WOCN® Wound, Ostomy, and Continence Nurses Society®

CARE AND MANAGEMENT OF PATIENTS WITH URINARY CATHETERS: A CLINICAL RESOURCE GUIDE

A CLINICAL RESOURCE GUIDE

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Introduction and Purpose

This document was originally developed by the Wound, Ostomy and Continence Nurses Society's Clinical Practice Continence Subcommittee as a best practice guide for clinicians (Wound, Ostomy and Continence Nurses Society [WOCN], 2009). The purpose of this updated document is to provide a clinical resource for nurses and other healthcare providers based on current research, guidelines, and published expert opinion to facilitate the care and management of patients with urinary catheters.

This document provides an overview of the care and management of indwelling urethral and suprapubic catheters and intermittent urinary catheters, which are commonly used in clinical practice. Prevention and management of complications associated with indwelling catheters are also addressed. Additional information is provided about documentation, how living with a urinary catheter impacts a patient's quality of life, patient and caregiver education, and implications for future research.

Significance. At any one time in the United States, 15% to 25% of hospitalized patients, 5% to 10% of long-term care residents, and 11% of home care patients have indwelling urinary catheters (Felix, Bellush, & Bor, 2014; Hooton et al., 2010; The Joint Commission, 2011). The inappropriate use of urinary catheters in acute care hospitals ranges from 21% to 63%, and often there is no documentation of a need for the catheter (Greene, Marx, & Oriola, 2008; Meddings et al., 2014). Indwelling urinary catheters have been referred to as one-point restraints because they can impair a patient's functional ability and activity (Newman, 2012). Both short- and long-term use of urinary catheters has been associated with significant morbidity affecting the urethra, bladder, and kidneys (Table 1). Therefore, catheter use requires careful decision-making (Newman, 2012).

Table 1: Urethral, Bladder, and Kidney Morbidity Associated with Urinary Catheters (WOCN, 2009).

Urethra	Bladder	Kidneys
• Urethritis • Pressure necrosis and erosion • Perforation • Stricture • Fistula • Diverticula • Para-urethral abscess • Epididymitis, orchitis • Scrotal abscess • Prostatitis	• Bacteriuria • Cystitis, bacteremia • Hematuria • Spasms and pain • Polypoid cystitis • Perforation and/or peritonitis • Stones • Fistula • Squamous cell carcinoma • Impaired detrusor tone and urinary retention • Detrusor over-activity and urgency; frequency	• Hydroureters • Hydronephrosis • Renal pelvis stones • Pyelonephritis, urosepsis • Renal insufficiency • Chronic kidney disease • Necrosis

Selection of Urinary Catheters and Equipment

Types of Catheters

Several types of catheters are used in clinical practice that are made of varied materials, and have different features, indications for use, and advantages or disadvantages. Refer to Appendix A, B, and C for additional information about types of catheters.

Catheter material (Appendix A)**.** Short-term use catheters are usually made of plastic, polyvinyl chloride (PVC), latex rubber, or polytetrafluoroethylene (PTFE)/,Teflon-coated latex. Long-term use

catheters are usually made of silicone, silicone-elastomer coated latex, hydrophilic polymer coated latex, silver-alloy coated, and antimicrobial/antibiotic or antiseptic impregnated material. Hydrophilic polymer or hydrogel coated catheters reduce friction on insertion and may contribute to improved patient comfort and satisfaction (Gould et al., 2009; Hill et al., 2013; Hooton et al., 2010; Newman, 2012; The Joint Commission, 2011).

Catheter size (Appendix B)**.** The optimal size of the urinary catheter is influenced by multiple factors including the following: patient's age, gender, body size, presence of urethral anomalies or resistance, history of previous catheterizations, character of urinary output, and duration of the catheter. Catheter size is measured by the external diameter of the catheter and ranges from 5 French (Fr) to 30 Fr (1 Fr = 0.33 mm). Indwelling catheters have one to three lumens that facilitate drainage and irrigation. It is recommended to use the smallest bore catheter that maintains adequate urine drainage to reduce irritation and trauma to the urethra, and use catheters with a small 5 mL balloon to reduce irritation of the bladder neck and development of residual urine in the bladder (The Joint Commission, 2011).

Catheter tip (Appendix C)**.** Catheters are designed with different tips, which are selected according to the patient's needs. Catheter tips have several openings or fenestrations to facilitate drainage of urine, sediment, and blood clots. The standard or straight tip is most commonly used. The Coude or curved tip may be used for males who have difficult catheterizations due to prostatic enlargement.

Catheter balloon (Appendix C)**.** Catheter balloons are designed to retain the catheter in the bladder without occluding the urethra. Balloons are available in two sizes for routine catheter use (5 and 10 mL), but the 5 mL is the most commonly used size. The balloon must be inflated with sterile water according to the manufacturer's instructions to ensure even, circumferential filling of the balloon, which is less irritating to the trigone muscle at the base of the bladder. It is important to monitor the balloon for deflation by checking the balloon's volume and instilling extra sterile water as needed. Silicone catheters can lose fluid from the balloon due to permeability; therefore, a recent clinical practice guideline recommended checking the volume in the balloon every 2 weeks and/or as indicated clinically (Senese, Hendricks, Morrison, & Harris, 2015).

Catheter inflation and deflation valves (Appendix C)**.** A valve is connected to the funnel of the catheter for balloon inflation and deflation, and the valve is activated by a push/twist motion, which accommodates most Luer-lock or Luer-tip syringes (WOCN, 2009). The valve is made of hard or soft plastic and color-coded according to French sizes.

Drainage Bags and Systems

Drainage bags are made of clear, soft, or hard plastic. Urine drainage bags are designed for day or night time use and are available in various sizes, ranging from 500 to 2,000 mL. Closed drainage systems minimize disconnections from the catheter to prevent risks of contamination. Drainage bags can be switched between leg and night bags; some individuals connect the leg bag to the night drainage bag in order to maintain a closed system. Some night time bags are single use with no outlet tap and are emptied and discarded after they are disconnected (Wilde, Fader, Ostaszkiewicz, Prieto, & Moore, 2013). Self- contained sterile systems, designed for intermittent catheterization, are one-time use products. Use of a preconnected drainage bag and tubing system is recommended to reduce catheter-associated bacteriuria (Hooton et al., 2010). See Appendix D for additional information and examples of drainage bags/systems.

Catheter drainage valves may be used as an alternative to a drainage bag. The drainage valve is a tap- like device that fits into the distal end of the catheter in the same way as the drainage bag connects to the catheter. Release of the valve every 3 to 4 hours for drainage enables the bladder to fill and empty, similar to a normal voiding process (Geng et al., 2012). The intermittent drainage helps maintain the bladder's capacity and tone, and creates a "flushing effect" similar to normal urination. The valve facilitates greater discretion and independence for emptying the bladder. Catheter valves are contraindicated in patients who have severe cognitive impairment, overactive bladders, urethral reflux or renal impairment, limited bladder capacity, urinary tract infections (UTI), or poor manual dexterity (Geng et al., 2012).

Securement Devices
The use of a securement device is required to stabilize a urethral or suprapubic catheter and tubing to prevent traction to the catheter and trauma to the urinary meatus, urethra, or urinary stoma without restricting the patient's movement (Gray, 2008; Hooton et al., 2010; Wilson, 2013; WOCN, 2012). Leg straps and holders and other adhesive or non-adhesive fixation devices are available. See Appendix E for examples of securement devices.

Indwelling Urethral Catheterization (IUC)

Definition/Description
A urinary catheter is inserted into the urethra and advanced into the bladder allowing for the continuous, passive drainage of urine from the bladder. A balloon at the proximal end of the catheter is inflated with sterile water to hold the catheter in place (Moore & Franklin, 2016).

Short-Term Versus Long-Term Catheterization
Short-term catheterization has been described differently by varying sources as a catheter that is expected to be removed after the bladder is emptied or within 1 to 14 days of use (Joanna Briggs Institute, 2008); or the catheter is used less than 30 days (Bernard, Hunter, & Moore, 2012). Long-term catheterization is referred to as catheter use for more than 30 days (Jahn, Beutner, & Langer, 2012). Long-term catheterization is used to manage urinary retention and incontinence when other methods are not effective or practical.

Indications for IUC (American Nurses Association [ANA], n.d.; Andreessen, Wilde, & Herendeen, 2012; Gould et al., 2009; Meddings et al., 2015; Moore & Franklin, 2016; Newman, 2012):

- Severe urine retention and obstruction of urine outflow (e.g., prostate enlargement). If acute prostatitis or urethral trauma is present, consult a urologist to determine the type of catheter to use and/or for placement of the catheter (Meddings et al., 2015).
- Comfort measures for patients who are terminally ill.
- Non-healing sacral, buttock, or perineal pressure ulcers/injuries (stage III or IV) in incontinent patients.
- Perioperative use:
  - Prolonged surgery.
  - Surgeries on organs of the genitourinary tract.
  - Operative patients with urinary incontinence.
  - Hemodynamic monitoring during surgery.
- Continuous bladder irrigation for prevention of urethral obstruction from blood clots after genitourinary surgery.
- Measurement of urinary output in critically ill patients.
- Urodynamic testing.
- Imaging studies of the lower urinary tract.

Inappropriate Use of IUC

- Urinary incontinence (Gould et al., 2009; Hooton et al., 2010; Meddings et al., 2015; Newman, 2012).
- Incontinence-associated dermatitis (Meddings et al., 2015).
- Obtaining a urine culture for diagnostic tests when the patient can void (Gould et al., 2009; Meddings et al., 2015; Newman, 2012).
- Prolonged use after surgery (Gould et al., 2009; Newman, 2012).
- Staff/caregiver convenience (Gould et al., 2009; Meddings et al., 2015; Newman, 2012)

Contraindications for IUC (WOCN, 2009):

- Undiagnosed hematuria.
- Priaprism.
- Urethral trauma.
- Known/suspected untreated cancer of the bladder.

Insertion and Management of IUC

- **Preparation for insertion** (Gould et al., 2009; Hooton et al., 2010):
  - Explain the procedure to the patient and the need for a catheter; ensure consent/assent; provide privacy.
  - Ensure that healthcare providers, family members, or patients are appropriately trained and adhere to proper technique for catheter insertion and management.
  - Select an appropriate catheter.
  - Perform hand hygiene.
  - Raise the height of the bed and position the patient appropriately.
  - Cleanse the perineal skin with soap and water or a perineal cleanser.
  - Open the catheterization kit using aseptic technique and sterile equipment; arrange the supplies on a sterile or clean field.
  - Do **not** inflate the balloon to test for inflation.
  - Cleanse the meatus with antiseptic solution.
    - *Note:* Topical antiseptic solutions can be associated with local allergic reactions.
    - There is limited research comparing the use of topical antiseptics and water in cleansing the periurethral area prior to catheterization. However, studies suggest that compared to water, cleansing with topical antiseptics does not significantly reduce the risk of UTI or bacteriuria (Cheung et al., 2008; Nasiriani et al., 2009). Strouse (2012) reported that periurethral cleansing with chlorhexidine gluconate (CHG) prior to indwelling catheter insertion did not result in a significant reduction in catheter-associated urinary tract infection (CAUTI).
- **Lubrication methods for IUC insertion** (Wilson, 2013; Yates, 2015):
  - Lubricate 2 inches at the end and tip of the catheter with a water soluble lubricant, or instill the lubricant into the urethra to dilate the urethra and mucosal recesses, minimize urethral trauma, and prevent sphincter spasms.
  - Determine the need to use a lubricant containing lidocaine hydrochloride (2% often used), and if used, choose a single-use container. Instruct the patient that a stinging sensation may occur as the lidocaine gel is inserted. Cooling the gel to 4 °C (39.2 °F) before insertion may reduce the stinging. Allow 5 to 10 minutes for the anesthetic to take effect.
    - Caution is advised in using the lidocaine for patients with cardiovascular morbidity, hepatic insufficiency, or epilepsy.
    - Lidocaine is contraindicated in patients with a known allergy to the product.
    - Do not use lidocaine if there is urethral mucosal damage that could allow systemic absorption of the lidocaine.
  - The use of chlorhexidine for insertion of IUCs to prevent encrustations or CAUTI is not supported with sufficient evidence for its use, and there have been rare cases of anaphylaxis due to use of chlorhexidine gel (Kyle, 2011; Wilson, 2013; Yates, 2015).
- **Insertion technique for an IUC.**
  - The female urethra is 3 to 5 cm in length, and the male urethra is 17.5 to 22 cm long (Wilson, 2013).
  - Females.

        - Lubricate the catheter generously with gel. If an anesthetic gel is needed, allow sufficient time for the anesthetic action to take effect.
        - Insert 6 mL of lubricant into the urethra (Wilson, 2013).
        - For difficult visualization of the female urethra:
            - Use additional lighting.
            - Use an assistant to help with positioning the patient and abduct the thighs for perineal exposure.
            - Place a folded towel under the patient's buttocks to raise the hips and abduct the thighs.
    - Males.
        - If using a syringe to insert lubricant or anesthetic gel, use 11 mL of gel, and avoid force (Wilson, 2013).
        - If uncircumcised – retract the foreskin for catheter insertion, and after the insertion, replace the foreskin over the glans penis to prevent injury.
            - The penis should be held erect (60 degree angle) after insertion of the lubricating gel; if anesthetic gel is used, allow sufficient time for it to take effect.
            - Ask the patient to cough to reduce spasm of the external sphincter.
        - Apply pressure to the base of the penis just above the scrotum during insertion to direct the catheter into the urethra as it passes through the prostate area.
        - For a difficult insertion related to obstruction, use a 14 Fr or smaller size catheter, or a Coude tip catheter.
    - Patients with impaired mobility (e.g., contractures, spasms, paralysis, painful osteoarthritis):
        - Place the patient in a side-lying position and insert the catheter using a rear entry approach.
        - Use caution to prevent contamination of the catheter with fecal material.
    - Bariatric patients.
        - Use an assistant to hold up the pannus or separate the labia.
        - Consider a side-lying position.
        - May need to insert the catheter up to the bifurcation before inflating the balloon to insure it is inserted sufficiently into the bladder.
- **Confirm placement of the catheter in the bladder.**
    - Females: When urine begins to flow, advance the catheter 1 to 3 inches.
    - Males: When urine begins to flow, advance the catheter 1 to 3 inches, or if no urine flows, advance the catheter with caution to the bifurcation between the drainage port and the arm of the retention balloon.
    - Lack of urine flow:
        - Verify correct placement of the catheter.
        - Verify there is urine in the bladder with a portable, bladder ultrasound scanner.
        - Check for kinks in the tubing.
        - Assist the patient to change position.
        - Slowly inflate the balloon and monitor for any resistance/discomfort.
        - Place the drainage bag lower than the patient's bladder, but no more than 12 inches below the hips, or negative pressure may collapse the catheter tip, which if occurs, can be corrected by raising the bag slightly to reduce the negative pressure.
        - If urine still does not drain, consider irrigating the catheter with 30 mL of saline to clear debris from the catheter tip.
        - Assess the patient's hydration status and provide fluids if the patient is dehydrated.
        - If none of the corrective interventions result in urine flow, remove the catheter and notify the primary healthcare provider.

