Nurses commonly provide the initial assessment, diagnosis, and outcome management of altered urinary elimination and related nursing diagnoses. Impaired urinary elimination is a nursing diagnosis used for dysfunction involving the urethra, bladder, or ureters. More specific nursing diagnoses include Stress Urinary Incontinence, Reflex Urinary Incontinence, Functional Urinary Incontinence, and Urinary Retention. Several additional nursing diagnoses are discussed throughout the chapter.

Because of the personal nature of the urinary system, its proximity to the reproductive system in females, and the shared urinary and reproductive system of males, urinary disorders commonly lead to feelings of shame, isolation, and embarrassment. It is vital that nurses be sensitive to the psychosocial needs of any client with a urinary disorder.

It is also important to recognize that urinary diagnoses may signal that other medical conditions coexist. Long-term sequelae or conditions occurring as a consequence of altered urinary elimination may include such problems as impaired kidney function, changes in fluid volume and electrolytes, skin breakdown, changes in quality of life, and other associated conditions.

INFECTION AND INFLAMMATORY DISORDERS

CYSTITIS

The diagnosis of a urinary tract infection (UTI) is typically confirmed on the basis of a certain number of microorganisms in the urinary system (usually 10⁵ organisms), although manifestations may begin with many fewer organisms. The infectious process usually affects the bladder, but the urethra, ureters, and kidneys may be involved. Cystitis, the most common type of UTI, is an inflammation of the bladder wall, usually caused by ascending bacteria or obstructive voiding patterns that lead to decreased flow or stasis of urine. UTI is one of the most common infections treated by primary care providers. Untreated, it has the potential for serious consequences, such as pyelonephritis (inflammation of the kidney) (see Chapter 35) and bacteremia (bacteria in the blood). On rare occasions, complications of a UTI can lead to death.

The prevalence of UTIs is about eight times higher in women than in men, probably because the female urethra is shorter and lies closer to the anal and vaginal openings. This position increases the risk of bacterial contamination of the lower urinary tract. About 6 to 7 million young women see physicians for UTIs each year, second in frequency only to upper respiratory tract infections. In 5% to 10% of cases, the UTI recurs after initial treatment.

The incidence of UTIs increases during hospitalization, usually from catheterization procedures and possibly
from inadequate catheter care. Nosocomial (hospital-acquired) UTIs occur in about 2% of inpatients. About 1% of nosocomial UTIs (5000 each year) become life-threatening. Catheter-associated urinary tract infections account for about 40% of all nosocomial infections and increase the duration of hospital stay, the cost, and mortality risk.

**Etiology and Risk Factors**

The most common UTI-causing bacteria are gram-negative organisms found in the intestine. *Escherichia coli* probably causes about 80% of UTIs, and *Klebsiella* causes about 5% of reported UTIs. *Enterobacter* and *Proteus* are found in about 2% of reported cases.

Women with vaginal *candidiasis* commonly complain of UTI manifestations. Other causative organisms, such as *Chlamydia trachomatis*, *Trichomonas vaginalis*, *Neisseria gonorrhoeae*, and herpes simplex, may be responsible for UTI manifestations as well. Therefore ask female clients about any gynecologic manifestations when clients present with potential UTIs.

Besides the shorter urethra and its proximity to the vagina and anus, other risk factors for women may be related to sexual intercourse, poorly fitting diaphragms, spermicides, pregnancy, poor hygiene, dysfunctional voiding patterns, or a history of female genital mutilation (see Chapter 39). Additionally, synthetic underwear and pantyhose, tight jeans, wet bathing suits, and allergens or irritants in perfumed toilet paper or feminine hygiene products can also foster the development of cystitis. Colonization of the vaginal opening and urethral meatus with *E. coli* is characteristic of women who have recurrent UTIs. Hormonal changes in pregnant and postmenopausal women alter the vaginal pH, change the vaginal flora, and may allow abnormal levels of normal bacteria to grow. In addition, shrinkage of the mucosal layer of the lower urogenital system of postmenopausal women increases the risk of urethral irritation during intercourse. In fact, sexual intercourse may increase the risk of UTI in all women. The thrusting motion during coitus can push organisms up the urethra and into the bladder, which can lead to cystitis if the woman does not void after intercourse. The term “honeymoon cystitis” is frequently used to describe this phenomenon.

Diabetes mellitus, tumors, calculus, or the presence of indwelling urethral catheters or kinked catheters that prevent proper drainage dramatically increase the occurrence of UTIs.

**Pathophysiology**

The most common mechanism by which a UTI develops is via ascending and invading bacteria. The organism triggers an inflammatory response in the lining of the urinary tract. This irritation leads to pain, frequent voiding, and other clinical manifestations.

**Clinical Manifestations**

Any change in a client’s voiding habits should be assessed as a possible UTI. The most common clinical manifestations of cystitis are burning pain on urination (dysuria), frequency, urgency, voiding in small amounts, an inability to void, incomplete emptying of the bladder, cloudy urine, and hematuria (blood in the urine). Asymptomatic bacteriuria (bacteria in urine) is seen in about 10% of cases, most often in older adults. The only reported manifestation of asymptomatic bacteriuria in an older client may be a change in the mental status with or without fever.

A urine culture is the most accurate diagnostic tool. Initially, a dipstick test for leukocyte esterase and nitrite activity may detect bacteriuria, allowing for immediate broad-spectrum antibiotic therapy to begin. However, the dipstick test should not be used as the exclusive diagnostic tool for a UTI. Some bacteria, such as *enterococci*, do not convert from nitrites to positive nitrites. Therefore a urine culture is essential for all clients with evidence of cystitis or a positive dipstick test. Sensitivity testing can determine which antibiotic will respond to specific bacteria. A urine specimen drawn by catheter yields a more accurate test than does a voided specimen. See the Integrating Diagnostic Testing feature on p. 668 for more information related to diagnosis of UTI.

**Medical Management**

**Inhibit Bacterial Growth**

To promote comfort and decrease complications, broad-spectrum antibiotics typically begin before the culture and sensitivity results are known. Later, on the basis of the sensitivity report, a more specific antibiotic may be
prescribed. The Integrating Pharmacology feature below describes medications used to treat urinary tract infections.

A client who reports continued manifestations after completing an antibiotic course or who complains of recurrent UTIs should return for a follow-up culture after antibiotic therapy. If the urine is not yet sterile, antibiotic therapy may be continued with the same or another antibiotic, based on the sensitivity report of the repeated culture.

Chronic or recurrent infections are a frustrating problem. Each infection must be treated with antibiotics. Persistent infections may call for suppression to keep the urine sterile. This measure consists of a small dose of antibiotic taken once daily or several times a week. Clients should be educated to avoid self-diagnosis and self-treatment with over-the-counter products, such as phenazopyridine. Each infection necessitates culture and sensitivity testing with specific treatment. The primary caregiver either may prescribe continuous suppression therapy or may continue episodic administration of antibiotics when a UTI recurs.

**INTEGRATING PHARMACOLOGY**

**Medications for Urinary Tract Infection**

The primary medication for the treatment of acute urinary tract infection is an antibiotic aimed at targeting the specific bacteria causing the infection. The specific bacteria should be cultured from a clean or sterile urine specimen. Each of the most commonly prescribed antibiotics and urinary antiseptics acts in a specific way to inhibit bacterial growth. Most commonly used pharmacologic agents include urinary antibiotics such as sulfonamides (trimethoprim-sulfamethoxazole [Bactrim]) and fluoroquinolones (ciprofloxacin [Cipro] and nitrofurantoin [Macrodial]). In addition, medications containing azo dyes, such as phenazopyridine (Pyridium), may also be prescribed to minimize the burning sensation often felt with cystitis. Pyridium turns urine bright orange and makes the client feel better after one dose. However, the client needs to understand that the complete course of the prescribed antibiotic must be taken to eradicate the bacteria.

The preferred course of treatment is a 7- to 10-day antibiotic regimen. If the client remains symptomatic following antibiotics, the urine should be cultured again. In some cases, the same bacteria are present despite the initial course of antibiotics. Therefore a second urine culture will report the presence of bacteria that may be more sensitive to a more specific or different antibiotic. In some clients, treatment must be extended for 14 days. This is especially true if the client is medically compromised, such as a hospitalized client with an indwelling catheter or a client with a history of diabetes mellitus or immunosuppression.

There is a growing trend to provide self-care for medication administration in clients with chronic infections. For example, women who experience UTIs in relation to sexual activity may receive a prescription for an antibiotic and instructions to take the medication after coitus. Other clients with frequent recurrences are:

- Offered a prescription for medication
- Taught to recognize early manifestations of a UTI
- Instructed to begin antibiotic therapy at the first hint of infection
- Reminded to complete the full course of antibiotics even if the manifestations disappear

Treating the client with asymptomatic bacteriuria is yet another problem. Some clinicians suggest that an asymptomatic infection be treated only if intervention is certain to prevent further morbidity or if the client is medically compromised. Others suggest immediate antibiotic treatment to reduce the risk of damage to the upper urinary tract.

**Modify Diet**

Certain foods are known to irritate the bladder, such as caffeine, alcohol, tomatoes, spicy food, chocolate, and some berries. Clients should be encouraged to avoid bladder irritants during the acute phase of the UTI.

Cranberry juice and ascorbic acid (vitamin C) have been used to acidify the urine. The use of these various dietary measures is under investigation, as explained in the Translating Evidence into Practice feature on p. 730. The tannin proanthocyanidins is thought to block bacteria from attaching to the bladder wall, thus flushing it from the urinary system.

**Increase Fluid Intake**

To treat and prevent UTI, encourage increased fluid intake, especially water, if the client is not required to restrict fluids. The desired amount is 3 to 4 L/day.

Research suggests that calculating 0.5 ounce of fluid per pound of body weight (or dividing body weight in half to find the ounces of fluid needed) is an easy way to individualize fluid intake. Increased fluids flush the urinary system and are important in preventing urolithiasis (urinary calculi, or stones) in clients treated with sulfa drugs. Fluids containing alcohol and caffeine should be avoided because they increase mucosal irritation.

**Prevent Complications**

Broad-spectrum antibiotic therapy may destroy normal flora in the body and allow an overgrowth of opportunistic organisms. On occasion, diarrhea, associated bowel problems, and vaginal candidiasis may develop. Some antibiotics may reduce the effectiveness of oral
contraceptives and estrogen, whereas sulfa drugs increase sensitivity to the effects of the sun.

Complications can also occur if the infection is not completely eradicated. An ascending infection can migrate from the bladder to the kidneys, resulting in pyelonephritis. Recurrent pyelonephritis can predispose the client to renal scarring and chronic renal failure if damage to the kidneys is severe enough. In clients with
a history of recurrent or chronic infections, diagnostic testing is necessary to prevent complications associated with recurrent UTIs.

**Nursing Management of the Medical Client**

**Assessment.** Direct the initial nursing assessment at the history and clinical manifestations, as described earlier, to determine whether the problem is acute or chronic. Also, take a gynecologic, sexually transmitted infection (STI), and contraceptive history from female clients. Question male clients about presenting manifestations and take an STI history.

A key nursing responsibility is to instruct the client about clean-catch urine collection to minimize contamination from surface organisms. Appropriate collection of a clean-catch urine specimen for a dipstick test and culture and sensitivity should be included in the assessment. The urine specimen should initially be checked for leukocytes, blood, and nitrites. Color, odor, and clarity should also be evaluated. The urine specimen should then be sent for culture and sensitivity testing. If a client presents with chronic manifestations, additional radiologic diagnostic testing may be ordered to locate the origin of the disease process.

**Diagnosis, Outcomes, Interventions**

**Diagnosis: Impaired Urinary Elimination.** The primary nursing diagnosis when a client is experiencing problems related to cystitis is *Impaired Urinary Elimination related to irritation and inflammation of the bladder mucosa.*

**Outcomes.** The client will have return of normal voiding habits within 3 days of starting antibiotic treatment as evidenced by an absence of fever, pain, burning, frequency, and urgency.

**Interventions**

**Inhibit Bacterial Growth.** Give adequate instructions to the client regarding antibiotic therapy and dietary and activity restrictions needed during antibiotic therapy. Make sure the client understands the drug, its side effects, whether to take it with or without food, and the importance of taking the full course of the drug even after manifestations disappear. Have the client restate the antibiotic instructions by asking questions to ensure that the instructions have been understood.

**Modify Diet.** Provide information about dietary changes needed to keep the urine acidic and to reduce bladder irritation, such as avoiding alcohol and caffeinated beverages. Caffeine is found in coffee, tea, chocolate, some carbonated beverages, and some over-the-counter medications. Spicy foods and tomatoes are also associated with increased bladder irritation. Encourage clients with chronic UTIs to drink 10 ounces of cranberry juice daily to acidify the urine and decrease the likelihood of bacterial attachment to the bladder wall.

**Increase Fluid Intake.** To control the urgency and frequency caused by a UTI, clients may limit rather than increase fluid intake. Instruct your client to eliminate fluids that increase urgency and frequency, such as caffeinated beverages, and to increase the intake of other fluids to 3 to 4 L/day to flush the urinary system. To treat infection and prevent recurrence, teach the client how to calculate an appropriate fluid intake: 0.5 ounce of fluid per pound of body weight per day unless this amount is contraindicated.

**Prevent Complications.** Tell the client about the increased manifestations that might result from infection of the upper urinary tract and what to do if those manifestations occur.

You should maintain a closed urinary drainage system and provide meticulous perineal care with mild soap and water for clients with an indwelling catheter. Keep the catheter bag below the level of the bladder at all times. These interventions help to achieve the TJC National Patient Safety Goal related to health care associated infections.

**Teach Health Promotion Strategies.** Encourage the client to engage in health promotion activities to prevent UTIs. For example, encourage a fluid intake of at least 3 L/day, especially of water and acid-ash items to acidify the urine (such as cranberry juice). Advise clients to avoid caffeinated and alcoholic beverages or any of the foods that may irritate the bladder lining.

An important health promotion activity centers on client teaching to prevent recurrence of UTI. Female clients should learn the risks associated with chemical irritants such as spermicides, intercourse, and poorly fitted vaginal devices, and the additional risk of lowered estrogen levels associated with menopause. A review of correct hygienic practices should also be included. Alert both male and female clients that STIs can cause manifestations similar to those of a UTI. Inform male clients about obstructive voiding problems caused by benign prostatic hypertrophy (BPH) that lead to urinary stasis.

Emphasize the importance of increased fluids and avoidance of foods and fluids that increase irritation. Also, remind the client to void every 2 to 4 hours during the day (unless the bladder program is planned otherwise) to keep the urinary system flushed. Pregnant women should be encouraged to void every 2 to 3 hours.

Encourage women to void before and after coitus. Suggest that sexually active women use positions that
Another common nursing diagnosis for clients with cystitis is Acute Pain related to irritation and inflammation of bladder and urethral mucosa.

**Diagnosis: Acute Pain.** Another common nursing diagnosis for clients with cystitis is Acute Pain related to irritation and inflammation of bladder and urethral mucosa.

**Outcomes.** The client will be able to urinate with minimal or no discomfort within 24 hours after treatment begins and will return to normal voiding habits within 3 days, as evidenced by an absence of pain and burning on urination.

**Interventions.** Medications prescribed specifically to treat pain, such as phenazopyridine (Pyridium), should be administered. Other comfort measures include forcing fluids to dilute urine and taking a warm sitz bath to decrease urethral smooth muscle spasms. Some clients find a heating pad applied to the suprapubic area helpful in reducing bladder spasms and suprapubic pain.

**Evaluation.** After the first 24 hours of treatment, the client should be able to report a reduction in pain, burning, urgency, and frequency. Antibiotic therapy usually brings about complete resolution of irritation and pain within 3 days. If indicated, urine culture specimens should be negative after 1 week of treatment or after the course of antibiotics is completed.

