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Review Article

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A REVIEW OF URINARY TRACT INFECTION IN CATHETERIZED PATIENTS

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ABSTRACT

One of the most common infections in humans is urinary tract infection (UTI) which accounts for more than 150 million cases worldwide. In addition to being the most common bacterial infection, UTIs also contribute 36% of all healthcare-associated infections. Of these 36% infections, 80% of them are estimated to be catheter associated [CAUTI]. The insertion of an indwelling urinary catheter is the most important predisposing factor for the development of CAUTI. The urinary catheter is an essential part of modern medical care and it has been associated with increased morbidity, mortality, hospital cost, and length of stay. The impact of a UTI on the individual can vary greatly, depending on age, comorbidities, and socio-economic circumstances. CAUTIs may lead to unnecessary use of antibiotics and antimicrobial resistance and longer hospital stay. Despite many efforts to reduce the occurrence of CAUTI, there remains a gap in the literature about CAUTI risk factors, especially on the effect of catheter dwell-time on CAUTI development and patient comorbidities. This review briefly focuses on the incidence of UTI in catheterized patients, its risk factors, and the prevention of CAUTI.

KEYWORDS: CAUTI, UTI, HAI, Risk factors, Prevention of CAUTI.

INTRODUCTION

According to the World Health Organization, a Hospital Acquired Infection (HAI) is, "an infection acquired in hospital by a patient who was admitted for a reason other than that infection. It includes infections acquired in the hospital which appears after discharge of the patient and also occupational infections that develop among the staffs of the facility".[1] The most frequent HAI is catheter associated urinary tract infections (CAUTI) accounting for 36% followed by surgical site infections, central line-associated bloodstream infections and, ventilator-associated infections. [2] The National Health Care Safety Network (NHSN) defined an indwelling catheter as any tube that is inserted into the urinary bladder through the urethra and does not include suprapubic catheters and nephrostomy tubes.[3] Urinary catheters are the most important risk factor for CAUTI.[2] CAUTI can range from asymptomatic bacteremia urinary tract infection to symptomatic urinary tract infection.[3] It is associated with major morbidity and can lead to genitourinary complications such as pyelonephritis, cystitis, prostatitis, epididymal-orchitis, and other systemic complications such as vertebral osteomyelitis, septic arthritis, endocarditis, endophthalmitis, and meningitis.[4]

WHAT IS CAUTI?

CAUTI is defined by CDC as any urinary tract infection in a patient who had an indwelling catheter in place at the time of or within 48 hours before the onset of infection with at least one of the following signs or symptoms: fever (>38°C), urgency, frequency, dysuria, suprapubic tenderness, costovertebral angle pain or tenderness and a positive urine culture of $\geq 10^5$ colony-forming units (CFU)/ml with no more than 2 species of microorganisms.[5]

CAUTIs can be caused by several bacterial species including uropathogenicEscherichiacoli(UPEC), Staphylococcus saprophyticus, Klebsiella pneumoniae, Enterococcus faecalis, Group B Streptococcus, Staphylococcus aureus, Proteus mirabilis, Pseudomonas aeruginosa, and Enterobacter spp whereas the most common causative agent for CAUTI is UPEC. It is estimated that UPEC is responsible for approximately 80% of all UTIs.[6] The microbiological profile and antimicrobial sensitivity pattern of CAUTI vary considerably from time to time and region to region.

Urinary catheters are widely used to relieve anatomic or physiologic obstructions and to provide a dry environment for comatose or incontinent patients. It also helps to measure the urine output accurately in severely ill patients. Approximately, 12% to 16% of all hospitalized patients are catheterized while up to 50% of those patients do not have an appropriate indication thus increasing the risk of catheter-related infections.[2]

APPROPRIATE INDICATIONS FOR INDWELLING URINARY CATHETERS
Acute urinary retention or bladder outlet obstruction
Need for accurate measurements of urinary output
Perioperative use for selected surgical procedures
Surgical procedures of anticipated long duration
Urologic procedures
Intraoperatively for patients with urinary incontinence
Need for intraoperative urinary monitoring or expected large volume of intravenous infusions
Urinary incontinence
Provide comfort for end-of-life.

