Catheters and all the stuff we should know!

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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 nurse 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, ? cause of bladder problem.)
Also dependent on patient’s activity level (at work, outdoors a lot etc.)

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. Silicone elastromer coated Foley catheters were introduced as a smoother alternative to Teflon coating. Hydrophilic coated catheters were introduced to further improve patient comfort and as a means to reduce bacterial adherence to the catheters surface. 100% Silicone Foley catheters are introduced due to a need for a stiffer less pliable catheter for use during certain urological procedures. Various types of Foley catheters were introduced with antimicrobial coatings to reduce the incidence of catheter associated urinary tract infection. More that 1,500 hospitals have adopted the use of antimicrobial catheters in an effort to reduce catheter associated urinary tract infection.
Types of Catheters

- Indwelling catheters
- Intermittent (Clean Intermittent Catheterization) (CIC)
- 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)
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 22 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, Purse size !)
What are long-term catheters made of?

* **Long-term** catheters are ones which are expected to stay in for more than 28 days (and are changed regularly as part of a care strategy).

* They can be made from latex, silicone, silicone-elastomer coated latex and hydrophilic polymer coated latex. (These materials are known to cause the least friction and tissue reaction). They are also less vulnerable to rapid colonisation by bacteria and encrusting by mineral deposits.

* **Silver-alloy coated** catheters (anti-microbial) and anti-biotic or antiseptic impregnated.

ICI, ICS 2013
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.
Silver has been used for medicinal purposes since Greek and Roman times.

Relatively new to the market so although they have been tested for safety, little is known about their long term performance.

Designed to reduce/prevent catheter-associated urinary tract infection (CAUTI) by reducing biofilm formation.

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
Silver Alloy Catheters address Biofilm/Bacteria

- Bardex® I.C. anti-infective Foley catheters with Bacti-Guard®* silver alloy coating and Bard® hydrogel has been clinically proven to reduce CAUTIs.

- The use of Antimicrobial Foley catheters received a Category IB recommendation from the CDC in the 2009 Recommendations for the prevention of CAUTI.
Hydrophilic Catheters:

- Coated catheters with hydrophilic or other coatings (such as antimicrobial or antibacterial) are sterile and not intended for reuse. May not be cleaned and re-used; surface drying times vary by product, and some become sticky when dry.

- **Hydrophilic-coated** catheters were introduced in an attempt to reduce long-term urethral complications, *(trauma)* and reduce friction.

- **Hydrogel coated** latex catheter 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).

- May **decrease** incidence of **urethral strictures**.

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

(Disokno, 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).
Cochrane Review: Which type of catheter to use?

- Evidence showed very few trials have compared different types of catheter for long-term bladder drainage.

- All trials were small and showed methodological weaknesses. Therefore, the evidence was not sufficient as a reliable basis for practical conclusions. Further, better quality trials are needed to address the current lack of evidence in this clinically important area.

- Modest evidence that hydrophilic catheters will reduce UTI in acute care.
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 bypassed. This portion of the distal urethra can be colonized with perineal bacteria, particularly E.coli.

(Bennett et al., 1997; Charbonneau-Smith, 1993). (Hudson & Murahata, 2005). (Bennett et al. 1997)
Colonization of pseudo monas and klebsiella frequently occurs in the perineum and urethra in men with a spinal cord injury. To bypass the distal urethra area, the catheter is advanced into the introducer tip, the tip is inserted into the distal urethra, and then the catheter is passed through the tip into the urethra.

This prevents contamination of the catheter and introduction of bacteria into the bladder and reduced UTI in hospitalized patients with spinal cord injury on intermittent catheterization.
Indwelling Catheters Should be used:

**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

**Contraindications:**
- **Urinary incontinence** not associated with full-thickness pressure ulcers
POSSIBLE COMPLICATIONS OF CATHETER USE INCLUDE:

- Allergy or sensitivity to latex
- Bladder stones
- Urinary tract or kidney infections
- Septicemia
- Hematuria
- Kidney damage (usually only with long-term, indwelling catheter use)
- Urethral injury, erosion, necrosis.
- ? Link to cancer ?
- (ICS Abrams Cardoza et al, Pg 1737)
* Single event – risk <1%
* 4 days – risk 30%
* 30 days – risk 95%
* Micro-organisms can enter the bladder through the external (extraluminal) (F) or internal surfaces of the catheter (intraluminal) (M).

Asymptomatic Bacteriuria (ASB) vs Symptomatic UTI

* Incidence of **Asymptomatic** bacteriuria as high as 60% in Intermittent Catheterization users.

* But... host develops resistance to organisms.

* Treatment: healthy lifestyle, regular CIC (<500 ml); No routine cultures or microscopy and **no prophylactic antibiotics**.
Symptomatic UTI

Lower tract Symptoms: (Seen more with CIC Caths)
* Incontinence
* Increased spasticity
* Urgency
* Frequency
* Pyuria
* Haematuria

Upper tract Symptoms:
* Temperature > 39 C
* Malaise, fatigue, chills
* Flank pain
Did You Know?

Visual inspection of urine, dividing it into clear and cloudy has a high negative predictive value of 97.3%. Stop smelling urine!
**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
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 microorganisms**
- 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.

* **Avoiding breakages** in the urinary collection system.

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

* **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**.

CAUTI Guidelines 2009
Catheter Stabilization & Friction

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

- Maximize patient comfort
  - More tolerable indwelling
  - 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)
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 (Bard, 1987; Pomfret 1996).

* Advance the catheter to the Y bifurcation. (Marsden 2001)
Ensure patient **relaxes** throughout procedure.

- Often “obstruction” particular in men is NOT BPH but Pelvic Floor contraction.

- Have patient cough if difficult catheterization.

