The In’s and Out’s of Catheters and CAUTI’s

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Catheter Use and CAUTI’s: Scope of the Problem

Indications for catheterization
Associated complications with catheterization and nursing care problems
Nursing management strategies for prevention of catheter associated complications

Overview

What is CAUTI?

• Catheter-associated urinary tract infections (CAUTIs) are infections caused by bacteria that have entered the urinary tract during:
  – the catheter’s insertion
  – through the catheter tube
  – through the catheter’s external surface
SO...What is All the Fuss About?

The Fuss...

- Catheter-associated urinary tract infections (CAUTI) are preventable adverse outcomes that cause increased morbidity, mortality, and financial burdens to hospitals and patients and should never occur.

Impact of Health Care-Associated Infections

- CAUTI's most common hospital acquired infections (35-40%)
- Up to 80% of UTI's associated with indwelling urinary catheters
- ~18%-25% patients in all hospital stays may have catheter during stay
- Up to 90% of patients in ICU have indwelling catheters
- 8%-23% patients admitted through ED have catheter
- Women > men
Impact of Health Care-Associated Infections

- Major risk factor for CAUTIs - prolonged catheterization
- Many patients managed by long term indwelling catheters (more than 2 weeks)
- ~100,000 LTC facility residents in US are managed by indwelling catheters
- 2nd among predisposing conditions for developing sepsis
- Rate of catheter use higher in Medicare patients
- Unnecessary antimicrobial use


Risks

For every day an indwelling catheter is in place it represents a 3%-10% increased risk of developing an infection


Morbidity of Health Care-Associated Infections

- 2013 - acute care hospitals experienced a 6% ↑ in CAUTI
- Genitourinary trauma
  - Occurred in 1.5% of indwelling catheter days
  - 1/3 of these traumatic complications required intervention
- ↑ risk illness with long-term catheterization use in patients with SCI
- Strong correlation between catheter use > six days and the development of a CAUTI

Mortality of Health Care-Associated Infections

- An estimated 13,000 deaths attributed to UTIs annually in the US
- Mortality rate ↑ to approximately 10% when the patient also has a secondary bacteremia
- Associated with a greater risk of death
  - 4x as great during hospitalization
  - 2x as great within 90 days after hospital discharge

Financial Implications

- For Medicare – these events are high-cost and or high volume
  - More than 1 health care-associated UTI for hospital patients annually
  - Adds ~ 2-4 days to hospital stay
  - Adds > $400 million dollars to hospital costs annually

  CAUTIs can be decreased by interventions that facilitate removal of unnecessary catheters

Costs of CAUTI

- Estimated cost per infection ranges from $750-$1,000

- Estimated total cost in the United States ranges from $340 million - 0.5 billion dollars per year nationally
Effective October 1, 2008, Medicare (CMS) stopped paying for eight conditions that could be acquired by patients during hospital stays that could have been reasonably prevented by following evidence based guidelines (CAUTI one of them)

• Hospital paid as if the complication or comorbidity were not present

It is ultimately about quality care, efficiency, and accountability


• CAUTI further targeted for complete elimination as a “never event”

• National goal to reduce CAUTI by 25% by 2014

• January 2012, began requiring acute care hospitals participating in their Hospital Inpatient Quality Reporting Program to report CAUTIs in adult and pediatric intensive (critical) care units

• January 2015, CMS began requiring acute care hospitals to report CAUTIs in adult and pediatric medical, surgical, and medical/surgical inpatient units
Long-term Care Facilities

- Follow CMS regulatory guidance

- F-315 tag
  - Use of urinary catheters must be medically justified and care rendered to reduce the risk of infection for all residents with or without a catheter

Benjamin Franklin
Inventor of the flexible catheter

“By failing to prepare, you are preparing to fail.”

