Catheter Associated Urinary Tract Infection Prevention

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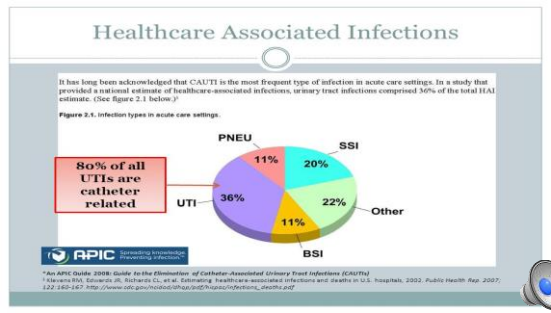
Learning Objectives

1. Learners will self report increased knowledge of the consequence of a CAUTI.
2. Learners will self report increased knowledge of the guidelines in the CDC CAUTI tool.
3. Learners will be able to identify indicators for timely catheter removal.
4. Learners will identify best practice for patients with a catheter to prevent a CAUTI.

Introduction and Rationale

Associated Healthcare-associated infections (HAI) are found in one in 25 hospital patients on any given day (CDC, 2016).

The leading cause of secondary healthcare-associated infection, and approximately 20% of healthcare-acquired infections occur from the urinary tract, and the mortality with this condition is about 10% (Fekete, 2017).



UTI

- Urinary tract infections are the most common type of healthcare associated infections.
- Urinary tract infections (UTIs) are the fourth most common type of healthcare-associated infection, with an estimated 93,300 UTIs in acute care.
- 75% of UTI's diagnosed in a hospital are associated with urinary catheterization (CDC, 2009).

How are Urinary Tract Infections Defined?

- Bacteria in a urine sample can represent contamination by bacteria from the periurethral area, and it can represent a UTI.
- To distinguish between contamination and a true UTI, various expert groups have suggested thresholds for bacterial growth from a urine culture.
- A CAUTI according to the Infectious Disease Society of America (IDSA) guidelines define catheter-associated bacteriuria as follows:

Symptomatic Bacteriuria

[Symptomatic bacteriuria or urinary tract infection (UTI)- culture growth of ≥ 10,000 colony forming units of uropathogenic bacteria in the presence of symptoms of signs compatible with UTI without other identifiable sources in a patient with indwelling urethral, indwelling suprapubic, or intermittent catheterization] (Fekte, 2017).

- Compatible symptoms included fever, suprapubic or costovertebral angle tenderness, and otherwise unexplained systemic symptoms such as altered mental status, hypotension, or evidence of a systemic inflammatory response syndrome.

Asymptomatic Bacteriuria

"Asymptomatic bacteriuria- Culture of ≥ 100,0000 colony forming units of uropathogenic bacteria in the absence of symptoms compatible with UTI in a patient with indwelling urethral, indwelling suprapubic, or intermittent catheterization". (Fekete, 2017, p. 4).

These definitions include patients who are not longer catheterized but have had either a urethral suprapubic or condom catheters in the past 48 hours (Fekete, 2017).

Issues Associated with Catheter Use

- Limited mobility
- Discomfort to the patient
- Prolonged hospital stay
- Increased cost
- Increased mortality rate

Etiology- Common Causative Pathogens

Endogenous Intestinal Flora

- Escherichia Coli
- Entorabacter
- Enterococci
- Proteus mirabilis
- Klebsiella specie

Etiology

Non-Intestinal Pathogens or Environmental Pathogens

- Candida species
- Enterobacter species
- MRSA
- Pseudomonas aeruginosa
- Staphylococcus coagulase negative

Risk Factors for development of a CAUTI

- Method of catheterization
- Quality of catheter care
- Host susceptibility
- Duration of catheter

Pathophysiology

Biofilm Formation

Biofilm formation is the most common cause of bacteria (Gesmundo, 2016). It occurs immediately after catheter insertion. Biofilm is a complex organic material consisting of micro-organisms growing in colonies within an extracellular mucopolysaccharide substance which they produce (Nicolle, 2014). Both interior and exterior catheters are involved.

Pathophysiology

Extraluminal Bacterial Ascension

Catheter-related urinary tract infections occur due to urethral catheter inoculation (Gesmundo, 2016).

Microorganisms colonize the external surface of the catheter, creating biofilms.

Bacteria can therefore ascend 1-3 days post catheter insertion with the help of capillary action.

Pathophysiology

Intraluminal bacteria infection

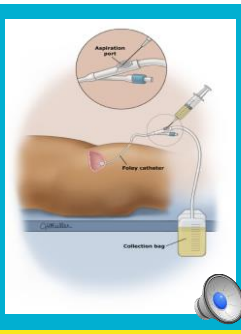
Bacteria can be introduced when opening a closed drainage system

Microbes can ascend from a urine collection bag by reflux. The urine in the catheter bag may flow backward into the bladder, causing urinary tract infection

Damages to the bladder mucosa helps facilitate biofilms on the surface

Specimen Collection

Remove catheter prior to urine sampling and obtain a clean catch sample if possible.



Specimen Collection

Goal of urine collection is to get an accurate representation of the bladder bacteria count with minimized contamination of urethra organisms.

Clean Catch UA

The following steps should be taken to minimize the degree of contamination of bacteria from the urethra:

1. Disinfect the meatus and surrounding mucosa ara with non-foaming antiseptic solution- an example would be Dakins solution.
2. The region should be dried with a sterile swab to avoid mixture of the antiseptic with urine.
3. Contact of the urinary stream with the mucosa should be minimized by pulling the foreskin in uncircumcised males back or by spreading the labia in females.
4. The initial stream of the voided specimen should be discarded- , rationale is that the initial urine flushed urethral contaminates.
5. Midstream as sample should be sent to lab for analysis.

