Catheter-Associated Urinary Tract Infection- CAUTI

Faisal Alasmari, MD

Introduction

- CAUTI a common infection encountered in healthcare facilities.
- **12 % - 16%** of patients who are admitted to acute care hospitals will have an indwelling placed at some time during their hospital stay.
- The daily risk of CAUTI : **3% - 7%.**

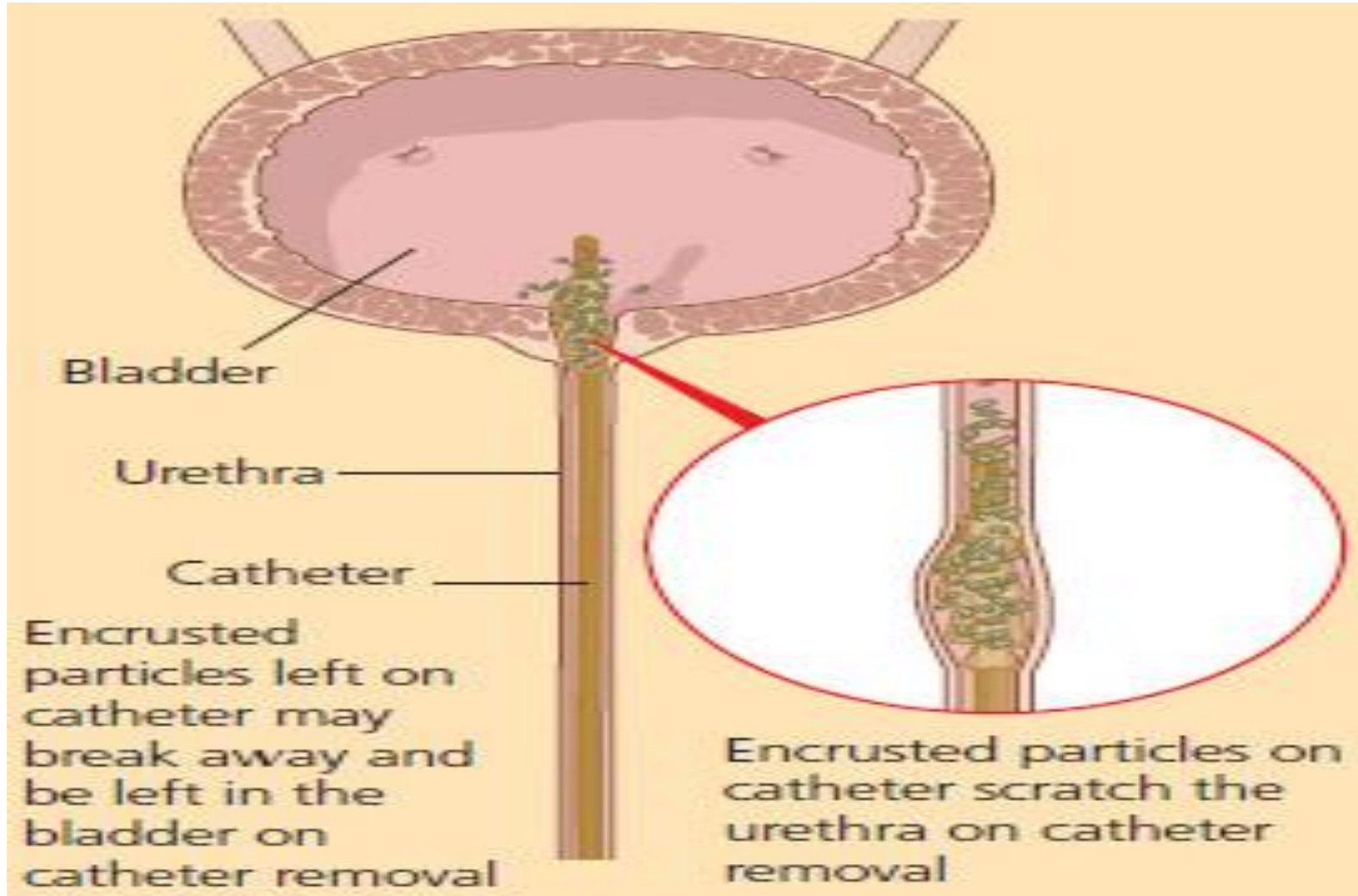
Pathogenesis

- The use of urinary catheter interfere with the following natural defense mechanism:

1- Urine flow & micturition.