Risk Factors

- ED as initial entry to health care facility
- Placement outside of OR
- Prolonged catheterization
- Level of professional training of inserter
- Functional impairment
- Impaired immunity
- Females
- Disconnection of drainage system
Risk Factors

- Conditions where risks outweigh benefits
  - Delirium
  - Dementia
  - Incontinence
  - Bed-ridden
  - Morbid obesity
  - Diabetes

Appropriate Use for Indwelling Catheters

- Management of acute urinary retention or BOO
- Urine output measurement in critically ill patient
- Single 24 hour urine sample for diagnostic test
- Assist in healing of Stage III or IV or unstageable pressure ulcers
- Reduce acute, severe pain with movement when other urine management strategies are difficult
- Improve comfort in end of life care


Appropriate Use for Indwelling Catheters

- Perioperative use in selected surgical procedures
- Need for intra-operative hemodynamic monitoring.
- Management of immobilized patients
  - Urologic/other surgeries
    - Placed just for bladder decompression/filling
    - When used for reconstructive surgery
  - Patients with urinary incontinence ***

Inappropriate Use of Indwelling Catheters

- As substitute for nursing care of patient with urinary incontinence
- Urinary incontinence
- Bed rest or decreased mobility
- Convenience of staff
- Routine monitoring of I&O
- PVR urine volume assessment.
- Prolonged post op duration without appropriate indications (i.e. structural repair of urethra)


Inappropriate Use for Indwelling Catheters

- Routine use in ICU
- As a means of obtaining urine for culture or other diagnostic tests
- Should not be routinely used for patients receiving thoracic epidural anesthesia/analgesia
- Patient or family request
- Preventing UTI in patient with fecal incontinence or diarrhea or management of frequent, painful urination in patients with UTI


Urinary Catheterization
Early Catheterization

Types of Urinary Catheters

- Indwelling
- Intermittent
- External Condom Catheters

Types of Indwelling Urinary Catheters

- Urethral Catheter (Foley)
- Suprapubic Catheter (SP tube)
Foley Catheters

- **Foley catheter**
  - Flexible hollow tube
  - Aseptically passed into the bladder through urethra (transurethral)
  - Held in place with a retention balloon and attached to a drainage bag
  - Closed, sterile system
  - Inserted by MD or nurse at bedside
  - Allows for immediate decompression
  - short term use 2 - 4 weeks
  - long term use ≥ 4 weeks
- Goal: short term use (≤ 30 days)

Foley Catheters

- **Disadvantages:**
  - Discomfort
  - Infection
  - Leakage of urine around catheter
  - Trauma during insertion
  - Drainage bag

Suprapubic Catheters

- **Suprapubic Catheter (SP tube)**
  - Inserted into bladder above the pubic bone
  - Surgical procedure performed by urologist or urogynecologist
  - Prevents urethral trauma, urethritis and stricture formation
  - May reduce incidence of CAUTI's
  - Access is easier for cleansing and catheter changing
  - ↑ satisfaction with long-term use
  - May provide greater comfort, particularly for patients who are wheelchair users
  - Greater freedom to be or remain sexually active
  - Allows attempts at normal voiding
Suprapubic Catheters

• Disadvantages:
  – surgical procedure
  – hematoma (initially)
  – potential difficult catheter insertion
  – leakage of urine around catheter
  – skin erosion at insertion site
  – drainage bag

When is it Time for a SP Tube?

• Suprapubic insertion:
  – Postoperative pelvic, lower urinary tract, (gynecologic, urologic) and orthopedic surgery
  – Difficulty inserting transurethral catheters
  – Prevent urethral trauma in a male patient or for healing of urethral erosion from a transurethral catheter
  – Need for long term IUC (greater than 2 years)
  – Inability to perform intermittent catheterization (IC)
  – Patient with chronic diarrhea or fecal incontinence that causes repeated catheter-associated urinary tract infections (CAUTIs)

