinary catheter and, if a catheter is necessary, to minimize the duration of use. Catheters should be inserted only when there are valid indications and removed as soon as they are no longer indicated. An indwelling catheter may be avoided for some male patients by using an external condom catheter. (9) Physicians may, in fact, be unaware that a patient under their care has an indwelling catheter—this occurred for 28% of catheterized patients in one study. (10) Strategies such as physician reminders to review whether a catheter is still appropriate (11-13) and automatic stop orders to facilitate nursing removal of catheters when no longer indicated (14) effectively decrease duration of catheter use. In addition, feedback of cUTI rates to ward caregivers leads to a subsequent decrease in infection. (15,16).

Following recommended practices for catheter insertion and care may delay infection acquisition and decrease risks of symptomatic infection. The CDC's Healthcare Infection Control Practices Advisory Committee (HICPAC) guidelines, first published in 1981, summarize recommendations for appropriate practice. (17) These include insertion techniques to minimize contamination and maintaining a closed drainage system to delay catheter colonization. Avoiding or early recognition of catheter obstruction and preventing catheter trauma will decrease the risk of symptomatic episodes. The HICPAC guidelines, fortunately, are now being revised and updated. Some facilities have recently initiated programs to address cUTI using a "bundled" approach—similar to the successful approaches reported for other health care–acquired infections. The appropriate components for a bundle and effectiveness of these "all or none" strategies are not yet known.

Is Current Practice Adequate?

In a survey of Veterans Affairs hospitals, Saint and colleagues document variable but, overall, relatively limited implementation of interventions to prevent cUTIs.⁽¹⁸⁾ In this study, 56% of hospitals did not monitor catheter insertions, and 74% did not monitor duration of catheter use. As the use of a catheter and the duration of catheter use are the most important determinants of cUTI, the limited documentation of patient exposure to this risk is of concern. There is little information describing current practice in other facilities, but observations are unlikely to differ substantially from those reported in the Saint study.

Why are facilities not uniformly applying effective practices? Safety programs must not only aim to prevent infections, but also limit patient risk. Restricting catheter use and removing catheters promptly are essential safety practices but require continual monitoring of indwelling urinary catheter use, together with timely analysis and reporting. To achieve accuracy and timeliness, electronic information systems are usually necessary for data collection—catheter use, indications, and removal—and analysis. Many facilities do not currently have this capacity and will need to commit resources to such a program.

Another issue limiting surveillance for cUTI is the current CDC definitions for surveillance to identify symptomatic cUTI.⁽¹⁹⁾ Lower tract symptoms, such as dysuria and urgency, are seldom present in patients with an indwelling catheter and, when present, do not correlate with infection.⁽²⁾ Individuals with an indwelling catheter are often unresponsive and cannot communicate symptoms. Fever, by itself, is the most common presentation of symptomatic cUTI, but the majority of patients with a urethral catheter and fever have a source other than the urinary tract, despite bacteriuria being present. Thus the definitions have limited utility and are not consistently interpreted.

The Way Forward

Catheter-acquired urinary tract infections must be acknowledged as an important patient safety issue, and the indwelling urethral catheter must be treated as an invasive intervention that carries a risk for patients. Assiduous attention to limiting catheter use, minimizing duration of use, and supporting optimal practices for catheter care must be implemented. Programs to accomplish these safe practices need to be supported by effective surveillance of both catheter use and cUTI morbidity, which in turn will require development and validation of consistently applied surveillance definitions for cUTI. The current revision of the HICPAC guideline, when available, should provide a necessary platform and roadmap for development of institutional policy and practices to address cUTI.

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