2- The urinary tract mucosa has antibacterial properties and secretes inhibitors of bacterial adhesion (e.g.,Tamm-Horsfall proteins and bladder mucopolysaccharides) that prevent attachment of bacteria.

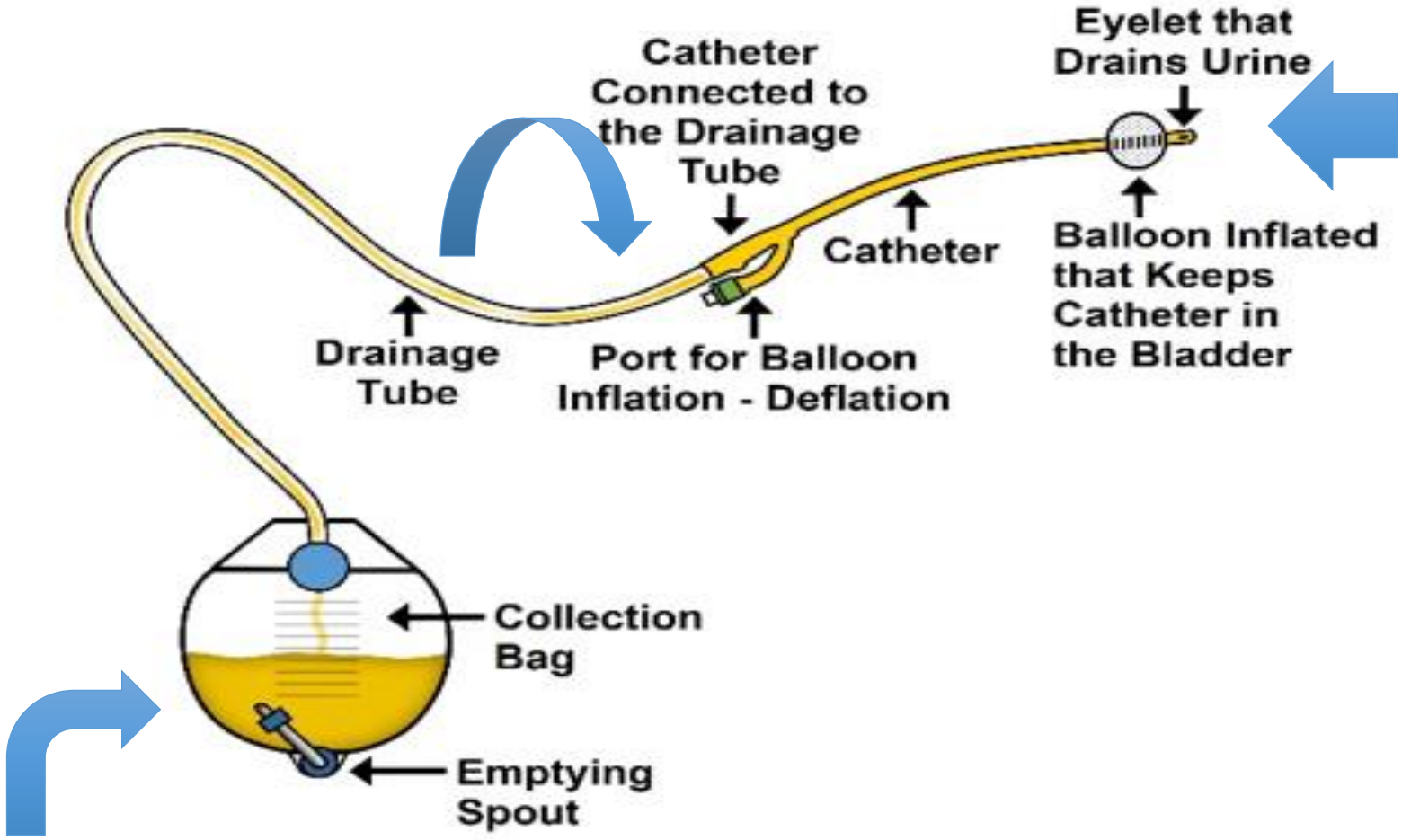
3- Urine osmolality and pH that inhibit growth of most organisms.