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**Surgical Management**

The need for surgery is rare; operations are performed only to address structural anomalies that cause repeated infections. Strictures of the bladder neck or urethra are the most common problems requiring surgical intervention. BPH may also be treated surgically (see Chapter 38). Nursing care after surgery is discussed under the specific disorder. Chapter 38 describes nursing care of men after surgery for BPH.

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**Self-Care**

Promotion of self-care for a client with a UTI includes recognition of lifestyle changes needed to decrease risk factors, the ability to restate the medication protocol, and return for follow-up urine cultures, if indicated. Explain risk factors for UTIs and health promotion strategies to prevent recurrence. These strategies include increased fluid intake, fluid and diet modifications, voiding every 2 hours, and lifestyle modifications, as previously discussed. Advise the client to seek care if manifestations recur.

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**Modifications for Older Clients**

In older people, cystitis may occur more often than in younger people but for different reasons. Causes might include immobility, constipation, fecal and urinary incontinence, urinary retention (incomplete voiding), altered mental status, or systemic disease.

In older women, atrophic changes resulting from decreased estrogen affect the vagina and urethra. In older men, increased size of the prostate gland can increase their risk for UTI. These alterations cause bladder dysfunction, which may predispose older clients to infection.

When administering medications to older or compromised clients, you must consider their renal and hepatic status. Many drugs used to treat UTIs necessitate that the client have adequate renal and hepatic function, particularly with long-term administration. Also, consider any changes in cardiovascular status that might prevent an increase in fluid intake.

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**URETHRITIS**

*Urethritis,* or inflammation of the urethra, is commonly associated with STIs or sexually transmitted infections (see Chapter 41) and is an associated manifestation of cystitis. The most common causes of urethritis are gonorrhea, chlamydial infection, and other bacterial infections. Among women, common causes also include feminine hygiene sprays, scented toilet paper, sanitary napkins,
spermicidal jellies, UTIs, and changes in the vaginal mucosal lining. In short, any irritant that comes into contact with the urethra can cause urethritis.

Exposure to irritants causes the mucosal lining of the urethra to become inflamed. The mucosal lining becomes swollen, painful, red, and irritated. Pus may be produced. *Pyuria*, the presence of pus in the urine, is a common indication of urethritis. Manifestations are similar to those described for cystitis. Frequently, women reveal a history of chemical irritant exposure. Male clients frequently exhibit a urethral discharge.

The diagnosis is often confirmed on the basis of the client’s history and clinical manifestations. Culture and sensitivity testing of the urine should be performed, and culture specimens should be obtained to exclude STIs if indicated.

Management of urethritis includes removing the etiologic mechanism. If a microorganism is the cause, administration of systemic and topical antibiotics is essential. Sitz baths and an increased fluid intake are also encouraged. Advise the client to avoid coitus until the manifestations subside or treatment of the STI is completed. The use of lubricants with intercourse decreases irritation in women who have had frequent episodes. Common medications are the same as those used to treat cystitis. The physician may also prescribe topical estrogens for a menopausal woman.

Prevention of urethritis by decreasing exposure to STIs is essential. Inform women about the increased risk of urethritis from spermicides and about the need to avoid feminine hygiene sprays, perfumed toilet paper, and scented sanitary napkins.

**URETERITIS**

*Ureteritis*, or inflammation of the ureter, is commonly associated with pyelonephritis (see Chapter 35). Once the kidney infection is treated, ureteral inflammation usually subsides. Chronic pyelonephritis can cause the ureter to become fibrotic and narrowed by strictures, which in turn can continue to foster this condition.

**UROSEPSIS**

*Urosepsis* is a gram-negative bacteremia originating in the genitourinary tract. It has become more prevalent among institutionalized clients, especially if the client has an underlying condition. The most common predisposing factors are an indwelling catheter or an untreated UTI in a medically compromised client. Two other primary risk factors for urosepsis are immunosuppression therapy and chemotherapy.

The most common organism responsible for gram-negative bacteremia is *E. coli*, which has the ability to develop resistant strains. Traditionally, gram-negative bacteria have always been recognized as the causative organism of urosepsis. However, there is increasing evidence to suggest that gram-positive bacteria, fungi, viruses, and parasites may also be responsible. Therefore more research, better diagnostic testing, and better and more aggressive implementation of a therapeutic program directed at eliminating bloodstream invasion of the bacteria with correction and prevention of the pathophysiologic events that cause urosepsis are essential.

The pathophysiologic mechanisms of urosepsis are complex and not fully understood. The disorder can lead to septic shock and death if it is not treated immediately and aggressively (see Chapter 81). The cell wall of the gram-negative bacillus is composed of a lipid-carbohydrate complex. Bacteria release endotoxins, which damage cells. The cells release lysosomes, which further damage tissues and instigate kinins and the complement cascade. Cellular metabolism becomes anaerobic, and lactic acidosis develops. Fever and altered mental status are the most common early manifestations. Additionally, research indicates that hyperventilation is often observed before fever begins in clients suffering from urosepsis.

Clients at increased risk for urosepsis should be monitored closely to prevent development of irreversible shock. To prevent sepsis and shock, treatment of urosepsis must be instituted immediately after specimen collection for culture and sensitivity testing.

Initial treatment consists of intravenous (IV) aminoglycosides, beta-lactam antibiotics (such as aztreonam), or third-generation cephalosporins until culture results are available. As soon as culture and sensitivity results are available, the antibiotic may be changed if necessary. IV treatment is directed by the status of the client and continued for 3 to 5 days once the client becomes afebrile. Oral antibiotics are continued for the duration of therapy.

**INTERSTITIAL CYSTITIS**

Cystitis may be noninfectious or abacterial. One type, interstitial cystitis (IC), is also called painful bladder disease (PBD), Hunner’s ulcer, urethral syndrome, pseudomembranous trigonitis, and other names. This greatly underdiagnosed condition involves urgency, frequency, and a painful bladder despite a lack of bacteria in the urine culture. The most severe forms of this disease involve ulcerations and hemorrhages in the bladder wall. The cause of these ulcers is unknown, but the ulcers may stem from a defect in the epithelial molecular layer of the bladder wall.

**Etiology and Risk Factors**

IC occurs mainly in young women (90% to 95% of all cases), usually white but occasionally African American
Clients with inflammatory and irritable bowel disorders also have a higher incidence of IC.

Pathophysiology

IC is a poorly understood disorder with an unclear pathophysiology. It may be a local autoimmune phenomenon. Despite clinical manifestations, the urine is usually sterile. The most current theory seems to be associated with a breakdown in the permeability of the glycosaminoglycan layer of the bladder mucosa, which is usually impermeable to urea and bacteria. This theory has been questioned in some studies that suggest that the permeability of the bladder in clients with IC is no greater than that in normal people.

Characteristic pathologic changes are found in more severe forms of IC, including nonspecific chronic inflammatory infiltrate, edema, vasodilation, and eventually fibrosis of the submucosa and detrusor layers of the bladder wall. The fibrosis of the submucosa seems to decrease the elasticity of the detrusor muscle, which decreases bladder capacity.

Mast cell infiltrates have been identified in the bladders of clients with IC, particularly in the detrusor layer. Because mast cells are associated with allergic reactions, it is worth noting that about half of clients with IC are reported to have allergies and 30% have inflammatory bowel disease. Finally, another hypothesis is that bacteria are found only in the mucosal wall of the bladder and not in the urine.

Clinical Manifestations

The clinical manifestations of IC are tenderness in the area of the bladder trigone during anterior palpation in a vaginal examination, complaints of lower abdominal or pelvic pain, urinary urgency and frequency (up to 60 times a day), nocturia (excessive urination at night), and, in some women, dyspareunia (painful intercourse). Presenting manifestations and their severity vary from client to client. Some women find the disorder debilitating. Manifestations may be present for years and treated as bacterial cystitis before an appropriate diagnosis is made.

The National Institute of Diabetes, Digestive, and Kidney Diseases recommends specific diagnostic criteria for identifying clients with clinical manifestations. These criteria include the following:

- A detailed client history with physical examination
- A completed bladder diary
- Urine cytology
- Urodynamic evaluation to determine bladder capacity and evaluate bladder function
- Cystoscopy with the client under anesthesia and with hydrodistention of the bladder
- Bladder biopsy

During cystoscopy and hydrodilation of the bladder, the presence of outpouches in the bladder wall, Hunner’s ulcers, and a severely decreased bladder capacity are considered by many physicians to be the clinical diagnostic features of IC. Others believe that IC may be present even without these findings.

Outcome Management

Medical Management

Reduce Pain

The treatment of IC is controversial, with no single accepted treatment. Anti-inflammatory, antispasmodic, antidepressant, and antihistamine medications and, occasionally, tranquilizers or opioids may be used.

Pentosan polysulfate sodium (Elmiron) is the newest oral medication of choice. This drug increases the bladder defense mechanism or detoxifies irritants in urine that might break down the bladder lining. The mechanism of action is like heparin, with anticoagulant and antifibrin effects. Relief of manifestations may take up to 3 months.

Other treatments include instillation of a variety of agents into the bladder to promote healing and pain reduction, such as sodium oxychlorosene (Clorpactin), silver nitrate, and dimethyl sulfoxide (DMSO). Heparin has been instilled in the bladder, initially daily for 3 to 4 months. Therapy is continued three times a week for 3 to 6 months. Some clients may not notice any improvement in manifestations until after the first 2 to 4 months of treatment. All of these treatments are designed to decrease the permeability of the bladder mucosa so that the causative agent has more difficulty penetrating the lining.

Although the mechanism of action is unclear, bacille Calmette-Guerin (BCG) has been effective as an intravesical agent administered weekly. BCG instillations for 6 weeks have led to a decreased need for pain medications, a doubling of cystometric capacity, and sometimes a decrease in client discomfort.

Referrals to centers providing conservative management programs with behavioral intervention, electrical stimulation, and biofeedback to the pelvic floor musculature may also alleviate manifestations of IC. Because of the chronic nature of the disorder, physicians are reluctant to offer opioids for pain reduction. During severe exacerbations, however, opioids may be appropriate.

Improve Coping

Many clients with IC complain of exhaustion and depression. The exhaustion usually stems from poor sleep patterns caused by nocturnal urgency, frequency, and pain. Depression can result from frustration, exhaustion, chronic pain, and difficulty in obtaining effective medical care.
During the acute phase, these clients may require medications to improve sleep as well as antidepressant therapy to increase coping ability. Referrals to social workers or other health care professionals to improve coping strategies and mental status may be needed. You also may need to refer the client to a center that specializes in treating IC.

**Nursing Management of the Medical Client**

**Reduce Pain**
Nurses provide a great deal of education about drug therapy. Many of the medications have a cumulative effect, making long-term therapy necessary for maximal results. You may need to continuously reinforce this point if the client grows frustrated with pharmacologic intervention. You also should counsel the client before opioid intervention. Because IC is a chronic problem, inform the client about risk factors associated with opioids.

**Improve Coping**
Your major responsibility is to support the client through diagnosis and treatment. Because the cause of IC is unclear, few nursing interventions are aimed at prevention. IC is a chronic disorder requiring long-term client support. Clients may need additional psychological counseling to help with stress-related coping strategies. Become familiar with national and local resources for clients with IC or painful bladder disease (Interstitial Cystitis Association), and refer clients as appropriate.

Bladder retraining with conservative management programs can help reduce clinical manifestations. Teaching clients to void by the clock rather than by urge gently and slowly increases bladder capacity. Biofeedback-directed pelvic floor exercises teach the client the urge suppression technique. This process decreases episodes of urgency and frequency and promotes control of manifestations. The additional use of transvaginal or transanal electrical stimulation may help override bladder spasms and can increase the quality of pelvic floor contractions.

**Surgical Management**
Surgery is rarely used to manage the client with IC. The traditional therapy is hydraulic distention of the bladder, with or without instillation of DMSO to increase the bladder’s functional capacity. Clients with severely reduced bladder capacity and incapacitating manifestations may be candidates for a transurethral resection (TUR), laser surgical resection of the lesions, a partial or complete cystectomy (resection of the bladder), and urinary diversion (surgical rerouting of the normal urinary flow) (see Bladder Cancer).

**OBSTRUCTIVE DISORDERS**

**BLADDER CANCER**
Most bladder cancers are transitional or papillary tumors in the bladder urothelium. These tumors may infiltrate the bladder wall. Bladder cancer is the most frequent neoplasm of the urinary tract, accounting for about 6% of all cancer cases in men and 2% in women. The American Cancer Society estimated 67,160 new cases of bladder cancer in 2007 and 13,750 associated deaths. Bladder cancer is rarely seen in adults younger than 40 years of age and occurs most frequently in 50- to 60-year-old adults. Now the fourth most common cancer in men and the tenth most common cancer in women, it affects whites twice as often as blacks.

**Etiology and Risk Factors**
The disease process has several possible causes. There is a strong correlation between cigarette smoking and bladder cancer. Hence a health promotion and health maintenance strategy is to encourage smokers to stop smoking and to be screened regularly after age 50 years for hematuria and other manifestations of bladder cancer. The use of supplements to reduce the risk of bladder cancer is considered in the Complementary and Alternative Therapy feature on p. 736.

Industrial exposure to certain substances, such as aniline dyes, asbestos, and aromatic amines (e.g., benzidine and 2-naphthylamine), may also result in bladder cancer. The latency period of industrial exposure can be as long as 18 to 45 years. Workers in this high-risk group should also be screened regularly after age 50 for hematuria and other manifestations of bladder cancer.

Artificial sweeteners have been weakly linked to the development of bladder cancer. Attempts to connect coffee consumption and bladder cancer have produced contradictory findings because of the increased use of artificial sweeteners and cigarettes associated with coffee consumption. Other risk factors may be chronic cystitis, pelvic radiation, the chemotherapeutic drug cyclophosphamide (Cytoxan), and low fluid intake. Increasing fluid intake to reduce the risk of cancer is discussed in the Complementary and Alternative Therapy feature on p. 736.

Clients who have undergone transurethral resection or removal of superficial bladder cancer should return for regular cystoscopic follow-up as a health maintenance and restoration activity. Teaching clients to care for a urinary diversion is a health restoration activity provided by nurses.

**Pathophysiology**
Bladder cancer appears to result from exposure of the bladder wall to a carcinogen (a cancer-causing agent).
Cigarette smoking or second-hand smoke may result in carcinogenic metabolites produced by abnormal tryptophan metabolism, with the metabolite excreted in the urine. Cigarette smoke also contains nitrosamines as well as 2-naphthylamine (both carcinogens), which are also excreted in the urine. Deletion in chromosome 9 is the most consistent chromosomal finding. Deletions in chromosomes 3, 8, 11, and 18 are often associated with high-grade disease.

Premalignant proliferative changes are often found in the transitional cell layer. These changes are called dysplasia and refer to abnormal cell configuration found in several degrees of severity. The extent of dysplasia may be described as mild, moderate, or severe, leading to carcinoma in situ (localized). Most bladder cancers start as papillary or transitional cell tumors and account for 70% of bladder tumors. These tumors are most commonly found in the trigone of the bladder and lateral wall of the bladder.

Staging of a tumor indicates the depth of penetration into the bladder wall and degree of metastasis. Staging must be done to determine the treatment modality. Clinical staging includes the results and review of an
excretory urogram, cystoscopy, biopsy, and bimanual examination with the client under anesthesia. For evaluation of specific areas of metastasis as well as for staging, chest radiography, lymphangiography, isotope bone scans, computed tomography (CT), and liver function analysis are needed. The most frequently used staging systems are the Jewett-Marshall-Strong System and the tumor-node-metastasis (TNM) classification. The stages refer to the depth of invading tumor found during biopsy (Figure 34-1).

