Catheters, Evidence Based Practice and Everything you need to know.

Frankie Bates RN, NCA
Learning Objectives:

• Understand the different types and designs of urinary catheters and techniques.

• Demonstrate understanding of indwelling catheters, urethral and suprapubic versus external devices.

• Identify the incidence and causes of encrustation and blocking of catheters due to biofilm formation.

• Recognize the indications and risks of indwelling catheters.

• Understand the Definition /Prevalence and types of Urinary Incontinence in the elderly.
Definition /Prevalence of Urinary Incontinence

Urinary Incontinence (UI) – Is the complaint of involuntary loss of urine.


400 million people worldwide suffer from UI. Affects 3.3 million Canadians

Epidemiology Of UI Committee, Int Consult on Incont ICI 2013. Can Continence Society
Urinary Incontinence and Fecal Incontinence in the frail elderly is a result of multiple risk factors:

Age related physiological changes
Comorbidity
Polypharmacy
Functional disability
Cognitive Impairment
Chronic conditions

Eight chronic conditions are prevalent in more than 10% of the population aged 65 and over.

Proportion of individuals 45 years of age and over with selected chronic conditions, Canada, 2008/2009

Urinary incontinence associated with higher levels of loneliness

Prevalence of urinary incontinence and loneliness, by age group and sex, household population aged 65 and over, Canada (excluding territories), 2008/2009

Source: Statistics Canada, Health Reports, 82-003-X, vol. 24, no. 10, October 2013
Data Source: Canadian Community Health Survey (2008/2009)– Healthy Aging
Breakdown of Types of UI by Gender

**Female**
- SUI: 50%
- UUI: 14%
- MUI: 32%
- Other: 4%

**Male**
- SUI: 24%
- UUI: 45%
- MUI: 19%
- Other: 12%

(Minassian, VA, Drutz, HP. *Int J Gynecol Obstet* 2003)
(Diokno A et al. *Int Urol Nephrol* 2007)
3 Phases:

Filling

Storage

Evacuation

A. Mechanism of Continence

B. Mechanism of Micturition

Cerebral Cortex
Awareness
Voluntary control

Pons
Micturition Center
Micturition reflex
Coordination of bladder urethra and pelvic floor

Sympathetic chain

Spinal Micturition Center

Hypogastric ganglion

Hypogastric nerve (sympathetic)

Relaxes detrusor muscle

Pudendal nerve (somatic)

Contracts internal sphincter

Contracts external sphincter
Cerebral Cortex
Awareness
Voluntary control

Pons
Micturition Center
Micturition reflex
Coordination of bladder urethra and pelvic floor

Pelvic nerve (parasympathetic)
Contracts detrusor muscle

B. Mechanism of Micturition

T_{11}
T_{12}
L_1
L_2
S_2
S_3
S_4
### Categories of Bladder Control Disorders

There are two general categories:

<table>
<thead>
<tr>
<th>Filling/ storage Disorders</th>
<th>Voiding Disorders</th>
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<tbody>
<tr>
<td>• Stress Urinary Incontinence (SUI)</td>
<td>• Overactive Bladder (OAB)</td>
</tr>
<tr>
<td>• Overactive Bladder (OAB)</td>
<td>• Urinary Retention</td>
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<td></td>
<td>• Overflow Incontinence</td>
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(Andersson, K-E., Cardozo, L., et al., Committee 8. Pharmacological Treatment of Urinary Incontinence)
Silicone elastomer coated Foley catheters were introduced as a smoother alternative to Teflon coating. Teflon coated latex Foley catheters are introduced to smooth the surface of the catheter and improve patient comfort. The first Foley catheter is marketed to hospitals made of latex rubber. Distribution begins of the first American woven Foley catheter.

100% Silicone Foley catheters are introduced due to a need for a stiffer less pliable catheter for use during certain urological procedures. Hydrophilic coated catheters were introduced to further improve patient comfort and as a means to reduce bacterial adherence to the catheters surface.