Diagnostic Criteria

Dipsticks- evaluate for urine leukocytes and nitrates that can be used as a screening tool.

Positive dipstick can support the diagnosis of a UTI with suggestive symptoms. Negative dipsticks should be sent for culture.

Diagnostic Criteria

>10,000/ml of leukocytes will be present in infected patients.

Follow with culture for causative agent susceptibility.

Complications Associated with CAUTI

If left untreated, catheter-associated urinary tract infections may cause complications such as:

Urinary catheter obstruction	Purulent urethritis	Prostatitis
Epididymitis	Orchitis	Cystitis
Pyelonephritis	Gram-negative bacteremia	
Endocarditis	Meningitis	
Vertebral osteomyelitis	Septic arthritis	

Recommended Treatment

The treatment of CAUTI includes catheter management and antimicrobial therapy.

Catheter management:

- Remove catheter if possible.
- Intermittent catheterization for patients who require extended catheterization.

Antimicrobial Therapy for CAUTI' s

Antimicrobial selection should be based on culture results when available. **Empiric treatment should cover gram negative bacilli-**

- Ceftriaxone 1 g IV once daily
- Cefotaxime 1g IV every eight hours
- Ciprofloxacin at 500 mg PO or 400 mg IV twice daily
- Levofloxacin 250 to 500 mg PO or IV once daily

Empiric Antimicrobial Therapy

For seriously ill or patients with multidrug resistant gram negative empiric therapy includes: (Example P. aeruginosa suspected)

- Ciprofloxacin, ceftazidime -1 g IV every eight hours
- Cefepime 1 g IV every 12 hours

Empiric Antimicrobial Therapy

For extended-spectrum beta-lactamase (ESBL) producing organism is suspected (Usually based on prior cultures) treatment limited to a carbapenem.

Gram positive cocci on a urine Gram stain may represent:

- Enterococci or Staphylococci- empiric management with vancomycin is appropriate pending further susceptibility

Targeted Antimicrobial Therapy

- Once a culture and susceptibility results are available the antimicrobial regimen should be designed for the specific organism that has been identified.
- Optimal duration of therapy is uncertain: 7-14 days.
- Oral therapy if organism is susceptible and well enough to adequately absorb medications.

Implications For Practice

- Hand hygiene considered best practice
- Insert catheter only when necessary
- Securement device in place
- Obtain urine samples aseptically
- Perineal care daily with soap and water
- Maintain closed sterile drainage system
- Monitor Foley use daily/ remove ASAP
- Keep Foley bag below level of bladder and off floor
- Maintain unobstructed flow urine flow.

Influencing Health of Individuals

Encourage patients to void or intermittently catheterize in place of indwelling catheters when possible.

Use good hand hygiene and clean techniques when self catheterizing.

- Cranberry products — Taking cranberry juice, cranberry tablets, or D-mannose has been promoted as one way to help prevent frequent bladder infections. However, several studies demonstrate no benefit with cranberry, and those studies showing that cranberry and D-mannose reduce the risk of recurrent bladder infections are not convincing.

Appropriate indications for catheter insertion

- Urinary retention
- Bladder outlet obstruction
- Patients undergoing urologic surgeries
- Anticipated prolonged duration of surgery
- Patients anticipated to receive large-volume infusions/ diuretics during surgery
- Need for intraoperative monitoring of urinary output
- To assist in healing of open sacral wounds in incontinent patients
- Patients requiring prolonged immobilization
- End of life comfort

Catheter Insertion

- Insert catheter using aseptic technique and sterile equipment
- Perform hand hygiene before and after catheter insertion
- Use sterile gloves, drape, sponges, aseptic or sterile solutions for periurethral cleaning.
- Use single-use packet of lubricant jelly
- Properly secure catheters

Catheter Insertion

https://m.youtube.com/watch?v=bU7oEkLnjF4

Catheter Care

- Maintain a closed drainage system
- Maintain unobstructed urine flow
- Hand Hygiene

Catheter removal

Leave catheters in place only as long as needed.

- Remove catheters ASAP postoperatively ideally within 24 hours or sooner unless the patients has appropriate indications for continued use.
- Have alerts or reminders to reassess need for catheters
- Have stop orders in place to remove catheters
- Implement protocol for nurse directed removal of unnecessary catheters
- Provide guidelines/algorithms for perioperative catheter management.

Catheter Removal

https://m.youtube.com/watch?v=vCIv0RTuO6A

Case Study #1

Mrs. Kelly a “49 year old female” is was admitted in the medical surgical unit yesterday after a debridement of diabetic foot ulcer with a postoperative indwelling catheter place. The indwelling catheter remains in place and no signs or symptoms of infection. Temp 37.0°C. The patient remains afebrile. There is a new order for catheter removal. The patient does not want the catheter removed because she states “it is convenient for me”. As the nurse how would you proceed?

Case Study #2

Mrs. Smith is a 52-year-old female that is post op day 3 from having an orthopedic surgery. Her postoperative catheter was removed on day two and today she is febrile, and is complaining of dysuria and her urine is cloudy. You have been tasked to obtain a urine specimen from Mrs. Smith. If this UA is positive for a UTI, is this considered a CAUTI and why or why not and what patient education would you give Mrs. Smith regarding obtaining a mid stream clean catch urine sample?

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