Superficial tumors have a good chance of being eradicated or stabilized; however, recurrence is frequent. Therefore it is crucial to do follow-up cystoscopic examinations every 3 months for 2 years, with additional cystoscopic examinations every 6 months for 2 years, then yearly. Most recurrences of superficial tumors represent lesions that can be controlled by transurethral resection.

Metastasis to other organs begins once the invading cancer penetrates the submucosal and muscular layers of the bladder. The invasion progresses through pelvic lymph nodes and spreads to liver, bones, and lungs. As metastasis progresses, it can extend into the rectum, vagina, other pelvic soft tissues, and retroperitoneal structures. The prognostic “dividing line” lies between stages B1 and B2; stage C and D tumors portend a much poorer prognosis. Clients with superficial bladder tumors have a survival rate of 70% after 5 years. Other clients with muscle invasive disease experience tumor recurrence within 18 to 24 months of the diagnosis.

**Clinical Manifestations**

Gross painless hematuria is most frequently the first manifestation of bladder cancer, occurring in 85% of all cases. Initially, the bleeding is usually intermittent, which may lead a client to delay seeking health care. As the disease becomes more invasive, the client may experience frequent bladder irritability with dysuria, frequency, and urgency. Frequently, gross hematuria or obstruction in voiding forces the client to seek help. The amount of hematuria does not correlate with stage of disease. See the Integrating Diagnostic Testing feature on p. 666 for diagnostic evaluation of hematuria.

Numerous attempts have been made to identify other screening tests including the BTA (bladder tumor antigen) test, NMP22 (nuclear matrix protein) test, and TRAP (telomeric repeat amplification protocol) assay, but all lack sufficient sensitivity. Newer techniques under investigation include assays designed to detect hyaluronic acid, hyaluronidase or survivin, a substance that inhibits cellular apoptosis.

Another examination, intravenous pyelogram (IVP), is a dye-enhanced x-ray examination that allows one to evaluate not only the bladder but also the ureters and kidneys. CT, magnetic resonance imaging (MRI), and ultrasonography also may be done to assess the bladder and surrounding structures, such as the rectum or uterus, possible sites of spread. A tumor marker, serum carcinoembryonic antigen (CEA), which is present with adenocarcinomas of the bladder, can also be evaluated.

**OUTCOME MANAGEMENT**

**Medical Management**

The outcome desired with medical management is to eradicate the bladder of transitional or papillary cell carcinoma in situ in the early stages. This is best achieved with alkylating intravesical chemotherapy or BCG instillations, which are the first-line and most common therapies. Advanced cancer that has invaded muscle is usually treated surgically with a radical cystectomy. Radiation therapy is rarely used in cases of advanced disease or as palliative treatment. Radiation therapy may be used in combination with chemotherapy for a bladder-sparing approach to invasive bladder cancer if surgery is not elected.
**Chemotherapy Administration**

Intravesical therapies can be administered for superficial tumors, such as transitional cell, papillary cell, or stage 0-A tumors. Intravesical BCG therapy appears to be successful in treating carcinoma in situ. The best results have been obtained with BCG as an intravesical agent for transitional cell tumors, although it has also been used for papillary tumors, adenocarcinoma, and squamous cell carcinoma.

Usually, BCG is instilled into the bladder through a urethral catheter. The catheter is clamped or removed. The client is directed to retain the fluid for 2 hours, with side-to-side position changes or supine-to-prone changes required every 15 to 30 minutes. Once the 2 hours have passed, the client voids in a sitting position or the catheter is unclamped to allow drainage. Finally, the client is instructed to drink two glasses of water to help flush the bladder. Steroids and ciprofloxacin (Cipro) have sometimes been given after intravesical BCG treatment to prevent recurrence. If two treatment cycles of intravesical BCG have been ineffective, most urologists recommend a cystectomy (see the Complementary and Alternative Therapy feature on Combination Mega-Dose Supplement and the Recurrence of Bladder Cancer at right).

Intravesical instillation of an alkylating chemotherapeutic agent, another common practice, provides concentrated topical treatment with relatively little systemic absorption. Gemcitabine (Gemzar), mitomycin (Mutamycin), doxorubicin (Adriamycin), valrubicin (Valstar), and cyclophosphamide (Cytoxan) are all used for low-grade, superficial papillary tumors. Systemic chemotherapy drugs are used for more advanced disease, to treat the metastasis of the bladder tumor, and to prolong life. However, surgical removal of the bladder is the most common approach in advanced disease when tumor has invaded muscle.

The major side effects or complications of intravesical chemotherapy or BCG instillation include bladder irritation, frequency, urgency, and dysuria. These manifestations usually resolve within 1 or 2 days. Occasionally, hematuria, fever, malaise, nausea, chills, arthralgia (joint pain), and pruritus (itching) are reported. These manifestations are more representative of systemic reaction and should be reported to the physician.

**Radiation Therapy**

Radiation therapy alone is not as effective a treatment for bladder cancer as surgery and chemotherapy; the 5-year survival rate after radiation alone is less than 40%. Radiation therapy is rarely used except as palliation for advanced disease that cannot be eradicated by intravesical chemotherapy or radical surgery. Most bladder cancers are poorly radiosensitive, and high doses of radiation are necessary.

**Combination Mega-Dose Supplement and the Recurrence of Bladder Cancer**

An older trial that has yet to be duplicated included 65 clients with transitional cell carcinoma (TCC) of the bladder and BCG (bacille Calmette-Guérin) immunotherapy. Clients were randomly assigned to a group that received by mouth either the recommended daily allowance (RDA) of several vitamins and a mineral or the RDA of several vitamins and a mineral plus 40,000 international units of vitamin A, 100 mg of vitamin B₆, 2000 mg of vitamin C, 400 international units of vitamin E, and 90 mg of zinc.

No difference in the time to recurrence was noted in the first 10 months of the study, but significant differences occurred after that time period. The overall follow-up was a mean of 45 months (40 months for the RDA group and 49 months for the RDA-plus-other-vitamins group). The 5-year estimates (Kaplan-Meier interval) of recurrence were 91% in the RDA group (n = 30) and 41% in the RDA-plus-other-vitamins group. This difference was statistically significant, and mild nausea was the most common side effect.

This study obviously requires a larger randomized trial to confirm its findings, but the initial result is interesting and should probably at least be discussed with clients undergoing a similar conventional treatment protocol. Some questions concerning the individual clients in this study were not addressed, such as nutritional or vitamin and mineral deficiency status and other lifestyle and genetic differences between the groups. These issues need to be addressed in future studies.

**Reference**

Nursing Management of the Medical Client

**Assessment.** Begin your assessment of a client being evaluated for bladder cancer with a careful health, medical, and surgical history. Because this client will be undergoing extensive diagnostic evaluation, be sure to collect additional information about drug, chemical, and food allergies. Explain risk factors from exposure to known carcinogens. Ask the client about changes in urine or urination patterns, noting changes in color, frequency, and amount.

**Diagnosis, Outcomes, Interventions**

**Diagnosis: Powerlessness and/or Decisional Conflict.** The client with bladder cancer may experience *Powerlessness and/or Decisional Conflict* related to lack of knowledge of disease process, options, treatment, and side effects of therapy; difficulty in deciding on treatment options; fear of the disease process and treatment; and loss of control following the diagnosis and decisions regarding treatment offered.

**Outcomes.** The client will learn about the medical management of the disease process, with a full understanding of client responsibilities during the treatment. The client and family will be involved with decisions about therapies and care. The client will also be encouraged to help direct care with involved health care professionals.

**Interventions**

*Provide Education.* To increase knowledge, educate the client and family about the use, rationale, risks, side effects, and expected outcomes of intravesical chemotherapy, BCG instillation, radiation, and surgery. You play an important role in client education of treatment modalities and complications that may accompany them.

*Encourage Decision Making.* Encourage the client to discuss and make decisions about care. Provide opportunities for the client to express desires for care as well as time to discuss what the diagnosis and treatment mean personally.

**Diagnosis: Impaired Urinary Elimination.** *Impaired Urinary Elimination* related to urgency, frequency, dysuria, and hematuria resulting from chemotherapy, radiation, or BCG instillation for treatment of bladder cancer.

**Outcomes.** Normal voiding will resume by day 3 after removal of the catheter, and the client will not experience sequelae to BCG instillation, chemotherapy, or radiation therapy.

**Interventions.** Nursing management of intravesical chemotherapy includes client education, administration of the chemotherapy agent, care of the client throughout the procedure, and monitoring for complications after administration.

**Provide Education.** Preparation before BCG or chemotherapy bladder instillation requires fluid restriction for 4 hours before the procedure to decrease the need to void for 2 hours afterward. Tell the client that a catheter will be inserted before the instillation and that it will be necessary to rotate and change positions every 15 to 30 minutes during treatment. After the 2-hour instillation, fluids are encouraged to flush the urinary system. Explain that treatments are typically repeated weekly for 4 to 8 weeks and then monthly for varying periods. Follow-up cystoscopy is required to monitor tumor growth.

**Promote Safety**

Because of the toxicity of the intravesical chemotherapy or BCG instillation, it is important to provide a safe environment for health care workers who may come in contact with the chemotherapeutic agent. For 6 hours after treatment, all urine and the toilet bowl must be disinfected with bleach.

**Promote Comfort.** Dysuria or irritation while voiding may result from the side effects of chemotherapy, placement of an indwelling catheter, and the presence of the tumor, and it must be managed. Tumor pain is managed with analgesics. Irritative problems of dysuria, frequency, and urgency from the catheter will diminish when the catheter is removed. Irritation from the chemotherapy will decrease after about 2 days.

Reassure the client that dysuria, frequency, and urgency from catheter placement and intravesical treatment will diminish over 2 days. Discuss prescribed analgesics, antispasmodics, or anticholinergics, and explain how they should be taken.

**Diagnosis: Risk for Injury.** The client who undergoes chemotherapy, BCG instillation, or radiation therapy is at Risk for Injury from side effects of these treatments.

**Outcomes.** Complications resulting from these treatments will be minimized. The client will verbalize an understanding of risk and side effects following the selected treatment option.

**Interventions.** Explain expected and unexpected outcomes of BCG instillation, chemotherapy, or radiation therapy. Inform the client and family how and when to alert medical staff to potential complications. Interventions for side effects include administering antispasmodics, increasing fluid intake, and administering urinary tract antiseptics or analgesics.

If a high temperature develops after BCG instillation, treatment with isoniazid or other medications used to treat tuberculosis may be indicated.
For radiation proctitis, the client requires a low-residue diet and drugs to decrease intestinal motility. For complete information on nursing care for clients receiving radiation therapy, see Chapter 17.

**Evaluation.** Complications that arise from medical treatment may be difficult to manage, but they typically resolve after the treatment has ended. Evaluation of the nursing management of radiation therapy and intravesical BCG and chemotherapy is based on the client’s ability to restate personal responsibilities, to verbalize an understanding of the disease process, and to participate in care.

Because clients with bladder cancer require long-term follow-up care and continuous evaluation, they must understand the disease process and long-term follow-up responsibilities needed to maintain optimal health. If medical therapies are unsuccessful, surgical removal of the bladder may be required.

### Surgical Management

Several surgical options may be used to treat bladder cancer that has not responded to medical therapies or that has invaded the bladder muscle. Surgical intervention ranges from local resection and fulguration of the tumor (destruction of tissue by electrical current through electrodes placed in direct contact with the growth) to total cystectomy, which requires diversion of normal urinary flow. Most of the surgical procedures can be performed via traditional open, laparoscopic, or robotic-assisted methods.

#### Transurethral Resection

The simplest procedure is transurethral resection of the bladder tumor and fulguration done for low-grade, superficial, isolated papillary tumors or, sometimes, for inoperable tumors for palliation. The bladder is accessed through a cystoscope, which has been inserted through the urethra. This procedure is commonly followed by intravesical BCG or chemotherapy to prevent recurrence from reattachment of loose bladder cancer cells. Assess for hematuria, stenosis, and other complications after surgery. Hematuria, a common problem after transurethral resection, is controlled with a three-way indwelling catheter and, if necessary, bladder irrigation.

After transurethral resection of the bladder, the client usually has hematuria. A three-lumen, indwelling urethral catheter is attached to a continuous or intermittent closed bladder irrigation system to facilitate urine flow, minimize blood clots, and monitor for postoperative bleeding. Nursing care is similar to that after transurethral resection of the prostate (see Chapter 38). Bright red or pink urine fades to clear in about 3 days.

### Partial Cystectomy

A segmental or partial cystectomy may be done if the client cannot tolerate a radical cystectomy and for an isolated tumor that cannot be treated by transurethral resection. Up to half the bladder can be removed. This procedure is appropriate for 10% to 15% of clients. The recurrence rate can be high.

During the initial postoperative period, bladder capacity is markedly reduced. The postoperative bladder may be able to hold no more than 60 ml. Over several months, bladder tissue expands, increasing its capacity from 200 to 400 ml.

#### Cystectomy and Urinary Diversion

A radical cystectomy with urinary diversion is the procedure of choice when potentially curable stage B disease is too advanced for transurethral resection or intravesical chemotherapy. The procedure may also be performed for treatment of the following:

- Neurogenic bladder (see later discussion)
- IC or radiation-induced cystitis with severely reduced bladder capacity
- Congenital anomalies of the lower urinary tract, such as bladder extrophy

Radical cystectomy entails removal of the bladder, urethra, uterus, fallopian tubes, ovaries, and anterior segment of the vagina in women. In men, the bladder, urethra, and usually the prostate and seminal vesicles are removed. Cystectomy also involves removal of perivesical fat and dissection of the pelvic lymph nodes. This procedure is necessary when the tumor has invaded the bladder wall, involves the trigone, or cannot be treated adequately by less radical methods. When the bladder and urethra are removed, permanent urinary diversion is required. The entire surgical procedure is done in one step, with urinary diversion and cystectomy performed at the same time.

#### Ileal Conduit

An ileal conduit (also called ureterointestinal, ileal bladder, or Bricker’s procedure) is one type of urinary diversion. Using a segment of the intestine as a conduit, the surgeon constructs a system in which urine empties through an artificial opening in the skin called a stoma (Figure 34-2). Usually a portion of the terminal ileum, which has the least reabsorptive power, is used for the conduit. After the continuity of the remaining intestine is reestablished with end-to-end anastomosis, the proximal end of the segment is closed. The distal end is brought out through a hole created in the abdominal wall, folded back, and sutured to the skin to form a stoma. The ureters are then implanted into the ileal segment. Urine flows into the conduit and is continually propelled out through the stoma by peristalsis. Mucous shreds are present in the urine because of the mucus produced by the lining of the bowel.
Indications. The client who has undergone an ileal conduit must wear an appliance over the stoma to collect the urine. This procedure involves less time and the conduit is easier to construct compared with other diversion procedures, which makes it an excellent choice for older clients who are unable to tolerate a lengthy surgery because of other medical conditions. Because the ileal segment is not a reservoir, absorption of electrolytes and the frequency of other complications are minimal.

Contraindications. Clients with chronic bowel disease or colon cancer may not be candidates. Any medical condition that prevents a major surgical procedure is also a contraindication.

Complications. Several complications related to stoma management (e.g., skin irritation, stomal defects, and stomal pouching problems) may arise. Leakage at the anastomosis site, stenosis, peristomal hernia, ulceration, and obstruction at the ureteroileal anastomosis may develop. Finally, clients who have undergone an ileal conduit procedure are at increased risk for pyelonephritis, hydronephrosis (distention of renal pelvis and calices with urine), and formation of calculi.

Outcomes. About 6 to 8 weeks after surgery, it is expected that the client will adjust to the stoma and appliance, maintain stoma and appliance care, and return to most previously enjoyed activities.

Indiana Pouch

Other diversionary procedures are the Indiana pouch, Florida pouch, Kock pouch, and continent internal ileal reservoir. A reservoir is created from the ascending colon and terminal ileum. The Indiana pouch is an improved and larger version of the original Kock pouch (Figure 34-3). Other continent reservoir operations vary slightly regarding surgical technique and the portion of the colon and ileum used.