Various types of Foley catheters were introduced with antimicrobial coatings to reduce the incidence of catheter associated urinary tract infection. More than 1,500 hospitals have adopted the use of antimicrobial catheters in an effort to reduce catheter associated urinary tract infection.
The number of catheter types and designs has increased with the advancement of new technology. This has added complexity to the catheterization process for both the HCP and the patient.

The health care provider who instructs the patient usually recommends the catheter choice, so knowledge of the different types of catheters is important.

Choice of Catheter is also dependent on the patient’s concomitant disease, health.

( i.e. In wheelchair, good manual dexterity, visual impairment, weight, age, on the cause of bladder problem.)

Also dependent on patient’s activity level (at work, outdoors a lot etc.)

Catheter sizes available for intermittent catheterization and indwelling urinary catheter are similar.

Catheter diameter is measured in French (Fr or Ch) units, and sizes range from 6 to 12 Fr for children and 12 to 26 Fr for adults. The funnel end of the catheter is usually color-coded to easily identify Fr size.

Length: 12 inches (about 40 cm) allow for adequate passage through a male urethra.

6 to 12 inches (20 to 40 cm), for female which is easier to grasp and manipulate because it will not loop or kink.

New designs! (With integral collection bag, Compact, discreet!)

ICI 2013
Types of Catheters

- Indwelling catheters
- Intermittent (Clean Intermittent Catheterization)
- External catheters (Condom)

- Straight tip
- Coude Tip (Tiemann)

- 100% Latex
- 100% Silicone
- Silicone coated latex
- Teflon Coated
- Hydrogel coated latex
- Silver Alloy
- Antimicrobial (Nitrofurazone releasing)

Center For Disease Control and Prevention. (CDC) 2009
Chartier-Kastler E et al Neurourol &Urodyn 2011
Silver has been used for medicinal purposes since Greek and Roman times.

Designed to reduce/prevent catheter-associated urinary tract infection (CAUTI) by reducing biofilm formation. However there is level 1 evidence to the contrary.

Studies conducted: Foley catheter coated with silver alloy on both inner and outer surfaces versus Teflonised latex Foley suggests that the silver impregnated urethral catheters reduce the incidence of CAUTI. (6pts versus 22 developed bacteremia)

However, there is no catheter material which is guaranteed to prevent UTI especially in long-term catheters.

Silver Alloy Coated Catheters Reduce Catheter-associated Bacteriuria
Hashmi et al., 2003 ICI 6th Edition 2017
Hydrophilic Catheters:

- Reduce long-term urethral complications, (trauma) and reduce friction.

- May decrease incidence of urethral strictures.

- May be indicated for patients who experience particular discomfort during catheterization and allow for easier insertion.

- Hydrogel coated latex catheter (For indwelling cath) rather than a silicone catheter may be better tolerated (risk ratio (RR) for need for early removal 0.41, 95% CI 0.22 to 0.77).

(Diokno, Mitchell, Nash, & Kimbrough, 1995). (Fader et al., 2001; Vapnek et al., 2003). (Biering-Sorensen, Bagi, & Hoiby, 2001;)( Stensballe et al 2005; Waller et al., 1995.) (De Ridder et al., 2005; Giannantoni et al., 2002; Stensballe et al., 2005).
Foley Catheter Construction

FEEL THE DIFFERENCE

Latex – Soft, Flexible, Reliable

Silicone – Stiff, Rigid, Inert

Each type of substrate has its own sets of performance characteristics and advantages.
Introducer tip catheters

- Some clinicians advocate the use of an **introducer tip** when performing intermittent self-catheterization.

- The introducer tip was first studied in the **1990s**.

- By inserting this tip in the urethra before advancing the catheter, the first portion (1.5 cm) of the **distal urethra is by-passed**. This portion of the distal urethra can be **colonized** with perineal bacteria, particularly E.coli.

- Especially with a spinal cord injury. Prone to Klebsiella.

