Insertion of an Indwelling Urethral Catheter in the Adult Male

Introduction

This procedure details the insertion process of an indwelling urethral (transurethral) catheter (IUC or Foley catheter) in an adult male. The male urethra length is 8.1 inches (20 cm) and is curved (referred to as an "S" curve) as it descends in its last 4 to 5 cm proximally through the urogenital diaphragm and prostate (Figure 1). Male urethral catheter placement can be difficult because of the length and curves of the male urethra and the skill of the person performing insertion.

This procedure uses an aseptic technique that is maintained throughout the insertion and based on professional guidelines. Only health care professionals trained in the technique of aseptic catheterization should insert an IUC. Persons attempting transurethral catheterization should be familiar with the facility or practice policy and standard precautions for urethral catheterization.

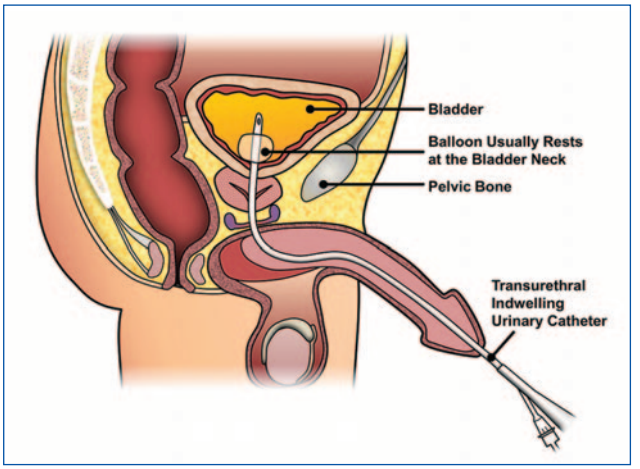
Prior to insertion or replacement of an existing IUC, an order from a health care provider should be verified. The patient and the patient's family, if present, should be informed of the reason for catheterization and what to expect in terms of discomfort. If the patient is unable to give consent and there is no family member or guardian to provide consent, there must be a clear rationale for using a catheter.

Indwelling urinary catheter (IUC) use indications and contraindications in adult males are found in Box 1.

Risk Assessment

- Determine any potential allergies (e.g., latex, betadine). Note any pertinent past medical and urologic history, including urethral stricture or scarring, benign prostatic hyperplasia (BPH), urethral implants, prior bladder, prostate. urethral or pelvic surgery, or radiation.
  - If the patient has an artificial urinary sphincter implant, a consult to urology may be necessary if the nurse is not familiar with this implant because the device's cuff must be deflated before insertion.
- If there is a history of difficult urethral catheterizations, consider the use of a guidewire (called a glidewire or Hiwire) with a hydrophilic coating. Hydrophilic-coated smooth surface guidewires have a very soft end, making it safe to pass through a stricture or distorted urethra with minimal risk of injury. Stiff guidewires should not be used. A Council tip (16 Fr gauge with an open end) catheter with a self-retaining balloon or regular IUC created as a Council tip can be inserted over the stiff outer end of the guidewire (Figure 2). The catheter is advanced over the guidewire via the urethra and into the bladder.

Figure 1.
Male Indwelling Urinary Catheter



Source: Courtesy of Diane K. Newman, DNP.

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Peer Review
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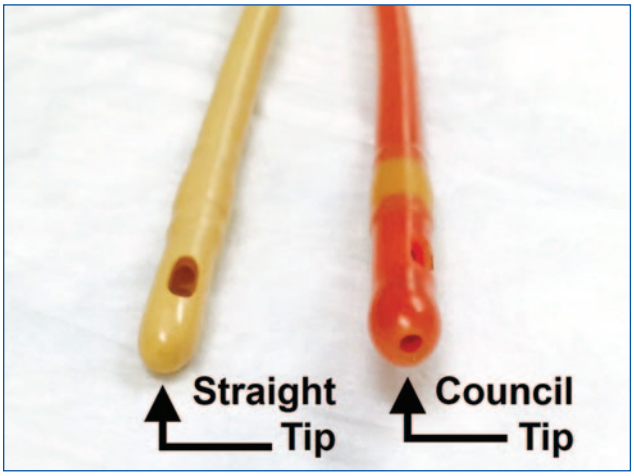
Box 1.
Indications and Contraindications for Use of an Indwelling Urinary Catheter (IUC) in Adult Men