Once the reservoir has been created, the ureters are implanted into the side of the diversion. A special nipple valve is then constructed and used to attach the reservoir to the skin. Several weeks after surgery, the client is taught to use a catheter to drain the reservoir at 3- to 4-hour intervals. Long-term goals suggest internal storage of up to 800 ml of urine is possible, with a daytime continence rate of up to 96% and a nighttime continence rate of up to 86%.

Indications. Because this procedure involves no appliance for collecting urine, it is used for clients with a life expectancy of more than 2 years. Creation of the reservoir and nipple valve requires 1 to 3 more hours of surgical time compared with the time needed to construct an ileal conduit. The client’s serum creatinine level should be 2.5 mg/dl or less. The client will need gross and fine
motor coordination to catheterize the nipple valve and must be willing and able to participate in self-care. Electrolyte reabsorption is minimal with this diversion technique as long as the urine is drained regularly.

**Contraindications.** Clients with a history of significant bowel resection and malabsorption related to diarrhea, irritable bowel syndrome, ulcerative colitis, diverticular disease, bowel cancer, Crohn's disease, progressive neurologic disorders, morbid obesity, kidney disease (creatinine level >2.5 mg/dl), and pelvic radiation are not candidates for an Indiana pouch. Clients who have poor manual dexterity or are not capable of self-care may not be candidates for this procedure.

**Complications.** Possible complications include incontinence, difficult catheterization, urinary reflux, anastomotic leaks, pyelonephritis, obstruction, bacteriuria, calculi, erectile dysfunction, electrolyte imbalances, malabsorption of bile salts or vitamin B₁₂, and rupture of the reservoir.

**Outcomes.** It can be normal for clients to experience urinary incontinence intermittently for months postoperatively. About 8 to 10 weeks after surgery, the client will have improving urinary continence, will remain free of UTI, and will return to activities pursued before surgery. Self-catheterization should begin 2 to 3 weeks postoperatively.

**Neobladder**

Sometimes the urethra can be spared, allowing the creation of a neobladder, also known as an ileal W-Bladder. This operation can be the treatment of choice for a client with bladder cancer requiring cystectomy. Although this procedure differs from one in which the reservoir empties through an abdominal stoma, a neobladder empties via a pelvic outlet to the urethra. If the urethra is resected, a reconstructed neourethra together with an artificial sphincter is created. This procedure is more successful in males because of the normal anatomy maintained, the neobladder technique is the preferred urinary diversion for clients with a life expectancy of more than 2 years and with no contraindications. Other indications are as described for an Indiana pouch.

**Contraindications.** In addition to the contraindications listed for an Indiana pouch, clients with bladder tumors in the trigone region of the bladder, diffuse carcinoma in situ, multifocal tumors, or bladder cancer involving the prostate are not candidates for this procedure.

**Complications.** Possible complications include pouch rupture from hypercontinence, inability to empty the bladder completely, incontinence, electrolyte imbalances, erectile dysfunction, and calculi. With resection of the ileum, possible metabolic changes include the following: (1) malabsorption of bile salts, vitamin B₁₂, fat, and fat-soluble vitamins A, D, E, and K; (2) increased risk of biliary and kidney stones and steatorrhea.

**Outcomes.** The client will go home 4 to 8 days after surgery with a catheter in place. The catheter will be removed about 4 weeks after surgery, and the client will be taught to “straining to void” (see later discussion on strain voiding or “Valsalva voiding” and self-catheterization). After 2 to 3 months, the client is expected to have urinary continence, to be able to empty the bladder completely, and to return to previously pursued activities.

### Palliative Procedures

#### Percutaneous Nephrostomy or Pyelostomy

For the client with inoperable bladder cancer, a percutaneous nephrostomy or pyelostomy may be performed to prevent obstruction. A catheter is inserted into the renal pelvis by surgical incision or, more likely, by a percutaneous puncture procedure. In the surgical approach, a balloon-tipped or mushroom-tipped catheter is connected to an external drainage system.

In the percutaneous nephrostomy procedure, a trocar is inserted under fluoroscopy by direct puncture into the renal pelvis or calyx. A flexible small-gauge needle is then used to instill contrast material to verify proper location. Using angiographic wire as a guide, the surgeon places the nephrostomy tube and connects it to a closed drainage system. The entire procedure is done with the client under local anesthesia. It is important to stabilize the tube to prevent dislodgment.

#### Nursing Management of the Preoperative Client

**Assessment.** Preoperative nursing management of the client with bladder cancer is directed at educating the client and family. Assess the client and family's
understanding of pending diagnostic testing, bladder cancer, and the proposed surgical procedure. Evaluate the client’s anxiety level by providing opportunities to talk about feelings and to ask questions about the upcoming surgery, the potential for distorted body image, and support systems outside the hospital.

In addition to educating and counseling the client, obtain physical assessment findings. Check for (1) costovertebral tenderness and masses in the upper abdomen and flank, (2) distention before and after urination, (3) vaginal or rectal masses, and (4) manifestations of discharge in urethral meatus and perianal areas. Assessment of other body systems includes (1) monitoring vital signs, (2) measuring intake and output, (3) examining skin for color, bruises, petechiae, and hydration, and (4) auscultating heart and lung sounds.

Complete a self-care or functional assessment to determine whether the client can manage drains and indwelling catheters and is able to catheterize a continent stoma or urethra. Finally, determine whether a family member can provide care or whether home health care is available to the client.

Diagnosis: Outcomes, Interventions
Diagnosis: Deficient Knowledge. The most common nursing diagnosis preoperatively is Deficient Knowledge related to bladder cancer and diagnostic testing, possible bowel preparation prior to surgical intervention, and surgical intervention with associated expected course of treatment.

Outcomes. Preoperative education will result in an increased awareness of the procedure and lowered anxiety preoperatively and postoperatively. The client will understand diagnostic tests, bowel preparation, surgical intervention, and the anticipated postoperative course, as evidenced by statements and demonstrations of self-care.

Interventions
Provide Preoperative Teaching. Assess the client’s educational deficits surrounding bladder cancer, the proposed treatment, and expected outcomes by encouraging discussion. Include the family in the discussion to review diagnostic evaluation, preoperative treatment, and postoperative expectations. Explain the purpose of various tubes, such as IV lines, the nasogastric (NG) tube, stents, drains, and catheters that will be present after surgery and when they will be discontinued. As needed, discuss support services available after discharge.

Discuss Bowel Preparation. If a diversion or pouch procedure has been chosen as the appropriate surgical intervention, discuss the preoperative bowel preparation (“bowel prep”). Because a segment of bowel will be used to create the conduit or reservoir, this measure relates to the segment of intestine to be used in the procedure.

Bowel preparation calls for a clear liquid diet for 1 to 3 days, laxatives and enemas to clear the bowel, and antibiotics to lower the bacterial count in the bowel. Because this step takes several days and includes enemas, dietary restrictions, and medications, it is extremely important to teach the client and family to strictly adhere to the directions.

Arrange for Wound, Ostomy, and Continence Nurse Visitation. If the client will have a pouch or diversion procedure, a visit from a wound, ostomy, and continence (WOC) nurse may be reassuring for the client and family. This visit allows the client and family to interact and learn the expected postoperative course with a nurse with expertise in this field.

Before surgery, the WOC nurse selects and marks the best site for ostomy placement if the surgeon plans to construct a stoma. The main criterion for stomal placement is finding a site that allows the faceplate of the drainage appliance to bind securely to the surface of the abdomen. The stoma must be clearly visible to the client. This means that the surgeon should avoid the umbilicus, rib margins, pubis, iliac crests, and pre-existing scars, wrinkles, or crevices. Placing the stoma directly on the client’s waistline can cause excessive pressure from clothing.

The client is observed in the supine, standing, and sitting positions during the selection process. Stoma placement is usually on the right lower quadrant of the abdomen, in the abdominal rectus muscle, about 2 inches below the waist and 2 inches from the midline. Explain the proper way to care for the urinary diversion.

Diagnosis: Risk for Disturbed Body Image. The client is at Risk for Disturbed Body Image related to surgery, possible stoma formation, possible sexual dysfunction, and potential change in urinary elimination.

Outcomes. The client will not experience body image disturbance postoperatively, as evidenced by the ability to discuss concerns regarding altered body image, stoma placement, change in urination pattern, risk of sexual dysfunction, and verbalization of fears.

Interventions. Identify factors that reveal the client’s difficulty in coping with anticipated changes in body image. If a diversion procedure is necessary, in addition to a preoperative visit from an enterostomal nurse, you may want to suggest a visit from a client with a similar diagnosis and procedure. These visits provide the client with a comfortable opportunity to ask questions, to experience a sense of comfort and support, and to receive information.
Preoperative teaching should include explanations of the expected anatomic and physiologic alterations and possible effects for the client. Because of the lifestyle changes that are required by diversion or pouch surgery, be sure to offer support and refer the client for additional counseling if indicated. Community associations, such as the United Ostomy Association and the American Cancer Society, provide tremendous help for clients undergoing urinary diversion.

Radical bladder surgery may cause a disturbance in sexual function. Because of the private and personal nature of this surgery, you should use this opportunity to discuss the risk for sexual dysfunction following radical surgery for bladder cancer. Although nervesparing procedures and vaginal reconstruction procedures can reduce sexual dysfunction, clients should be prepared to take advantage of available resources in case impotence or difficulty with intercourse develops after surgery.

**Evaluation.** It is expected that the client will be prepared for and will undergo the selected surgery successfully. The client should restate information about bladder cancer, diagnostic testing, bowel preparation, and surgical intervention. In addition, the client should voice concerns about body image disturbance and sexual dysfunction after surgery. The client should be aware of outside resources available following discharge.

**Nursing Management of the Postoperative Client**

**Assessment.** Routine postoperative evaluation and care involve the usual assessments for a client after major abdominal surgery. The Critical Monitoring feature at right describes specific assessments to be completed.

Peristalsis in the intestinal tract is absent for several days because of the manipulation and resection of the bowel. The client continues to receive nothing by mouth (i.e., remains on NPO status) with IV lines and a nasogastric tube in place until peristalsis returns. Assessment of bowel sounds and nasogastric contents is required as well as passing of flatus.

Urine flow never stops after surgery. Ureteral stents originating in the renal pelvis extend through the ureters and through the reservoir, conduit, or neobladder. The stents that exit through a stoma are contained in the pouch. With continent reservoirs, a catheter is placed through the nipple valve to drain the internal reservoir for 2 to 3 weeks until healing occurs. For an Indiana pouch and neobladder, a suprapubic catheter may be placed through the abdominal wall into the reservoir to keep it drained while another catheter is placed through the urethra and is used as a stent. This protects the anastomosis of the urethra and neobladder.

In some instances, ureteral stents or catheters may drain urine after neobladder or continent reservoir surgery. The stents and suprapubic catheter are removed once adequate healing has occurred, usually in 3 to 4 weeks. The suprapubic catheter is usually the last tube to be discontinued. Constantly monitor the tubes for patency and continuous drainage, usually in separate closed gravity systems, with irrigation as prescribed to maintain patency. For the first 24 to 48 hours, hourly intake and output records may be required. Clients should be kept from manipulating tubes immediately after surgery.
Complications. The greatest potential problems after any diversion or pouch procedure are infection, wound dehiscence, skin irritation, ulceration, and stomal defects. Monitor the client for other complications as well following a radical cystectomy. Cystectomy is a very invasive surgery that puts the client at risk for most of the usual postoperative complications, including shock and hemorrhage. The extensive pelvic dissection associated with this surgery can increase the risk of thrombophlebitis. Additionally, pelvic lymph node dissection can predispose the client to lymphedema in the lower limbs. You may need to assess calf circumference during each shift for clinical manifestations of deep venous thrombosis (DVT).

Later complications are renal deterioration caused by reflux, stenosis of the stoma, strictures at the site of the anastomosis, hydronephrosis, calculi, incontinence, urinary retention, and peristomal hernia. Stenosis of the stoma may occur from scarring during stomal maturation. If the opening on the faceplate is too large, epithelial hyperplasia or thickening of the peristomal skin may contract the stoma. Clients with urinary diversion are also susceptible to uric acid and calcium stone disease. The onset of urinary stone development usually occurs at least 2 years postoperatively and sometimes as long as 5 to 10 years later. Obstruction anywhere in the urinary tract may interfere with normal urine flow.

Other potential complications of continent reservoirs or pouch procedures include incontinence, difficult catheterization, urinary reflux, and possible pyelonephritis, obstruction, bacteriuria, electrolyte imbalances, urolithiasis, or absorptive problems. The reservoir may leak if the client does not comply with the self-catheterization protocol.

Diagnosis, Outcomes, Interventions

**Diagnosis: Risk for Injury: Occlusion of Urinary Drainage.** A potential problem for the postoperative client is *Risk for Injury: Occlusion of urinary drainage device related to hematuria, clot formation, and swelling following the surgical procedure.*

**Outcomes.** Catheters and other drainage tubes will not become obstructed, and urine will flow freely.

**Interventions.** Nursing care after segmental bladder resection centers on maintaining constant urinary drainage to ensure that the remaining bladder does not become distended, putting strain on the suture line. The client usually has both urethral and suprapubic catheters. The client is discharged with the catheters in place, and they remain in place for about 2 weeks or until complete healing has occurred.

As with any major abdominal surgery, clients who undergo a radical cystectomy and urinary diversion are at an increased risk for hemorrhage. Monitor the client’s vital signs, the incision, and the drainage tubes closely for early signs of excessive bleeding. If an ileal conduit is formed, the client has a pouch in place to collect urine from the ileal conduit or ureteral catheters or stents.

After a continent diversion, make sure that the catheter is draining urine freely. If any obstruction occurs, the newly created reservoir can become damaged and internal leakage along the suture line can occur. Monitor the catheter output closely, and perform irrigations at regular intervals as directed. Perform catheter irrigation gently in the immediate postoperative period, using about 30 to 60 ml of normal saline solution. Irrigation is necessary to prevent obstruction from clots or mucus.

After neobladder surgery, one catheter and one suprapubic drain will be in place to prevent overdistention of the newly created bladder. These are treated as closed drainage systems. Carefully monitor the neobladder for possible obstruction. Regular irrigation is needed to rid the neobladder of mucus.

When ureteral stents or catheters are placed, patency is important to prevent hydronephrosis and pyelonephritis. Because there is no mucus in urine from the kidney, irrigation is usually not required and is kept to a minimum to prevent pyelonephritis and hydronephrosis.

**Do not irrigate ureteral catheters unless you have a specific order to do so, and then only use 5 to 10 ml of sterile saline solution. Urine output from each ureteral catheter should be 0.25 ml/kg/hour or roughly half of the 0.5 ml/kg/hour normally expected from a urethral catheter.**

Ureteral catheters may drain into a pouch when a stoma is present (see the Critical Monitoring feature on Postoperative Monitoring After Urinary Diversion Procedures).

If the client has a stoma, a temporary, clear urostomy pouch over the stoma is connected to a gravity drainage system. Sometimes ureteral stents are used to splint the ureters while they heal. These stents, usually removed before the client is discharged from the hospital, may extend through the stoma.

**Label all catheters, stents, and drainage tubes to prevent errors in irrigation and output calculations. Secure all tubes. Use a separate closed gravity drainage system for each tube unless, as with an ileal conduit, ureteral catheters exit into the pouching system until they are discontinued. A separate system for each tube minimizes the risk and extent of bacterial infection.**

**Diagnosis: Readiness for Enhanced Self-Care and Effective Therapeutic Regimen Management.** Clients undergoing any type of urinary diversion need to learn new self-care strategies. The nursing diagnoses of Readiness for Enhanced Self-Care and Effective Therapeutic Regimen Management related to complexity of therapeutic regimen are applicable for this client.
Outcomes. The client will effectively manage the urinary diversion or neobladder, as evidenced by the ability to describe the regimen and to perform the required care successfully.