- **Balloon inflation.**
  - Inflate the balloon with sterile water according to the manufacturer's guidelines. Do not use saline or other electrolyte solutions, which can cause crystallization in the balloon's port (Smith, 2003).
  - Instruct the patient to report any discomfort or pressure. If any pressure is felt, discontinue inflation, deflate the balloon, and advance the catheter into the bladder. If the patient continues to have discomfort, deflate the balloon, remove the catheter, and contact a urology specialist.
  - After the balloon is inflated, gently tug on the catheter until resistance is felt.
  - Improper inflation can cause the catheter tip to bend and cause improper drainage, bladder spasms, and bladder irritation (Smith, 2003).
  - See Figures 15a and 15b for examples of proper and improper inflation of the balloon.
- **IUC securement.**
  - Indwelling catheters should be secured to avoid traction on the catheter, which causes irritation and trauma to the urethra (e.g., urethritis, necrosis, erosion, stricture), and/or the bladder trigone muscle resulting in pain, spasm, and incontinence (Moore & Franklin, 2016; Newman, 2012). Securement is needed to prevent inadvertent dislodgement of the catheter (WOCN, 2012).
  - A recent study found that catheter securement practices are inadequate, despite several national guidelines recommending securement (Appah, Hunter, & Moore, 2016). Appah and colleagues examined the securement practices for IUC (*N* = 44) on 21 medical and surgical units, and found that only eight (18%) of the catheters were secured. Seven of the eight catheters were secured correctly; six of eight (75%) were secured with a commercial adhesive device, which was available on 47% of the medical units and 92% of surgical units.
  - Catheter securement devices include the following products: tapes, leg straps, and adhesive and non-adhesive stabilizers or anchors (Wilson, 2013; WOCN, 2012). See Appendix E for examples of securement devices.
    - Skin barrier products may be used to ensure adhesion of securement devices (Gray, 2008).
    - Use adhesive products and tapes cautiously because adhesives can cause damage to the catheter's coating, and tape can irritate the skin leading to denudation of the epidermis or dermatitis. Adhesives should be completely removed from the external surface of the catheter to prevent colonization of microorganisms and their migration up the catheter (Hooton et al., 2010; Wilson, 2013).
    - Use caution with constricting securement devices for patients who have bleeding disorders, fragile skin, or sensitivities to adhesives (WOCN, 2012); and in patients with phlebitis, impaired circulation, and diabetes (Wilson, 2013).
  - Devices may be changed weekly and as needed, and adhesive devices should be gently removed from the skin to avoid tissue damage.
  - Monitor the urethra daily for irritation, erosion, or urine leakage; and assess the skin integrity under the securement device (Gray, 2008; WOCN, 2012).
  - Positioning of the catheter securement device: Catheters for both men and women can be secured to the abdomen or thigh as long as tension on the catheter is minimal during rest and activity (Moore & Franklin, 2016).

Special Issues/Considerations for Insertion/Care of IUC

- **Urethritis/atrophic urethritis.**
  - Use the smallest bore catheter available.
  - Apply a liberal amount of lubricant to the catheter; consider using anesthetic gel to minimize discomfort.

- **Urethral obstruction** (e.g., prostatic enlargement)**:** Use the smallest bore, Coude tip catheter and a generous amount of lubricant.
- **Iatrogenic trauma.**
  - Genitourinary trauma events have been reported in 1.5% of catheter-days (Lo, Nicolle, et al., 2014).
  - Prior to catheterization, ensure there is some urine (≥ 300 mL) in the bladder (Geng et al., 2012).
  - Minimize urethral trauma by using adequate lubricant and the smallest size catheter available (Tenke et al., 2008).
  - Secure the catheter to avoid manipulation; prevent traction trauma, erosion, or pressure necrosis of the bladder neck and proximal urethra in women; and prevent traction trauma, leading to urethral erosion and stricture, in men (Geng et al., 2012; Gray, 2008; Wilson, 2013).

Suprapubic (SP) Catheterization

Definition/Description
For SP catheterization, a urinary catheter is passed percutaneously through the anterior abdominal wall into the bladder, and is usually sited approximately 2 cm above the pubic bone (WOCN, 2011).

Advantages of a Suprapubic (SP) Catheter
- Provides an alternative to short-term, IUC to reduce the risk of catheter-associated bacteriuria (CA-bacteriuria) and CAUTI, but data are insufficient to determine if SP catheters are preferable to long-term IUC (Hooton et al., 2010; Moore & Franklin, 2016).
- Avoids urethral trauma and stricture (WOCN, 2011).
- May provide increased comfort (WOCN, 2011).
- Enhances the ability to attempt normal voiding without the need for re-catheterization (Hooton et al., 2010).
- Causes less interference with mobility and sexual activity (Chapple, Prinjha, & Feneley, 2015; Hooton et al., 2010).
- *Note:* Advantages/benefits of suprapubic catheters must be considered in light of the surgical risks associated with the procedure (e.g., potential for bleeding and visceral injury during insertion), and some patients may still leak through the urethra (Hooton et al., 2010; The Joint Commission, 2014).

Disadvantages of a SP Catheter (Anema, Schalich, Skewis, & Foster, 2014):
- Bowel perforation during insertion.
- Tip of the catheter can lodge in the urethra or bladder wall causing bleeding.
- Urethral leakage.
- Increased incidence of stone formation.
- Hypergranulation tissue may form and cause stricture at the cystostomy site.
- Altered body image.

Indications for Short-Term Use of SP Catheters (Anema et al., 2014; Hunter, Bharmal, & Moore, 2013; Moore & Franklin, 2016; WOCN, 2011):
- Acute retention of urine in men caused by prostate obstruction, infection, or stricture.
- Urinary tract or pelvic trauma.
- Disorders of the genitalia, bladder, or urethra (e.g., urethral fistula).
- Severity of incontinence that prevents healing of stage III-IV pressure ulcers/injuries.

- Management of acute urinary retention when clean intermittent catheterization is not possible.
- Surgical or acquired urethral closure.
- Some urologic procedures to allow instruments to pass via the urethra.
- Temporary diversion of urine for some gynecological, abdominal, or urological surgeries.
- Traumatic bladder rupture or persistent problems due to urethral catheters (e.g., irritation, blocking, or leakage around a urethral catheter).

Indications for Long-Term Use of SP Catheters (WOCN, 2011):

- Patients who live alone and need to manage long-term urinary incontinence or retention and are unable to self-catheterize or lack a caregiver.
- Management of a urethral closure.
- Chronic bladder drainage when no other alternative therapy is possible.
- Worsening or deterioration of an underlying disease or medical condition.
- Personal choice for conditions in which a long-term catheter is indicated.

Contraindications for SP Catheters (Anema et al., 2014; Hunter et al., 2013; Moore & Franklin, 2016; WOCN, 2011):

- Non-distended or non-palpable bladder.
- Pregnancy.
- Bladder cancer or pelvic irradiation.
- Long-term management in persons with chronic unstable bladder (i.e., detrusor instability, detrusor hyperreflexia, and intrinsic sphincter deficiency).
- Antiplatelet therapy; bleeding disorders; gross hematuria with clots.
- Abdominal wall sepsis.
- Presence of a femoral vascular graft.

Relative Contraindication for SP Catheters

- Use SP catheters with caution in the presence of excess abdominal adipose tissue if the stoma site would be concealed, which could result in suboptimal care of the site (Cottenden et al., 2009; WOCN, 2011).

Insertion and Management of SP Catheters

- **Insertion/reinsertion of the SP catheter.**
  - Initial insertion of the catheter is performed by a physician or specially trained urology specialist.
  - The new suprapubic tract matures in approximately 2 weeks, but the catheter should not be changed for 6 to 12 weeks (Harrison, Lawrence, Morley, Pearce, & Taylor, 2011).
  - A 12 to 14 Fr size catheter should be used for adult patients (Geng et al., 2012).
  - The catheter should fit snugly so it does not move around in the tract (Anema et al., 2014).
  - The exchange of an SP catheter in a well-established tract may be performed by a nurse who has been trained in the process (Anema et al., 2014).
  - Patients at risk for UTI may be treated with an antibiotic prior to the catheter exchange (Geng et al., 2012).
  - During a catheter exchange, insert the catheter within 10 minutes of removing the existing catheter because the catheter tract will close quickly (Anema et al., 2014).
  - Determine the proper length/depth to insert the new catheter: Mark the length of the existing catheter at the skin level where it exits; mark the corresponding length on the new replacement catheter to ensure it is placed at the correct depth; lubricate the tip of the catheter with water soluble gel and reinsert the catheter to the same length; and inflate the balloon

slowly to assure that the balloon is not inflated outside of the bladder (Adeyemo, Makovitch, & Foo, 2013; Vaidyanathan, Soni, Hughes, Singh, & Oo, 2011).

- **SP catheter removal.**
  - When removing a SP catheter, a "ridge" can form on the catheter's balloon resulting in a "cuffing" effect. Do not withdraw water out of the balloon, but attach a syringe and allow the water to flow out by gravity (Geng et al., 2012).
  - Consider clamping the catheter, prior to removal, to ensure there is a sufficient volume of urine in the bladder to drain with the insertion of the new catheter, and avoid a prolonged wait to confirm the placement (WOCN, 2011).
  - Have the patient take deep breaths and relax the abdominal muscles during removal and reinsertion of the catheter.
- **SP catheter care** (Anema et al., 2014; Carter, Reitmeier, & Goodloe, 2014; Geng et al., 2012; Wilson et al., 2013):
  - Use hand hygiene when handling the catheter and drainage bag, and use a separate clean collection container for emptying the drainage bag.
  - Clean the insertion site and catheter daily with soap and water; avoid aggressive cleansing, which can lead to skin irritation and local skin infection.
  - Keep dressings in place for the first month until the stoma site is healed and then dressings can be discontinued. Application of anti-microbial agents at the stoma site is not recommended.
  - Secure the catheter to the lower abdomen to prevent traction and trauma to the anterior bladder wall or skin at the insertion site, and prevent dislodgement (WOCN, 2009, 2011, 2012).
  - Monitor the stoma daily for irritation, erosion, urine leakage, and assess the skin integrity under the securement device (WOCN, 2012).
  - Observe for urine output from the catheter to make sure it is patent.
  - Perform catheter irrigations only with a physician's order. Routine bladder irrigations are not beneficial, but may be recommended in special circumstances, such as for management of blood clots or calculi blocking the catheter.
  - Empty the catheter drainage bag frequently to avoid the bag pulling on the stoma site.
  - Keep the drainage tubing below the level of the patient's bladder and free of kinks at all times to assure a constant flow of urine.
  - The catheter may be clamped so the patient can void; then check the residual urine to determine if there is a continued need for the catheter.
  - *Note:* Clamping the catheter and using anticholinergic drugs to preserve bladder capacity have not been proven to be effective for patients with long-term SP catheters (Harrison et al., 2011).

Special Issues/Considerations for Insertion/Care of SP Catheters

- **Stomal abnormalities.**
  - Stoma strictures and skin dermatitis.
  - Entero-cutaneous fistula.
  - Hypergranulation tissue, which can cover the stoma site and narrow the SP tract can be treated with topical steroids (Anema et al., 2014), or cauterized with silver nitrate as prescribed by a primary healthcare provider (WOCN, 2009).
- **Urine leakage.**
  - Leakage around the catheter can be caused by kinked tubing, positioning of the tube, or bladder spasms.

  - Maceration of tissue around the stoma from urine leakage may lead to inflammation, breakdown, and erosion.
  - Surgical closure of the urethra may be considered for urethral urine leakage.
- **Spasms and pain.**
  - Individuals may have varying pain experiences with a SP catheter.
  - It has been reported that SP catheters cause less bladder pain than urethral catheters, possibly by avoiding trigonal stimulation (Niël-Weise, van den Broek, da Silva, & Silva, 2012).
- **Injury associated with insertion and removal.**
  - Injury to the suprapubic tract and anterior bladder wall:
    - Trauma during insertion, bleeding, or infection.
    - Difficulty with reinsertion due to scar tissue or contraction of detrusor fibers as a result of traumatic removal.
  - Catheter misplacement during insertion can cause bladder or small bowel injury and perforation.
  - Urethral injury can occur when the balloon is inflated in the urethra instead of the bladder.
  - Incisional hernias may occur.

General Principles: Management of Indwelling Urinary Catheters

Routine Perineal Hygiene

- Routine daily hygiene using soap and water is appropriate for meatal care (Conway & Larsen, 2012; Geng et al., 2012; Gould et al., 2009; Hooton et al., 2010; Willson et al., 2009).
- Routine daily meatal cleansing with antiseptics (i.e., povidone-iodine solution, silver sulfadiazine, polyantibiotic ointment or cream, or green soap and water) is not recommended (Geng et al., 2012; Gould et al., 2009; Hooton et al., 2010).
- CAUTI rates have not been reduced when CHG wipes were used for routine daily patient bathing (Strouse, 2015).
- In uncircumcised males, the area under the foreskin should be cleansed daily to remove smegma, decrease trauma and ulceration to the meatus and glans penis, and reduce the risk for CAUTI.