Different Types of Catheters Used

<table>
<thead>
<tr>
<th>Catheters</th>
<th>Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Latex</td>
<td>Soft, flexible, comfortable, and low cost</td>
</tr>
<tr>
<td>Silicone-elastomer</td>
<td>Strength and flexibility of latex with durability and reduced encrustation all silicone</td>
</tr>
<tr>
<td>Latex catheter coated in silicone</td>
<td></td>
</tr>
<tr>
<td>100% Silicone</td>
<td>Thin walled with larger lumen, more rigid Use in latex allergy/sensitive patients</td>
</tr>
<tr>
<td>Hydrogel</td>
<td>Hydrophilic – absorb water to produce cushion around catheter ↓ friction/irritation</td>
</tr>
<tr>
<td>Antimicrobial coatings</td>
<td>↓ bacterial attachment, colonization, and migration organisms to ↓ CAUTIs</td>
</tr>
<tr>
<td>Antibiotic coated, silver coated</td>
<td></td>
</tr>
</tbody>
</table>
Types of Indwelling Catheters

Complications of Indwelling Catheters
- Increased risk of UTI's
- Obstruction of catheter (urine bypasses catheter)
  - blood clots, sediment, encrustations
- Bladder spasms
- Expulsion of catheter
- Discomfort / pain
- Bleeding
- Traumatic (complications occurring during placement or dislodgement)

Complications Associated with Long-term Indwelling Catheters
- Infection
- Meatal tears and erosion
- Bladder neck destruction
- Bacteriuria / Symptomatic UTI
- Chronic bladder inflammation
- Urinary calculi and catheter encrustation
- Hematuria
- Obstruction (of catheter with encrustations)
- Pseudopolyps
- Strictures
- Urosepsis → Death (3x ↑ catheterized patients)
- Urethral fistula
- Fournier’s Gangrene (necrotizing fasciultis)
- Bladder cancer – squamous cell
Complications

Membranous Urethritis

Urethral Stricture
Urethral Tear
foley balloon inflated in urethra, creation false passage

Catheter Encrustation

Cystitis / Edema
Strategies For Indwelling Catheters

Catheterization Tips

- Use leg bags with cloth straps
- Keep overnight bags off the floor and air vent dry
- Keep leg bags above knee unless extension tubing used
- For men, keep leg bag and leg strap on side of leg that penis angles towards
- Stabilize all catheters to the leg and reduce tension

Catheter Positioning to Reduce and Prevent Trauma
Catheter Positioning
Incorrect

Catheter Positioning
Correct

Alternatives to Indwelling Catheters
Clean Intermittent Catheterization

- CIC is insertion of a catheter several times daily to empty the bladder
- Immediately removed after bladder drainage is complete
- Used to drain urine from a bladder that is not emptying adequately
- An effective bladder management strategy for patients with incomplete bladder emptying and/or urinary retention

Clean Intermittent Catheterization

- Preferable to IUCs or SP tubes in patients with bladder emptying dysfunction
- Compared to IUC:
  - Promotes self-care
  - Promotes independence
  - Allows greater intimacy
  - ↓ need for additional equipment
  - ↓ CAUTI

Complications of CIC

- Complications and adverse events can arise from CIC over the long term
  - Bleeding
  - Urethritis
  - Stricture
  - Creation of a false passage
  - Epididymitis
  - UTIs and stones
Indications for Clean Intermittent Catheterization

- Short or long term management of urinary retention or neurogenic LUTD
- Incomplete bladder emptying resulting in high PVRs
- Self-dilatation for patients with urethral stenosis and urethral stricture disease
- PVR assessment
- Random urine sample collection for sterile or nonsterile specimens
- Urinary retention with or without bladder outlet obstruction

Considerations for CIC

- Body type and position
- General motor function
- Dexterity
- Cognition
- Obstruction
- Caregiver
- Access to bathroom

Clean Intermittent Catheters
Clean Intermittent Catheterization

- Clean technique is taught and used
- Catheters are reusable within certain parameters
- Medicare now allows for a new catheter for each catheterization

Closed systems may be used in certain instances

- Patient will always appear to have an infection on urinalysis or dipstick due to the act of catheterization itself
- Only treat patient if symptomatic