Indications
- Postoperative urinary retention (per facility catheter-removal policy).
- Bladder outlet obstruction (i.e., gross hematuria, benign prostatic hyperplasia [BPH], urethral strictures).
- Acute urinary retention, which requires immediate attention.
- Need for accurate measurements of urinary output in critically ill patients for which urine cannot be measured in another way.
- Patients who require prolonged immobilization (e.g., potentially unstable thoracic, or lumbar spine, multiple traumatic injuries, such as pelvic fractures).
- Continuous bladder irrigation (CBI) for clot retention or intravesical drug infusion.
- Administration of drugs directly into the bladder (e.g., chemotherapeutic medication to treat bladder cancer).
- To improve comfort for end-of-life care, if needed
- Perioperative use in selected surgical procedures:
  - Urologic/gynecologic/perineal procedure and other surgeries on contiguous structures of GU tract.
  - Anticipated prolonged duration of surgery (should be removed in PACU once patient is awake).
  - Patients anticipated to receive large volume infusions or diuretics during surgery.
  - Operative patients with urinary incontinence.
  - Need for intra-operative hemodynamic monitoring of fluids.

Contraindications
- For perceived comfort in patients with urinary or fecal incontinence.
- As a means for obtaining urine for tests when patient can voluntarily void.
- Prolonged postoperative use without appropriate indications.

- Consider obtaining assistance (e.g., two-person insertion) to facilitate appropriate visualization for high-risk populations (e.g., patients who are obese or comorbid, or with dementia/behavioral issues).
  - Challenging aspects of male urethral catheterization can be accessing the meatal orifice, especially in an obese man with a large girth or those with an enlarged prostate that may obstruct the urethra.
- Assess the patient's ability to cooperate with procedure (e.g., need to keep legs straight and relaxed during procedure). Assess level of anxiety about catheter insertion, and if present, provide information about the procedure and methods that will be used to minimize discomfort (e.g., analgesic gel).
- Prior to starting the procedure, assess the penis. If penile edema or a buried penis is present, expose a buried penis by having an assistant press down firmly around the base of the penis or use a small vaginal speculum through the swollen foreskin to allow visualization of meatus.
- According to the National Institute for Health and Care Excellence (NICE) (n.d.), routine prescribing of antibiotics is not recommended when inserting an IUC or changing a catheter in patients with a long-term IUC and antibiotic prophylaxis is only recommended in those patients who have a history of symptomatic urinary tract infection (UTI) after catheter change or experience trauma during catheterization.

Figure 2.
Council Tip Next to Straight Catheter Tip



Source: Courtesy of Eric Rovner, MD.

Equipment

Assemble all equipment before beginning procedure.
- Lighting as needed.
- Perineal care items: Disposable clean gloves, mild soap, chlorhexidine gluconate (CHG) soap, water, and/or cleansing foam.
  - Castile soap is the recommended alternative for cleansing patients with a betadine allergy.
  - Closed catheter system contain supplies (e.g., gloves, cleanser) for periurethral cleansing (Figure 3).
- Waterproof pad.
- Indwelling catheter insertion tray (e.g., all-in-one catheterization kit with a "closed or pre-connected, sealed catheter-tubing junction system" preferred) includes sterile gloves, single-use

Figure 3.
Indwelling Urinary Catheter Tray System with Perineal Cleansing Supplies (SureStep® Foley Tray Peri-Care Kit by Bard Medical)

Photo: Courtesy of Diane K. Newman, DNP.

Figure 4.
Balloon Port Noting Catheter Size (16 Fr) and Balloon Size (10 cc)

Photo: Courtesy of Diane K. Newman, DNP.

water-based lubricant (tray may include a pre-filled syringe), indwelling balloon-retention catheter (use smallest size [gauge] possible that allows free flow of urine unless otherwise prescribed, standard is 14 Fr), Luer-Lok syringe pre-filled with sterile water (standard balloon size is 10 ccs, always inflated with 10 ccs of sterile water to ensure a symmetrical shape), anchoring device for securing catheter, and pre-connected urinary drainage bag.

- The balloon port has a cover that notes the size of the catheter and balloon size (Figure 4).
- Sealed or closed sterile systems have a pre-connected, tamper-resistant tape or seal that keeps the catheter and drainage system connected (Figure 5). It is designed to prevent inadvertent opening of the closed drainage system and may prevent catheter-associated urinary tract infections (CAUTIs) by acting as a physical barrier to the migration of microbes into the lumen of the catheter and drainage tube. There are potential disadvantage of these systems because only the prepackaged catheter can be inserted.