Bladder
Urethra
Catheter
Encrusted particles left on catheter may break away and be left in the bladder on catheter removal
Encrusted particles on catheter scratch the urethra on catheter removal

Examples of Encrustation

	Intraluminal Route	Extraluminal Route
Mechanism	Reflux or migration inside the catheter. Through failure of a closed drainage system or contamination of the collection bag	migration in the mucous film surrounding the external aspect of the catheter.
Source of the organisms	Exogenous- cross transmission via the hands of HCWs.	Endogenous, originating from rectum & colonize the perineum .
Sex	Common in male patients	Common in female patients
Frequency	34%	66%

Entry points for bacteria



Microbial Etiology:

Organism	Percentage of CAUTIs
Escherichia coli	27.7
Klebsiella species	23.1
Enterococcus species	16.9
Pseudomonas aeruginosa	10.8
Candida species and unspecified yeast	10.8
Other Enterobacteriaceae (Enterobacter species, Serratia species)	7.7
Staphylococcus aureus	3.1
Stenotrophomonas maltophilia	3.1
Streptococcus species	3.1

- 27% of staph.aureus bacteremias were associated with secondary bacteriuria .
- The presence of Staph.aureus in the urine should prompt consideration for coinciding bacteremia or endocarditis .

- Most infections (80 percent) associated with short-term indwelling urinary catheters are due to **a single species of organism.**

- Long-term indwelling catheters are **polymicrobial** in 77% to 95% of cases and 10% have 5 species of organisms present .

Risk Factors:

- Most studies on CAUTI have focused on bacteriuria, a precursor of symptomatic infection.
- The most important, consistently described risk factor for healthcare-associated bacteriuria is the **duration of catheterization**.
- Among patients with a urinary catheter in place for 2–10 days, 26% will develop bacteriuria.
- Nearly all patients catheterized for a month will have bacteriuria, making this duration the dividing line between short-term and long-term catheterization.

Risk Factors

Risk Factors
Increasing duration of catheterization
Female gender
DM
Older age
Rapidly fatal underlying disease
Nonsurgical disease
Faulty aseptic management of indwelling catheter
Bacterial colonization of drainage bag
Azotemia (serum creatinine concentration > 2 mg/L
Catheter not connected to urine meter
Periurethral colonization with uropathogen

General Strategies for Prevention

- Compliance with hand hygiene before and after patient care is recommended for prevention of all healthcare-associated infections

Specific Strategies for Prevention

Avoid use of indwelling urinary catheters
● Place only for appropriate indications
● Follow institutional protocols for placement, including preoperatively
● Use alternatives to indwelling catheterization (intermittent catheterization, condom catheter, or portable bladder ultrasound scanner)
Remove indwelling catheters early
● Use nurse-based interventions
● Use electronic reminders
Use proper techniques for insertion and maintenance of catheters
● Adhere to sterile insertion practices
● Use a closed drainage system
● Avoid routine bladder irrigation

Appropriate indications for Foley catheter insertion:

Indications
Accurate monitoring of urine output in critically ill patients
Acute anatomical or functional urinary retention or obstruction
Perioperative route for selected procedures
- For surgical procedures of anticipated long duration.
- For urological procedures.
- For procedure in patients with urinary incontinence.
- For procedures requiring intraoperative urinary monitoring or expected large volumes of venous fluids.
Urinary incontinence in patients with open perianal or sacral wounds.
Improved comfort for end-of-life care, if desired.