Indwelling Catheters Should be used:

**Contraindications:**
- Urinary incontinence not associated with full-thickness pressure ulcers

**Indications:**
- Monitoring acutely ill patients (I & O)
- Manage terminally or severely ill
- Short term decompression of acute urinary retention
- Manage urinary incontinence in older adults with Stage III or IV pressure ulcers
- Bladder outlet Obstruction
- Neurogenic Bladder

Cent for Dis Cont Prev. 2009
Eberle C, Winsemius D et al J Gerent. 1993
POSSIBLE COMPLICATIONS OF CATHETER USE INCLUDE:

- Allergy or sensitivity to latex
- Bladder stones
- Urinary Tract Infections/ Pyelonephritis
- Septicemia
- Hematuria
- Kidney damage (usually only with long-term, indwelling catheter use)
- Urethral injury, erosion, necrosis.

(ICS ICI, Abrams P, Cardoza L et al, Pg 1737)
Bacteriuria is a function of time.

- Single event – risk <1%
- 4 days – risk 30%
- 30 days – risk 95%

Micro-organisms can enter the bladder through the external \textbf{(extraluminal)} (F) or internal surfaces of the catheter \textbf{(intraluminal)} (M).
Catheter Care:

- **Bacteriuria is universal** in catheterized patients; do not treat in absence of clear symptoms.
- Bacteria can be **free floating** or can **colonise** with the formation of **biofilms**, which attach themselves to the catheter surface and may subsequently cause catheter blockage.
- **Do not routinely culture** (changing flora, cannot predict infection)
- Culture **symptomatic** patients after old catheter is removed and new catheter is placed.

Biofilms and Encrustation

Bacterial biofilms: Influence on the pathogenesis, diagnosis and treatment of urinary tract infections

J. Curtis Nickela,
J. William Costertonb,
Robert J. C. McLeana and
Merle Olsonb
Biofilms are a BIG issue!
They are a collection of micro-organisms
Replicate every 20 seconds!
Happen in all parts of the body (including urinary tract)
First described by a dentist!
Present in surfaces such as water pipes, food surfaces etc.
NIH guidelines: 80 % of all infections are from Biofilms!
Reducing biofilm formation, therefore, is important in reducing CAUTI.
Multiple strategies have been deployed to reduce catheter associated urinary tract infections.

- Correct **hand-washing** procedures.

- Taking measures to prevent commensal bacteria from the patient contaminating the catheter.

- Avoiding breakages in the urinary collection system.

- **Good clinical practice**, we need to be mindful of the potential technological and equipment solutions.
When to change the Catheter?

- **No real guidelines!** Do **NOT** suggest arbitrary fixed intervals.

- **Vary** from patient to patient depending on various factors including; mobility, drinking habits, “blocker” or “non blocker”, Incidence of UTI’s, obstruction, encrustation, freq of opening/closing of system, etc.

- With silicone catheters the balloon can often “leach”. Suggest Q 2 weekly to remove **ALL fluid** in balloon and **replace it**.

- Not suggested to do routine bladder irrigations or clamping

CAUTI Guidelines 2009
Catheter Stabilization & Friction

• Catheter securement reduces FRICITION
  • movement
  • micro-motion
  • pistoning
  • pulling and tugging.

• Maximize patient comfort
  • More tolerable
  • Decreased meatal discomfort, pain and potential ulceration.
  • Minimize accidental catheter dislodgement

Proper catheter stabilization is recommended in almost ALL literature, including CDC Recommendations (category 1b recommendation)
Look closely! Things are not always as they appear to be! Erosion very evident!
If left insitu this could very well be the end result!
Placement of catheter and Balloon Inflation

- Ensure correct insertion of catheter and inflation of balloon.
- Under-inflated balloons may occlude the drainage holes of the catheter, or cause distortion of the catheter tip, leading to irritation and trauma to the bladder wall.
- Advance the catheter to the Y bifurcation.

(Bard, 1987) (Pomfret, 1996) (Marsden, 2001)
Suprapubic Catheters

- Can **offer advantages** over urethral route
- **Prevents** urethritis, prostatitis, urethral erosion, necrosis, accidental expulsion etc.
- May be necessary from urethral / pelvic trauma
- Provides easy access to **wheelchair bound** patients
- Facilitates **post surgical** voiding trials (clamping)
- Enables **sexuality**
- Less bladder **spasms**
- Reduced Risk of **Contamination** (fecal incontinence)
Initial insertion by physician generally as an inpatient.