Interventions

Ileal Conduit. For a client with an ileal conduit, teach stoma care and skin care, promote self-care of the collection device, prevent odor, promote independence, and encourage follow-up.

Teach Stoma and Skin Care. The client needs to learn to care for the stoma and skin with proper application of a urinary pouch. See the Bridge to Home Health Care feature at right, a fundamentals of nursing textbook, and the figure on the website: Applying a disposable ostomy pouch. An opening, no more than 3 mm larger than the stoma, must be cut in the skin barrier to fit over the stoma. This opening should be remeasured after the edema in the stoma recedes. The barrier is then applied to the skin before attaching the pouch or faceplate. Skin irritation or breakdown is a constant threat to a client with a urinary diversion. The pouch may be left on as long as it is not leaking for a maximum of 7 days. Nystatin creams or powders are effective against topical yeast infections around the stoma.

Promote Self-Care of the Collection Device. Urine pouches have a valve in the bottom for intermittent urine drainage. Alternatively, the pouch may be drained by gravity into a leg or bedside bag, especially at night. The self-contained pouch drainage system allows the client to resume most, or all, former activities with little or no change in style of dress. Instruct clients to empty the pouch when it is one-third to one-half full. The weight of accumulating urine may pull the faceplate away from the skin and cause leakage. Advise clients to check the seal often if they are perspiring heavily.

Prevent Odor. Urine odor is a common problem with urinary stomas. Noxious odors result mostly from poor hygiene, alkaline urine, normal breakdown of urine (ammonia), concentrated urine from insufficient fluid intake, and the ingestion of certain foods, such as asparagus. Because diluted urine has less odor, adequate fluid intake is helpful. Reusable appliances can be washed with mild soap and lukewarm water. Rinse the pouch and allow it to dry.

Promote Independence. Long-term nursing intervention aims to maintain a functional urinary system and prevent complications. It takes time for clients and significant others to adjust to a urinary diversion. Even though counseling may have been excellent during the preoperative period, the reality of the diversion commonly produces anxiety, depression, and anger. The client may need help at first to look at or even talk about the stoma. As soon as possible after surgery, the client must begin to help care for the stoma, peristomal skin, and drainage system, gradually assuming more...
responsibility until achieving independence (see the Client Education Guide feature on Learning to Care for a Urinary Diversion on the website).

**Encourage Follow-Up.** A client with bladder cancer and complications such as calculi and stenosis must receive follow-up at regular intervals to assess for a recurrence of the cancer. The client should also continue to be seen by a WOC nurse to check for problems with the ostomy.

** Continent Diversion.** Postoperative care for the client with an Indiana pouch is similar to that for any client with a urinary diversion, except there is no external pouch. The client has a catheter and suprapubic drain in place to drain urine continuously until the pouch heals. The reservoir is irrigated through the catheter with about 50 to 60 ml of normal saline every 4 hours to wash out clots or mucus, which may cause obstruction.

**Teach Reservoir Catheterization.** After a radiographic study, remove the catheter at 2 to 4 weeks after surgery to make sure that the continent reservoir is functioning properly. The client must learn to empty and irrigate the reservoir at regular intervals. The principles of catheterization of a urinary reservoir are the same as for clean, intermittent urinary self-catheterization.

Using a 16f to 20f catheter with a generous amount of water-soluble lubricant, show the client how to insert the catheter into the nipple valve. Warn against forcing the catheter into the reservoir. If resistance occurs, tell the client to pause and apply only gentle pressure while slightly rotating the catheter. If this does not work, the client should call the physician. Advise the client to insert the catheter every 2 to 3 hours to drain the reservoir. Each week thereafter, the interval is increased by 1 hour, until finally catheterization is completed every 4 to 6 hours during the day and every 6 hours at night.

**Teach Reservoir Irrigation.** Once the urine has stopped flowing, the client should take several deep breaths and move the catheter in and out 2 to 3 inches to be sure that the pouch is fully emptied. The catheter should be withdrawn slowly so additional urine can drain.

After urine has been drained from the reservoir, tell the client to leave the catheter in place and to use 50 to 60 ml of normal saline solution to irrigate the reservoir and to prevent excess mucus buildup, which may cause obstruction. The fluid can be either gently aspirated or allowed to drain from the catheter. Once the irrigant is drained, the catheter is removed and the end of the catheter is pinched before removal to prevent dripping. The irrigations may be repeated until the drainage returns free of mucus. If the mucus is viscous (thick), increasing fluid intake and drinking cranberry juice can decrease the viscosity. Usually, mucus production lessens over time.

Because the catheterization procedure can be unpredictable, advise clients to carry catheterization supplies with them. Most clients develop a sensation of abdominal pressure when catheterization is needed. Regular fluid intake and adherence to the catheterization schedule are important. A full reservoir puts pressure on the nipple valve, making catheterization much more difficult. Clients should be taught to practice these skills before discharge. They may need follow-up with a visiting nurse for additional help.

**Teach Strain Voiding and Intermittent Self-Catheterization.** With a neobladder, the client must learn how to strain void, relaxing the external sphincter and increasing abdominal pressure to start the urine stream. Show the client how to perform clean self-catheterization in case the bladder cannot be emptied by regular voiding.

**Encourage Follow-Up.** Following urinary diversion, the client should be monitored at 3, 6, 9, and 12 months. The assessment includes electrolyte values, serum creatinine and blood urea nitrogen (BUN) values, and renal function studies. Renal damage may occur in noncompliant clients who neglect to empty the pouch and who then develop infection. These clients often experience severe kidney infections and damage, and an ileal conduit may be created to replace the neobladder or Indiana pouch so that urine will drain freely.

**Diagnosis: Risk for Sexual Dysfunction.** Extensive surgical dissection may alter the reproductive anatomy, creating a Risk for Sexual Dysfunction related to potential postoperative impotence in men or painful intercourse in women following a radical cystectomy and changes in body image affecting sexuality.

**Outcomes.** The client will accept and adopt alternative methods of sexual expression and will obtain additional information about sexuality through questions and statements.

**Interventions.** Male clients have a risk of impotence after a radical cystectomy related to the prostate removal. Offer counseling both before and after the surgery to help the client adjust to any alterations (see Chapter 38 for information about alterations in male sexuality). PDE-5 inhibitors, given three times weekly, are offered to most male clients immediately after the catheter is removed to maintain blood flow to the corpora cavernosa, so that when sexual intercourse can be resumed the client will have fewer problems with impotence. Other medications and devices are available to increase blood flow in the penis.
Carcinoma in situ is considered curable with surgery, but the 5-year survival rate for clients with muscle-invasive tumor (stage C or greater) is only 40% to 50%

For partners of any client, encourage holding, touching, kissing, and other activities to promote intimacy. Partners are often afraid to touch the client for fear of inflicting pain; embarrassment may also be an issue. Encourage open discussions.

**Evaluation.** Carcinoma in situ is considered curable with a simple transurethral resection. Intravesical chemotherapy or BCG may be combined to decrease the risk of recurrence. If the postoperative care of the client has been successful, the client will be able to make the transition to self-care with minimal difficulty. Even with a radical cystectomy, however, the 5-year survival rate for clients with muscle-invasive tumor (stage C or greater) is only 40% to 50%.

**Self-Care**

Motivation to promote preoperative self-care may influence the postoperative course. Direct the client toward self-care by improving knowledge, encouraging independence, and fostering participation in care and treatment. When the client increases self-care, the need for nursing care decreases and health promotion activities increase.

For reservoir irrigation or intermittent self-catheterization, the client may need referrals to durable medical equipment companies for ostomy supplies or catheters. These items can be delivered to the client's home. If the client lives alone, it may be necessary to arrange home delivery of groceries and medications.

Housekeeping and lifting are limited for the first 6 to 8 weeks after surgery. Evaluate the client's ability to engage in self-care, and identify the need for additional care from home health nurses. If the client cannot provide care and if a family member is involved with care, respite services may be required. Also consider directing the client and family to local support groups.

**Modifications for Older Clients**

The major modification for older clients with urinary diversion stems from difficulties with self-care. Changing an appliance is one area of difficulty because some dexterity is required. Older clients commonly have arthritis and other disabilities, including decreased visual acuity, that may limit their ability to manipulate catheters and pouches. These concerns must be closely assessed and appropriate assistance offered.

**URETERAL TUMORS**

Primary tumors of the ureter are rare. Ureteral cancer occurs mainly in men in their 50s and 60s. This form of cancer rarely affects women. Ureteral neoplasms usually extend from renal or bladder neoplasms or from tumors originating in the bowel, uterus, or ovary. Those primary neoplasms usually occur first as a papillary, transitional cell, or squamous cell carcinoma. These tumors are most frequently found in the lower third of the ureter. In later stages of ureteral cancer, the tumor extends outside the ureter to adjacent structures and regional lymph nodes or to distant sites. Common sites for metastasis include the lungs and liver.

Usually, the first manifestation of ureteral malignancy is gross hematuria. The tumor normally develops painlessly until obstruction occurs. At this point, the client may experience flank pain with or without hydronephrosis. Diagnosis is made through urine cytology, IVP, cystoscopy, ultrasonography, and CT scanning.

Treatment of ureteral cancer almost exclusively involves surgical excision and resection. Radiation may also be used in advanced cases with local extension. When the lesion is located in the middle or proximal third of the ureter, the surgical procedure usually involves nephroureterectomy—removal of the kidney, ureter, and attached segment of the bladder on the affected side. If the tumor is in the distal third of the ureter and noninvasive, a more conservative procedure may be used; in this case, just the distal portion of the ureter is resected with ureteral reimplantation.

Silicone rubber (Silastic), polytetrafluoroethylene (Teflon), and bovine carotid heterograft are used to replace the resected ureter, facilitating reimplantation in the bladder. A ureter-ureter anastomosis also may be performed. Preoperative and postoperative intervention is similar to that for clients undergoing nephrectomy, ureteral reimplantation, or segmental resection of the bladder.

If the decision is made not to perform any of these procedures, some palliative measure may be needed to prevent or alleviate ureteral obstruction. Percutaneous nephrostomy tube placement may be a temporary or permanent palliative option. Urinary diversion may be performed, as described previously, or a ureteral stent catheter may be placed into the ureter during cystoscopy to maintain its patency. The older catheter—a flanged, winged stent (Gibbon’s stent)—or the newer double J stent prevents migration up the ureter or dislodgment by ureteral peristaltic waves or gravity.

**URINARY CALCULI**

Urinary calculi (urolithiasis) are calcifications in the urinary system. Commonly called stones, calculi form primarily in the kidney (nephrolithiasis), but they can form in or migrate to the lower urinary system. They
are typically asymptomatic until they pass into the lower urinary tract. Stones are usually managed by a urologist. Primary bladder calculi are rare and usually develop from a history of urinary stasis from obstruction or chronic infection.

Up to 4% of the population in the United States have urolithiasis. About 12% of the male population have a renal stone by age 70 years. More than 200,000 Americans require hospitalization for treatment of stones each year. Many more people pass stones spontaneously with only minor manifestations that require no treatment, whereas others are treated in an ambulatory setting. The recurrence rate for calcium oxalate stones is about 50% within 5 years.

**Etiology and Risk Factors**

The two primary causative factors are (1) urinary stasis and (2) supersaturation of urine with poorly soluble crystalloids. Increased solute concentration occurs because of fluid depletion or an increased solute load. This increased concentration leads to the precipitation of crystals, such as calcium, uric acid, and phosphate. Urinary pH influences the solubility of certain crystals, with some crystal types precipitating readily in acid urine and some in alkaline urine. Abnormal pH levels occur in renal tubular acidosis with the administration of carbonic anhydrase inhibitors, in the presence of urea-splitting bacteria, and in severe, chronic diarrhea. Stasis of urine from bladder neck obstruction, continent urinary diversion, and immobilization increases the risk for development of stones because the crystals in unmoving urine precipitate more readily.

Infection, foreign bodies, failure to empty the bladder completely, metabolic disorders, obesity and weight gain, and obstruction in the urinary tract contribute to the formation of calculi as well. The presence of precipitators has been noted in the urine (such as protein matrix and bacteria or inflammatory elements).

Inhibitor substances, such as citrate and magnesium, appear to keep particles from aggregating and forming crystals; a lack of inhibitors increases risk of stone development. Not only does the deficiency of inhibitors predispose the client to calculi, but there may be “anti-inhibitors” in the urine, such as aluminum, iron, and silicon. Certain medications may induce calculus formation, such as acetazolamide, absorbable alkalis (e.g., calcium carbonate and sodium bicarbonate), and aluminum hydroxide. Massive doses of vitamin C increase urinary oxalate levels.

There is an increased risk of calculus formation in the southeast part of the United States—an area known as “the stone belt.” Men between ages 30 and 50 years have three times the risk of calculi. Stones are also more common among people of European or Asian descent. Once a client has had calculi, there is an increased risk of additional ones.

Urolithiasis results not from any single factor but from multiple phenomena. One unanswered question is “Why do some clients form calculi when others do not?” This problem is particularly important with recurrent “stone formers.”

Risk factors for stone formation include anything that causes either stasis or supersaturation of the urine, such as the following:

- Immobility and a sedentary lifestyle, which increase stasis
- Dehydration, which leads to supersaturation
- Metabolic disturbances that result in an increase in calcium or other ions in the urine
- Previous history of urinary calculi
- Living in stone-belt areas
- High mineral content in drinking water
- A diet high in purines, oxalates, calcium supplements, animal proteins
- UTIs
- Prolonged indwelling catheterization
- Neurogenic bladder
- History of female genital mutilation

Health promotion and health maintenance activities are discussed under Nursing Management of the Medical Client.

**Pathophysiology**

The exact mechanism of stone formation has not been clearly defined. Some researchers believe that a low dietary calcium intake contributes, whereas others contend that a high calcium intake contributes. Both groups agree on the role of supersaturation, however. Crystallization appears to be the primary factor in calculus development from the following:

- Supersaturation of urine with increased solutes
- Matrix formation caused when mucoproteins bind to the mass of the stone
- Lack of inhibitors caused by increased or absent protectors against stone formation
- A combination of these conditions

In general, crystal growth involves nucleation, in which crystals are formed from supersaturated urine. Growth continues by aggregation to form larger particles. One of these particles may travel down the urinary tract until it is trapped at some narrow point where stone formation occurs.

Inhibitor substances (e.g., citrate, pyrophosphate, and magnesium) have been identified as chelating agents. When present in adequate amounts, they act to keep crystals from aggregating and forming stones. When inhibitors are absent, stone formation
following crystal aggregation is more likely. Also, a fibrous matrix of urinary organic material (mostly mucoproteins) may form in the kidney or bladder, producing a substance into which crystallites are deposited and trapped. This, then, becomes the nidus of the stone. The excessive production of this mucoprotein may, in part, account for a family history of urolithiasis in clients with calculi.

Types of Calculi

Stones may be of one crystal type or a combination of types.

Calcium

Calcium is the most common substance and is found in up to 90% of stones. Calcium stones are usually composed of calcium phosphate or calcium oxalate. They may range from very small particles, often called “sand” or “gravel,” to giant staghorn calculi, which may fill the entire renal pelvis and extend up into the calyces (Figure 34-4). The peak onset is during a person’s 20s, and these stones affect primarily males.

Hypercalciuria (an increased solute load of calcium in the urine) is caused by four main components:

- A high rate of bone reabsorption, which liberates calcium, as in Paget’s disease, hyperparathyroidism, Cushing’s disease, immobility, and osteolysis caused by malignant tumors of the breast, lung, and prostate
- Gut absorption of abnormally large amounts of calcium, as in milk-alkali syndrome, sarcoidosis, and excessive intake of vitamin D
- Impaired renal tubular absorption of filtered calcium, as in renal tubular acidosis
- Structural abnormalities, such as “sponge kidney”

About 35% of all clients with calcium stones do not have high serum levels of calcium and demonstrate no apparent cause of hypercalciuria.