Pathogenesis of CAUTI
CAUTI’s

- UTI’s occurring in persons with an indwelling catheter are more complicated and are more likely to involve multiple bacterial species
- Typically arise from a bladder colonized by bacteria
- Following placement of a catheter, 5% of patients / day will develop bacteriuria
- 100% colonized within 1 month – usually asymptomatic

CAUTI’s

- Many of these bacteria dwell within an antibiotic-resistant biofilm
- Arise from a milieu of chronic bacterial colonization
- Most common complication in long-term use MRSA, VRSA

Catheter Biofilms

- Biofilm defined as micro-organisms colonizing the internal surface of catheter forming biofilm
- Long-term catheterization can contain up to 16 different strains of bacteria
- Thicken as they multiply
- Generally unaffected by antibiotic treatment
- If organizations detach from the biofilm, can become free-floating symptomatic infection
Background

- Formation of biofilms by urinary pathogens common on the surfaces of catheters and collecting systems
- Bacteria within biofilms resistant to antimicrobials and host defenses
- Some novel strategies in CAUTI prevention have targeted biofilms

Background: Pathogenesis of CAUTI

Extraluminal
- Early, at insertion
- Lates, by capillary action

Intraluminal
- Break in closed drainage
- Contamination of collection bag urine

Biofilms
Bacteriuria

- Presence of bacteriuria and pyuria on urinalysis alone are not sufficient indications for treatment
- Because of the colonization, will always appear to have UTI if checked
- Colonization nearly universal by 30th day of catheterization
- Bacteriuria alone in a catheterized patient should not be treated with antibiotics


Bacteriuria

- Prophylactic antibiotics in catheterized patients are not recommended
- Prolonged antimicrobial therapy rarely resolves the underlying bacteriuria
- Development of resistant organisms possible


Obtaining Urine for Culture

- If a UTI is suspected and a urine culture is to be obtained, it is strongly suggested that a new catheter and collection system be placed and the urine sample for the C&S be obtained from the new system.

- Recommended due to the colonization of the catheter, tubing and bag
Obtaining Urine for Culture

- If not possible, or may cause the patient harm or burden to change the system:
  - Obtain the sample from the established system
  - If treatment is to be initiated, the course of treatment will be improved if the catheter system is changed prior to, or along with, starting therapy.

When to Treat the Catheterized Patient?

- Only symptomatic UTI’s should be treated in the patient with an indwelling catheter
- Symptoms include:
  - hematuria (gross)
  - pyuria
  - fever
  - increased leg spasms and/or suprapubic tenderness
  - change in mental status in elderly
  - bladder spasm
- Sediment and odor do not indicate an infection

When to Change the Catheter?

- Usual medical practice - change monthly (based more on insurance reimbursement than research)
- Current clinical opinion – change as needed for the patient’s needs (obstruction, frequent UTI’s)
  - q2 weeks – q8 weeks
Important Reminders

• Bladder spasms/leakage around catheter: **does NOT mean using a larger catheter or balloon to correct!**

• Correct balloon inflation 10cc sterile water (not saline and not increasing the amount of water)

• Specimens should be obtained from a new catheter (**not optimal** from the bag or old indwelling catheter!)

Catheter Encrustations

• Caused by a collection of minerals, crystalization of protein, or mucus plugs

• Urine pH normally acidic (pH 5-6)

• Infection of Proteus mirabilis or other urease producing bacteria

Catheter Encrustations

• Precipitation of minerals in alkaline urine → can attach to the balloon and obstruct the eye of the catheter preventing deflation of the balloon or adequate drainage

• Obstruction of lumen with precipitates can cause prevention of adequate drainage

• Unaffected by antibiotics or acidification of urine

Catheterization Tips

- Whenever possible, teach clean intermittent catheterization (CIC)
- Use the smallest size catheter possible (≤ 16Fr)
- Fill 5cc foley balloons with 10cc sterile water (never saline)
- Large balloon size → urethral/bladder neck erosion

