antibiotics and urinary anti-infectives is commonly used. In some cases, surgery may be indicated to correct contributing factors.

**Diagnostic Tests**

Laboratory testing for UTI includes:

- **Urinalysis** to assess for pyuria, bacteria, and blood cells in the urine. A bacteria count greater than 100,000 (10⁵) per milliliter is indicative of infection. Rapid tests for bacteria in the urine include using a nitrite dipstick (which turns pink in the presence of bacteria) and the leukocyte esterase test, an indirect method of detecting bacteria by identifying lysed or intact white blood cells (WBCs) in the urine.

Urine should be a midstream clean-catch specimen; if necessary, straight catheterization or “mini-cath,” with strict aseptic technique may be used. Catheterization is avoided if possible to reduce the risk of further infection.

- **Gram stain of the urine** may be done to identify the infecting organism by shape and characteristic (Gram positive or negative).

- **Urine culture and sensitivity** tests may be ordered to identify the infecting organism and the most effective antibiotic. Culture requires 24 to 72 hours, so treatment to eliminate the most common organisms often is initiated without culture.

- **WBC with differential** may be done to detect typical changes associated with infection, such as leukocytosis (elevated WBC) and increased numbers of neutrophils.

In men and in adult women with recurrent infections or persistent bacteriuria, additional diagnostic testing may be ordered to evaluate for structural abnormalities and other contributing factors.

- **Intravenous pyelography (IVP)**, also known as excretory urography, is used to evaluate the structure and excretory function of the kidneys, ureters, and bladder. As the kidneys clear an intravenously injected contrast medium from the blood, the size and shape of the kidneys, their calices and pelvices, the ureters, and the bladder can be evaluated, and structural or functional abnormalities, such as vesicoureteral reflux, may be detected.

- **Voiding cystourethrography** involves instilling contrast medium into the bladder, then using X-rays to assess the bladder and urethra when filled and during voiding. This study can detect structural or functional abnormalities of the bladder and urethral strictures. This test has a lower risk of allergic response to the contrast dye than IVP.

- **Cystoscopy**, direct visualization of the urethra and bladder through a cystoscope, may be used to diagnose conditions such as prostatic hypertrophy, urethral strictures, bladder calculi, tumors, polyps or diverticula, and congenital abnormalities. A tissue biopsy may be obtained during the procedure, and other interventions performed (e.g., stone removal or stricture dilation).

- **Manual pelvic or prostate examinations** are done to assess for structural changes of the genitourinary tract, such as prostatic enlargement, cystocele, or rectocele.

Nursing implications for these diagnostic procedures are presented on p. 000.

### Nursing Implications for Diagnostic Tests

#### The Client with UTI

**Intravenous Pyelography (IVP)**

**Preparation**

- Assess knowledge and understanding of procedure, clarifying information as needed.
- Schedule IVP prior to any ordered barium test or gallbladder studies using contrast material.
- Ask about allergy to seafood, iodine, or radiologic contrast dye. Notify physician or radiologist if allergies are known.
- Verify the presence of a signed consent for the procedure.
- Assess renal and fluid status, including serum osmolality, creatinine, and blood urea nitrogen (BUN) levels. Notify the physician of any abnormal values.
- Instruct the client to complete ordered pretest bowel preparation, including prescribed laxative or cathartic (see p. 000) the evening before the test, and an enema or suppository the morning of the test. Withhold food for 8 hours prior to the test; clear liquids are allowed.
- Obtain baseline vital signs and record.

**After the Test**

- Monitor vital signs and urine output.
- Report manifestations of delayed reaction to the contrast media such as dyspnea, tachycardia, itching, hives, or flushing.

**Client and Family Teaching**

- X-rays and a dye that is rapidly excreted in the urine and X-rays are used to show the structures of the kidney, ureters, and bladder. The test takes about 30 minutes.
- A laxative and possibly an enema or suppository are used before the test to clear the bowel of feces and gas. Do not eat after the ordered time the evening before the test; you may drink clear fluids such as water, coffee, or tea (without creamer).
- As the dye is injected, you may feel a transient flushing or burning sensation, along with possible nausea and a metallic taste.
- Notify your doctor immediately if you develop a rash, difficulty breathing, rapid heart rate, or hives during or after the test.
- Increase fluid intake after the test is completed.

**Voiding Cystourethrography**

**Preparation**

- Assess knowledge and understanding of procedure, clarifying information as needed.
- Verify the presence of a signed consent for the procedure.
- Ask about allergy to seafood, iodine, or radiologic contrast dye. Notify physician or radiologist if allergies are known. Because the dye is not injected, allergic reactions are rare, and allergy does not contraindicate the examination.
- Instruct to consume only clear liquids the morning of the exam, or as recommended by radiology.
- Insert indwelling catheter if ordered.
Men and women with pyelonephritis, urinary tract abnormalities or stones, or a history of previous infections with antibiotic-resistant infections require a 7 to 10 day course of TMP-SMZ, ciprofloxacin, ofloxacin (Floxin), or an alternate antibiotic. The client with severe illness may need hospitalization. Intravenous ciprofloxacin, gentamicin, ceftriaxone (Rocephin), or ampicillin may be prescribed for severe illness or sepsis associated with UTI. See Chapter 8 for the nursing implications for antibiotic therapy.

The outcome of treatment for UTI is determined by follow-up urinalysis and culture. Cure, as evidenced by no pathogens present in the urine, is the desired outcome. When therapy fails to eradicate bacteria in the urine, it is known as unresolved bacteriuria. Persistent bacteriuria or relapse occurs when a persistent source of infection causes repeated infection after initial cure. Reinfec tion is the development of a new infection with a different pathogen following successful UTI treatment (Tierney et al., 2001).

Clients who experience frequent symptomatic UTIs may be treated with prophylactic antibiotic therapy with a drug such as TMP-SMZ, TMP, or nitrofurantoin (Furadantin, Nitrofan). TMP and nitrofurantoin do not achieve effective plasma concentrations at recommended doses, but do reach effective concentrations in the urine. Nitrofurantoin also may be used to treat UTI in pregnant women. Nursing implications for these urinary anti-infectives and for phenazopyridine (Pyridium), a urinary analgesic, are outlined on page 000.

Antibiotics and urinary anti-infectives are not generally recommended to treat asymptomatic bacteriuria in catheterized clients. The preferred treatment for catheter-associated UTI is removal of the indwelling catheter followed by a 10 to 14 day course of antibiotic therapy to eliminate the infection.

**Surgery**

Surgery may be indicated for recurrent UTI if diagnostic testing indicates calculi, structural anomalies, or strictures that contribute to the risk of infection. Table 26–1 lists major causes of urinary tract obstruction that may contribute to UTI.

### Medications

Most uncomplicated infections of the lower urinary tract can be treated with a short course of antibiotic therapy. Upper urinary tract infections, in contrast, usually require longer treatment (2 or more weeks) to eradicate the infecting organism.

Short-course therapy (either a single antibiotic dose or a 3-day course of treatment) reduces treatment cost, increases compliance, and has a lower rate of side effects. Single dose therapy is associated with a higher rate of recurrent infection and continued vaginal colonization with *E. coli*, making a 3-day course of treatment the preferred option for uncomplicated cystitis. Oral trimethoprim-sulfamethoxazole (TMP-SMZ), TMP, or a quinolone antibiotic such as ciprofloxacin (Cipro) or enoxacin (Penetrex) may be ordered.