There are two variants of hypercalciuria:

- The primary abnormality is increased intestinal absorption of calcium or increased bone reabsorption. The resulting higher serum calcium level triggers increased renal filtration of calcium and parathyroid hormone (PTH) suppression. This in turn decreases tubular reabsorption, thereby increasing the concentration of calcium in the urine.
- “Renal leak” of calcium, the other abnormality, is caused by a tubular defect. The resulting hypocalcemia stimulates PTH production, which increases intestinal absorption of calcium. This cycle fits into the previous one, causing an increased solute load of calcium. Clients with this problem are often called “calcium wasters.”

Oxalate

The second most frequent stone is oxalate, which is relatively insoluble in urine. Its solubility is affected only slightly by changes in urinary pH. The mechanism of oxalate availability is unclear but may be closely related to diet. The disease is most common in areas where cereals are a major dietary component and least common in dairy farming regions.

An increased incidence of oxalate stones may be related to the following:

- Hyperabsorption of oxalate, seen with inflammatory bowel disease and a high intake of soy-based products
- Postileal resection or small bowel bypass surgery
- Overdose of ascorbic acid (vitamin C), which metabolizes to oxalate
- Familial oxaluria (oxalate in the urine)
- Concurrent fat malabsorption, which may cause calcium binding, thus freeing oxalate for absorption

Struvite

Struvite stones, also called triple phosphate, are composed of carbonate apatite and magnesium ammonium phosphate. Their cause is certain bacteria, usually
Proteus, which contain the enzyme urease. This enzyme splits urea into two ammonia molecules, which increases the urine pH. Phosphate precipitates in alkaline urine. This action is responsible for the label “urea-splitter” characterizing these organisms.

Stones formed in this manner are staghorn calculi (see Figure 34-4). Abscess formation is common. Struvite stones are difficult to eliminate because the hard stone forms around a nucleus of bacteria, protecting them from antibiotic therapy. Any small fragment left after surgical removal of the stone begins the cycle again.

Uric Acid
Uric acid stones are caused by increased urate excretion, fluid depletion, and a low urinary pH. Hyperuricuria is the result of either increased uric acid production or the administration of uricosuric agents. Approximately 25% of people with primary gout and about 50% of people with secondary gout develop uric acid stones. A high dietary intake of foods rich in purine (a crystalline base) may predispose clients to uric acid stone formation. Also, treating neoplastic disease with agents that cause rapid cell destruction may increase the urinary uric acid concentration. Moreover, a link between hyperuricuria and calcium stone formation may exist. It is hypothesized that uric acid crystals absorb some of the crystal inhibitors normally found in urine.

Cystine
Cystinuria is the result of a congenital metabolic error inherited as an autosomal recessive disorder. Cystine stones typically appear during childhood and adolescence; development in adults is very rare.

Xanthine
Xanthine stones occur as a result of a rare hereditary condition in which there is a xanthine oxidase deficiency. This crystal precipitates readily in acid urine.

Summary
Despite the type of stone that forms, the potential damage is essentially the same: (1) pain, spasm, or colic from peristalsis movements of the ureter contracting on the stone; (2) obstruction with possible hydronephrosis or hydroureter; (3) tissue trauma with secondary hemorrhage; and (4) infection.

Clinical Manifestations
The most characteristic manifestation of renal or ureteral calculi is a sharp, severe pain of sudden onset caused by movement of the calculus and consequent irritation. Depending on the site of the stone, this pain may be either renal colic or ureteral colic. Renal colic originates deep in the lumbar region and radiates around the side and down toward the testicle in the male and the bladder in the female. Ureteral colic radiates toward the genitalia and thigh.

When the pain is severe, the client usually has nausea, vomiting, pallor, grunting respirations, elevated blood pressure and pulse, diaphoresis, and anxiety. Visceral pain such as renal colic is mediated by the autonomic nervous system via celiac ganglia, which causes nausea, vomiting, decreased intestinal motility, and possibly paralytic ileus. Some people, especially those with bladder stones, experience manifestations of urgency, frequency, hematuria, and chronic cystitis. Pressure against the bladder neck during micturition (voiding) may cause a heavy feeling in the suprapubic region, obstruction in voiding, a decreased bladder capacity, and an intermittent urinary stream. If the stone enters the urethra, urine flow is obstructed. The pain lasts for minutes to days and can be somewhat resistant to opioid intervention.

Pain may be intermittent, which usually means that the stone has moved. Physicians hypothesize that the ureter dilates just proximal to the calculus, which allows urine to pass, relieving the ureteral distention. Then, as the stone moves into a new obstruction site, the pain returns. The pain subsides when the stone reaches the bladder.

Pain caused by renal stones is not always severe and colicky. It may be dull or aching or may be experienced as a heavy feeling. This is particularly true during the early stages of hydronephrosis. Other manifestations of calculi include infection with an elevated temperature and white blood cell (WBC) count and urine obstruction that causes hydroureter, hydronephrosis, or both. The Integrating Diagnostic Testing feature on p. 752 provides more information related to the diagnosis of urinary stones. Once the stone is retrieved, its components must be analyzed. Additional studies of blood and urine may be required to determine whether metabolic problems predispose the client to stone formation. Other possible disease processes, such as metastatic bone cancer, must be ruled out as possible causes of calculi.

OUTCOME MANAGEMENT
Determining the size of the calculus is essential in selecting the treatment. Stones smaller than 4 or 5 mm can pass without intervention.

Medical Management
Conservative or medical management is appropriate if there is no obstruction, if the pain can be managed, if the client can be hydrated with oral fluids, and if the stone
is less than 5 mm. Medical management is directed at relieving the acute manifestations while facilitating the passage of small stones. The desired outcomes of medical management are to increase fluids, reduce pain, and minimize calculus formation by implementing diet changes and administering medications. Most clients pass the stone naturally from the ureter and bladder. If the stone does not move, if it causes obstruction, or if x-ray studies suggest that the calculus is too large to pass safely to the urethra, more invasive treatment is necessary. After the acute phase, medical management is directed toward preventing recurrence of stone formation.

Increase Fluids

The most effective management strategy is to increase fluid intake to facilitate passage of small stones and to prevent the development of new ones. Encourage clients to increase fluids to 3 to 4 L daily, unless
contraindicated, to ensure a urine output of 2.5 to 3 L daily. The increased urine volume resulting from this high fluid intake decreases the concentration of solutes and alleviates urinary stasis. Increased fluids may also decrease pain, prevent an increase in stone size, and prevent infection. The kind of fluid the client drinks depends on dietary restrictions, but at least one half of the fluid should be water.

Reduce Pain
Pain is most severe in the first 24 hours. In addition to pain control with increased fluids, the client usually requires treatment with opioids and antispasmodic agents. Opioids such as morphine sulfate are given intravenously or intramuscularly (IV or IM) to control moderate to severe pain. Nonsteroidal anti-inflammatory drugs (NSAIDs) may also be effective.

Antispasmodic agents, such as oxybutynin chloride (Ditropan), are very effective for relieving and controlling colic pain associated with spasms of the ureter. Clients with repeated stone formation may have a family member drive them to a clinic, ambulatory care center, or emergency department for administration of opioid analgesics and antispasmodic agents so that they can relax, go home, and pass the stone naturally. Other clients may require admission to an acute care setting for administration of these medications. For nausea and vomiting associated with colic, antiemetics may also be necessary.

Prevent Stone Recurrence
Diet modifications and medications may be required to prevent further calculus formation in clients who return with repeated stones. Increased fluid intake is still the primary prevention measure. Results of a stone analysis are essential before these recommendations are implemented.

Implement Dietary Changes
Some controversy exists over dietary restrictions because of their uncertain effectiveness and the problems clients experience in following the regimen. In the past, calcium stones and hypercalciuria were controlled by limiting excessive calcium intake to 800 mg daily. However, more recent research has supported increasing dietary intake of calcium-rich foods. This research is explored in the Translating Evidence into Practice feature on p. 754.

Clients with oxalate stones should avoid high-oxalate foods, such as tea, tomatoes, instant coffee, cola drinks, beer, rhubarb, green beans, asparagus, spinach, cabbage, celery, chocolate, citrus fruits, apples, grapes, cranberries, peanuts, and peanut butter. Megadoses of vitamin C increase oxalate excretion in the urine and should be avoided. If the stone is composed of uric acid, the client should follow a low-purine diet, which involves limiting such foods as aged cheeses, wine, bony fish, and organ meats.

Administer Medications
Following recurrent stone formation, analysis of the stone, or abnormal metabolic findings, medications may be required. For hypercalciuric clients, a thiazide diuretic such as hydrochlorothiazide promotes calcium resorption from the renal tubules, thereby preventing excess calcium loads in the urine. Potassium citrate is commonly added to the thiazide diuretic to replace potassium as needed.

For low urine citrate levels, potassium or sodium citrate may be ordered. Because these medications can be expensive, many urologists encourage the client to drink a quart of lemonade for both the increased fluid and citrate benefits.

Calcium oxalate stones may be treated with vitamin B6 (pyridoxine), magnesium oxide, or cholestyramine. For clients with hyperuricosuria and calcium oxalate stones, allopurinol (Zyloprim) is prescribed only if a reduced purine diet fails and stones persist.

Uric acid stones are treated with drugs to lower uric acid concentration, such as allopurinol. In addition, sodium bicarbonate or citrate may be indicated to increase urinary pH because uric acid stones form in acidic urine. This treatment is also effective for xanthine stones, which are inhibited in alkaline urine. Cystine stones are treated with tiopronin (Thiola) and d-penicillamine, which make cystine more soluble for excretion. Long-term antibiotics are used to control the infection that leads to struvite stone formation.

Nursing Management of the Medical Client

Assessment. Ask the client about any family history of calculi, previous UTIs, immobility, and recent dietary habits. For instance, a large intake of purines may be significant, as would be drinking a large amount of fruit juice or tea, which could cause oxalate precipitation. Also assess the amount, pattern, and types of fluids consumed.

Assess the client for the clinical manifestations described earlier. Use rating scales to measure the severity of pain. Many clients describe renal or ureteral colic as “the worst pain I’ve ever had.” Vital signs should be monitored. A decreasing blood pressure may indicate severe pain and impending shock; increased pulse rate and temperature may result from infection. A sudden onset of little or no urine output suggests obstruction, which is an emergency that must be treated immediately to preserve kidney function. Frequency and dysuria commonly occur when a stone reaches the bladder.

All urine voided should be strained through several layers of gauze or through a commercial urine strainer.
**Calcium Intake and Its Relationship to Kidney Stone Formation**

In the past, clients with a history of calcium oxalate kidney stones have been advised to decrease their intake of calcium-rich foods to 800 mg/day to reduce the recurrence of kidney stones. However, more recent literature contradicts these previous dietary instructions. New theories propose that calcium stone formation in the kidney may be linked to a diet high in protein. A high-protein diet increases urinary calcium, oxalate, and uric acid secretion and increases the probability of stone formation in normal subjects.

Study findings by Curhan and colleagues questioned previous research findings and treatment of kidney stones. Their results suggest that a higher intake of dietary calcium was strongly associated with a decreased risk of calcium-based renal stones. Curhan et al. reported the incidence of kidney stones was lower by 50% in men with a calcium intake of up to 1326 mg/day compared with the incidence in those who took 516 mg of calcium/day. The men who ingested up to two glasses of milk per day had half the risk of stone formation as those who drank less than one glass per month. Another study reported a similar diet of high calcium, low protein, and low sodium reduces the risk of reoccurrence of kidney stones.

In women, it has been reported that increased dietary intake of calcium was not associated with risk of kidney stone formation. However, the intake of supplemental calcium was related to an increased risk of kidney stones. Additional dietary, increased intake of sucrose and sodium increased the risk of stone formation, whereas increased fluids or potassium decreased the incidence. Sodium citrate preparations and cranberry juice were found to decrease the risk of calcium oxalate stone formation in two separate studies.

**IMPLICATIONS**

Nurses should encourage clients who have had at least one calcium oxalate kidney stone to increase fluids and dietary calcium intake and to reduce protein and sodium intake. Intake of dietary calcium should be encouraged in all clients to prevent osteoporosis and to prevent calcium oxalate kidney stones. Other dietary adjustments to lower oxalate intake, take sodium citrate, or ingest cranberry juice may also be recommended.

**REFERENCES**

Teach Stone Prevention Measures. Besides increased fluid intake, teach the client about other measures to prevent stone recurrence, such as diet modifications, medications if required, and avoidance of urinary stasis (see the Client Education Guide feature on Preventing Recurrence of Urinary Stones on the website). Prompt treatment of UTIs and early recognition of manifestations of stone recurrence are also important.

Health promotion activities include frequent turning and range of motion for immobilized clients, increased fluid intake, and decreased intake of stone-forming solutes in the diet, such as oxalates, purines, and animal proteins. Health maintenance interventions include monitoring high-risk clients with indwelling catheters or obstructions for calculi.

Evaluation. If medical management is successful, the client’s pain is controlled, the stone passes unaided, and the client has no complications of obstruction or infection. The client is able to describe factors that increase the risk of developing stones and is able to identify self-care strategies to prevent stone recurrence.

Surgical Management

About 20% of stones require additional treatment with shock wave lithotripsy or endourologic or surgical procedures. Open surgery is used only for the small percentage of clients who cannot be successfully treated with lithotripsy or endourologic procedures.

Endourologic Procedures
Depending on the position of the calculus, cystoscopy may be done. Small stones may be removed transurethrally with a cystoscope, ureteroscope, or ureterorenoscope. Additionally, one or two ureteral catheters or stents may be inserted past the stone. From this point, several different interventions are appropriate. The catheters may be left in place for 24 hours or longer to drain urine trapped proximal to the stone and to dilate the ureter, which may prompt spontaneous movement of the calculus. Otherwise, the catheter may mechanically guide the stone downward as it is removed.

At times, a continuous chemical irrigation may be used to dissolve uric acid, struvite, and cystine stones. Finally, an attempt may be made to manipulate or dislodge the stone with a variety of special catheters with loops and expanding baskets used to snare the stone. Care is the same as that following cystoscopy.

Larger stones may be crushed with an instrument called a lithotrite (stone crusher) to facilitate removal. Cystolithoblastaxy is performed when a bladder stone is soft enough to be crushed. In cystoscopic lithotripsy, an ultrasonic lithotrite is placed to pulverize the stone, followed by extensive flushing of the bladder. Possible complications associated with this procedure include hemorrhage, urinary retention, infection, bladder perforation, and possibly retained stone fragments.

A flexible ureteroscope, passed through a cystoscope, is used to collect stones in the ureter. This procedure, called ureteroscopy, is used to retrieve 4- to 5-mm stones or, combined with ultrasonic lithotripsy, to remove fragments after treatment. Minimal sedation or anesthesia is necessary, and postoperative complications are usually few.

A flexible ureterorenoscope can be passed for access to the entire upper urinary tract, including the distal ureter and intrarenal collecting system so that stones or lesions in the lower pole or lateral calices can be reached.

A nephroscope may be inserted to retrieve free-lying renal stones. Figure 34-5, A shows a nephroscope in place. The stone may be removed with alligator forceps or a stone basket followed by irrigation. Electrohydraulic, laser, or ultrasound lithotripsy may be completed through the nephroscope. After this procedure, a nephrostomy tube remains in place for 1 to 5 days. The client can go home with it in place. Increased fluids are essential to achieve a urine output greater than 3000 ml (3 L). The tube is removed after diagnostic studies determine that all stone fragments have been removed.