Figure 5.
SureStep® Indwelling Urinary Catheter Tray by Bard Medical

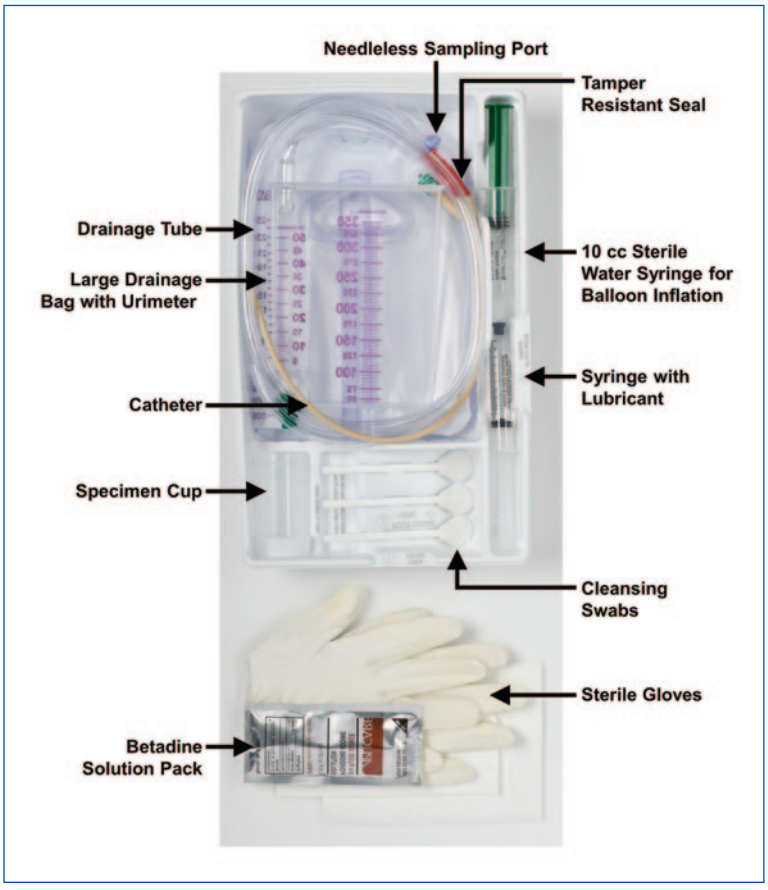


Photo: Courtesy of Diane K. Newman, DNP.

Figure 6.
Indwelling Silicone Catheter with Parts Identified

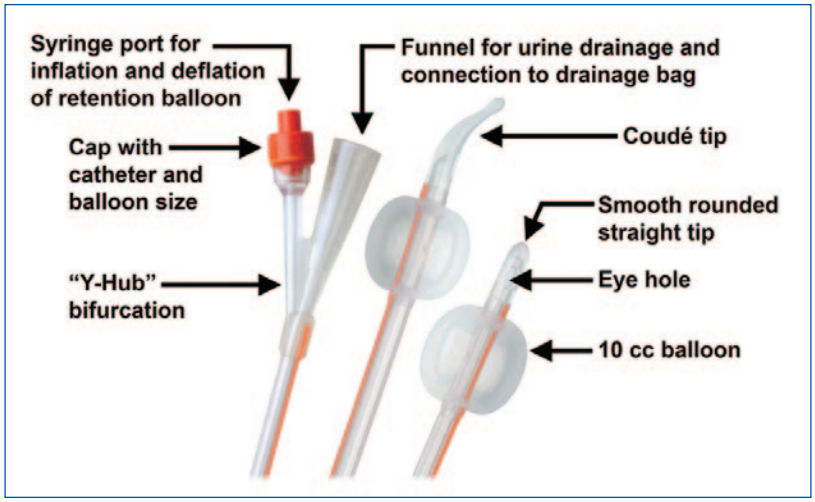


Photo: Courtesy of Diane K. Newman, DNP.

- ➢ Consider having a second insertion tray easily available in case of contamination during sterile insertion.
- ➢ If all-inclusive insertion tray is not available, alternative sterile equipment can be used, but all parts must be sterile (e.g., gloves, single-use sterile water-based lubricant packet, catheter, syringe filled with 10 cc sterile water, drainage bag/valve, securement device).

- ○ Only sterile water should be used to inflate the balloon because saline may crystallize in the balloon port, obstructing it, preventing balloon deflation at time of IUC removal.
- ○ If patient has an allergy to latex, use a 100% silicone catheter.