- Try Coude catheter

- Instill sterile water into balloon SLOWLY in case incorrect positioning (in prostate!)

- When changing foley, plug catheter or instill sterile water/ NAACL so you know you are in bladder!
**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
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)
Suprapubic Catheters

- 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.
- Localised pain related to skin tags, securement issues.
Low-quality evidence suggested a **benefit of suprapubic catheters** over indwelling urethral catheters in selected populations.

- **Not used:**
  - Haematuria
  - Bladder cancer
  - Chronic unstable bladders
Suprapubic catheters

* **Dressing and tapes** should only be used when **absolutely necessary**. If a dressing is required to secure the catheter it must be **sterile** and applied using an aseptic technique. (Wilson 1995).

* Where the procedure is more permanent, the catheter should be changed every **10-12 weeks**. (Scott et al 1975, Sheriff et al 1988)

* Wait until **4 weeks** prior to the **first change** of SPC.

* Hygiene is important and once healed the site should be **washed with warm soapy** water, preferably **twice daily** (McMahon-Parkes 1998).

* **Cleaning** should be directed **away** from the insertion site.

* Talc, creams and strongly perfumed soaps should be avoided.

* Patients should be made aware of the importance of **hand washing** both before and after handling the catheter drainage system.
Always consider alternatives to Indwelling catheters if possible:

* Clean Intermittent Catheterisation
* External catheter drainage (Condom drainage)
* Products for incontinence
Clean Intermittent catheters (CIC)

- **CIC** can be *performed by patient* in comfort of home or away.

- Need to be *taught procedure* by healthcare professional initially.

- Need to be *on a schedule* (i.e. Q4H)

- Suggested *one time use* (However studies show, can be reused with care and cleaning)
As per industry standards, all disposable catheters are intended for one-time use.

However, uncoated catheters have frequently been re-used in the past because of cost or concern about the environment (Gray, 2009). (Moore KN; Fader M et al. Cochrane database 2007)

Most catheters are used with a separate lubricant, although this is a matter of personal choice as some patients may just use water or nothing. (Newman & Wein, 2009).

A national survey of intermittent catheterization practice in a Canadian spinal cord injury group (N = 912) that 74% of the sample used uncoated catheters for intermittent self-catheterization, with 53% using it only once. (Woodbury and colleagues (2008))
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
False passage, urethral trauma & abscess
When is IC required?

Is there a cut-off value for PVR measurements?

How do you know how often a pt should catheterize?

How do you know if pt should start/can stop IC? (Bladder/IC diary)

Ask patient about symptoms of obstruction (straining, “never feel empty”, hesitancy, intermittency, nocturia, weak stream, UI).
Ensure patient has good technique.

- **Safe Volumes:** Guide is <400-500 ml per catheterization. approx. 4-5 times a day.

- Should be **urodynamically and functionally** assessed with bladder diary.

- • May require **fluid advice**, management (normal requirement 30 ml/kg).

- **Ensure follow up with healthcare provider.** (Renal US, GFR; Urinalysis (proteinuria), BP (and of course adherence to CIC, impact on QOL).
For Male patients with intractable Urinary incontinence.

“Texas” Catheters, penile sheaths, condom cath., etc.

Now are clear so easier to visualise sores etc. (Silicone based)

Not in obstructed patients (i.e. BPH, Bladder neck contracture, Neurogenic bladder.)

Can be used for spinal cord injured patients for UI between CIC procedures (with care)

Very Little evidence/studies done but have shown pt preference compared to other products.
Case Study: Mr. Smith

* 78 year old male
* History:
  - Mild BPH for 8 years
  - Diabetes for 15 years
  - Uncircumcised
* Medications: Flomax
  - Proscar
  - Metformin
Case Study 1: Mr. Smith

* “Suddenly” went into urinary retention one year ago. 16 Fr Foley catheter inserted for two weeks.

* Mr. Smith had Cystoscopy which showed some narrowing through the prostatic urethra - exam was otherwise normal. Patient unable to void so new catheter inserted. Pt. placed on Flomax and Proscar. After three weeks catheter was noted to be plugging off and not draining. Catheter was flushed but again blocked so was removed and an 18Fr was inserted.

* After 6 weeks of Flomax and Proscar, Mr. Smith again had his catheter removed but was unable to void so a new 18Fr Foley was inserted.

* Foley was left insitu and changed PRN. Generally q 8-12 weeks.

* 1 year after retention began Mr. Smith went for repeat Cysto.
Case Study 1: Mr. Smith

- When the Catheter was removed for the repeat cystoscopy it was discovered that the long term catheterization had resulted in erosion of the urethra.

- Catheter removed and pt. was taught clean intermittent self catheterization (CIC) and placed on a schedule of QID and PRN

- At 1 year follow up he was doing well with CIC and there was no further progression of the urethral erosion.
Look closely! Things are not always as they appear to be!
If left insitu this could very well be the end result!

(LeBlanc & Christensen. JWOCN, 2005; 32: 131)
Encourage LOTS of fluids (Water/juices)

Keep bag OFF the floor and below level of bladder.

Keep catheter and collection tube free from kinking.

Bladder irrigations not routinely recommended (Only post op PP etc. with high bleeding rates).

Clamping not necessary

Antimicrobial bladder irrigations not recommended

Antiseptic/ antimicrobial instillations into urinary bag not recommended

From HICPAC
References


References

* Hedlund, Hjelmås, Jonsson, Klarkskov, and Talja (2001)
* De Ridder and colleagues (2005)
* Cardenas and Hoffman (2009)
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)*
Mortality Regardless of whether the urinary catheter is used for therapeutic or diagnostic purposes, catheters should only be inserted when deemed absolutely necessary, due to their association with significant morbidity and mortality.

Saint S, Kaufman SR, Thompson M et al