Lithotripsy

Laser Lithotripsy
A newer treatment for calculi is laser lithotripsy. Lasers are used together with a ureteroscope to remove or loosen impacted stones. Constant water irrigation of the ureter is required to dissipate the heat. Complications resulting from this procedure are the same as those of any endourologic procedure.
Extracorporeal Shock Wave Lithotripsy

Extracorporeal shock wave lithotripsy (ESWL) is the use of sound waves applied externally to break up stones in the kidney or ureter (Figure 34-6). High-energy shock waves, aimed by fluoroscopy, are transmitted to the stone. The shock waves break the stones into small fragments, which are passed or retrieved endoscopically. The client may be strapped to a frame in a water bath or secured on a table, depending on the type of lithotripsy equipment used. The client is usually offered conscious sedation or general anesthesia.

The procedure lasts 30 to 50 minutes with administration of 500 to 1500 shock waves. Cardiac monitoring is required to synchronize shock waves with the R wave to prevent cardiac dysrhythmias. Complications of ESWL include ecchymosis on the affected flank, retained fragments, urosepsis, perinephric hematoma, and hemorrhage.

Stone fragments may collect in the distal ureter, obstructing the kidney. To prevent this accumulation and obstruction, a double J stent is commonly placed percutaneously (through the skin) under fluoroscopy near the area of the stone. An ultrasonic wave is aimed at the stone to break it into fragments.

Percutaneous Lithotripsy

Percutaneous lithotripsy involves the insertion of a guide (through the skin) under fluoroscopy near the area of the stone. An ultrasonic wave is aimed at the stone to break it into fragments.

Open Surgical Procedures

If the stone is too large or if endourologic and lithotripsy procedures fail to remove it, an open surgical procedure is performed. Surgery is rarely needed because of the success of modern, less invasive options.

A ureterolithotomy is the surgical removal of a stone from the ureter through a flank incision for higher stones or an abdominal incision for lower ones. A Penrose drain and ureteral catheter are usually placed postoperatively for healing and drainage of urine.

Cystolithotomy, removal of bladder calculi through a suprapubic incision, is used only when stones cannot be crushed and removed transurethrally. A stone is removed from the renal pelvis by pyelolithotomy and from the renal calyx by a nephrolithotomy. Figure 34-5, B and C on p. 755 illustrates these procedures.

Rarely, a partial or total nephrectomy (see Chapter 35) is necessary because of extensive kidney damage, overwhelming renal infection, or abnormal renal parenchyma, which can be responsible for stone formation.

Nursing Management of the Surgical Client

Assessment. Preoperative assessment includes the general condition of the client, including the presence of conditions that may present problems postoperatively. It is a priority to assess the client’s understanding of the condition and the procedure to be performed. Other assessments are similar to those described under Nursing Management of the Medical Client.

Diagnosis, Outcomes, Interventions

Diagnosis: Risk for Injury. With any endourologic procedure, lithotripsy, or surgery, the client has a Risk for Injury related to postoperative complications.

Outcomes. The client will remain free from injury, as evidenced by absence of hemorrhage, by vital signs within preoperative limits, by normal WBC count and temperature, and by a total urine output of at least 0.5 ml/kg/hour from all sources.

Interventions

Increase Fluids. Increase the client’s IV or oral fluids to 3 to 4 L daily as described earlier, unless contraindicated.

Monitor Urine Output

Maintain the client’s urine output at 0.5 ml/kg/hour or more. Assess any indications of hemorrhage, stone retention, urinary retention, or infection. As needed, irrigate the client’s bladder to wash out possible stone fragments. See Chapter 38 for discussion of continuous bladder irrigation (CBI). Continue to strain all urine.

Nursing care after a ureterolithotomy may involve care of a ureteral catheter.

Output of at least 0.25 ml/kg/hour from the ureteral catheter should be expected and closely monitored. Because the renal pelvis holds only 5 ml, ureteral catheters must be kept patent (open) and are never clamped. Institute prompt intervention with
any unexpected reduction in urine flow. Several conditions—such as mucus shreds, blood clots, and chemical sediment—can interfere with the flow of urine through these catheters. Plus, ureteral peristalsis occasionally pushes the catheters out of the ureter into the bladder.

Closely monitor the catheter output. Each ureteral, suprapubic, and urethral catheter should drain into its own collection bag so that the source of the reduced urine flow is noticed immediately. Each tube or bag should be labeled. Measure and record the output of each catheter every hour for the first 24 hours. Output from each catheter should be monitored every 4 to 8 hours until removal. Most of the urine will drain from the ureteral catheters for the first 48 to 72 hours postoperatively. As the inflammation decreases, urine flows around ureteral catheters and is drained by the urethral or suprapubic catheters. Report a total urine output of less than 0.5 ml/kg/hour or a lack of output from ureteral catheters for more than 15 minutes to the physician immediately.

If the physician orders ureteral catheter irrigation, use strict sterile technique. A maximum of 3 to 5 ml of irrigating solution, usually sterile saline solution, should be allowed to flow in by gravity. Very gentle force should be used. If you cannot confirm patency, notify the physician immediately. Use extreme care to ensure that the catheter is not dislodged. If it is not sutured in place, secure it carefully to the client’s skin with tape.

Drainage from a nephrostomy tube should also be carefully monitored and cared for with interventions similar to those used for ureteral catheters. Irrigation amounts, if ordered, are no more than 3 to 5 ml. Because the tube goes directly into the kidney, maintain sterile technique to prevent infection.

Clients with any type of catheter must be taught how to care for the catheter before returning home. Clients should learn how to clean around catheters, empty them, prevent kinking, and irrigate them if necessary. A home health nurse may be required to assist with these activities.

Prevent Complications. If the client has a flank incision, care is similar to that needed after nephrectomy (see Chapter 35). To prevent pneumonia, the client should cough and deep breathe 10 to 20 times each hour. To facilitate this, administer opioids regularly to control incisional pain. Other postoperative interventions are similar to those for a client with any major abdominal incision, such as monitoring bowel sounds, vital signs, and output from drains and nasogastric tubes. Antibiotics may be given prophylactically or at the first sign of infection.

Evaluation. It is expected that surgical intervention for stone removal would be completed with the least invasive procedure possible and before renal damage occurs. In most instances, the client can go home the day of the procedure and does not need to be hospitalized. Clients may go home with catheters in place for about a week; they need to learn catheter care or have home health follow-up. For major surgical intervention, the client is dismissed 3 to 4 days after the procedure.

Self-Care

A client with urolithiasis is at risk for recurrence. You have a major role in helping the client develop and maintain an effective, individual regimen to prevent stone recurrence. The main components of prevention are (1) increased fluids, (2) dietary modifications, (3) medications as ordered, and (4) prompt treatment of UTIs. The client must understand that these are lifelong changes in lifestyle. If catheters are in place after surgical intervention, client management of the tubes is necessary before discharge from the hospital.

URINARY REFLUX

Urinary reflux is the backward flow of urine in the urinary tract. It usually begins at the vesicoureteral junction. Urine flows back into the ureter and upward into the renal pelvis. The severity of vesicoureteral reflux is stated as grade I, which is least severe, through grade V, which is most severe. There is an increase in the development of reflux in men older than 50 years of age because of chronic bladder neck obstruction from BPH. Reflux typically occurs in younger children or in young adults from congenital abnormalities of the vesicoureteral junction.

Etiology and Risk Factors

Reflux can be caused by a congenital abnormality, such as ectopic ureter, chronic bladder infections secondary to dysfunctional bladder, or outlet obstruction in the bladder neck. Urinary reflux is more frequently seen as a result of another condition. Reflux contributes to the increase of intravesical pressure (within the bladder) until it finally overwhelms the resistance of the intramural ureteral sphincters, allowing reflux to occur. Clients with obstructions must be evaluated to have the cause identified and treated to prevent and relieve intravesical pressure.

Pathophysiology

In bladder outlet obstruction, the main result is the continuous presence of residual urine, which leads to chronic UTIs. Continual overdistention of the bladder can also decrease detrusor tone, increasing the bladder’s capacity and raising the threshold needed to start the micturition reflex.
Renal damage and pyelonephritis are the two primary problems resulting from vesicoureteral reflux. Because the capacity of the renal pelvis is only 5 ml, larger amounts of urine can cause renal parenchymal changes, hydronephrosis, or hydronephroureterosis if they result from ureteral obstruction or reflux. The increased hydrostatic pressure leads to renal cortical atrophy from ischemia and hypoxia and then to calicectasis (dilation of the renal calices). The destruction of kidney tissue, often asymptomatic and undetected, can progress to end-stage renal disease. The kidneys are usually protected from ascending infections by the intramural portion of the distal ureter. With reflux, however, any pathogens in the bladder are carried through the ureters to the kidney. This problem leads to recurrent pyelonephritis. Chronic pyelonephritis leads to renal failure.

Clinical Manifestations
The major manifestation of reflux in the bladder neck is pyelonephritis. When the obstruction is in the vesicoureteral junction or higher, renal failure may be clinically evident. The major diagnostic studies are (1) the voiding cystourethrogram (VCUG) to visualize the lower urinary system during voiding, (2) cystoscopy to evaluate manifestations of obstruction, (3) ureteroscopy to assess the vesicoureteral junction, (4) ultrasound to assess for hydronephrosis, and (5) IVP to evaluate the entire collecting system. Blood studies of BUN and creatinine levels are also done to assess renal function.

Nursing Management of the Surgical Client
Carefully assess any client with a high risk of obstruction for any manifestation of urinary reflux. The client being evaluated for urinary reflux requires support during this diagnostic process. Preoperative preparation for ureteral surgery is similar to that required by any client who needs surgery (see Chapter 14).

Postoperative care is similar to that discussed earlier for urinary calculi. Assess the color of the client’s urine frequently. Expect it to progress from bright red to clear yellow over a matter of days. Discharge teaching depends on a variety of factors, including the cause of the reflux, the treatment or procedure done, and the amount of renal damage present. For the client with kidney damage, renal function must be monitored at regular intervals to evaluate any changes in status.

VOIDING DISORDERS

URINARY RETENTION
Urinary retention is the inability of the bladder to empty partially or completely during voiding. Treatment is directed at relieving the cause of the problem.

Etiology and Risk Factors
Detrusor failure is the most common cause of urinary retention in women. Failure of the bladder to contract is often associated with neurologic conditions. In men, obstructive voiding resulting from an enlarged prostate is the frequent cause of retention. Other disorders, urethral strictures, medications, detrusor-sphincter dyssynergia, calculi, blood clots, tumors, bladder neck contractures, and history of female genital mutilation may also cause retention. Neuropathies affecting bladder function include diabetes mellitus, strokes, and spinal cord injuries. These long-term problems affect the neurologic status of the bladder and interfere with the micturition reflex. Remember, urinary retention is a manifestation of another pathologic condition.

Retention may be caused by decreased sensory input to and from the bladder, muscle tension, anxiety, or other neurologic conditions affecting the bladder. Surgery has traditionally been a factor; spinal anesthesia causes retention more often than does general anesthesia. After surgery, 10% to 15% of clients who received general anesthesia require catheterization because of an inability to void, and 20% to 25% of those who received spinal anesthesia require a catheter.

In women, prolapse of the back wall of the vagina (rectocele or enterocoele) increases the risk of retention by exerting pressure against the urethra. Also, a large cystocele may cause kinking of the bladder neck, decreasing the bladder’s ability to empty.
More than half of men older than age 50 experience BPH, a common cause of retention. This is not a preventable problem, although the client with an enlarged prostate should be monitored closely for obstruction secondary to the enlargement. Neurologic injury or disease, such as diabetes mellitus, spinal cord injuries, or multiple sclerosis, may lead to urinary retention as well. Other risk factors are a history of structural abnormalities and use of certain medications, such as tricyclic antidepressants. In some clients, a psychogenic origin may be found.

**Pathophysiology**

Retention of urine is hazardous because the resulting urinary stasis contributes to UTIs, stone formation, and eventual complications of long-term structural damage to the bladder, ureters, or kidneys. Additionally, continued bladder distention leads to loss of bladder tone.

The pathologic process of retention produces a snowball effect. Retained urine increases hydrostatic pressure against the bladder wall, which results in hypertrophy of the detrusor muscle, formation of trabeculae (connective tissue in the bladder wall), or development of diverticula. At the same time, peristalsis in the ureteral musculature increases against the pressure of the accumulating urine. The ureter may gradually become elongated, tortuous, and fibrotic. Increasing pressure is also transmitted through the renal pelvis and calices into the renal parenchyma. The resulting hydronephrosis exerts pressure on the blood vessels, causing ischemia and increasing the renal damage. If the process is not interrupted, it can proceed to renal failure and death. Figure 34-7 demonstrates the sequence. Even after the retention is relieved, when the alterations caused by increased pressure reach the renal parenchyma, the damage may be permanent and irreversible.

Medications, such as opioids, tricyclic antidepressants, sedatives, antispasmodics, anti-Parkinson drugs, beta-adrenergic blockers, and psychotropic agents, can interfere with normal neurologic function and the micturition reflex. Diseases with neurologic effects, such as stroke, multiple sclerosis, diabetes mellitus, tabes dorsalis, and spinal cord lesions, also disrupt the micturition reflex.

Urinary retention may result in chronic UTIs or a series of UTIs and dysfunctional voiding. Conversely, chronic UTIs and dysfunctional voiding may result in urinary retention. The detrusor muscle may become irritated and fail to function correctly, leading to incomplete bladder emptying. Irritation and scarring of the bladder neck or urethra may develop, thus placing these clients at greater risk for urinary retention.

A disorder of psychogenic origin, such as anxiety or fear of voiding in a public restroom, may lead to distention of the bladder and urinary retention. Inability to relax the urethra because of anxiety or neurologic deficit may lead to urinary retention as well.

Anorectal problems, such as hemorrhoids, abscess, fecal impaction, and vaginal prolapse, can be contributing factors, either from obstruction or from secondary spasms of the perineal musculature that interfere with the urethra during voiding.

Decreased oral or IV fluid intake reduces the glomerular filtration rate (GFR), which causes very slow urine production and overfilling of the bladder. The slow increase allows the detrusor muscle to accommodate the increased volume until the muscle’s fibers are stretched beyond their ability to contract, hampering micturition.

Urinary retention with overflow incontinence results from the following events. As the bladder continues filling, the intravesical pressure increases. Eventually, this pressure overcomes the resistance of the sphincter. Urine flows out of the bladder until it reduces the intravesical pressure, but only to the level at which the external sphincter can again control the flow of urine. Most clients report that the bladder does not feel empty. It overfills again, and the cycle is repeated.

Prolonged obstruction leads to increased pressures in the urinary tract and may predispose the client to bladder diverticula. A diverticulum is a pouch or sac resulting from the herniation of the mucous membrane lining caused by weakness in the muscular wall of an organ. Bladder diverticula are most common in men. Many diverticula are asymptomatic and are usually discovered by chance during assessment of other conditions.
Bladder diverticula can cause two major problems: (1) UTIs, resulting from stasis of urine, and (2) malignancies, probably a result of chronic irritation by persistent infection. Intervention involves removing the obstruction and relieving the retention, followed by surgical excision of the pouch and reestablishment of normal patency of the urinary tract. Postoperatively, catheter drainage of urine is required to allow complete tissue healing. Clients who have had chronic or recurring infections usually require long-term antibiotic therapy after surgery.

**Clinical Manifestations**
The primary manifestation of urinary retention is a distended bladder or an inability to empty the bladder completely. Voided amounts of 25 to 50 ml one or more times an hour may indicate retention with overflow. The major diagnostic test is catheterization. A post-void residual amount greater than 100 ml after an attempt to void signals retention. Other diagnostic measures, such as cystoscopy and urodynamic testing to include pressure voiding studies, help identify the cause of the retention.

**OUTCOME MANAGEMENT**

**Medical Management**
Identifying the cause of urinary retention is the first step in determining treatment. Finding the underlying neurologic problem or obstructive disorder is crucial in selecting a treatment plan.