Specimen Collection

- Prior to initiation of antimicrobial treatment for presumed UTI, obtain a urine specimen for culture and sensitivity to guide the treatment (Hooton et al., 2010). If the catheter has been in place for 2 weeks or longer at the onset of the UTI and is still indicated, replace the catheter to hasten resolution of symptoms, and obtain the culture from the freshly placed catheter (Hooton et al., 2010).
  - Obtain the specimen through the sampling port on the drainage bag (Geng et al., 2012; WOCN, 2009). First, disinfect the port with 70% alcohol, allow the port to dry, and follow standard precautions (WOCN, 2009).
  - On the laboratory requisition, indicate that the urine was obtained from an indwelling urinary catheter.

Routine Drainage Bag Care (Geng et al., 2012; Hooton et al., 2010):

- Follow standard (or appropriate isolation) precautions. Perform hand hygiene before and after manipulating the system, and use a new pair of non-sterile gloves with each patient.
- When emptying the drainage bag, use a separate, clean container for each patient and avoid contact between the tap and the container; wipe the tap with alcohol.
- Empty the drainage bag every 4 to 8 hours or when the bag is half full, and before transporting the patient.

- Place the bag in a dependent position, about 12 inches (30 cm) below the level of the hips.
  - Do not rest the bag on the floor.
  - Keep the tubing above the level of the drainage bag and free of kinks. If the tubing must be raised for an extended period of time (e.g., transporting the patient), care should be taken to prevent backflow of urine from the bag.
  - Tape the connections if there is a risk that the catheter and tubing may be disconnected (e.g., confused patient).
- Do not place additives, such as antiseptic or antimicrobial solutions in the drainage bag.
- Replace the drainage bag monthly or more frequently if there is clouding, odor, or discoloration of the drainage bag.

Drainage Bag Decontamination

- A closed system is considered the best way to prevent infection (Geng et al., 2012; Gould et al., 2009; Hooton et al., 2010), but if a closed system is interrupted, replace it with a new bag or refer to facility policies for decontamination of the drainage bag (WOCN, 2009).
- There is insufficient evidence to support either daily single use or multiuse drainage bags for the reduction of CAUTI rates (Hooton et al., 2010).
- Based on a systematic review of six studies and nine clinical guidelines that evaluated decontamination methods (i.e., tap water, acetic acid, hydrogen peroxide, bleach solutions, commercial products), Wilde, Fader, et al. (2013) concluded there was insufficient evidence to recommend any particular method for decontaminating drainage bags. While bleach solutions and a commercial product were found to decrease colony counts on the drainage bags more effectively than 0.25% acetic acid or 3% hydrogen peroxide, only one study included CAUTI as an outcome measure. Additionally, Wilde and colleagues reported that drainage bag integrity, leakage, discoloration, breakdown, stickiness, and bag longevity were not affected by reuse or cleaning with bleach solutions or commercial products.
- Preferred method for cleaning drainage bags (Moore & Franklin, 2016; WOCN, 2009):
  - Disconnect the drainage bag from the catheter; replace with a clean bag.
  - Use a soft, plastic squirt bottle to rinse the used bag with tap water and drain.
  - Cleanse the drainage bag with a dilute solution of 1 part regular household bleach (5.25% concentration) mixed with 10 parts tap water (i.e., 15 mL bleach diluted with 150 mL tap water). Instill the diluted bleach solution through the drainage tubing or top of the leg bag, and agitate the solution in the bag for 30 seconds. Drain the bleach solution, and allow the bag to air dry with the clamp open on the tap.
    - Use bleach that is not scented or concentrated.
    - When using a bleach solution, use gloves, aprons, and goggles to protect from fumes and irritation caused by contact. Also, be aware that bleach solution stains fabrics (e.g. clothing, linens, furniture, carpet, etc.).
- Alternate method for cleaning drainage bags (Moore & Franklin, 2016; WOCN, 2009):
  - Use a soft, plastic squirt bottle to rinse the bag with tap water and drain.
  - Cleanse the drainage bag with 120 mL of diluted acetic acid solution. Mix 1 part plain, white vinegar to 3 parts tap water (i.e., 30 mL vinegar diluted with 90 mL of tap water). The solution may reduce the level of bacteria in the bag; however, there is insufficient evidence for the practice.
- After cleansing, air-dry the bag. After disinfection, cap the drainage bag tubing between uses, and disinfect the end of the tubing before reconnecting it to the catheter.

Purple Urinary Bag Syndrome (Geng et al., 2012; Meekins, Ramsay, & Ramsay, 2012; Mohamad & Chong, 2013; Mumoli, Vitale, Brondi, Basile, & Cei, 2013; Sriramnaveen et al., 2016; Yaqub, Mohkum, & Mukhtar, 2013):

- A blue to purple discoloration of the urine, catheter tubing, and collection bag may be seen in some patients. Women and chronically debilitated patients have higher rates of the syndrome, and it has been associated with severe constipation.
- Others factors associated with the syndrome include asymptomatic UTI, increased dietary tryptophan, and increased urine alkalinity.
- The discoloration is thought to be due to several processes: Dietary tryptophan is metabolized into to indole in the intestine, which is later converted by the liver to indican (indoxyl sulfate, a precursor of indigo); indican is excreted by the kidney and converted to indirubin (red) and indigo (blue) by certain bacteria that produce sulfatase and phosphatase; and in the presence of alkaline urine, this mixture of pigments gives rise to the purple or blue color.
- The clinical course is generally considered benign without serious consequences. There is no evidence that the discoloration itself is harmful. Most individuals are asymptomatic. Urine cultures and antibiotics are not considered necessary unless the patient is symptomatic.
  It often resolves after treatment of the UTI and changing the catheter and collection bag.

Frequency of Catheter Changes

- Changing indwelling catheters or drainage bags at routine, fixed intervals is not recommended by national guidelines (Gould et al., 2009; Hooton et al., 2010). There is insufficient evidence that routine catheter changes reduce the risk of asymptomatic bacteriuria or CAUTI in patients with long-term catheters (Hooton et al., 2010).
- Catheters and drainage bags should be changed based on clinical indications such as infection, obstruction, or when the closed system is compromised (Gould et al., 2009).
- Patients who form encrustations that can quickly lead to an obstruction (‘blockers’) need more frequent catheter changes (i.e., weekly or twice weekly) at intervals adapted to the individual patient, and the catheter should be changed before blockage is likely to occur (Tenke et al., 2008).
  - Monitoring the time between the blockages on at least three different occasions can help determine the interval between the blockages so the catheter can be changed before the date of the expected blockage (WOCN, 2009).
  - Also testing the urine pH can help determine when the catheter might block (WOCN, 2009):
    - Test the pH of the urine three times a week for one week to establish a baseline.
    - As the time approaches when blockage is expected, test the pH more often to identify the specific pH when obstruction occurs (e.g., pH > 6.8).
    - Schedule the catheter change before the blockage is expected.
- When changing a long-term indwelling catheter, it has been recommended to leave the catheter out for at least 1 hour, but no longer than 2 hours to allow the urethral glands to drain (Tenke et al., 2008).

Catheter Removal – Routine, Difficult, and Accidental

- Urinary catheters should be removed as soon as the catheter is no longer required; there is insufficient evidence to support clamping a catheter prior to removal (Geng et al., 2012; Gould et al., 2009; Hagen, Sinclair, & Cross, 2010; Joanna Briggs Institute, 2008; Newman, 2012).
- In surgical patients, the removal of the indwelling catheter on the first postoperative day, compared to removal on the fourth or fifth postoperative day, has been associated with a lower incidence of UTI, although there was an increased risk of re-catheterization (Ercole et al., 2013).
- Routine catheter removal (WOCN, 2009):

  - Loosen the plunger of a syringe by sliding it up and down the barrel several times, and leave it pulled back approximately 0.5 mL. Connect the syringe to the balloon port, and allow the balloon to self-deflate. Wait at least 30 seconds for water in the balloon to force the plunger back, and then drain the balloon.
    - Note the amount of water returning to the syringe.
    - With slow or no deflation of the balloon, gently reinsert the syringe into the port; if the balloon still fails to deflate in the absence of kinks or traction, apply gentle, slow aspiration with the plunger.
    - Avoid deflation of the balloon by manual aspiration or cutting the valve, which can create creases and ridges that are irritating to the urethra and make removal of the catheter difficult.
  - Slowly and gently remove the catheter.
- Difficult catheter removal (Geng et al., 2012):
  - Difficult removal may be due to balloon encrustations, enlarged prostate, or scar tissue formation after surgery; management should be guided by history and assessment (WOCN, 2009).
  - Examine the balloon port by cleansing the port to remove any visible encrustation or debris.
  - If unable to deflate the balloon due to a damaged or faulty inflation valve:
    - Check the valve for evidence of damage.
    - Add 2 to 3 mL of sterile water into the inflation channel to try to dislodge the blockage.
    - Attach a syringe to the inflation channel, and leave it in place for 20 to 40 minutes so the effect of gravity will help with the deflation process. If this is unsuccessful, use a needle and syringe (inserted above the valve) to aspirate fluid from the inflation channel.
    - Wrinkling of the balloon following deflation may result in formation of a “cuff” on the balloon. Withdraw the catheter gently when the balloon is deflated; if resistance is met, stop the procedure. Re-instill 1 to 2 mL of sterile water into the balloon to remove the “cuff”, and attempt to slowly remove the catheter.
  - Inability to deflate the balloon will require referral to a physician or urology specialist for ultrasound-guided, transabdominal balloon perforation using a fine-gauge metal guide wire passed through a flexible cystoscope (Geng et al., 2012). Transrectal perforation of catheter balloons should be avoided due to the risk of sepsis (Geng et al., 2012).
  - Accidental catheter removal:
    - Secure the catheter to minimize risk of unintentional removal (WOCN, 2009).
    - Use caution during transfer or transport of the patient to prevent dislodgment of the catheter.
    - Monitor for balloon deflation. Check the amount of water in the balloon and instill extra water as needed; silicone catheters are prone to loss of fluid volume in the balloon (WOCN, 2009).

Post-Removal Catheter Care

- Implement a post-removal catheter protocol to assess the patient’s voiding pattern, ability or difficulty in emptying the bladder (e.g., dysuria, incontinence), and assess the post-void residual using a portable, bladder ultrasound or straight or intermittent catheterization, if indicated (ANA, n.d.). See Appendix F for details about assessment of bladder emptying after removal of an IUC from the ANA’s evidence-based RN tool for CAUTI prevention.
- Continence management after catheter removal.
  - Consider use of toileting programs (Morgan, Endozoa, Paradiso, McNamara, & McGuire, 2008; Newman & Wein, 2009):

        - Routine toileting: Patient is taken to the toilet every 4 to 6 hours whether or not there is a sensation to void. This schedule approximates a normal voiding routine of before and after meals, upon arising, and before bedtime.
        - Habit training: Patient is taken to the toilet on a schedule that matches their normal voiding habits after a bladder diary has been reviewed.
        - Prompted voiding for patients with altered mental status: Patient is asked every 2 to 4 hours if they are wet or dry, and then the patient is prompted and encouraged to void. Communication focuses on the positive aspects of toileting, continence, and improved bladder awareness. Praise is offered for toileting attempts and for dryness. Fluids are offered with each toileting.
    - Assess the need for devices and equipment to promote continence (Lekan-Rutledge, Doughty, Moore, & Wooldridge, 2003; Newman, Fader, & Bliss, 2004; Newman, 2012; Smith et al., 2009):
        - Bedside commode.
        - Male and female urinals.
        - Females:
            - Intravaginal devices to support the bladder and urethra: tampons, vaginal sponges, pessaries (e.g., ring, donut, gellhorn, incontinence dish or ring, ring with support), or diaphragms.
            - Bladder neck support prosthesis; vaginal continence guard.
        - Male urethral compressive devices (Cunningham clamp).
    - Determine need for incontinence management products (Lekan-Rutledge et al., 2003; Newman et al., 2004; Smith et al., 2009):
        - Absorbent products: disposable; reusable/washable.
            - Underpads, bed pads, and booster pads.
            - Pad inserts/liners in panties/briefs.
            - Pull ups/adult briefs.
        - Urinary pouch/sheath for males.
        - Male external catheters: condom catheters; external catheters that attach/adhere to the tip of the glans penis with a petal-shaped, hydrocolloid adhesive.

Bladder Ultrasound Scanning

- Use of a portable, bladder ultrasound scanner can potentially reduce unnecessary catheterizations (Gould et al., 2009; Hooton et al., 2010; Lo, Nicolle, et al., 2014; Meddings et al., 2014).
- Indications/purpose of ultrasound bladder scans:
    - To measure for retained urine volume and assess for adequate bladder emptying after removal of an indwelling catheter (ANA, n.d.; Hooton et al., 2010; Lo, Nicolle, et al., 2014).
    - To help determine the need for catheterization in patients with acute or chronic urine retention (Meddings et al., 2015), or for postoperative patients with voiding difficulty (Hooton et al., 2010).
    - To determine when to catheterize after removal of an indwelling catheter as part of a bladder training and management program for urinary retention.
- Ensure that the indications for bladder scanning are clearly stated, nursing staff are trained, equipment is cleaned and disinfected in between patients, and equipment is maintained according to the manufacturer's instructions (Lo, Nicolle, et al., 2014).

Intermittent Catheterization (IC)

Definition/Description

Intermittent catheterization (IC) is a safe and effective method to empty the bladder in patients with voiding disorders and should be considered as an alternative to short-term or long-term IUC. IC involves the use of a short, flexible catheter that is inserted through the urethra into the bladder to drain urine (Hill et al., 2013). Long-term IC is preferable to indwelling urethral or suprapubic catheters in patients with bladder emptying dysfunctions, and IC is associated with an infection risk between 0.5% and 8% (The Joint Commission, 2011).