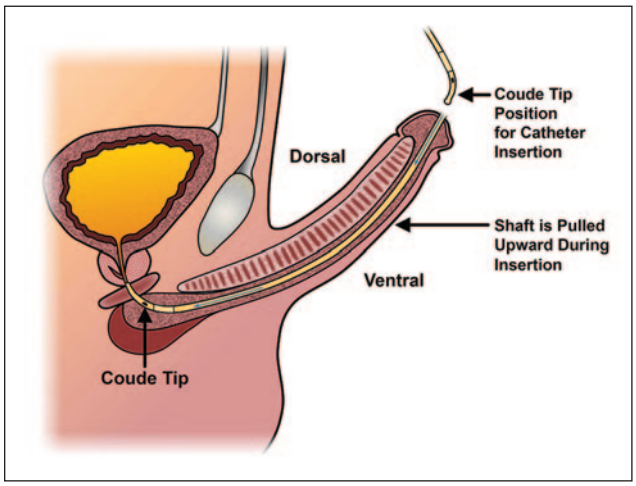
- If a history of previous difficult catheterization and/or an enlarged prostate, the clinician should use a catheter with a Coudé (curved Tiemann type) tip (Figure 6) that allows for easier passage through the prostate. The angled catheter tip should point cephalad (toward the head, 12 o'clock position) during the insertion (Figure 7). This will allow for smoother passage through an enlarged prostate and is the most important component to ensure correct position of the urethra while passing the catheter. Always inform the patient of the use of a Coudé-tip catheter, which may make the catheterization less painful, thus relieving fear of catheterization.
- The use of an anesthetic gel (lidocaine gel 2%) inserted in the urethra prior to catheterization is an option in male catheterization and should be considered if this is the patient's first catheterization or if a difficult catheterization is suspected, especially if actual discomfort with catheter insertion is anticipated. The main benefit may be from the lubrication as opposed to the anesthetic effect (Averch et al., 2014). It may reduce pain, promote pelvic muscle/sphincter relaxation to add insertion, and/or it may help to distend ("open") the urethral lumen when the lubricant is held in the urethra using mild compression at the fossa navicularis (just below the glans penis). Inform the patient that an anesthetic gel is being used to make the catheterization more comfortable, and thus, may lessen the anxiety and fear associated with catheterization.
  - ○ Use with caution in patients with sepsis and/or traumatized mucosa because there is potential for rapid systemic absorption.
  - ○ An order/prescription is usually required to administer lidocaine 2% gel via the urethra prior to inserting a urinary catheter.
  - ○ Do not use if the patient has an allergy to lidocaine 2% gel.

Procedure

Provide as much privacy for the patient as possible.

- Identify the patient using two identifiers (name, date of birth) according to facility/practice policy.
- Perform hand hygiene and put on clean medical gloves.
- Raise bed as necessary to provide adequate visualization of penis.

Figure 7.
Proper Position for Insertion of a Coudé-Tip Catheter



Source: Courtesy of Diane K. Newman, DNP.

- Assist the patient into a supine position with legs extended and separated slightly. Expose the patient's genitalia, ensure positioning is appropriate and lighting is adequate.
- Place a waterproof pad under the man's buttocks.
- Remove and discard existing catheter if present by first deflating the balloon by attaching an empty syringe and allowing fluid to passively flow into the syringe from the balloon. Some advocate not to actively pull the fluid with the syringe if at all possible because the balloon may collapse on itself or the port may lock up. Check that the volume of fluid in the syringe is equal to the volume inserted to ensure balloon is completely deflated (may be less with a silicone catheter balloon that loses some fluid). Discard removed catheter and bag away from sterile field.
  - If pain or discomfort or difficulty occurs, the catheter balloon may have ridges or a cuff that remains around the catheter, hampering catheter withdrawal. This problem may be seen more commonly with silicone catheters.
- Perform peri-care with recommended perineal cleansing solution. Visualize the urinary meatus.
- If separate from tray, attach anchoring (securement) device to upper thigh.
- Remove gloves, re-perform hand hygiene, and apply disposable gloves.
- Open catheterization kit.
- Ask the patient to raise buttocks and place square-shaped drape (if present) touching ends only, slightly under the buttocks and perineum (shiny side down).
- If anchoring device is in the tray and under drape, attach to upper thigh.
- Remove gloves, re-perform hand hygiene.
- Set up sterile tray for IUC insertion and maintain a sterile field throughout the actual IUC procedure.
  - If inserting lidocaine 2% gel, use aseptic technique by opening the packaging containing the gel and dropping the syringe onto the sterile tray (Box 2).
- If there is a break in sterile technique during preparation or the actual procedure, restart process with new insertion tray. Having a second person assist with insertion can facilitate sterile insertion technique.
  - Open glove package in the tray and put on sterile gloves.
  - Remove top tray and set to side on sterile field.
  - Drape (fenestrated drape) the penis, ensuring the ability to access the penile shaft and meatus and surrounding area.
  - Open lubricant packet and squirt lubricant in tray, remove plastic cover from catheter and generously coat 5 to 7 inches (11 mL or one-half of the length) catheter with lubricant to minimize urethral trauma and facilitate insertion, reducing infection and discomfort during insertion.
  - Attach sterile syringe with water to balloon inflation port but do not inflate balloon.
    - ➤ Do not pre-inflate the balloon to test it; this not recommended.
  - Saturate cotton balls with betadine or open betadine swab sticks.
- Cleanse the patient.
  - Grasp the penile shaft behind the glans with non-dominant hand (hand is no longer sterile) and visualize the meatus. If the patient is uncircumcised, retract the foreskin to clean the glans.
  - Hold the shaft taut at a 90-degree angle to the patient's thighs to extend the urethra and to straighten the pendulous curvature of the penis. The position should be maintained throughout the procedure.
- With dominant (non-contaminated) hand, use the forceps to pick up betadine-soaked cotton balls or betadine swab sticks. Using a new cotton ball or betadine swab stick with each stroke, cleanse meatus. Wipe in circular motion (inner to outer in widening circle).
- Dispose of soiled cotton ball or swab stick away from sterile field after each stroke.