Alternatives to Indwelling Urinary Catheters

- Intermittent urinary catheterization may reduce the risk of UTI compared with indwelling urinary catheterization.
- Patients with neurogenic bladder and long-term urinary catheters may benefit from intermittent catheterization.
- One meta-analysis demonstrated reduced risk of asymptomatic bacteriuria and symptomatic UTI in postoperative patients following hip or knee surgery with intermittent catheterization compared with indwelling catheterization (relative risk, 2.90) but included only 2 studies with a total of 194 patients.
- Several studies of intermittent catheterization in postoperative patients have demonstrated increased risk of urinary retention and bladder distention.
- Incorporating use of a portable bladder ultrasound scanner with intermittent catheterization may attenuate this risk.

Alternatives to Indwelling Urinary Catheters

- External catheters, or condom catheters, should be considered as an alternative to indwelling catheters in appropriately selected male patients without urinary retention or bladder outlet obstruction.
- A randomized trial demonstrated a decrease in the composite outcome of bacteriuria, symptomatic UTI, and death in patients with condom catheters compared with patients with indwelling catheters, although the benefit was limited to those men without dementia.

Proper Techniques for Insertion and Maintenance of Urinary Catheters

- Urinary catheters should not be routinely exchanged, except for mechanical reasons, because any reduction in the rate of bacteriuria with routine changing is generally only transient.
- Use of closed urinary catheter systems with sealed catheter-tubing junctions reduces the risk of CAUTI.
- Breaches of the closed system should be avoided, and urine should be sampled only from a port after cleaning with an antiseptic solution
- The collection bag should always remain below the level of the bladder to prevent reflux of urine into the bladder.

Anti-Infective Catheters

- Use of antiseptic and antibiotic-impregnated urinary catheters may have an impact on the rates of catheter-associated bacteriuria.
- Antiseptic catheters currently available are coated with silver alloy. Earlier catheters coated with silver oxide lacked efficacy compared with silver alloy–coated catheters and are no longer available.
- Other antibiotic-impregnated catheters have utilized various types of antibiotics, including nitrofurazone, minocycline, and rifampin.

Anti-Infective Catheters

- In a large meta-analysis, use of silver alloy–coated catheters significantly reduced the incidence of asymptomatic bacteriuria (RR, 0.54) among adult patients catheterized for less than 7 days compared with use of latex catheters.

- Among patients catheterized for more than 7 days, a reduction in asymptomatic bacteriuria was less pronounced (RR, 0.64).

Anti-Infective Catheters

- In the same meta-analysis, antibiotic-impregnated catheters were compared with standard catheters and were found to decrease the rate of asymptomatic bacteriuria (RR, 0.52) for duration of catheterization less than 7 days but demonstrated no benefit for duration of catheterization of more than 7 days.
- Another meta-analysis demonstrated similar reductions in asymptomatic bacteriuria in patients with short-term catheterization.
- There are few trials assessing antiseptic and antibiotic-coated catheters in patients with long-term urinary catheterization, and no conclusions can be drawn regarding such patients.

Anti-Infective Catheters

- Use of anti-infective urinary catheters appears to be one option to reduce the incidence of bacteriuria in patients with short-term urinary catheterization (for less than 7 days), *but the effect on the more important outcomes of symptomatic CAUTI and urinary catheter-associated bloodstream infection are not clear from the current literature.*
- The current consensus is that anti-infective urinary catheters should not be used routinely to prevent CAUTI.

Anti-Infective Catheters

- The use of anti-infective catheters may be considered when the rates of CA-UTI remain high despite the implementation of other evidence-based practices, or in patients deemed to be at high risk for CA-UTI or its complications .
- The CDC Guideline has made the use of antiseptic-impregnated catheters a 1B recommendation .

- The incidence of CAUTI is typically expressed as the number of infections per 1,000 urinary catheter-days.
- The use of device-days as a denominator may mask successful CAUTI prevention efforts, as an overall reduction in catheter use may paradoxically lead to higher CAUTI rates.
- Thus, the standardized infection ratio (SIR) may be a preferred performance measure.

- Monitor compliance with process/proxy measures :

1- documentation of catheter insertion and removal dates.

2-documentation of indication for catheter placement.

3- Rates of asymptomatic bacteriuria.

4- percentage of patients with indwelling catheters

5- percentage of catheterization with accepted indications,

6- Duration of catheter use have been used with good success .

Thank you

References

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