Indications for IC

- Urinary incontinence that can be managed by IC such as overflow incontinence (Meddings et al., 2015).
- Alternative to short-term or long-term IUC to reduce CA-bacteriuria and CAUTI; however, data are insufficient to make a recommendation as to whether IC is preferable to SP catheterization for reduction of CA-bacteriuria or CAUTI (Hooton et al., 2010).
- Acute urinary retention without bladder outlet obstruction (Meddings et al., 2015).
- Acute urinary retention with bladder outlet obstruction due to noninfectious, nontraumatic diagnosis such as benign prostatic hypertrophy: If acute prostatitis or urethral trauma is present, consult a urologist to determine catheter type and/or placement (Meddings et al., 2015).
- Chronic urinary retention with/or without bladder outlet obstruction, as an alternative to an indwelling catheter (Meddings et al., 2015).
- Installation of medications into the bladder (Meddings et al., 2015).
- Collection of random urine samples for sterile or nonsterile specimens, if impossible by other collection strategies (Meddings et al., 2015).
- Assessment of post-void, residual urine volume if a bladder scanner is unavailable, and a more accurate measurement of urine volume is needed than can be determined by suprapubic fullness (Gould et al., 2009; Meddings et al., 2015).
- For management of stage III, IV, or unstageable pressure ulcers/injuries, or other types of severe wounds, that cannot be protected from overflow urinary incontinence, despite appropriate wound care and urinary management strategies (Meddings et al., 2015).
- For catheterization of continent urinary diversions through the urethra (neobladder) or the stoma (urostomy or ileoconduit).

Inappropriate Use of IC

- Hourly measurements of urine volume are required to provide treatment (Meddings et al., 2015).
- The patient can voluntarily void for collection of urine samples (Meddings et al., 2015).
- May not be an appropriate option for urinary management in patients at the end of life, due to concerns about potential discomfort from IC.
- Management of incontinence-associated dermatitis (Meddings et al., 2015).

Contraindications for IC

- High intravesical pressure, which would require continuous free drainage to avoid renal damage (Vahr et al., 2013).
- Spasticity interfering with catheterization, incontinence despite anticholinergic agents, or an unhygienic environment, which would prohibit a clean procedure (Queensland Health, 2013).
- Limited dexterity and poor technique in the absence of an appropriately trained caregiver (Queensland Health, 2013; Vahr et al., 2013).

Insertion and Management of IC

- **Insertion technique.**
  - IC is performed by inserting a short, flexible catheter (15 cm to 40 cm) into the urethral opening and advancing it into the bladder to drain the urine (Hill et al., 2013).
    - Catheter diameter sizes for IC vary from 14 Fr to 22 Fr for adults. Catheter lengths of approximately 12 inches (40 cm) are appropriate for males; females may use shorter catheters ranging from 6 inches (20 cm) up to 12 inches (40 cm), if needed for larger women (Newman & Willson, 2011).
    - The size of the catheter should be the smallest size that passes easily into the bladder and allows adequate drainage (Bortel, Hensley, Kliever, Lesher, & Newman, 2010).
  - No single technique for insertion or type of catheter material has been determined to be the best for IC, because these choices depend on the anatomical, social, and economic factors for each patient (Wyndaele et al., 2012).
    - In the acute care setting, aseptic technique and sterile equipment is recommended for IC (Gould et al., 2009; Institute for Healthcare Improvement [IHI], 2011).
    - Several national guidelines have reported no differences in the risk of bacteriuria or CAUTI between sterile or clean IC technique, use of sterile/single-use or multiple-use catheters, whether multiple-use catheters were changed daily or weekly, and use of hydrophilic or standard catheters (Gould et al., 2009; Hill et al., 2013; Hooton et al., 2010; The Joint Commission, 2011).
    - In the non-acute care setting, clean technique is an acceptable and practical alternative to sterile technique for patients needing long-term IC (Gould et al., 2009).
    - Using a clean “no-touch” technique for IC reduces microbial contamination of the catheter, but has not been proven superior to the sterile technique (Hooton et al., 2010).
  - A moist towelette or non-irritating soap and water can be used to wash the hands and urethra before and after IC; there has been no proven benefit from any particular type of meatal care (Gould et al., 2009; The Joint Commission, 2011).
  - Only properly trained patients or care providers should perform IC to reduce the risk for cross-infection (Gould et al., 2009).
  - Routine antibiotic prophylaxis is not recommended (Tenke, Köves, & Johansen, 2014).
- **Frequency of IC.**
  - Perform IC at regular intervals (4 to 6 times per day) to empty the bladder, prevent overdistention of the bladder (< 500 mL), help protect the kidneys from reflux, prevent incontinence, reduce the risk of bacterial growth/infection, and reduce stone formation by promoting good drainage, while lowering pressure inside the bladder (Gould et al., 2009; Hill et al., 2013).
  - Using a portable, bladder ultrasound scanner to estimate bladder volume and help determine the frequency needed for IC has been found to reduce incontinence, the number of catheterizations, and cost (Gould et al., 2009; Hill et al., 2013; Hooton et al., 2010).
- **Catheter types for IC.**
  - Data are insufficient to determine whether the incidence of UTI is affected by a specific type of catheter or technique; use of single (sterile) or multiple-use (clean) catheters; or the method of cleaning multiple-use catheters (Gould et al., 2009; Hill et al., 2013; Hooton et al., 2010; Prieto, Murphy, Moore, & Mader, 2014).
    - Only standard PVC catheters can be reused after washing with soap and water (Hill et al., 2013).
    - A guideline from Hill et al. (2013) indicated that multi-use catheters can be washed with soap and water, air-dried, stored in a clean, sealed plastic bag or container; and may be reused for up to four subsequent catheterizations.

        - Hakansson (2014) conducted a recent review of the literature and reported that overall there is a lack of consensus on reuse of catheters and no uniform agreement on cleaning procedures; practices vary from single use in some settings to reuse of the catheter for 1 to 7 days or longer.
        - Procedures shown to reduce bacterial contamination of reused catheters (e.g., rinsing with water after use, air-drying and keeping the catheter dry until reuse; microwaving; soaking in hydrogen peroxide, bleach, or betadine) have not been proven to prevent CA- bacteriuria or CAUTI (Gould et al., 2009; Hooton et al., 2010).
    - Hydrophilic catheters may reduce friction on insertion and are associated with increased patient satisfaction (Gould et al., 2009; Hill et al., 2013; Hooton et al., 2010; The Joint Commission, 2011). However, current data are insufficient to support the routine use of hydrophilic catheters to reduce CA-bacteriuria or CAUTI (Hill et al., 2013; Hooton et al., 2010; Tenke et al., 2014).
- **Complications of IC.**
    - IC is widely viewed to be associated with fewer complications compared to IUC (Gould et al., 2009; Hooton et al., 2010; Wyndaele et al., 2012).
    - IC-related UTI rates vary in published studies according to the technique used, definitions of UTI, methods of evaluation, and patient characteristics.
- **Barriers/challenges to IC.**
    - The method and type of catheterization must be matched to the patient's preferences and their ability to maintain cleanliness and access facilities that enable them to catheterize frequently and in a sanitary manner (Hill et al., 2013).
    - Barriers include educational and motivational issues for the patient, the amount of time required for staff to educate the patient for successful implementation of IC (Hooton et al., 2010), and patient discomfort and caregiver burden (Meddings et al., 2015).
    - Specific challenges for the patient in performing IC may include:
        - Inadequate/inaccessible bathroom facilities (Hill et al., 2013).
        - Inconvenience or difficulty in cleaning catheters; individual feels it is unaesthetic to carry and/or reuse catheters.
        - Cost and/or lack of optimal supplies (Hill et al., 2013; Wilde, Fairbanks, et al., 2015).
        - Inability or unwillingness to perform frequent catheterizations (Hooton et al., 2010).
        - Anatomical constraints: urethral strictures, false passages, or bladder neck obstruction (Hooton et al., 2010).
        - Physical limitations: upper extremity impairment, visual problems, or difficulty in positioning (females).
        - Co-morbid conditions: inability to feel the catheter being inserted, spasticity, and obesity (Hooton et al., 2010).

Prevention and Management of Catheter Complications

Catheter-Associated Urinary Tract Infection (CAUTI)

- **Definition/description.**
    - CAUTI is the most important adverse outcome of urinary catheterization: Most infections occur after placement of the "convenient, often unnecessary, and easily forgotten urinary catheter" (Meddings et al., 2014).
    - CAUTI refers to urinary tract infections in which the patient is currently catheterized or was catheterized within the previous 48 hours before onset of the infection, and has at least one sign or symptom (i.e., fever, costovertebral angle pain, suprapubic tenderness, dysuria, urgency, frequency) that is not attributable to an alternate source (Centers for Disease Control and Prevention [CDC], 2016; Hooton et al., 2010).

        - There is no minimum period of time that the catheter must be in place for the UTI to be considered catheter-associated (CDC, 2016; Greene et al., 2008).
        - Bacteriuria is a nonspecific term that refers to UTI and asymptomatic bacteriuria combined, and in the CAUTI literature, CA-bacteriuria is most commonly asymptomatic (Hooton et al., 2010). See Appendix G for CDC's algorithm for identifying asymptomatic and symptomatic CAUTI (CDC, 2016).
- **Burden/significance of CAUTI.**
    - The daily risk of CAUTI is 3% to 10%, with higher rates in women and older adults (Hooton et al., 2009; Nicolle, 2014; The Joint Commission, 2014).
    - The majority of healthcare-acquired UTIs are due to CAUTI (CDC, 2016), and many are preventable (American Urological Association [AUA], 2014; The Joint Commission, 2014). CAUTI accounts for over 30% of healthcare-acquired infections in acute care hospitals and almost 40% in all healthcare settings (The Joint Commission, 2014).
    - CAUTI is associated with increased morbidity and mortality, unnecessary use of antimicrobials, development of multi-drug resistant organisms and *Clostridium difficile* infections, longer hospital stays, increased costs, and lower quality of life (CDC, 2016; Gould et al., 2009; Greene et al., 2008; Lo, Nicolle et al., 2014; The Joint Commission, 2014).
        - CAUTI can increase a hospital stay from 0.4 days to 2 days, with additional average expenses of $3,803 per episode (Greene et al., 2008).
        - CAUTI mortality rate is 14% to 19% and accounts for over 13,000 deaths annually (CDC, 2016; The Joint Commission, 2014).
        - Patients with UTIs are three times more likely to die than patients without infections (The Joint Commission, 2014).
- **Risk factors for CAUTI.**
    - Many risk factors for CAUTI are modifiable and potentially preventable. It is important to minimize the use and duration of urinary catheterization in all patients, but especially those at higher risk for CAUTI-related morbidity and mortality such as women, the elderly, and individuals with impaired immunity (Gould et al., 2009; Lo, Nicolle, et al., 2014).
    - Modifiable and non-modifiable risk factors for CAUTI are summarized in Table 2.

Table 2. Modifiable and Non-Modifiable Risk Factors for CAUTI (Chenoweth & Saint, 2013; Gould, n.d.; Newman, 2012; Nicolle, 2014; The Joint Commission, 2014; Tsuchida et al., 2008).

Modifiable Risks for CAUTI	Non-Modifiable Risks for CAUTI
• Meatal contamination. • Limited professional training of the individual inserting the catheter. • Duration of the catheterization. • Increased number of hospital days before detecting bacteriuria. • Fecal incontinence. • Disconnection of the system.	• Female gender; older age. • Impaired immunity: immunosuppressant therapy within 2 weeks; corticosteroids within 7 days. • Antibiotics within 3 days. • Smoking within the past 5 years. • History of malignancy. • Diabetes mellitus. • Renal disease. • Neutropenia

- **CAUTI pathogenesis.**
    - Microorganisms can enter the bladder via the catheter in two ways: intraluminal due to contamination of the catheter tip during insertion, or extraluminal where organisms ascend into the bladder from the meatus, rectum, and/or vagina (Gould, n.d.).

- Up to 20% of patients will be colonized immediately after catheter insertion as a result of poor insertion technique, with women at higher risk for extraluminal colonization (Tenke et al., 2008).

- **Clinical presentation of CAUTI.**
  - Patients with CAUTI may not manifest the classic signs and symptoms of UTI; therefore, signs and symptoms have a low predictive value (Hooton et al., 2010; Tambyah & Maki, 2000).
    - Many catheterized patients with bacteriuria are asymptomatic. Foul smelling urine and cloudy urine are not diagnostic for CAUTI.
    - Catheterized patients should be thoroughly evaluated for the source of signs and symptoms before attributing them to the urinary tract.
  - Atypical presentation of CAUTI in older adults.
    - Nonspecific clinical manifestations may include cognitive changes, lethargy, anorexia, weakness, tachycardia, hypotension, and increased respiratory rate (AUA, 2014; Balogun & Philbrick, 2014; High et al., 2009; Midthun, 2004).
    - Older adults may present with a delayed, muted or absent fever response, or hypothermia.
      - Fever (i.e., oral temperature > 38 °C/100.4 °F) may not be evident due to age-related changes in thermoregulation and lower baseline temperatures; medications (e.g., corticosteroids, antipyretics, chemotherapy, antibiotics); and medical conditions such as hypothyroidism, renal insufficiency, malnutrition, and alcoholism (High et al., 2009; Midthun, 2004; Tenke et al., 2008).
      - Afebrile response may be indicated by various alterations in temperature: temperatures equal to/greater than 100 °F (37.8 °C); a 2 °F increase (1.1 °C) over baseline; an oral temperature equal to/greater than 99 °F (37.2 °C); or a rectal temperature equal to/greater than 99.5 °F (37.5 °C) on repeated measurements (High et al., 2009; Midthun, 2004).
  - Bacteremic CAUTI and sepsis.
    - CAUTI is often overlooked as a cause of secondary bloodstream infections.
    - The prevalence of bacteremia is low (1% to 4%), but all-cause 30-day mortality is 15% and is influenced by other comorbid diseases (Fortin, Rocher, Frenette, Tremblay, & Quach, 2012; Nicolle, 2014; The Joint Commission, 2014).

- **CAUTI prevention strategies.**
  - It is estimated that 17% to 69% of CAUTIs (380,000 infections) and 9,000 deaths due to CAUTI could be prevented annually with implementation of CAUTI prevention strategies (Rebmann & Greene, 2010; The Joint Commission, 2014).
  - The most important strategies to prevent CAUTI are avoiding unnecessary use of urinary catheters and removing them as soon as indicated (Chenoweth & Saint, 2013; Meddings et al., 2014).
  - CAUTI prevention strategies focus on using a urinary catheter for appropriate indications, proper maintenance, and early removal. The lifecycle of a urinary catheter involves four stages that can be targets for interventions to reduce catheter use and CAUTI: catheter insertion, catheter care, catheter removal, and catheter reinsertion (Meddings & Saint, 2011; Meddings et al., 2014).
  - Table 3 provides an overview of key CAUTI prevention strategies.

