

Catheter associated urinary tract infection (CAUTI)—Prevention better than cure

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Abstract

Catheter associated urinary tract infection (CAUTI) is the most common healthcare-associated infections (HCAIs) worldwide. It has been of major concern causing increased morbidity and mortality and discomfort with extra financial burden and longer duration of stay of the hospitalized patients. The implementation of evidence based guidelines and the proper surveillance of CAUTI by the health care facilities, play a major role in its prevention. The various research and studies have proved that the most important determinant of CAUTI is the duration of an indwelling urinary catheter. Thus restricting the use of catheter only when indicated and its early removal forms the most important preventive strategy. The authors emphasize the importance of prevention of CAUTI with good and meticulous infection control policies.

Keywords: Bacteriuria; CAUTI; Healthcare associated infection; Urinary catheter; Urinary tract infection

Introduction

Hospital acquired infections(HAI) or the health care associated infections (HCAI) are one of the most frequently associated cause of morbidity and mortality throughout the world [1,2]. The inclusion of HAI as the quality indicator of the health care facility indicates its importance and its impact on the patients not only in terms of discomfort but also the financial burden including the extra length of stay in hospital [1-3]. Catheter associated urinary tract infection (CAUTI) is the most common and easily preventable cause of HAI [1-3]. The use of an indwelling urinary catheter for various reasons is quite frequent in the era of modern medical care. Thus, the prevention of the urinary tract infection (UTI) attributable to these catheters (about 70-80%) makes it an important goal in the patient care and infection control programs [4].

The indwelling urinary catheters, if in situ for less than 30 days (usually used in acute healthcare facilities) are referred to as short term catheters and when in situ for 30 days or more (used in cases of long term health conditions like spinal cord injuries, neurological or musculoskeletal diseases hampering the urinary bladder control, etc.) referred to as chronic or the long term catheters [5].

Risk factors

There are various multiple risk factors associated with the occurrence of CAUTI- duration of the indwelling catheter, the quality of the aseptic precautions taken while insertion of the catheter, appropriate aseptic care of the catheter including the hand hygiene.

- a. The duration of catheterization: The duration for which the urinary catheter is in situ constitutes the most important determinant for CAUTI. It is estimated that with an indwelling urinary catheter

the daily risk of acquisition of bacteriuria is 3–10% (cumulative risk accounting to almost 100% after 30 days), the rate being higher in females and elderly patients above 65 years of age [5, 6]. Therefore, it is recommended that the top priority for CAUTI prevention should be to remove the indwelling catheter as soon as it is no longer indicated and also minimize the unnecessary placement of urinary catheter in the first place.

- b. The quality of the aseptic precautions taken while insertion of the catheter, appropriate aseptic care of the catheter including securing the catheter and proper hand hygiene.
- c. Recurrent break/disconnect of the closed drainage (urinary bag and the catheter) system.
- d. Colonization of the urethral meatus with pathogens.

Diagnosis of CAUTI

The 2015 United States of America's Center for Disease Control (CDC) surveillance guidelines for a laboratory-confirmed CAUTI: the presence of an indwelling urinary catheter for more than two calendar days on the date of the event, with day of device placement being day one, and an indwelling urinary catheter was in place on the date of the event or the day before. If an indwelling urinary catheter was in place for more than two calendar days and then removed, the date of the event of the CAUTI must be the day of discontinuation or the next day. The cultures with less than 100,000 colony-forming units (CFU)/ml and positive urinalysis diagnostic tests are no longer considered in diagnosis of CAUTI. Also, the presence of Candida species and yeast does not qualify as the presence of CAUTI [7].

Clinically, the surveillance criteria for symptomatic UTI in adults:- the patient has a recognized pathogen

cultured from urine of no more than two organism species, where at least one organism is a bacteria of more than 100,000 CFU/ml and the patient has at least one of the following signs or symptoms: fever ($>38.0^{\circ}\text{C}$), suprapubic tenderness, costovertebral angle pain or tenderness, urinary urgency, urinary frequency or dysuria, where symptoms except for fever have no other recognized cause within the infection window period [7].

The common uropathogens responsible for CAUTI include *Escherichia Coli* (most common), *Pseudomonas* species, *Enterococcus* species, *Staphylococcus aureus*, coagulase-negative staphylococci, and *Enterobacter* species.

The pathogenesis for the occurrence of CAUTI is the formation of a biofilm by the uropathogenic bacteria along the catheter surface [8]. This biofilm formation initiates almost immediately post catheter insertion.

The other complications worth mentioning in patients with a chronic indwelling catheter, include: infectious complications- catheter obstruction, purulent urethritis, bladder urolithiasis, gland abscesses and, proctitis in males and the non-infectious complications of the urinary catheter include non-bacterial urethral inflammation, urethral strictures, mechanical trauma, and mobility restriction [9, 10].

Prevention strategies for CAUTI

During insertion

- Ensure that the urinary catheter should only be inserted in cases where really indicated and left in place only as long as indications remains. Wherever feasible and appropriate the other methods for bladder management may be considered like intermittent catheterization.
- Proper technique of hand wash and hygiene including aseptic procedure and sterile equipments to be used during insertion.
- The size of catheter to be inserted should be as small as possible consistent with proper drainage, so as to minimize the trauma to the urethra.
- The catheter should be secured properly and adequately to prevent its movement and traction.