Box 2.
Instillation of Lidocaine 2% Gel

Insert the nozzle in the meatus and inject approximately 5 to 10 mL into the urethra. The average male urethra volume is 20 mL. Allow the gel to dwell for approximately 3 to 5 minutes before starting catheter insertion. A sterile gauze pad may be placed over the meatus to help prevent spillage of anesthetic jelly. The urethral opening should then be held closed for 3 to 5 minutes.

Lidocaine Syringe

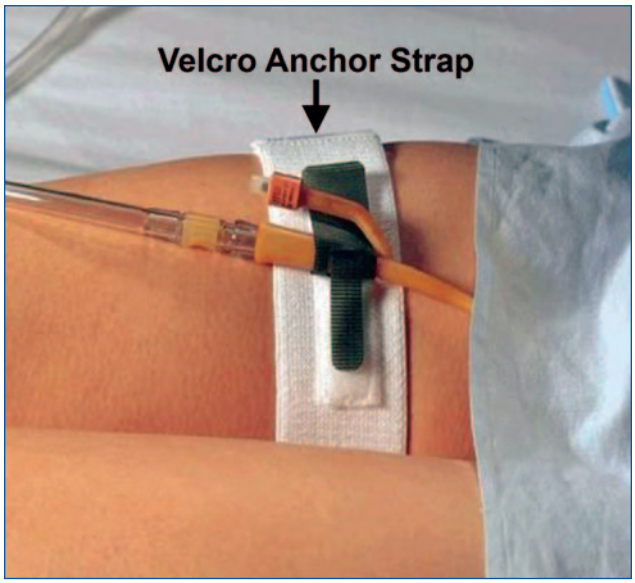
Source: Courtesy of Sagent. Used with permission.

- Before inserting the catheter, educate the patient on diaphragmatic breathing techniques to relax the pelvic floor and prevent urethra contraction, promoting easier insertion of the catheter and minimizing discomfort.
- Pick up lubricated catheter as you would grasp a pencil or a dart 3 to 4 inches from the tip and slowly insert catheter through the urethra with a smooth constant motion, about 7 to 10 inches (16.8 to 25.4 cm) into the urethra. Urine should begin to flow through the tubing, but if urine is not draining, ask the patient to cough gently or perform Valsalva maneuver, which may promote drainage of urine if the catheter's eyes are blocked with lubricant.
  - As you near the prostate and sphincter (about two-thirds of the way), resistance may be felt if the patient has urethral narrowing (e.g., from an enlarged prostate, urethral stricture).
  - If you are not able to pass the catheter because of resistance, stop the procedure, consider using a Coudé-tip catheter. If still unable to pass with a Coudé-tip catheter, notify the prescribing provider.
  - If inserting a Coudé-tip catheter, point the tip upward (toward the patient's head/umbilicus) in the 12 o'clock position throughout the insertion. An arrow or raised bump on the catheter shaft indicates the correct angle of the tip during insertion.
- Once urine flow is established, insert the catheter two more inches further into the urethra, to the bifurcation ("Y" juncture) before inflation of the balloon.
  - If there is any doubt the catheter is in the bladder or concern about it coiling in the urethra, stop the insertion procedure. Signs include patient complaint of severe pain during insertion, inability to pass the catheter due to resistance, and/or no urine drainage.
- Inflate the balloon with non-dominant hand (hand that is holding the penile shaft). Instill the correct and full amount of sterile water because under-inflation can increase the risk that the catheter may become dislodged.
  - If there is any question as to the location of the catheter, as evidenced by no return of urine or patient complains of pain, do not inflate the balloon.
  - Underinflated balloons often fail to expand evenly, causing balloon distortion and the catheter to be angled to one side.
- If the catheter is not attached to a pre-connected drainage bag, then connect the drainage port at the "Y" junction of the IUC to the appropriate drainage system.
- If the penis is uncircumcised, ensure that the foreskin is returned to its normal anatomical position (over the glans) so as to prevent paraphimosis (entrapment of retracted foreskin behind the corona of the glans penis).
- Secure the catheter to the upper thigh or lower abdomen with penis directed toward the patient's head and without tension or traction using a catheter stabilization device (e.g., elasticized straps, hydrocolloid adhesive devices) (Figure 8).
  - Properly secured catheters reduce the risk of bladder neck and urethral trauma, urethral erosion, CAUTI, accidental removal, and bladder spasms.
  - Securement should minimize tugging or stretching of the catheter.
- Drainage bags should be placed below the level of the bladder, preferably near the patient's lower leg (but not resting on the floor) to allow for free flow of urine and to decrease the risk of CAUTI.
  - Use a urimeter bag for patients requiring hourly urine measurements.
  - Leg bags are useful for patients who are mobile or undergoing rehabilitation.
  - The emptying port should be readily accessible and easily opened and closed, especially for those with limited hand function. Some bags have caps secured onto the end to prevent dripping of urine if the valve becomes partially open.
  - All components of a bag, including the tubing, should be non-latex to avoid hypersensitivity responses.
- Check IUC system for closed connections and no obstructions/kinks.
- Discard used equipment, remove gloves, perform hand hygiene.