Table 3. Key CAUTI Prevention Strategies (Chenoweth & Saint, 2013; Gould, n.d.; Gould et al., 2009; Meddings & Saint, 2011).

Core Strategies	Supplemental Strategies	Quality Improvement Strategies
• Insert catheters only for appropriate indications; limit unnecessary catheter use. • Leave catheters in place only as long as needed and discontinue as soon as possible. • Insure only properly trained persons insert and maintain catheters. • Insert catheters using aseptic technique and sterile equipment. • Maintain a closed drainage system. • Maintain an unobstructed flow of urine. • Use hand hygiene and follow standard (or appropriate isolation) precautions.	• Consider alternatives to indwelling urinary catheterization (e.g., intermittent catheterization, external catheters, gender-appropriate collection devices, toileting programs, absorbent products). • Use portable, bladder ultrasound scanners to reduce unnecessary catheterizations and determine the need for re- catheterization after removal of a catheter. • Consider use of antimicrobial/antiseptic impregnated catheters if CAUTI rates are not decreasing after first implementing the core strategies for use, insertion, and maintenance.	• Implement a system of alerts or reminders to identify all patients with urinary catheters, and assess the need for continued catheterization. • Use protocols for catheter insertion. • Utilize reminders to review the continuing use of catheters, and/or provide prompts for removal of catheters. • Implement guidelines and protocols for nurse-directed removal of unnecessary catheters. • Use portable, bladder ultrasound scanners to assess and manage urinary retention. • Implement systems for documentation and infection surveillance programs. • Conduct audits, and provide feedback regarding compliance with practice guidelines. • Provide continuing education and training to healthcare personnel. • When patients are discharged or transferred with an indwelling urethral catheter, document the reason for the catheter, indications for continued use, and a date for removal or review by a clinician.

- Other CAUTI preventive strategies:
  - Consider using plain bathing wipes instead of bath basins in healthcare facilities (Strouse, 2015):
    - Strouse reported that bath basins have been shown to be a source of bacteria that can lead to CAUTI and other hospital-acquired infections.
    - Alternatives to basin baths, such as routine patient bathing with CHG wipes or baths, have not lowered the incidence of CAUTI in adults in ICUs, burn, trauma, or medical and surgical units.

- Bladder bundles: Evidence-based practices to prevent CAUTI have been successfully implemented as bladder bundles.
  - Implementation of a bladder bundle involves education to improve appropriate catheter use, catheter restriction and removal protocols, skill in catheterization technique; and use of technologies such as portable, bladder ultrasound scanners (Andreessen et al., 2012; Felix et al., 2014; Meddings et al., 2014; Newman, 2012; Saint et al., 2009).
  - Example of a CAUTI prevention bundle is the ABCDE approach (Chenoweth & Saint, 2013; Meddings et al., 2014):
    - **A**dherence to infection control principles (i.e., hand hygiene, surveillance and feedback, aseptic insertion, proper maintenance, education).
    - **B**ladder ultrasound may avoid indwelling catheterization.
    - **C**ondom or intermittent catheterization in appropriate patients.
    - **D**o not use the indwelling catheter unless you must.
    - **E**arly removal of the catheter using reminders or stop orders as warranted.
- Additional information and recommendations about CAUTI prevention are available from the following resources:
  - CDC and Healthcare Infection Control Practices Advisory Committee (HICPAC) Guidelines for CAUTI prevention (www.cdc.gov/hicpac/pdf/CAUTI/CAUTIguideline2009final.pdf).
  - Agency for Healthcare Research and Quality: Toolkit for reducing CAUTI in hospitals (www.ahrq.gov/professionals/quality-patient-safety/hais/tools/cauti-hospitals/index.htm).
  - American Nurses Association CAUTI prevention tool: Streamlined Evidence-Based RN Tool: Catheter-Associated Urinary Tract Infection (CAUTI) Prevention (www.nursingworld.org/ANA-CAUTI-Prevention-Tool). See Appendix F for a copy of ANA's tool.

- **Treatment of CAUTI.**
  - Antimicrobial treatment is recommended only for symptomatic infections and according to sensitivities of the pathogens (Gould et al., 2009; Meddings et al., 2014; Tenke et al., 2008).
    - Consider replacing or removing the catheter before starting antimicrobial therapy if the catheter has been in place for more than 7 days (Tenke et al., 2008). There is no evidence of harm from catheter removal strategies (Meddings et al., 2014).
    - Antimicrobial treatment is not recommended for asymptomatic CA-bacteriuria, except, in certain circumstances such as prior to invasive urinary tract interventions (Lo, Nicolle, et al., 2014; Tenke et al., 2008).
    - Antifungal therapy is not indicated for asymptomatic candida infection, but removal of the catheter should be considered (Tenke et al., 2008).
    - Bladder instillations of antimicrobials are not recommended (Hooton et al., 2010).
    - Bacterial interference using bladder inoculation with low virulent non-pathogenic bacterial strains (e.g., *Escherichia coli* and *Lactobacillus*) to reduce symptomatic CAUTI in long-term catheterization requires further research (Darouiche & Hull, 2012; Gould et al., 2009).
    - Management of fecal incontinence may reduce CAUTI (Tsuchida et al., 2008).
    - Consider using antimicrobial/antiseptic–impregnated catheters if the CAUTI rate does not decrease after implementing a comprehensive CAUTI prevention program (Gould, n.d.; Gould et al., 2009).
- **CAUTI surveillance** (Gould et al., 2009)**.**
  - Routine screening of catheterized patients for asymptomatic bacteriuria is not recommended.
  - Consider surveillance for CAUTI when indicated by facility-based risk assessment.
    - Identify the patient groups or units on which to conduct surveillance based on the frequency of catheter use and the potential risk of CAUTI.

        - Use standardized methodology for performing CAUTI surveillance:
            - Examples of metrics to use for CAUTI surveillance include: number of CAUTI per 1,000 days; number of bloodstream infections secondary to CAUTI per 1,000 days; and catheter utilization ratio (urinary catheter days/patient days) times 100.
            - Additional information/guidance for conducting surveillance is available from the CDC/National Healthcare Safety Network (www.cdc.gov/nhsn/acute-care- hospital/cauti/index.html), and U.S. Department of Health & Human Services (HHS) Action Plan to Prevent Healthcare-Associated Infections (www.health.gov/hcq/prevent-hai.asp).
    - When performing surveillance for CAUTI, consider providing regular (e.g., quarterly) feedback about unit-specific CAUTI rates to nursing staff and other appropriate clinical staff.

Obstruction

- **Description:** Partial or complete blockage of the catheter that prevents urine from flowing though the catheter.
- **Causes/contributive factors.**
    - External interference.
        - Kinked tubing.
        - Collection bag above the level of the bladder.
        - Constipation and fecal impaction.
        - Enlarged prostate, epididymitis, prostatitis, and scrotal abscess.
    - Internal obstruction.
        - Blood clots.
        - Stones.
        - Encrustation and blockage (Nicolle, 2014; Stickler & Feneley, 2010).
        - More than 50% of patients with urinary catheters develop catheter encrustation and blockage. Patients requiring frequent re-catheterization due to encrustation and blockage are identified as “blockers”.
    - Biofilm.
        - Biofilm is an accumulation of bacteria, host cells, and cellular byproducts in a dense matrix that forms within 1 to 2 days of catheter insertion (Greene et al., 2008; Hooton et al., 2010; Stickler & Feneley, 2010).
        - Biofilm protects bacteria from antimicrobials, antiseptics, mechanical flushing by urine flow, and the body’s immune responses (Tenke et al., 2008; The Joint Commission, 2014).
        - Mature biofilms are dynamic and polymicrobial and may not reflect the bacterial population within the bladder (Hooton et al., 2010).
        - Bacteria within biofilm are highly resistant to antimicrobials due to genetic alterations and are reported to be resistant to three or more drugs (Chatterjee, Maiti, Dey, Kundu, & Dey, 2014).
        - Common organisms in biofilms such as *Proteus* species, *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, and *Providencia* species have the ability to hydrolyze urea in the urine to free ammonia, which increases the urine pH (Hooton et al., 2010). Crystallization of minerals in alkaline urine yields formation of struvite (magnesium ammonium phosphate) and apatite (calcium phosphate) deposits in the biofilm leading to encrustation, restricted flow, formation of stones, and blocked catheters (Hooton et al., 2010; Stickler & Feneley, 2010).
- **Prevention and treatment.**
    - Insure an unobstructed flow of urine.

    - Elevation of the catheter bag to lower pressure within the bladder urothelium may reduce the risk of polypoidal inflammation and blockage (Geng et al., 2012).
    - If obstruction is anticipated (e.g., bleeding after prostatic or bladder surgery), closed continuous bladder irrigation is suggested to prevent obstruction (Gould et al., 2009).
    - Intermittent drainage every 2 to 4 hours reduces the rate of catheter blockage compared to continuous flow (Geng et al., 2012).
- Reassess the type of catheter material.
    - All catheter materials (e.g., silicone, silver alloy coated, silicone coated, hydrogel coated, latex) are vulnerable to biofilm formation (Stickler & Feneley, 2010).
    - If it is likely that the catheter material is contributing to obstruction, change the type of catheter (Gould et al., 2009).
    - Silicone catheters (100%) might be preferable to other materials to reduce the risk of encrustation in long-term catheterized patients with frequent obstruction (Geng et al., 2012; Gould et al., 2009). Decreased frequency of obstruction with a silicone catheter may be due to its larger lumen (Geng et al., 2012).
- Consider the need for antimicrobial treatment.
    - Antibiotics to eliminate *Proteus mirabilis* as soon as it appears in the catheterized urinary tract could reduce encrustation, blockage, and stones (Stickler & Feneley, 2010).
    - For patients who are chronic blockers and stone formers, antibiotic treatment is unlikely to be effective since crystalline biofilm is resistant to penetration (Stickler & Feneley, 2010).
    - Do not use systemic antimicrobials routinely to prevent CAUTI in patients requiring short- or long-term catheterization, except when clinical indications exist such as bacteriuria upon catheter removal post urologic surgery (Gould et al., 2009).
- Consider if catheter irrigation is appropriate.
    - Catheter irrigation with antimicrobials, saline, or acidic solutions should not be performed routinely to reduce CAUTI or obstruction in patients with short- or long-term catheterization due to insufficient evidence (Gould et al., 2009; Hagen et al., 2010; Hooton et al., 2010).
    - Catheter irrigation with antimicrobials may be considered in selected patients who undergo surgical procedures and short-term catheterization to reduce CA-bacteriuria (Hooton et al., 2010).
    - The catheter should be replaced prior to initiating antimicrobial therapy for a patient with symptomatic UTI (Hooton et al., 2010; Nicolle, 2014).
    - Prophylactic antimicrobials given systemically or by bladder irrigation should not be administered routinely at the time of catheter placement or replacement to prevent CAUTI (Hooton et al., 2010).
- Ensure adequate fluid intake (Geng et al., 2012):
    - Adequate fluid intake keeps urine diluted, flushes the bladder, and helps maintain the pH to decrease the risk of encrustation and blockage.
    - The goal for fluid intake should consider the amount of fluid loss, food intake, and circulatory and renal system function.
    - Ensure a consistent fluid intake: 30 mL per kg per day (approximately 2 L/day) to achieve a urine specific gravity of 1.015 or less (Frassetto & Kohlstadt, 2011; Stickler & Feneley, 2010), and a urine output of 50 to 100 mL/hour (Geng et al., 2012).
    - Avoid long intervals without intake of fluids (Frassetto & Kohlstadt, 2011; Stickler & Feneley, 2010).
    - *Note*: Intake of bladder irritants including caffeine and artificial sweeteners may contribute to bladder irritation, inconsistent urine production, and dehydration.

- Lower urine pH.
  - Lower the urine pH to less than 7 with diet or supplementation (Frassetto & Kohlstadt, 2011). Data are insufficient to recommend the best way to achieve low urinary pH (Hooton et al., 2010).
  - Options to lower urine pH include:
    - Betaine hydrochloride, 650 mg orally three times per day with meals (Frassetto & Kohlstadt, 2011).
    - Citrate supplements and increased fluids (Stickler & Feneley, 2010).
    - Lemon juice supplements (Geng et al., 2012).
    - Cranberry products: There is insufficient evidence to support the use of cranberry products to reduce CA-bacteriuria or CAUTI in patients with neurogenic bladders managed with intermittent or indwelling catheterization (Hooton et al., 2010).
- Consider use of methenamine salts (methenamine hippurate or methenamine mandelate preparations).
  - Methenamine salts should not be used routinely to reduce bacteriuria or CAUTI in patients with long-term intermittent or indwelling urethral or suprapubic catheterization (Hooton et al., 2010).
  - Methenamine hippurate may be effective for preventing UTI in patients, particularly for short-term prophylaxis (Lee, Bhuta, Simpson, & Craig, 2012; Lo, Hammer, Zegarra, & Cho, 2014).
  - If using methenamine, urine pH should be maintained below 6.0 (Hooton et al., 2010).
  - Further research is needed on the use of methenamine in prevention of encrustation in patients at high risk for blockage (Gould et al., 2009).
  - Prevention of struvite stones (magnesium ammonium phosphate) with acetohydroxamic acid, 15 mg per kg in three or four divided doses per day may be helpful (Frassetto & Kohlstadt, 2011).

Bypass Leakage

- **Description:** Leakage of urine around the catheter from bladder contractions expelling urine.
- **Causes/contributive factors.**
  - Obstructed urine flow due to kinking or twisting of the catheter or drainage tubing.
  - Blockage of the catheter lumen from encrustation or stones.
  - Urethral damage from traumatic insertion or removal of the catheter, balloon inflation in the urethra, frequent insertions, or long-term use.
  - Bladder spasms and pain.
- **Prevention and treatment.**
  - Secure the catheter and drainage tubing to maintain unobstructed flow.
  - Downsize to a smaller sized catheter (< 18 Fr).
  - Fill the balloon appropriately according to the manufacturer's instructions to avoid under- or over-filling.
  - Consider treatment with anticholinergic medications.
  - Establish a bowel program to prevent constipation.

Catheter-Related Bladder Discomfort (CRBD)

- **Description.**
  - CRBD may be experienced during short- and long-term catheterization and after urologic surgery (Bai et al., 2015).
  - Symptoms include sensations of suprapubic, urethral, and bladder burning and pain, the urge to void, and bladder spasms (Bai et al., 2015; Wilde et al., 2010; Wilde, McDonald, et al., 2013).