Wound care until cystostomy heals – simple gauze dressing.

Difficulty in removing catheter.

Check deflation of IDC; balloon memory; encrustation issues?

Bard 16Fr are recommended to avoid these issues.

Routine changes – check timing.

Localized pain related to skin tags, securement issues.
Trouble Shooting

- Causes of persistent leakage around catheter:
  - Irritation from large Foley balloon.
  - Catheter diameter too large.
  - Bacteriuria.
  - Constipation or impaction.
  - Improper catheter positioning/ anchoring
Always consider alternatives to Indwelling catheters if possible:

- Clean Intermittent Catheterisation
- External catheter drainage (Condom drainage or sheaths, body worn)
- Products for incontinence

Cottenden A, Fadder et al. Incont 6th Ed 2017
External Catheter drainage system
25mm to 41 mm
Clean Intermittent catheters (CIC)

- Overall IC is effective & with low side effects
- Strictures (both urethral, meatal) are rare but are more frequent with prolonged use. Less with Hydrophilic.
- Epididymitis/Orchitis approx 5%
- UTIs can occur
- False passage rare especially in sensate individuals
- For product usage, ensure your patient is adequately assessed by specialist nurse in UI.
Various Products
(No single device to manage incontinence is appropriate for all situations.)

Recent developments in technology for the assessment and management of incontinence.
Hilary CJ; Slovak M et al 2014

Obscuring Urinary Incontinence. Diapering of the Elderly
(Starer; Journal of The American Geriatrics Society 1985)
ICI Recommendations on Indwelling Catheters

- Indwelling catheters should only be used after alternative management strategies have been exhausted. (Grade A recommendations)

- Duration of catheter should be minimal. (Grade A recommendation)

- All currently available catheter materials are subject to biofilm formation. (Level 1)

- Disinfectants, antiseptic / antimicrobial instillations into urinary bag not recommended. Antimicrobial bladder irrigations not recommended. (Grade A)
ICI Recommendations on Indwelling Catheters

- Routine washouts NOT recommended to reduce encrustation or debris. (Grade B)

- Asymptomatic Bacteriuria should NOT be treated in absence of symptoms. Routine culture is unnecessary. *(Level Evidence 1)(Grade A recommendation)*

- Meatal cleansing of catheterized pts by simple washing with soap and water is recommended, not with antimicrobial agents. *(Level 1 evidence) (Grade A recommendation)*

- A closed drainage system should be maintained when possible. *(Level 2 evidence) (Grade A recommendation)*

Int. Consult on Incont. 6th Edition Volume 2 2017  HICPAC
ICI Recommendations on Indwelling Catheters

- Silver Alloy catheters do not reduce on onset of CAUTI (Level 1). Antimicrobial catheters can prevent bacteruria during short term catheterization. (Level 1) (Grade A Recommendation)

- For long term catheter use, silicone or hydrogel coated catheters should be used. (>14 days) (Grade B)

- SPC and UC should be considered for long term catheterization. (Grade B recommendation) (Former to be conducted by trained personnel)

- Adequately supporting the catheter by means of an anchor to prevent damage from traction is recommended. (Grade C)
Encourage LOTS of fluids (Water/ juices)

Keep bag OFF the floor and below level of bladder.

Keep catheter and collection tube free from kinking.

Encourage patient to mobilise

Effective handwashing may reduce CAUTI. (Grade C)
References

- ICI 6th Edition 2017 Recommendations for Indwelling Catheters
- Friedman B, Can Urol Assoc J. 2012
- Bo K, Neurourol Urodyn. 2003
- Cochrane Database Syst Rev. 2011
- Hedlund, Hjelmås, Jonsson, Klarskov, and Talja (2001)
- De Ridder and colleagues (2005)
- Cardenas and Hoffman (2009)
References


International Consultation on Incontinence 6th Edition Volume 2 2017
10. Catheter Change Interval
Indwelling catheters should not be changed at arbitrary fixed intervals (34). Category II

E. Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended. Rather, it is suggested to change catheters and drainage bags based on clinical indications such as infection, obstruction, or when the closed system is compromised. (Category II) (Key Question 2C)
Questions/ Discussion