Maintaining the indwelling catheter:

- Hand hygiene steps to be followed before and after handling or manipulation of the catheter or urinary drainage bag, while maintaining a continuous sterile closed drainage system.
- Keeping the catheter and the peri-catheter area clean with regular use of antiseptic solutions, along with the incontinence care.
- The urine flow into the catheter should be kept unobstructed by minimizing dependent loops or kinks, keeping the drain bag always below the level of bladder and regular emptying of the bag by using separate collecting container for each patient.
- Whenever fresh sample of urine is required for examination, it should be collected by aspirating

urine through the needleless sampling port with a sterile syringe after cleansing the port with disinfectant.

Removal of the urinary catheter:

As mentioned, the duration of indwelling catheter plays the most important factor in causing CAUTI, it is recommended that the catheters must be removed as soon as the indication of insertion is resolved and the catheter is no longer necessary. Alternative urinary devices like urinals, and external male condom should be supported.

Other approaches:

- The various clinical trials have not shown any superiority of the antibiotic impregnated catheters in prevention of CAUTI in comparison to the normal catheters [11].
- The routine screening of asymptomatic patients (with urinary catheter in situ) for the presence of any bacteraemia is not recommended as this has often resulted in over-treatment with antibiotics and lead to development of anti-microbial resistance [12].
- Catheter irrigation should be avoided.
- The routine change of catheters is not recommended. The catheter must be changed if patient has symptoms indicating CAUTI, or obstruction/malfunction of the catheter.

The health care facilities have the most important role in prevention of CAUTI with their infection control policies and their proper implementation, regular education of the healthcare personnel and keeping them updated with the latest guidelines, regular surveillance and interpretation of the data, and modifying the policies accordingly to offer the best to the patients.

Surveillance of the urinary catheter use, its indications, complications and proper documentation using the standard evidence based guidelines/definitions forms the major preventive strategy by the healthcare facility.

Conclusions

CAUTI is a common, but preventable cause of device-associated health care acquired infection. An indwelling urinary catheter not only causes discomfort to the patient but also increases the morbidity and mortality owing to an increased frequency of symptomatic urinary tract infection, and other infectious and non-infectious complications, along with extra financial burden with prolonged hospital stay. The major focus is emphasized on the prevention rather than cure by the judicious and restricted use of an indwelling urinary catheter and prompt early removal of the catheters when no longer indicated. The hospital infection control programs must be developed and implemented to monitor the use of the catheters with proper education to the healthcare staff and dissemination of knowledge.

Conflicts of interest: None declared

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References

1. Nicolle LE. Catheter associated urinary tract infections. *Antimicrob Resist Infect Control*. 2014;3:23.
2. Zarb P, Coignard B, Griskeviciene J, Muller A, Vankerckhoven Weist K, Goossens MM, et al. The European Centre for Disease Prevention and Control (ECDC) pilot point prevalence survey of healthcare-associated infections and antimicrobial use. *Euro Surveill* 2012, 17(46):pii=20316.
3. Magill SS, Edwards JR, Bamberg W, Beldaus ZG, Dumyati G, Kainer MA, et al. Multistate point-prevalence survey of healthcare-associated infections. *N Engl J Med*. 2014;370:1198–1208.
4. Weber DJ, Sickbert-Bennett EE, Gould CV, Brown VM, Huslage K, Rutala WA. Incidence of catheter-associated and non-catheter-associated urinary tract infections in a healthcare system. *Infect Control HospEpidemiol*. 2011;32:822–23.
5. Hooton TM, Bradley SF, Cardenas DD, Colgan R, Geerlings SE, Rice JC, et al: Diagnosis, prevention and treatment of catheter-associated urinary tract infection in adults: 2009 international clinical practice guidelines from the Infectious Diseases Society of America. *Clin Infect Dis*. 2010;50:625–63.
6. Sotto A, Lavigne JP, Bruy e F. Catheter-associated urinary tract infection. *Rev Prat*. 2014;64(5):651-55.
7. Septimus EJ, Moody J. Prevention of Device-Related Healthcare-Associated Infections. *F1000Res*. 2016 Jan 14;5. pii: F1000 Faculty Rev-65.
8. Stickler DJ. Bacterial biofilms in patients with indwelling urinary catheters. *Nat Clin Pract Urol*. 2008;5(11):598–608.
9. Nicolle LE. Urinary catheter associated infections. *Infect Dis Clin North Am*. 2012;26(1):13-27.
10. Hollingsworth JM, Rogers MA, Krein SL, Hickner A, Kuhn L, Cheng A, et al. Determining the noninfectious complications of indwelling urethral catheters: a systematic review and meta-analysis. *Ann Intern Med*. 2013;159:401-10.
11. Pickard R, Lam T, MacLennan G, Starr K, Kilonzo M, McPherson G, et al. Antimicrobial catheters for reduction of symptomatic urinary tract infection in adults requiring short-term catheterisation in hospital: a multicentre randomised controlled trial. *Lancet*. 2012; 380(9857): 1927–935.
12. Trautner BW, Grigoryan L, Petersen NJ, Hysong S, Cadena J, Patterson JE, et al. Effectiveness of an Antimicrobial Stewardship Approach for Urinary Catheter-Associated Asymptomatic Bacteriuria. *JAMA Intern Med*. 2015;175(7):1120–127.