- **Causes/contributive factors.**
  - Intra-urethral pressure from the catheter.
  - Catheter material or size (e.g., large lumen catheter > 18 Fr).
  - Large balloon (30 mL) or partially filled balloon.
  - Manipulation and traction of catheter, and/or its position (e.g., sitting on catheter).
  - Technique or procedure for catheter change.
  - Concentrated urine.
  - Local bladder irritation.
  - Bladder stones.
  - Constipation and fecal impaction.
- **Prevention and treatment.**
  - Change to a smaller sized catheter such as a 16 Fr or 12 Fr, and/or use a catheter with a different type of material.
  - Secure the catheter and tubing to prevent traction.
  - Fill the balloon according to the manufacturer's instructions.
  - Establish a bowel program to prevent constipation.
  - Maintain adequate fluid intake to achieve dilution of the urine (Frassetto & Kohlstadt, 2011).
  - Consider medications to prevent/reduce spasms/pain:
    - Antispasmotic/anticholinergic medications reduce the incidence and severity of spasms and pain in short- and long-term catheters (Agarwal et al., 2006; Bai et al., 2015; Geng et al., 2012; Nazarko, 2007; Tenke et al., 2008).
    - Some medications such as Ketamine and botulinum toxin A have been used in other countries, but in the United States, the use of these drugs would be considered off label:
      - Ketamine at a sub-anesthetic dosage (i.e., 250 mcg/kg IV) has been shown to reduce the severity and incidence of bladder pain in the postoperative setting (Agarwal et al., 2006; Geng et al., 2012).
      - Intra-detrusor injections of botulinum toxin A might be of benefit if anticholinergic medications fail (Geng et al., 2012).

Skin Breakdown

- **Description:** Irritation or breakdown may occur in the periurethral/perineal area and/or in areas where the catheter and drainage tubing are placed or secured.
- **Causes and contributive factors.**
  - Sensitivity to the catheter's material.
  - Urine leakage.
  - Wetness/moisture from the catheter.
  - Positioning of the drainage tubing or catheter straps on the skin.
  - Yeast/fungal infection.
- **Prevention and treatment.**
  - Use hypoallergenic catheter materials.
  - Cleanse and protect the skin (e.g., barrier ointments).
  - Treat yeast or fungus.
  - Consider alternate methods for securing the catheter and drainage tubing.
  - Secure the catheter and drainage tubing in areas that will not cause pressure or tension when changing position.

Documentation of Catheterization and Catheter Care

Documentation requirements regarding catheterization and catheter care depend on the setting. Documentation can be completed using a checklist or hand written progress notes. Complete, accurate, and timely documentation is essential to evaluate the clinical effectiveness of nursing interventions.

Evidence-based guidelines provide sample documentation forms and policies to assist the health care provider (ANA, n.d.; Bernard et al., 2012; IHI, 2011; Lo, Nicolle, et al., 2014; The Joint Commission, 2011).

- **Routine documentation.**
  - Type of catheter in place; date of last catheter change.
  - Color, clarity, character, odor, and amount of urine.
  - Presence/absence of bladder urethral discomfort, pain, or spasms.
  - Signs or symptoms of infection: change in urine, suprapubic pain, costovertebral pain or tenderness, bladder spasms, or altered mental status.
  - Hydration goals and status.
  - Type/location of anchoring device.
  - Presence/absence of problems (e.g., leakage, blockage).
  - Patient/caregiver education and response to education; skill and competence.
- **Documentation of catheter insertion.**
  - Indication for catheter, date and time of insertion; type and size of catheter (i.e., material, balloon size, amount of fluid instilled in the balloon); and type/amount of anesthetic gel, if used for insertion.
  - Indicate if this is the initial insertion or replacement of an existing catheter. If an existing catheter is replaced, describe the condition of the catheter upon removal (e.g., encrustations, obstructed).
  - Alterations in perineal anatomy and skin integrity.
  - Difficulty or complications with insertion.
  - Color, characteristics, and amount of urine returned.
  - Type/location of the anchoring device.
  - Type of drainage collection device.
  - Patient/caregiver education and response.
- **Suprapubic catheter (additional considerations).**
  - Difficulties encountered with catheter insertion (e.g., pseudo tract).
  - Condition of tissue and surrounding skin (e.g., hypergranulation).
  - Duration between catheter changes.
- **Intermittent catheterization (additional considerations).**
  - Technique used and asepsis.
  - Difficulties with self-care.
  - Adaptation and psychosocial status.

Living with a Urinary Catheter: Implications for the Patient's Quality of Life

Individuals with voiding dysfunctions must learn to live with an indwelling catheter or intermittent catheterization as part of their normal routine (Fowler, Godfrey, Fader, Timoney, & Long, 2014; Chapple et al., 2015; Wilde, Fairbanks, et al., 2015). Living with a catheter can have a negative effect on a patient's quality of life. Accepting and adjusting to the catheter may take months, and is influenced by several factors: reasons for the catheterization; involvement of the individual in decisions about the catheter; development of difficulties or complications; and the level of support from family and

significant others. Although the need and benefits of the catheter may be acknowledged, living with a catheter presents many challenges such as the following:

- Aesthetics: anxiety and concerns about urine odor, reliability of the catheter (e.g., leakage and being wet in public), and visibility of the catheter and/or the drainage bag.
- Privacy: bathroom accessibility and managing the catheter away from home.
- Psychological distress: difficulty expressing feelings about the catheter, problems with intimacy, threatened self-image, shame and embarrassment, and social isolation.
- Skill competence: difficulty mastering the skills needed to perform catheterization or catheter care, time management, and dependence on others.
- Pain and/or discomfort from trauma to the urethra or bladder irritation.
- Frustration with managing complications (e.g., CAUTI, spasms, autonomic dysreflexia, leakage, blockage, skin irritation or breakdown).
- Lifestyle: Limitations on activity and social endeavors, maintaining adequate and consistent fluid intake, and adverse effects on sleep.

It is important for healthcare providers to be sensitive to the needs of individuals who require catheterization. It is necessary to educate, guide, and support the individual and their caregivers through the adjustment phase to increase their understanding about catheterization. Several measures can be used by healthcare providers to support and help individuals adjust to a new lifestyle and their perception of themselves (WOCN, 2009):

- Help the patient recognize that catheterization is invasive and can be an uncomfortable and distressing experience; acknowledging these feelings can help the individual overcome a sense of vulnerability.
- Help patients explore and discuss factors such as self-image, sense of control, comfort, and the desire for intimacy.
- Reassure the patient/caregiver of their ability to care for the catheter to foster their adjustment, promote a sense of empowerment, and encourage healthy behaviors.
- Discuss how to incorporate the catheter into everyday life and adapt to social needs (e.g., work, recreational activities, travel, and bathroom issues). Assist patients/caregivers in problem solving and planning for different scenarios when traveling: “Map” the location of bathrooms at social venues, plan clothing needs prior to social outings, and pack a bag to take extra supplies.
- Be open to discuss issues related to sexuality. Introduce the topic if the individual does not mention it. Ask if the individual has questions, and let them know you will get back to them if you do not know the answer.
- Assist in locating support groups.

Patient/Caregiver Education

It is important to provide patients and caregivers with written and verbal, and/or web-based information on appropriate techniques for management of the catheter, bladder health, and prevention of complications (Hill et al., 2013; Pickard et al., 2012; Wilde, McDonald, et al., 2013; Wilde, McMahon, et al., 2015; Wilde, Fairbanks, et al., 2015). Many individuals and their families will benefit from guidance and assistance to access web-based sites that provide appropriate education regarding urinary catheterization and tools for self-management.

- Provide self-monitoring tools (e.g., diary, checklists) to reinforce healthy practices and show trends that warn of impending complications.
- Instruct in routine care:
  - Help the patient select the appropriate supplies to meet their healthcare needs and that are within their financial limitations. Instruct where/how to obtain supplies. Help the patient stay up-to-date on new products, and retail or mail order sources for supplies.

  - Frequency for changing the catheter and drainage bag; identify who changes the catheter and drainage bag.
  - Hygiene practices: handwashing, meatal care, and catheter care.
  - Care of the drainage system: how to set up a night drainage system, maintenance of a closed system (e.g., positioning the drainage bag below the level of the bladder and above the floor; interval for emptying, reuse, and cleaning the bag).
  - Bowel management to prevent constipation.
  - Self-monitoring of fluid intake to prevent leakage and dehydration.
  - Suggest clothing styles and drainage bag covers to provide privacy.
- Instruct about catheter complications such as blockage and infection, actions to take and how to deal with specific problems; and provide contact numbers to access for advice and support.
- Discuss sexual behavior (Geng et al., 2012; WOCN, 2009):
  - Patients (or partner) can be taught to remove the catheter and replace it after intercourse.
  - Women can tape the catheter to the abdomen or side of the leg.
  - Men can tape the catheter along the erect penis and secure it under a male external catheter or a condom.
  - The drainage bag, after it is emptied, can be positioned out of the way in the bed. Alternatively, the drainage bag can be disconnected from the catheter and a valve attached during intercourse.
  - A water-based lubricant can be used to facilitate insertion. Oil-based lubricants should not be used because they can damage catheters, including male external catheters.
  - A suprapubic catheter, rather than a urethral catheter, may be considered.
  - Consider different positions during intercourse.

Implications for Future Research

There are multiple areas for future research regarding catheters and their use (e.g., indwelling, suprapubic, and intermittent catheterization), prevention of complications, and caregiver and patient education. The following topics represent a few of the CDC's recommendations for future investigation regarding catheter use (Gould et al., 2009):

- Effects of antimicrobial and antiseptic-impregnated catheters on reducing the risk of symptomatic UTI and other clinically significant outcomes.
- Role of bacterial biofilms in the pathogenesis of CAUTI; optimal catheter materials for reducing the risk of biofilms and CAUTI.
- Optimal catheter materials to enhance patient comfort.
- Optimal methods for preventing encrustation in long-term catheterized patients who have frequent obstruction.
- Appropriate use of urinary catheters to manage sacral or perineal wounds.
- Use of antiseptic versus sterile solutions for periurethral cleaning prior to catheter insertion.
- Procedure for cleaning or the safe reuse of urine drainage bags.
- Optimal cleaning and storage procedures (e.g., wet versus dry storage) for clean intermittent catheterization.
- Risks and benefits of suprapubic catheters as an alternative to long-term indwelling urethral catheters.
- Use of catheter valves in reducing the risk of CAUTI and other urinary complications.
- Irrigation with acidifying solutions or oral urease inhibitors.
- Use of portable, bladder ultrasound scanners for patients with low-urine output to reduce unnecessary catheter insertions or irrigations (in catheterized patients).

- Spatial separation of patients with urinary catheters to prevent transmission of pathogens colonizing urinary drainage systems.
- Role of nursing education and translation of knowledge into practice in different care settings for managing incontinence and reducing the inappropriate use of indwelling catheters.

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Appendix A
Catheter
Types

(C. R. Bard, Inc., 2004; Felix et al., 2014; Hooton et al., 2010; International Continence Society, 2013; Newman, 2012; Nicolle, 2014; Tambyah, 2004; The Joint Commission, 2011; WOCN, 2009)

Catheter Types	Features and Indications	Disadvantages
Latex (Figures 1, 2)	• Short- and long-term use. • A rubber derivative; some pre-coated with lubricant or hydrogel. • Amber latex is soft, flexible, durable, and comfortable. • Might have a hydrophilic polymer/hydrogel coating. • Low cost. • Red latex (Figure 2) is radiopaque for observation under fluoroscopy (Barium added to amber latex).	• Unpopular due to latex allergies. • Potential discomfort due to high surface friction; prone to rapid encrustation by mineral deposits. • Latex allergic reactions may lead to inflammation, development of urethritis, and urethral stricture or anaphylaxis. • Pre-coated catheters may help reduce urethral trauma; should be avoided in patients that are allergic to latex, because the coating can wear off. • Red latex is stiffer than amber latex.
Polytetrafluoroethylene (PTFE) Teflon-Coated Latex	• Coating bonded to latex to reduce sensitivity/allergies to latex. • Smooth outer surface reduces urethritis and encrustations. • Short-term use.	• Do not use with latex sensitive patients.
Hydrophilic Polymer Coated Catheters; Hydrogel Coated	• Hydrogel and other polymers have hydrophilic properties and absorb fluids from the body to provide a thin smooth, protective barrier on the catheter to optimize patient comfort. • Reduces urethral friction and inflammation. • Resists encrustation and bacterial colonization (Newman, 2012). • Hydrophilic catheters may be preferred for intermittent catheterization (Hooton et al., 2010).	• Do not use pre-coated latex catheters in latex sensitive patients; coating wears off exposing patients to latex.
Plastic or PVC	• Wide internal diameter. • Balloon made with latex. • Short-term use. • Often used for intermittent self-catheterization.	• Do not use with latex sensitive patients. • Uncomfortable due to stiffness. • May cause tissue trauma due to high surface friction.

Appendix A
Catheter Types
Continued

Catheter Types	Features and Indications	Disadvantages
Silicone (100%/Latex Free) (Figures 3, 4)	• Used in patients with latex allergies and in general, used to reduce development of latex allergies. • Mid-to long-term use. • Thinner walls provide a larger internal lumen for better drainage of urine; lumen less prone to collapse with aspiration of blood clots or sediments. • Believed to cause less encrustation. • Available with a hydrogel coating for improved patient comfort.	• Balloon has tendency to lose fluid; check regularly, and add fluid if needed. • Balloon can form creases or cuffs when deflated, which can lead to painful and difficult removal. • Patients may experience discomfort due to stiffness of catheter; not recommended for suprapubic catheter use due to stiffness. • Increased expense.
Silicone Elastomer Coated Latex Catheter (Interior and Exterior) (Figure 5)	• More flexible, more comfortable than 100% silicone catheters. • Has a hydrophobic coating that rejects moisture; reduces urethral irritation. • Balloons are less likely to lose fluid than the 100% silicone catheters. • Less expensive than 100% silicone catheters. • Long-term use.	• Do not use with latex sensitive patients. • Coating wears off exposing patients to latex.
Silver Alloy (Figure 6)	• Available in silicone and latex. • May reduce bacteriuria and CAUTI in short-term catheterized patients, up to 14 days (Hooton et al., 2010).	• Limited benefits beyond 14 days (Hooton et al., 2010). • Some studies have found no benefit of silver alloy-coated catheters for prevention of CAUTI (Hooton et al., 2010; Lam, Omar, Fisher, Gillies, & MacLennan, 2014).
Nitrofurazone Impregnated Catheter	• Has been found to reduce the risk of symptomatic CAUTI and bacteriuria during the first week after catheterization, but the magnitude of reduction was low (Hooton et al., 2010; Lam et al., 2014). • Nitrofurazone catheters may have a more potent antibacterial effect than silver hydrogel catheters (Hooton et al., 2010).	• Limited clinical studies. • Concerns about antimicrobial resistance. • Limited benefit beyond 1 week after catheterization (Hooton et al., 2010).