Catheterization Tips

- Use all silicone catheters with latex allergy

- In men, insert catheter to hub prior to balloon inflation
  - Pull foreskin back (and replace!)
  - Pull penis straight up

Catheterization Tips

- In women, separate labia and lift up slightly
  - After obtaining urine, insert a little further then inflate the balloon. Pull back gently.
  - If cystocele, reduce this prior to attempting catheterization
Catheterization Tips

• Different types of catheters:
  – Straight – usual type used
  – Coude – enlarged prostate in men or females urethra in vaginal canal

• Can use in male and female

Urinary Tract Infections
Foley Catheters

• Silver impregnated catheters may reduce UTI risk (especially in short term use)

• Silicone coated catheters may reduce UTI risk

Alternatives to Indwelling Catheters

• Male External Catheters:

• aka “Condom Catheters” or “Texas Catheters”
Male External Catheters

• Who are candidates:
  – Patients with reflex voiding
  – bothersome urinary incontinence
  – free flow of urine (total incontinence)

Indications for External Device

– Non-obese and cooperative
– UI without abnormal PVRs, no penile lesions (e.g., male SCI patients)
• Daily (not hourly) measurement of urine volume
  – Can minimize urethral trauma, are more comfortable, and allow mobility
  – Patient request for EC to manage UI while hospitalized

Male External Catheters

• External device attached to the skin of the penis with adhesive
  - connected to drainage bag and tubing
• Lowest infection rate
• Alternative to indwelling urethral catheter
• Disadvantages:
  - can leak urine if improper application or if tubing becomes kinked
  - skin irritation and breakdown (significantly less with newer devices)
Male External Catheters

• Considerations:
  - correct sizing of catheter
  - size of penis: penile length sufficient to support the catheter
  - as male ages, penis retracts
  - skin integrity
  - dexterity of patient

Challenges of External Catheters

• Preventing unintentional dislodgement
• Most used in the acute care setting have an internal adhesive that adheres to the penile shaft to stay in place
• Complications:
  – Generally irritative, allergic, or compressive in nature
  – Many of the more serious complications d/t ring devices used to keep in place (rarely used now)
How to Prevent CAUTI’s?

Interventions to Decrease Risk of CAUTI’s and Complications

- Use aseptic technique for catheter insertion
- Maintain sterile closed drainage system
- Hand washing by staff before and after handling catheters (alcohol hand rubs more effective than soap and water)
- Insert smallest possible size catheter (≤ 16Fr)
- Fill 5cc balloon with 10cc sterile water
- To minimize urethral trauma during insertion, use generous amounts of sterile lubricant

An ounce of prevention is worth a pound of cure.
Benjamin Franklin
Interventions to Decrease Risk of CAUTI’s and Complications

- Always secure catheter properly to leg using a leg strap (not tape!) to prevent movement of catheter and urethral traction
- Maintain drainage bag in dependent position and off floor
- Empty drainage bags at least q8h (or volume >400ml)
- Use separate graduated containers for each patient
- Maintain adequate hydration

Interventions to Decrease Risk of CAUTI’s and Complications

- Routine meatal care does not reduce incidence of bacteriuria, symptomatic UTI and is not recommended (routine bathing with soap and water or use of peri wash bottle can be used)
- Use of antimicrobial ointments or creams should be avoided as it may increase risk of bacteriuria
- Duration of catheter less than 6 days whenever possible

Interventions to Decrease Risk of CAUTI’s and Complications

- Assess bowel function
- Bowel management program to eliminate or correct constipation and impaction
- Control diarrhea and keep patient clean
Resources

SUNA Clinical Practice Guidelines

- www.suna.org
- Clinical Practice Guidelines on:
  - Prevention and Control of Catheter-Associated Urinary Tract Infection (CAUTI)
  - Care of the Patient with an Indwelling Catheter
  - Suprapubic Catheter Replacement
  - Male and Female Urethral Catheterization

Available in June! www.suna.org

Healthcare Infection Control Practices Advisory Committee (HICPAC)


Questions?

Thank You!