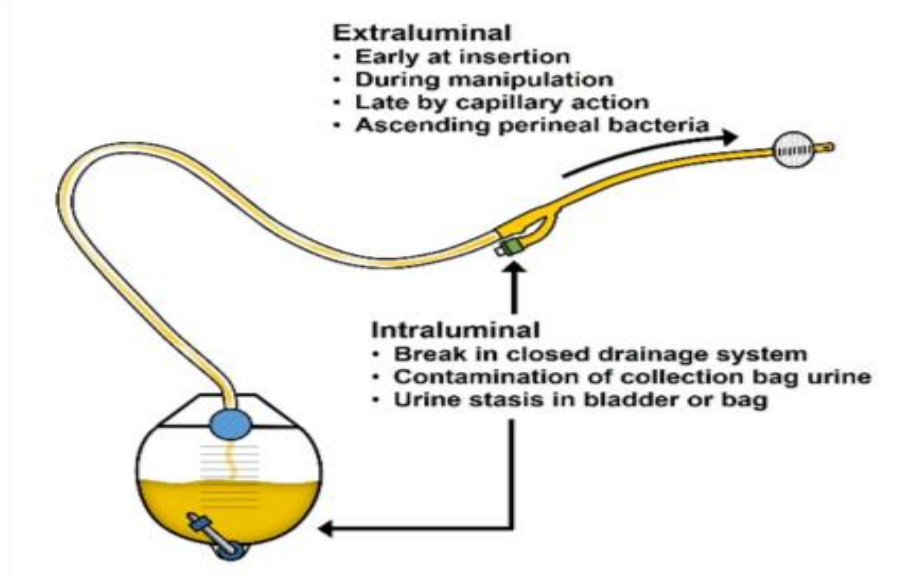
Risk factors of UTI in catheterized patients

The predisposing factors associated with the development of a CAUTI are female gender, obesity, immune deficiency, duration of catheter use, length of stay in ICU, and unnecessary placement of urinary catheters[7] whereas the duration of catheterization remains the most important risk factor for the development of catheter-associated bacteriuria.

Mechanism of CAUTI

Following the insertion of an indwelling urinary catheter, bacterial biofilm can form on its inner and outer surfaces which can cause bacteriuria and CAUTI. The biofilm comprises bacteria from the periurethral area which can migrate upwards to the urinary bladder. These bacteria from the biofilm tend to show slow growth, are protected from antibiotic exposure, and have less susceptibility to these agents. When a mature biofilm has formed, catheter removal may be necessary for the control of bacterial replication and for the effective antimicrobial therapy.[8] Because of the presence of biofilm, leaving the catheter in place during the treatment of CAUTIs makes it difficult in eradicating bacteriuria or candiduria and can lead to the development of antimicrobial resistance.

Route of entry of bacteria in urinary tract



PREVENTION OF CAUTI

As it is estimated that 69% of CAUTI events are avoidable, the US Department of Health and Human Services spearheaded national efforts in 2009 to reduce CAUTI rate. CAUTI can be prevented by maintaining a closed urinary drainage system and early removal of the catheter. The efforts undertaken to reduce the CAUTI rate include avoiding unnecessary catheterization, reducing the duration of catheterization, emphasizing antiseptic technique for insertion, and using hydrophilic-coated catheters. Complications of infection can be prevented by giving antibacterial therapy for bacteriuria.[4] Preventive measures such as catheter reminders for removing the catheter will help to restrict the number of catheter days and thereby decrease the incidence of CAUTI. Although not all CAUTIs can be prevented, it is believed that the incidence can be reduced through active surveillance and by the proper management of the indwelling catheter.[9]

Urinary tract catheterization must be done only if there are specific and adequate clinical indications. Therefore nurses are required to have adequate knowledge regarding urinary catheter indications, maintenance, and removal. Even though CAUTI is the most frequent infection, they are preventable if the healthcare provider respects the recommended catheter placement indications and evidence-based methods of catheter maintenance and

care. The knowledge of using some basic preventive measures like hand hygiene, changing gloves before and after patient contact, adherence to a sterile and closed urinary drainage system has been shown to markedly reduce the risk of catheter associated infection acquisition.

CONCLUSION

A urinary catheter is an essential part of modern medical care. Unfortunately, when used inappropriately or when left in place for too long, it is a hazard to the patient. It is widely accepted that the incidence of CAUTI is proportional to the number of days a catheter remains indwelling. The most important risk factors of CAUTI are improper indication and duration of catheterization. Therefore reducing the days of indwelling catheterization is a cornerstone of any CAUTI prevention.

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CONFLICT OF INTEREST

There is no conflict of interest between the authors.

ABBREVATIONS

CAUTI: Catheter associated urinary tract infection.
UTI: Urinary tract infection.
HAI: Health associated infection.
CDC: Center for disease control.
NHSN: National Health Care Safety Network

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