Documentation

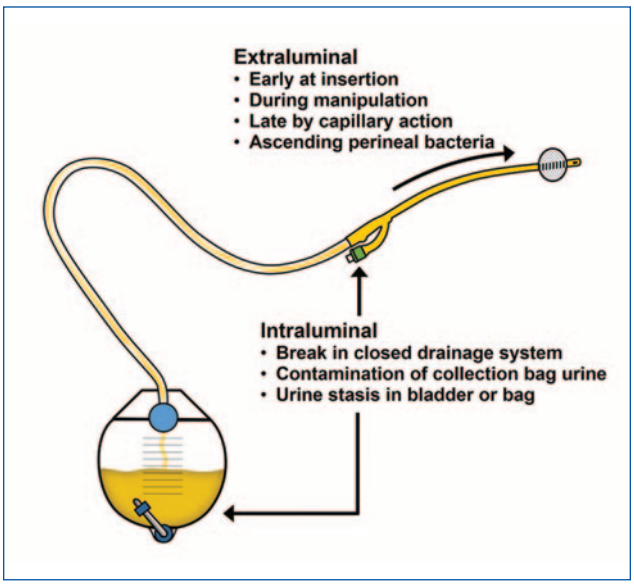
Documentation should include the reason for catheterization, date and time, catheter type (length

Figure 8.
Catheter Secured to the Upper Thigh



Source: Courtesy of Dale Medical.

Figure 9.
Intraluminal and Extraluminal Pathways



Source: Courtesy of Diane K. Newman, DNP.

and size), volume of water used to inflate the balloon, use of lidocaine, insertion of Coudé-tipped catheter if appropriate, any problems encountered during procedure (i.e., resistance to insertion, bleeding, pain) with insertion, amount and description of urine drained, and the patient's response to the procedure. Document education completed. Write on the drainage bag the date and time of catheter insertion.

Possible Adverse Events

1. **Bleeding:** Insertion of the IUC in a male patient may cause minimal bleeding from trauma to the urethral lining. Increasing catheter lubrication will reduce the risk of urethral trauma and friction on catheter insertion.
2. **Pain:** Male catheterization is uncomfortable for most men, and in many cases, is driven by fear and anxiety. Once the catheter is in place, discomfort should abate. Generous amount of lubrication should reduce discomfort and pain. If pain occurs during balloon inflation, this may be a sign the catheter is not in the bladder and perhaps being inflated in the prostatic urethra. Removal of an existing catheter may be painful if a there is ridge formation on the catheter balloon. Straightening out the penis (urethra) during removal may decrease discomfort.
3. **Difficult transurethral catheterization:** Defined as failure to insert a catheter after two attempts, and in many cases, requires urologic consultation. Male catheterization can be more challenging due to the length and tortuous nature of the urethra, which is curved. Although the incidence of difficult IUC insertion in men is unknown, many causes have been identified, including patient anxiety, poor catheterization technique, unfavorable body habitus, and presence of urethral stricture, phimosis, anasarca (subcutaneous tissue swelling), bladder neck contracture, and BPH. A traumatic catheter insertion can cause penile pain and lead to bleeding, CAUTIs, rectal injury, and increased length of stay and catheter days.
4. **Inability to visualize urinary meatal opening:** This can occur when the foreskin cannot be retracted in an uncircumcised man or if a "buried" or retracted penis is present. This may also be caused by meatal stenosis (e.g., lichen sclerosus).
5. **Urethral trauma:** Approximately 0.3% of male catheterizations result in urethral trauma. These are usually mechanical in nature and can become long-term problems (e.g., urethral strictures, chronic penile or pelvic pain), result in the need for reconstructive surgery, as well as extreme physical and emotional distress to the patient. Catheter lubrication, use of a Coudé tip catheter, and gentle and smooth passage of the catheter will minimize urethral injury.
6. **Creation of a false passage:** One that is rarely reported, but is probably common, is false passage of the catheter through the urethra and into the bladder. A false passage is created during