Appendix A
Catheter Types
Continued

Catheter Types	Features and Indications	Disadvantages
Temperature Sensing Indwelling Urinary Catheter (Figures 7a, 7b)	• Catheter with temperature sensing technology for monitoring critical patients. • Available in latex, red rubber, silicone, and silver-coated latex. • For continuous measurement of body temperature, which is a reliable index of core temperature during thermal instability. • Eliminates the need for alternate sites for temperature measurement.	• Risk for latex sensitivity in some catheters. • More expensive.

Diagnostic Catheters		
Type Catheter	**Features**	**Indications/Uses**
Lapides (Figure 1)	• A type of Foley catheter that has five radiopaque rings (each ring 1 cm apart) below the balloon.	• Facilitates calibration of the female in order to evaluate/profile the urethra. • Used for visual or tactile measurements.
Davis (Figure 8)	• A unique double balloon design: A 30 cc balloon is in the bladder, and a 20 cc cone-shaped, meatal balloon provides an effective seal of the meatus to contain the contrast material. • The meatal balloon can slide to accommodate any female urethral length.	• Aids in diagnosing urethral diverticula. • The radiopaque contrast medium is introduced into the central lumen of the catheter to visualize false passages of the urethra as diverticula fill during urination.
Trattner (Figure 9)	• A unique double-balloon design. • A single eye is located below the bladder balloon and above the meatal balloon to introduce the radiopaque contrast medium. • A 5 cc balloon is in the bladder, and a 20 cc cone-shaped meatal balloon provides an effective seal of the meatus to contain the contrast material.	• Aids in diagnosing urethral diverticula. • The radiopaque contrast medium is introduced into the central lumen of the catheter.

Appendix B

Catheter Sizes and Lengths

(C. R. Bard, Inc., 2004; Geng et al., 2012; Newman, 2012; Pickard et al., 2012; Willette & Coffield, 2012; WOCN, 2009)

Catheter Size (Fr)	Indications
10	• Adult • Clear urine, no debris, no encrustations.
12-14	• 14 Fr is the standard caliber for short-term monitoring (Pickard et al., 2012). • Adult female (13 years of age or older). • Clear urine, no debris, no encrustations, no hematuria. • Patients with urethral strictures (Willette & Coffield, 2012).
12-16	• Adult male (13 years of age or older). • Slightly cloudy urine, light hematuria with or without small clots, with or without mild grit or mild debris.
18	• Adult • Moderate to heavy grit, moderate to heavy debris, hematuria with moderate clots.
20-24	• Heavy hematuria, need for flushing; and/or • Adult obstruction or prostate enlargement (Willette & Coffield, 2012).
30	• Adult male. • Prostatic bleeding.
Catheter Length (cm)	**Indications**
15-40	• Intermittent catheterization.
25	• Female
41-45	• Male, female; severely obese female.

Appendix C
Catheter Lumens, Tips, Balloons, and Inflation and DeflationValves

(C. R. Bard, Inc., 2004; Hooton et al., 2010; Newman & Willson, 2011; The Joint Commission, 2011; Willette & Coffield, 2012; WOCN, 2009)

Table C1. Catheter Lumens

Number of Lumens	Indications
2-Lumens (Figures 1, 3)	• Most commonly used type.
3-Lumens (Figure 4)	• Commonly used for continuous bladder irrigations.
4-Lumens (Figure 2)	• Most commonly used in surgeries. • Three lumens provide a drainage conduit, access for balloon inflation and deflation, and access for continuous irrigations; while the fourth lumen is used for irrigation or aspiration of the surgical site (C. R. Bard, Inc., 2004).

Table C2. Catheter Tips

Types of Tips	Features	Indications
Standard/Straight Tip (Robinson or Nelaton)	• May have one or two eyes, a rounded tip or a “whistle” tip. • No balloon.	• Most commonly used for routine catheterization.
Coude (Tieman) Tip (Figures 10a, 10b, 11)	• Design accommodates the male prostatic curve. • Tip should be pointed upward and toward the umbilicus during insertion. • With or without a balloon.	• Used for difficult catheterizations. • Outlet obstruction in men with benign prostatic hypertrophy.
Olive Tip (Figure 11)	• Features a conical dilating tip, soft balloon. • Silicone	• Used to dilate constricted urethral orifices/urethral stricture.
DePezzer (Figure 12)	• Features a mushroom tip with funnel end; triangular tip design. • Requires a stylet to insert.	• Suprapubic catheterization, or to drain urine from the renal pelvis.
Malecot (Figure 13)	• Four-wing tip with a funnel end. • Requires a stylet to insert. • Radiopaque • More painful than DePeezer to remove.	• Placed in renal pelvis for nephrostomy drainage. • Suitable for drainage of thick viscous fluids.
Whistle Tip (Figure 14)	• Catheter has an opening at the end and one or more openings on the lateral side. • Available in different type materials/coating and with or without a balloon	• Openings provide a large drainage area to drain debris and blood clots.

Appendix C
Catheter Lumens, Tips, Balloons, and Inflation and DeflationValves

Continued Table C3. Catheter Balloons

Balloons (cc)	Indications	Considerations
5	• Adult • Generally the 5 cc balloon is inflated with 10 cc of sterile water to achieve symmetrical inflation (Smith, 2003; Figure 15a).	• Improper balloon inflation can result in an asymmetrical balloon, which may cause the catheter tip to bend resulting in improper drainage, bladder spasms, and/or leakage (Smith, 2003; Figure 15b).
30	• Used post-operatively for urological procedures. • When a catheter cannot be retained with a smaller balloon.	• A filled 30 cc balloon sits high in the bladder and may prevent complete urinary drainage, which could cause urinary stasis and infections (The Joint Commission, 2011; WOCN, 2009). • A filled 30 cc balloon weighs approximately 48.2 grams and can cause pressure/trauma to the bladder neck, which may lead to bladder spasms and leakage; therefore, it is not recommended for long-term use (Moore & Franklin, 2016; WOCN, 2009). • Bladder stones may puncture the balloon (WOCN, 2009). • Improper inflation can cause the catheter tip to bend and cause poor drainage, bladder spasms and/or leakage (Figure 15b).

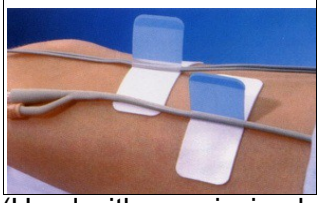
atheter Inflation and Deflation Valves

Features of Valves	Advantages
Universal Adapters	• Accommodate most Luer-tip or Luer-lock syringes.
Self-Sealing	• Easy, positive seal.
Ergonomically Designed	• Enhanced speed of inflation and deflation.
Most are Color-Coded	• Easy identification of French sizes (C. R. Bard, Inc., 2004).

Appendix D
Drainage Bags and Systems (WOCN, 2009)

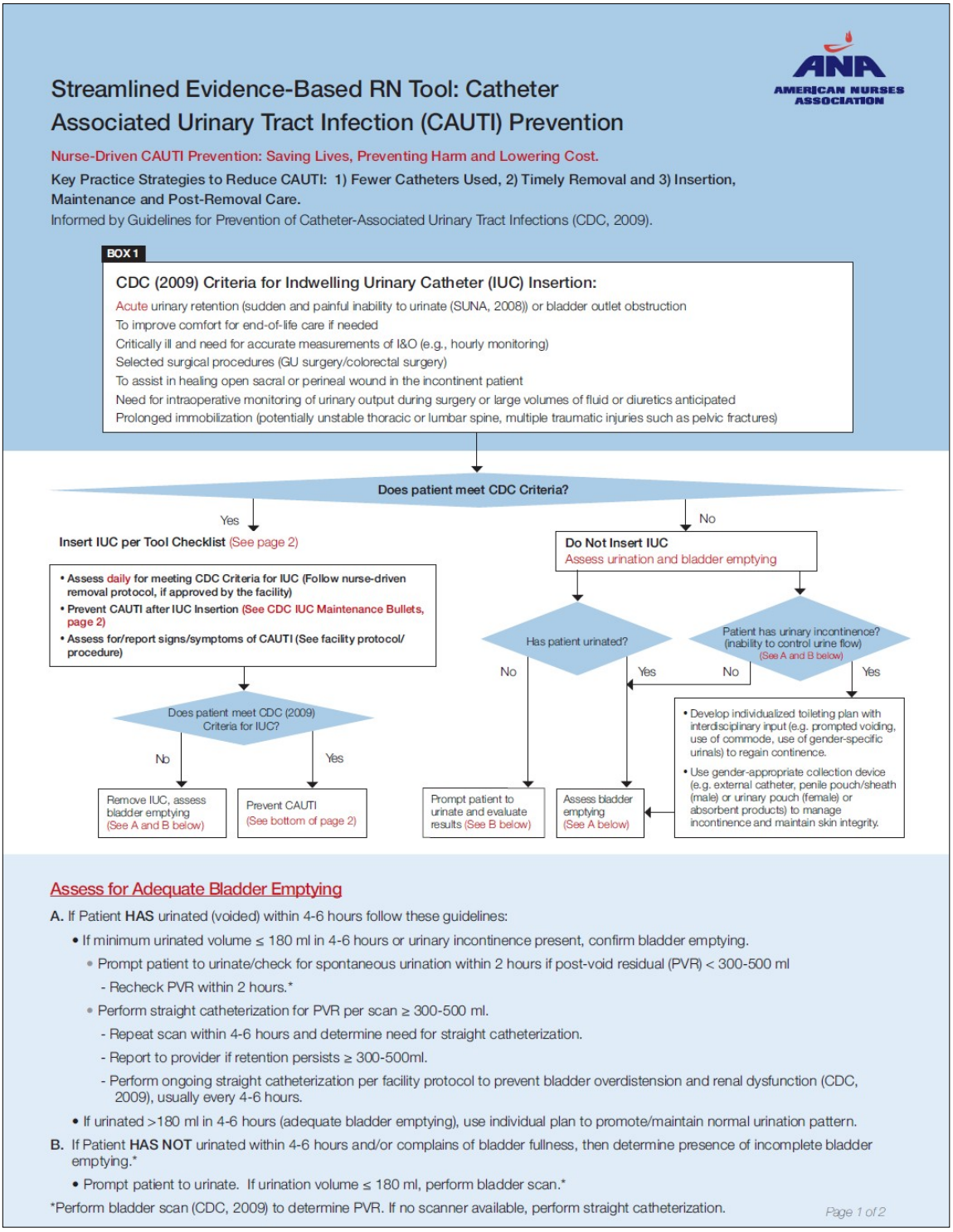
Types of Drainage Bags	Advantages	Considerations
Closed Drainage System (Figure 16)	• Minimizes disconnections from the catheter to prevent risks of contamination.	• Drainage bag should be kept below the bladder level.
Bedside Drainage Bag (Figure 17) **Leg Bag** (Figures 18 a, b, c) **Belly Bag** (Figure 19)	• Makes it easier to move about in the home and travel outside the home with a Foley catheter. • Belly and leg bags are more discrete than a bedside/large drainage bag. • Belly bag has an antireflux valve to prevent back flow.	• Changing/connecting to a night drainage bag increases the risks of bacterial contamination, bacteriuria, and CAUTI. • The bedside drainage and leg drainage bags should be kept below the bladder level.
Self-Contained Sterile System	• For self- and intermittent catheterization.	• Bag cannot be emptied and is intended for one-time use (Newman & Willson, 2011).

Appendix E
Examples of Securement Devices

Securement Devices	Examples
Adhesive Foley Catheter Securement Device	 (Used with permission by Medline Co.)
Foley Catheter Securement Device	 (Used with permission by Centurion)
Catheter Leg Strap	 (Used with permission by Medline Co.)
Foley Stabilization Device	 (Used with permission by Bard Medical)
Foley Anchoring Device	 (Used with permission by ConvaTec)

Appendix F

Streamlined Evidence-Based RN Tool: Catheter-Associated Urinary Tract Infection (CAUTI) Prevention (ANA, n.d.). Available at http://nursingworld.org/ANA-CAUTI-Prevention-Tool



Appendix F
Streamlined Evidence-Based RN Tool: Catheter-Associated Urinary Tract Infection (CAUTI) Prevention continued

Indwelling Urinary Catheter (IUC) Insertion Checklist to Prevent CAUTI in the Adult Hospitalized Patient: Important Evidence-Based Steps.	Yes	Yes with Reminder	Comments
Before IUC insertion:			
1) **Determine if IUC is appropriate per the CDC Guidelines** (CDC, 2009) (See page 1, Box 1).			
2) **Select smallest appropriate IUC** (14 Fr., 5ml or 10 ml balloon is usually appropriate unless ordered otherwise).			
3) **Obtain assistance PRN** (e.g., 2-person insertion, mechanical aids) **to facilitate appropriate visualization/insertion technique.**			
4) **Perform hand hygiene.**			
Patient Preparation/Insertion of IUC:			
1) **Perform peri-care**, then, **re-perform hand hygiene.**			
2) **Maintain strict aseptic technique throughout the actual IUC insertion procedure, re-perform hand hygiene upon completion.** • Use sterile gloves and equipment and establish/maintain sterile field. • Do not pre-inflate the balloon to test it, as this is not recommended.			
3) **Insert IUC to appropriate length and check urine flow before balloon inflation to prevent urethral trauma.** • In males, insert fully to the IUC "y" connection, or in females, advance ~1 inch or 2.5 cm beyond point of urine flow.			
4) **Inflate IUC balloon correctly:** Inflate to 10 ml for catheters labeled 5 ml or 10 ml per manufacturer's instructions.			
After IUC insertion completion:			
1) Perform **Triple Action for IUC/Drainage System:** • **Secure IUC** to prevent urethral irritation. • **Position drainage bag below the bladder** (but not resting on the floor). • **Check system for closed connections and no obstructions/kinks.**			

Note: Refer to Expert Nurse for consults (e.g., urology, WOC, infection control, geriatrics, rehabilitation) and other team members per facility protocol to reduce iuc use and days and to manage complex care (e.g., incontinence, immobility).

