

Strategies for Preventing Catheter-associated Urinary Tract Infections

Catheter-associated-urinary tract infections (CA-UTIs) account for over 80% of all intensive care patients treated with an indwelling urinary tract catheter during their hospital stay.^[1-3] CA-UTIs occurs at a rate of 3%–10% per day of catheterization and the incidence approaches 100% within the 30 hospital days. CA-UTIs in critically ill patients can lead to bacteremia which is one of the leading causes of mortality and morbidity among hospitalized patients and it can be avoided using appropriate preventive measures.^[4-7] Sterile catheter insertion, maintenance of a closed drainage system, and aseptic technique for urine collection must be used. Other risks include prolonged catheterization and improper catheter insertion, as well as catheter care and prevention of backflow. Health-care providers should attempt to eliminate these risk factors associated with CA-UTIs.^[7]

Urinary catheterization should be avoided unless there is medically necessity and when unnecessary it should be removed immediately.^[5] Medical indications for urinary catheter placement include bladder outlet obstruction, acute urinary retention, neurogenic bladder, and pelvic surgery.^[6,7]

Female gender and patients with diabetes mellitus, malnutrition, chronic kidney disease, and immune deficiency are at higher risk for CA-UTIs.^[4]

Patients with CA-UTIs often are asymptomatic and do not develop the “classic” signs and symptoms.^[7]

Asymptomatic UTI occurs in the absence of fever and suprapubic or costovertebral angle tenderness, with a urine culture of 10^5 colony-forming units (cfu)/mL of bacteria with a single isolated pathogen.^[8] Therefore, obtaining a urine culture is warranted when a patient with an indwelling urinary catheter develops unexplained systemic symptoms.

CA-UTIs may be extraluminal or intraluminal. Extraluminal is far more common than intraluminal infection.^[9]

Extraluminal infection occurs when microorganisms colonize the external catheter surface, most often creating a biofilm, leading to entry of bacteria into the bladder. Organisms in biofilms may ascend the catheter in 1–5 days after catheterization. Biofilms form a protective environment for organisms with poor penetration by antimicrobials.

Intraluminal infection is an ascending infection from the urine collection bag into the bladder via reflux. Contamination of the collecting system and drainage failure are the most common reasons for intraluminal infection.

Extraluminal acquisition of organisms is usually associated with endogenous organisms, i.e., bacteria that colonize the patient’s own perineum such as *Escherichia coli* and *Proteus*. Intraluminal acquisition is most often associated with exogenous organisms and results from cross-contamination from the hands of health-care workers or hospital acquired such as multidrug-resistant *Klebsiella*. *Candida* also is a common colonizing organism of urinary catheters.^[10]

Most studies suggest that antimicrobial prophylaxis is not useful in the prevention of CA-UTIs in asymptomatic patients.^[6-8] For symptomatic patients with suspected CA-UTIs, treatment with appropriate systemic antibiotics, based on local antibiograms, as well as removal or replacement of the urinary catheter, is warranted. Gram-negative bacilli may be treated empirically with a third-generation cephalosporin such as ceftriaxone or a beta-lactam (piperacillin-tazobactam). Older children and adolescents may be treated with a fluoroquinolone (ciprofloxacin). Gram-positive cocci including enterococci or staphylococci are less common pathogens which can be treated with piperacillin-tazobactam or other beta-lactam antibiotics. The addition of vancomycin may be appropriate if there is a high level of resistant Gram-positive organisms in local geographic practicing area. The optimal duration of antibacterial therapy is 10–14 days. When the patient becomes asymptomatic and can tolerate oral feedings, and has a negative urine culture, health-care providers should consider a change from parenteral to enteral antibiotics.^[11]

Strict handwashing with soap and water should be done immediately before and after any manipulation of the catheter site or device.^[6,7,12,13]

Unobstructed flow of urine should be maintained at all times. Indwelling catheter must be properly secured to the patient’s thigh to prevent urethral meatus injury. The skin condition around the catheter should be checked regularly and if skin irritation is noted the site must be changed.

Routine hygiene of the urethral meatus surface should be performed during daily bathing or showering. Urethral cleaning with povidone-iodine solution or soap and water has not been shown to prevent CA-UTIs. However, there is evidence that frequent urethral cleaning can lead to mucosal irritation and breakdown that may increase the risk of infection.^[6,14,15]

The catheter and collecting system should be replaced if breaks in aseptic technique, disconnection, or leakage

occur. The smallest catheter size that allows good urinary drainage flow should be used. Antibiotic-coated catheter has not been shown to decrease CA-UTIs and should be used as a routine prevention measure.

A sterile, closed unobstructed urinary drainage should be used with indwelling catheters. The indwelling catheter and collecting system should not be disconnected. Avoid breaking the collecting system to obtain urine specimen for analysis and bacterial culture. To obtain urine specimen, the sampling port for the urine collection must be used.

If this is not available, urine can be aspirated with a sterile needle and syringe from the distal end of the catheter using aseptic technique. Larger volumes of urine can be obtained from the drainage bag of the collecting system. The catheter and collecting system junction should be cleaned with chlorhexidine gluconate, a povidone-iodine solution, or a 70% isopropyl alcohol solution before disconnection of any intervention of the catheter site or device.

The collecting bag should be placed below the level of the bladder and off the floor and should be kept and emptied regularly.

Bladder irrigation with normal saline or antibiotic-containing solution should be avoided unless obstruction is suspected. If the catheter requires frequent irrigation, it should be removed and replaced only if medically necessary.

Summary of recommendation

National prevention program implementation is the key factor to reduce CA-UTIs.^[16,17] The CA-UTIs prevention program enables health-care workers to recognize the magnitude of the problem, what interventions are needed, and to assess what measures are effective in preventing CA-UTIs. Training and education of health-care providers and increasing their awareness regarding basic infection control knowledge of optimal hand hygiene practices and methods of handling indwelling catheter and urine collecting system appropriately, securing catheter properly, and maintaining unobstructed urine flow and closed sterile drainage system using sterile technique properly are among some of the effective prevention strategies that must be implemented to reduce the risk of CA-UTIs.

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