continued on page 95

Table 1.
Urinary Drainage Bags

Type of Bag	Description	Considerations	Sample
Large bedside/ overnight	• Used for non-ambulatory and overnight drainage. • 2-liter capacity most commonly used. • Anti-reflux valve. • Length of tubing can lead to "dependent loops." • 4-liter bags are available and used short term post-urological surgery and for continuous bladder irrigation.	• Cannot be attached to the leg. • Difficult to conceal. • Needs to be supported on a stand or support hanger. • Contact with the floor should be avoided as this would increase the risk of contamination and a CAUTI.	See Figure 10 on next page.
Leg	• Available in several sizes (350 mL, 500 mL (most common), 750 mL). • Have three lengths of tubing: directly attached to catheter, short or long tube. • Shape may be rectangle or oval. • Can be placed horizontally or vertically. • May have separate inflow chambers which can reduce sloshing effect in bag. • Tubing length should be easily adjustable to promote patient comfort and choice of clothing (e.g., short pants versus long pants).	• Promotes independence. • Can be concealed. • Can be attached to thigh or lower leg, but the calf is usually the easiest place for attachment. • Women who wear skirts may use a thigh bag or waist belt. • Secured with elastic, mesh, or Velcro straps, or with a knitted bag, or a cloth undergarment. Any securement should maintain catheter tubing securely and avoid excess tension and pressure on the soft tissue of the meatus. • May have a woven fabric backing that comes into contact with skin, which may decrease sweating and irritation.	See Figures 11 and 12 on next page.
Abdomen bags (belly bag)	• 1-liter capacity. • Anti-reflux valve behind the catheter port. • Soft, non-woven backing. • Secured to mid-abdomen with a soft expandable belt.	• Discrete. • Promotes independence. • Helpful when it is necessary to monitor urine output on hourly basis in certain clinical scenarios (e.g., congestive heart failure, extensive burns, hemodynamic instability).	See Figure 13 on next page.
Urimeter (collection meter)	• Distinct collection meter with easy-to-read markings on the bag to allow for urine output measurement. • Designs include the ability to empty urine into the larger collection bag or emptying it directly from the urimeter.	• Adds additional weight to the large bag.	See Figure 14 on next page.

Figure 10.
Overnight Bag

Source: Courtesy of Hollister.

Figure 12.
Leg Bag with Extension Tubing and Straps

Source: Courtesy of Hollister.

Figure 11.
Horizontal Non-Woven Leg Bag

Source: Courtesy of Coloplast.

Figure 13.
Abdominal Bag

Photo: Courtesy of Diane K. Newman, DNP.

Figure 14.
Components of a Large Drainage Bag with Collection Meter (Urimeter)

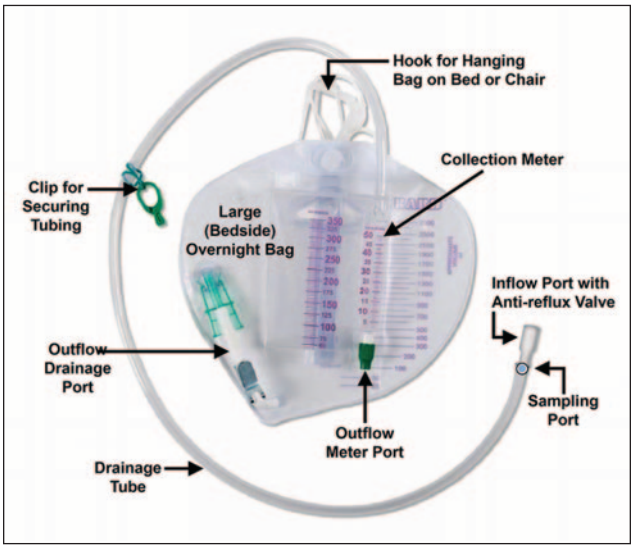


Photo: Courtesy of Diane K. Newman, DNP.

Box 3.
Obtaining a Urine Specimen from an Indwelling Urinary Catheter (IUC)

- Urine samples shall be obtained from a sampling port or directly from a catheter valve using an aseptic technique.
- A sampling port (Figure 14) is needleless and designed to be accessed directly using a syringe without a needle.
- Do not collect a urine sample from the drainage bag because it may be contaminated and lead to inaccurate results and inappropriate treatment.

Obtaining Specimen from Catheter Port

- Perform hand hygiene and put on clean medical gloves.
- Check for urine in the catheter drainage tubing. If no urine, clamp the tube below the sampling port.
  - Allows urine to collect above the clamp, and sample can be obtained.
- A sample should be obtained using aseptic technique so as to reduce cross-infection or contamination of the specimen.
- With gloved hands, clean the sampling port with an alcohol swab.
- Depending on the type of catheter sampling port, one the following two methods should be used: 1) insert a syringe (non-Luer-Lok) at an angle of 45° into the sampling port or 2) insert a Luer-Lok syringe into a needleless access port. Aspirate the required amount (at least 10 mL) of urine.
  - Using the port reduces infection risk, as disconnecting the catheter from the bag to obtain a urine specimen breaches the closed system, increasing the risk of a CAUTI.
- Put the urine sample into sterile urine collection container ensuring the syringe does not touch the container and close.
- Release clamp (if used) and observe if urine is flowing freely.