BOX 2

Maintenance of IUC/Drainage System and Other Patient Care to Prevent CAUTI (CDC 2009)

- **Maintain appropriate catheter securement** per facility protocol/procedure and the drainage bag below the level of the bladder at all times (but not on the floor, even when emptying).
- **Empty the drainage bag regularly** using a separate, clean collecting container for each patient; avoid splashing, and prevent contact of the drainage spout.
- **Maintain unobstructed urine flow** by keeping the catheter and tube free from kinking.
- **Maintain a closed drainage system.**
- **If breaks in the closed system are noted** (e.g., disconnection, cracked tubing), replace the catheter and collecting system following above IUC insertion checklist.
- **Perform perineal hygiene** at a minimum, daily per facility protocol/procedure and PRN.
- **Use timely fecal containment device when appropriate for fecal incontinence.**
- **Teach nursing assistants and patient/family iuc maintenance.**

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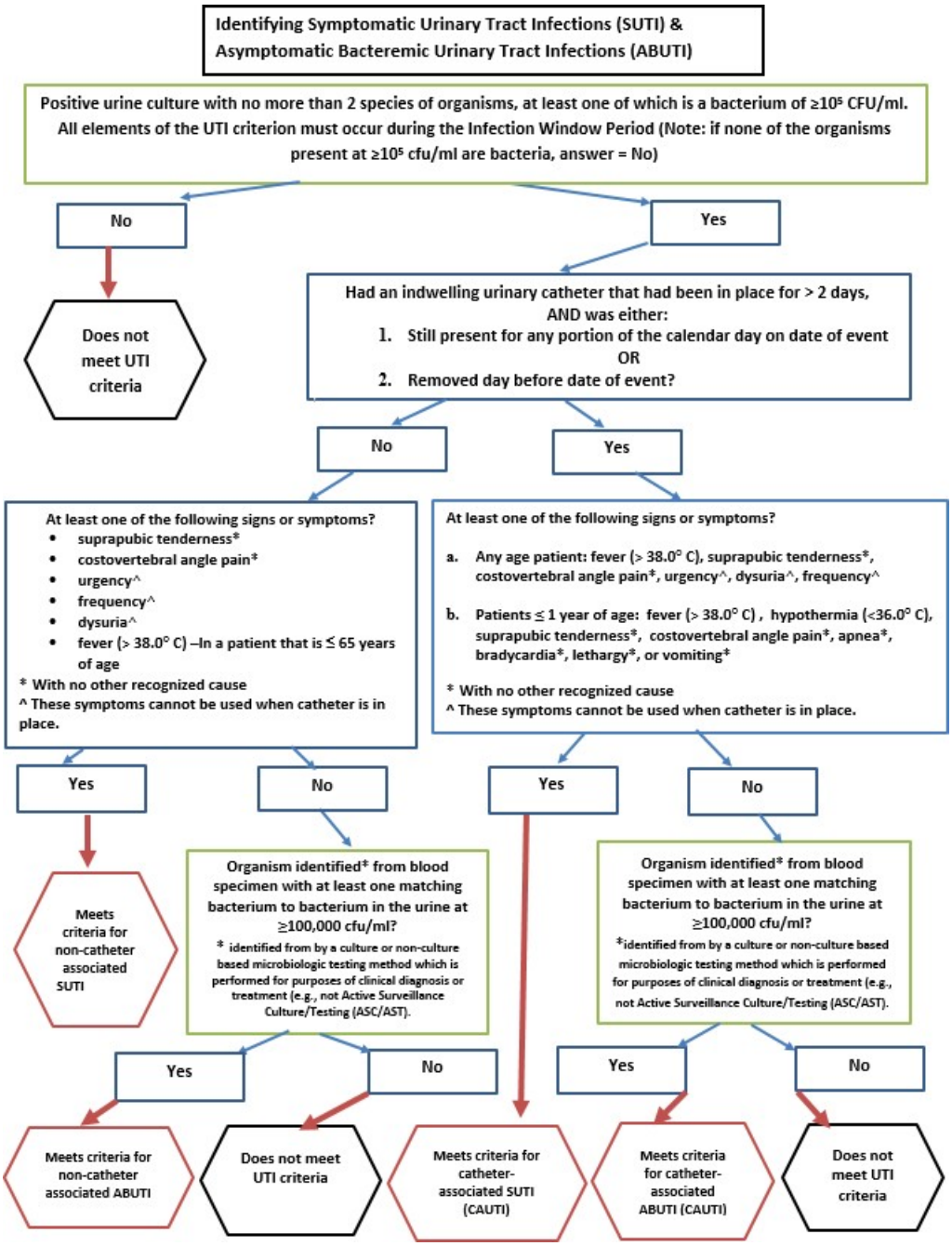
Appendix G
Algorithm for Symptomatic and Asymptomatic UTI and CAUTI (CDC, 2016)



Source: CDC. (2016). Open Access. Available from http://www.cdc.gov/nhsn/PDFs/pscManual/pcsManual_current.pdf

Figures

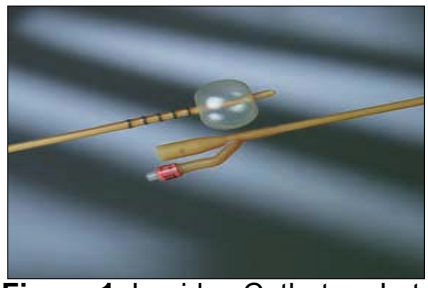


Figure 1. Lapides Catheters-Latex (Used with permission by Bard Medical).

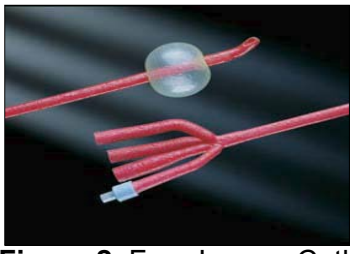


Figure 2. Four-Lumen Catheter (Used with permission by Bard Medical).

Figure 3. 100% Silicone Catheter (Used with permission by Medline Co).

Figure 4. Three-Lumen Silicone Catheter (Used with permission by Bard Medical).

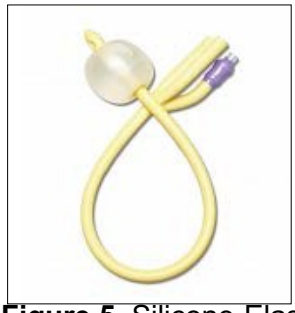


Figure 5. Silicone-Elastomer Coated Latex Foley Catheter/Three Lumens (Used with permission by
Medline Co.).

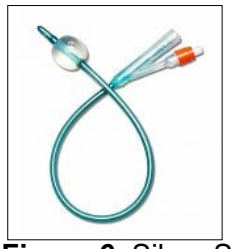


Figure 6. Silver Silicone Catheter (Used with permission by Medline Co.).

Figure 7a. Temperature-Sensing Foley Catheters (Used with permission by Medline Co.).

Figure 7b. Temperature-Sensing Catheters/Three Lumens (Used with permission by Bard Medical).

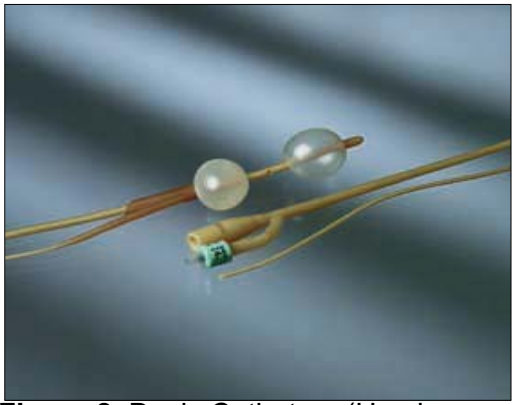


Figure 8. Davis Catheters (Used with permission by Bard Medical).

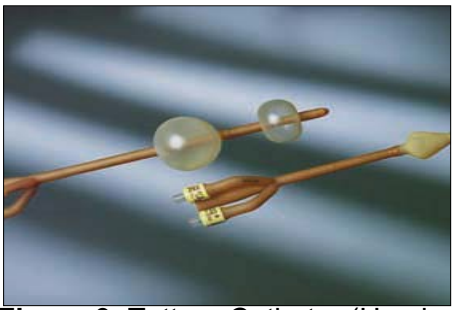


Figure 9. Tattner Catheter (Used with permission by Bard Medical).

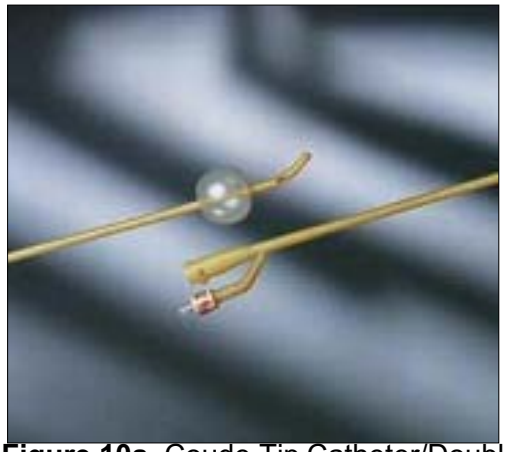


Figure 10a. Coude Tip Catheter/Double Lumen

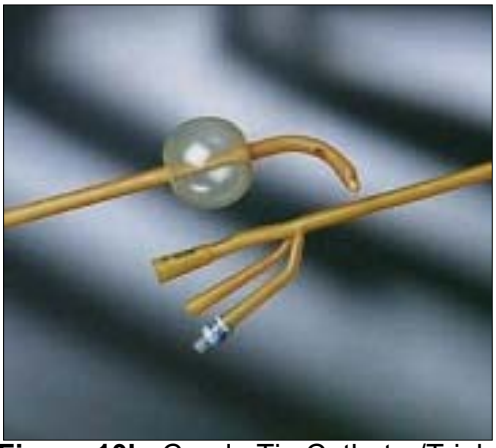


Figure 10b. Coude Tip Catheter/Triple Lumen

Figures 10a and 10b (Used with permission by Bard Medical).

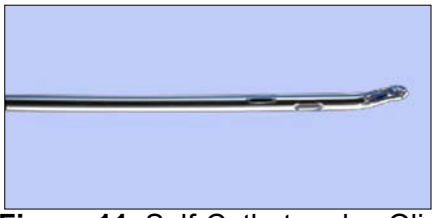


Figure 11. Self-Catheter plus Olive/Coude Tip (Used with permission by Coloplast Inc.).

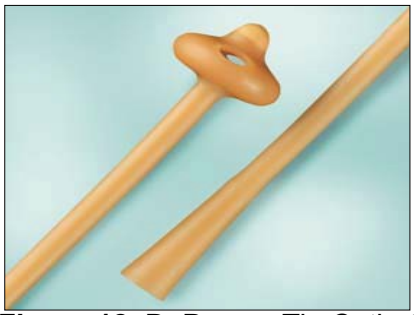


Figure 12. DePezzer Tip Catheters (Used with permission by Bard Medical).

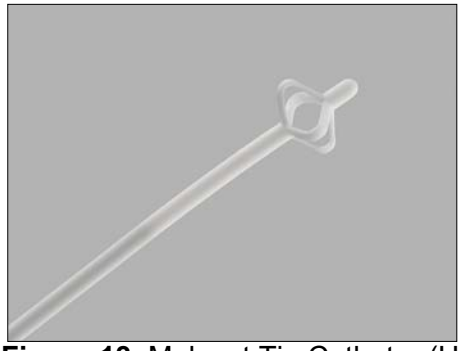


Figure 13. Malecot Tip Catheter (Used with permission by Cook Medical Inc.).

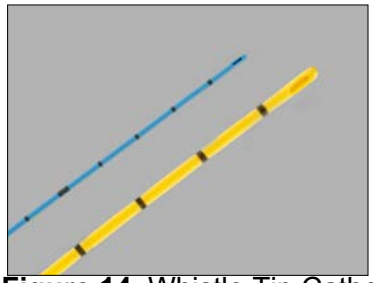


Figure 14. Whistle Tip Catheter (Used with permission by Cook Medical, Inc.).

Figure 15a. Properly Inflated Balloon **Figure 15b.** Underinflated Balloon

Figures 15a and 15b: From: Smith, J. M. (2003). Indwelling catheter management from habit-based to evidence based practice. *Ostomy Wound Management*, *49*(12), 34-45. Used with permission.

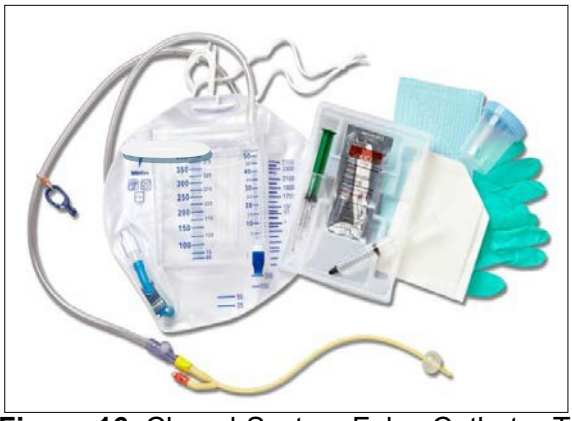


Figure 16. Closed-System Foley Catheter Tray (Used with permission by Medline Co.).

Figure 17. Drainage Bag (Used with permission by Medline Co.).

Figure 18a.

Figure 18b.

Figures 18a and 18b. Leg Bags (Used with permission by Medline Co.).

Figure 18c. Leg Bag System (Used with permission by Hollister Co.).

Figure 19. Belly Bag Urinary Collection Device (Used with permission by Medline Co.).