Obtaining Specimen from Catheter Valve

- Perform hand hygiene and put on clean medical gloves.
- Clean the valve port with an alcohol swab and allow to dry.
- Open the valve and drain a small amount of urine to flush the valve.
- Open valve again and drain urine into a sterile specimen container, ensuring the valve does not touch the container and secure the container.
- Close valve

insertion if the catheter curls or kinks in the urethra, hits up against one of the urethral curves, bending the tip, or the catheter could not pass through the prostate because a spasm occurred. Determining the need for using a Coudé-tip catheter prior to catheter insertion can prevent many adverse events of catheterization in the male patient.

7. **Catheter-associated urinary tract infections:** Urinary tract infection (UTI), accounts for approximately 32% of infections reported by acute care hospitals in the United States and approximately 18% to 25% of all nosocomial bacteremias. The majority of hospital-associated UTIs are caused by instrumentation of the urinary tract, mainly from an IUC. CAUTIs can result in increased morbidity, mortality, hospital cost, and length of stay. Bacteria can establish colonization of a patient's bladder by one of two routes: introduction into the urinary tract via the internal or intraluminal (34%) or external or extraluminal (66%) surface of urinary catheters (Figure 9). Intraluminal bacteria are transmitted through the entire length of the drainage tube and catheter. Intraluminal entry can occur from several causes: urinary stasis because of drainage failure, break in the closed system, contamination of the urine collection bag, or urinary stasis in the bag with subsequent ascending infection. Extraluminally, bacteria contaminate externally by being introduced and ascending into the urethra and bladder during catheter insertion or manipulation, which may indicate a lack of asepsis during initial insertion or occur by microorganisms ascending from the perineum along the outer surface of the catheter. So any break in sterile technique during insertion can lead to introduction of bacteria resulting in a CAUTI or urosepsis. The bacteria causing a CAUTI attach to the surface in the inner lumen of the catheter, producing a biofilm, a densely adherent polysaccharide structure. The biofilm protects the bacteria from the body's natural defense, allowing bacteria to multiply. Use of a sterile catheter tray with a closed system and pre-connected drainage bag minimizes the risk of contamination during insertion but the use of other supplies not included in the tray (need for a Coudé-tip catheter, addition of a lidocaine syringe) and practices that necessitate opening the system (e.g., switching drainage bags) can increase the risk of contaminating a sterile field. Practicing good hand hygiene is the best defense against prevention of infection. Keeping the drainage bag below the level of the bladder allows free urine drainage and prevents reflux of urine into the bladder, which increases the risk of infection. Box 3 lists the steps for obtaining a urine specimen from an IUC.

Other adverse effects of an IUC, such as urine bypassing, urinary stones, accidental catheter dislodgement, urethral stricture, blockage, and encrustations, are seen in IUCs that remain in-situ long-term (> 30 days).

Other Considerations

Changing time: The optimal interval for changing IUCs is not well defined. According to the Centers for Disease Control and Prevention (CDC)'s *Guideline for Prevention of Catheter-Associated Urinary Tract Infections* (Gould et al., 2010), changing an IUC should be based on clinical indications, such as infection, obstruction, or when the closed system is compromised. However, clinical practice has been to change/replace chronic IUCs every four weeks to minimize stone formation and biofilm development, and examine the urethral for trauma or tearing.

Drainage bag: There are a number of catheter drainage bags, and they are described in Table 1. Material is latex, silicone, or vinyl. These are one-way anti-reflux valve disposable bags and changing the bag monthly is usual practice. Large-capacity (bedside overnight) bags are usually used in hospitals, whereas small-capacity (leg) bags are used by patients at home. There are several concerns with legs bags, including the bag sliding up and down the leg, over-tightening of the straps, and the plastic backing against the skin can lead to sweating and skin breakdown. The patient and/or caregiver should be involved in selection because the bag can have an effect on lifestyle, particularly independence. Drainage tubes are available in differing lengths, and some can be adjusted to individual requirements.

There are a variety of drainage bag tap options for emptying these bags (lever-type valve [easiest to use], T-bar valve, slide valve, push-pull valve, twist valve, or clamp valve), and manual dexterity is needed to operate opening and closing them. The use of a catheter valve as an alternative to continuous drainage is an option. Drainage bags are always positioned below the level of bladder and should not be allowed to fill beyond three-quarters filled.

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