**Administer Medications**
In some cases, cholinergic medications have been known to help stimulate bladder contractions. If a mechanical obstruction is present, however, cholinergic drug therapy should not be used. In this instance, intravesical pressure increases against an obstructed outlet, causing ureterovesical reflux or a ruptured bladder.

Although their effects are somewhat controversial, bethanechol (Urecholine) and neostigmine (Prostigmin) are commonly administered. Bethanechol not only improves detrusor tone but also increases bladder outlet and urethral resistance. To counteract this, bethanechol is sometimes combined with phenoxybenzamine (Dibenzyline), prazosin (Minipress), and terazosin (Hytrin), which are potent alpha-adrenergic blockers.

**Urethral Dilations**
In some instances, urinary retention is relieved by dilation of the urethra by means of the placement of progressively larger urethral sounds (see the table on the website titled Urologic Instruments Most Commonly Encountered in a Clinical Setting for examples of sounds). Local or sometimes general anesthesia is used for sedation during sound placement.

**Nursing Management of the Medical Client**
Interventions described next are appropriate for the nursing diagnosis *Urinary Retention*.

**Assess Urine Output Patterns**
It is important to distinguish retention from oliguria (diminished urinary secretion) and anuria (complete suppression of urinary secretion). In urinary retention, the kidneys are producing a normal amount of urine but the bladder does not function properly. It fills with urine and rises above the level of the pubic symphysis, sometimes being displaced to either side of midline. Percussion over the bladder produces a dull sound. The client may experience increasing discomfort and the need to urinate. The client also may complain of restlessness, sweating, anxiety, bladder pain, and feelings of bladder fullness. A bladder scan estimates urine amounts in the bladder accurately.

**Implement Measures to Stimulate Independent Voiding**
Nursing interventions may be used initially to treat retention. Provide privacy, and place the client in a normal sitting or standing position, using gravity and increased intra-abdominal pressure to help relieve an acute problem. Running the water or flushing the toilet within earshot of the client may encourage voiding. Tape-recorded aquatic sounds may be effective. A warm bath or pouring warm water over the perineum often promotes muscle relaxation. Immersing the client’s hands in water sometimes works. Applying ice or gently stroking the inner thigh sometimes works as well. These measures may stimulate trigger points of the micturition reflex. If the client is tense and anxious, any measure that induces relaxation may aid in relieving the situation, even a back rub or soothing music.

The client should not be catheterized unless urine amounts by bladder scan are greater than 300 ml or the client complains of discomfort. For clients with persistent urinary retention, a straight or retention catheter may be inserted through the external meatus, into the urethra beyond the internal sphincter, and into the bladder. A straight catheter is removed after the bladder drains. An indwelling (Foley) catheter is usually inserted after two straight catheterizations. The catheter is kept in place for continuous or intermittent drainage by inflating a balloon near the catheter’s tip. Strict sterile techniques are used for insertion except for clients on an intermittent self-catheterization program; these clients may use clean technique.
The indwelling catheter is attached to either a bedside drainage bag or a leg bag. A leg bag may be used for long-term catheterization, especially for a client going home with the catheter in place. A newer belly bag is also available for clients with long-term catheter placement. These devices allow the client more mobility and eliminates the embarrassment of carrying a drainage bag in public view.

Because of the bag’s small capacity, the leg bag must be emptied frequently. A conventional drainage system is used at night to avoid the need to empty the leg bag at night. (The change in bags is not necessary with the belly bag.) Instruct the client to avoid attaching the rubber straps too tightly, because doing so may cause skin irritation, thrombophlebitis, and ulcer formation. Loose straps tend to tighten as the bag fills. Recent improvements have led to the use of nylon self-fastening tape (Velcro) leg straps for clients with circulatory problems, those with latex allergy, and those at high risk for skin breakdown. Meticulous skin care and periodic removal of the bag help prevent these problems. Cleanliness and odor control are managed by washing the apparatus with mild soap and water and allowing the bag to air dry.

Prevent Infection

Minimizing hospital-acquired infections is one of the TJC National Patient Safety Goals. Prolonged use of an indwelling catheter increases the risk of UTI and tissue trauma. More than 80% of people who develop nosocomial (hospital-acquired) UTIs have undergone urologic instrumentation. The risks of bacteriuria leading to urosepsis increases in direct relationship to duration of catheter placement; estimates of infection rates range from 4% (within 24 hours) to 95% (within 4 weeks). Organisms enter the catheter through any contamination or break in the system or intrude via the thin layer of fluid and exudate that forms around the outside of the catheter.

Catheter insertion should be avoided unless necessary to monitor urine output. Wash your hands thoroughly before and after handling a catheter or drainage system. In addition, do the following:

1. Maintain a closed drainage system.
2. Avoid backflow of urine.
3. Avoid unnecessary manipulation of the catheter during perineal cleaning.
4. Prevent microbial invasion and colonization in the urine collection bag.
5. Maintain patency of the catheter.
6. Encourage a high fluid intake.

On occasion, prophylactic antibiotics are given to clients with catheters in place. The practice is not routine, however, because of the threat of resistant organisms and possible adverse reactions.

Prevent Tissue Injury

Tissue trauma may occur during catheterization. Tissue irritation or necrosis may result from the following:

- Use of an oversized catheter
- Continuous pressure and pulling of the catheter between the meatus and the site of taping on the leg or abdomen
- Friction caused by the continuous movement of the catheter, causing tissue breakdown and enhancing encrustation on the outside of the catheter
- Local or systemic allergic reactions to rubber in clients with a history of latex allergy; silicone catheters may be used in these clients

The subject of bladder decompression drainage is still misunderstood. In the past, it was incorrectly assumed that rapid emptying of a distended bladder through a catheter could result in bladder hemorrhage and hypotension. Consequently, the catheter was clamped after 1000 ml of urine had been drained, reopened after an hour to drain another 1000 ml, and clamped and reopened again until the bladder was decompressed. Cystometric studies have shown that this problem does not occur with retention. It is currently thought that any amount of urine can be drained. Drainage does not occur rapidly, because the usual size of a catheter does not allow rapid drainage.

Surgical Management

Surgical intervention is usually done when a structural defect is found. Intervention may include (1) removal of an enlarged prostate gland or urethral stricture or (2) correction of a structural abnormality.

Bladder Neck Repair

Surgical intervention is sometimes needed for obstructions below the bladder. If the bladder neck becomes rigid as a result of inflammation, cystoplasty may be done by insertion of an elastic wedge into the area. A transurethral incision of the bladder neck might also be performed. Excision of urethral strictures, sometimes with a urethroplasty (plastic repair of the urethra), helps return proper functioning. Alternatively, a meatotomy may be performed to open the urethral meatus.

Suprapubic Cystotomy

Indications. Suprapubic catheterization is sometimes used to relieve urinary retention. Placement of the catheter allows postoperative clients to begin a bladder training program. The catheter is placed when urethral catheterization is difficult, as in clients with a severely enlarged prostate, urethral strictures, or quadriplegia. Local anesthesia is used, although general anesthesia
may be used if another surgical procedure is also performed. To facilitate proper placement of the catheter, the bladder must be distended with urine or water before insertion. If the bladder is insufficiently distended with urine, additional fluid is instilled through a catheter or cystoscope.

The suprapubic skin is prepared. Under sterile technique, the suprapubic catheter is inserted through a small surgical incision or by passing a trocar through the skin into the bladder. Once the trocar is in place, the pointed core of the cannula is removed. The catheter is threaded through the cannula and attached to a closed drainage system. The catheter is commonly sutured in place or secured with a commercially made retention seal. When the catheter is removed, the muscle layers of the bladder immediately contract over the puncture site and shrink the surface wound.

**Contraindications.** Short-term catheter placement may be a possible contraindication.

**Complications.** Potential complications of a suprapubic catheter include dislodgment of the catheter, hematuria (especially after the use of a large-bore catheter), bowel perforation during trocar insertion, and failure of the wound to close, which results in a urinary fistula.

**Outcomes.** When a suprapubic catheter is used instead of a urethral catheter, a lower rate of UTIs, increased comfort, and easier implementation of a bladder training protocol are expected.

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**Nursing Management of the Surgical Client**

The client with a suprapubic catheter requires care similar to that needed for clients with a urethral catheter. The most frequent problem is catheter obstruction caused by (1) twisting or kinking or (2) sediment or clots. Disconnecting the catheter from the drainage tubing can disrupt the siphon drainage. When the catheter is removed, dressing changes may be needed to protect the skin from urinary leakage from the site. The suprapubic catheter site usually closes completely immediately or within 24 hours of removal.

**Self-Care**

The client who is discharged with an indwelling suprapubic or urethral catheter needs to know how to care for the catheter at home. The family and significant others should learn how to empty the drainage bag and how to prevent infection. They should also be taught the clinical manifestations of UTI and instructed to call the physician if they occur. When the client is discharged with a catheter in place, follow-up care is required. Removal of the catheter depends on the cause of the retention.

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**Modifications for Older Clients**

Older clients are more susceptible to urinary retention because of a chronic decrease in bladder tone. Retention leading to infection may also be worse in older clients. Treatment, however, remains the same.

**URINARY INCONTINENCE**

*Urinary incontinence* has been defined by the International Continence Society (ICS) as “a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable.”¹ Approximately 13% to 56% of noninstitutionalized adults older than age 60 years and at least half of nursing home residents have problems related to incontinence.¹ The annual cost of incontinence exceeds $15 billion.¹ Yet most people avoid seeking treatment because they feel shame and embarrassment, which means that the problem is severely underreported and underdiagnosed. Many health care providers do not understand the effects of urinary incontinence on quality of life. Affected people may forfeit their active lifestyles and turn to a reclusive existence because they fear embarrassment.

There are three major types of incontinence: (1) **stress urinary incontinence**, (2) **detrusor overactivity**, and (3) **overflow urinary incontinence**.¹ Under each of these types are many subtypes that may present in clients as an individual diagnosis or a combination of diagnoses.

**Etiology and Risk Factors**

*Urinary incontinence* commonly results from many factors, including anatomic defects and physical, physiologic, psychosocial, and pharmacologic factors. Anatomic and physiologic incontinence results from sphincter weakness or damage, urethral deformity, altered muscle tone at the urethrovesical junction, and detrusor instability.

**Stress urinary incontinence** is the complaint of involuntary leakage on effort or exertion.¹ It commonly results from obstetric or surgical trauma, the loss of estrogen associated with menopause, repeated straining, urogenital prolapse, and congenital weakness. After a suprapubic prostatectomy and transurethral prostatectomy, men may experience some exertional urine loss after the postoperative catheter is removed. Surgical interventions may cause bladder neck damage, with possibly permanent incontinence. A radical perineal or retropubic prostatectomy may cause permanent incontinence if the bladder neck is partially damaged during surgery.
Dysfunction of the urethrovesical junction (the area where the bladder meets the urethra) occurs mainly in women. Common causes include pregnancy, vaginal delivery, menopause, and surgical procedures that damage nerves leading to muscles of the pelvic floor. These injuries may lead to stress incontinence of varying degrees. A change in the angle of greater than 30 degrees from a horizontal plane during straining indicates hypermobility resulting from relaxation of the urethrovesical junction.

A simple diagnostic test for a hypermobile urethrovesical junction is a Q-tip test. A sterile, well-lubricated cotton applicator is placed in the urethra. The client is asked to strain as if to have a bowel movement. More than a 30-degree difference in a horizontal plane indicates a positive result or urethral hypermobility of the urethrovesical junction (Figure 34-8).

Detrusor overactivity (referred to as Urge Incontinence by NANDA-I) has many possible causes, although in many cases the cause remains unknown. On occasion, the cause can be identified as a bladder lesion, lower or upper spinal cord lesion, complication of pelvic surgery, or neurologic deficit. The ICS offers two descriptions to characterize bladder overactivity. In the first, the bladder contracts either spontaneously or with provocation while the client attempts to inhibit micturition. These contractions are seen during the filling phase of a cystometrogram in a neurologically intact client. In the second, detrusor overactivity results from disturbances of the nervous control mechanism. These clients have objective evidence of bladder dysfunction from a neurologic disorder. This type of bladder overactivity, known as detrusor hyperreflexia (called Reflex Incontinence by NANDA-I), is commonly seen in the client with a history of a stroke or neurologic impairment.1

Incontinent episodes of detrusor overactivity (called Urge Incontinence by NANDA-I) occur randomly. Those who have this diagnosis often report they experience involuntary urination that is preceded by a warning of a few seconds to a few minutes. It is caused by uncontrolled contraction or overactivity of the detrusor muscle. It is sometimes observed in clients who have central nervous system disorders (Alzheimer’s disease, brain tumor, Parkinson’s disease, multiple sclerosis), bladder disorders (interstitial cystitis, radiation effects, carcinoma in situ), and spinal cord interference with spinal inhibitory pathways (spondylosis, cancer growth in spinal cord). However, it is diagnosed in clients who do not have these central neurologic disorders.

Overflow urinary incontinence, as defined by ICS and NANDA-I, is an involuntary urine loss associated with overdistention of the bladder. The bladder is able to store urine but does not empty completely, causing urine loss as a result of diminishing resistant pressures.

Functional incontinence may be the result of physical, psychosocial, or pharmacologic causes unrelated to the status of the urinary system. Physical causes of incontinence independent of disorders of the urinary tract are often related to physical immobility, especially with older adults. These clients are often physically unable to get to the toilet independently because of stroke, fractures, or weakness. Failing vision and distances from the bathroom can also contribute to incontinence if the client cannot see the commode or bedpan.

Psychosocial causes of incontinence range from true psychological problems, such as dementia, to simple confusion. Clients may be unaware of the need to void or may be unable to respond appropriately when they feel the urge to empty the bladder. Other possible causes include regression, dependence, insecurity, sensory deprivation, and the disturbance of conditioned reflexes.

Drugs can also contribute to incontinence, especially overflow incontinence. Examples include the following:

- Opioids, tranquilizers, sedatives, and hypnotic agents, all of which may affect sensory perception
- Alcohol
- Rapid-acting diuretics
- Antihistamines
- Atropine and atropine-like substances
- Hypotensive agents
- Alpha-adrenergic blockers
- Beta-adrenergic agents
- Ganglionic blockers

Other causative factors include fecal impaction, bladder scarring, urethral adhesions, diabetes mellitus, and obesity. Frequent voiding by clients who fear “accidents” leads to decreased bladder capacity, increased detrusor tone, and thickening of the bladder wall, which only fosters the dysfunction.

Incontinence health promotion activities involve preventing impaired mobility and UTIs, exercising to minimize muscle weakness, and assisting clients to the
bathroom by the clock to prevent accidents. Health maintenance measures are to thoroughly assess clients who report incontinence and monitor high-risk clients for development of incontinence. Teaching clients to perform pelvic muscle exercises (Kegel exercises) to improve muscle tone, to follow bladder training protocols, and to decrease incontinence by regulating fluid intake (e.g., not drinking large amounts of fluid at bedtime) are examples of health restoration interventions.

Pathophysiology
Pathophysiologic changes associated with incontinence vary with the specific cause of the disorder. In stress incontinence, increased vesical pressure commonly stems from such activities as sneezing, coughing, laughing, and exertion. There may be some dysfunction of the urethral sphincter or, in women, changes in the urethrovesical junction caused by weakness of periurethral muscles. Muscle weakness from childbirth, menopause, or other problems loosens the pelvic floor. In addition to the loss of muscle tone supporting the pelvic floor, there is increased descent, with a funneling effect of the bladder neck during exertion. In men, the pathophysiologic change usually results from BPH, which causes retention, overflow, and stress incontinence.

Detrusor overactivity (Urge Incontinence) according to NANDA-I is associated with several pathophysiologic changes, and in some cases, the pathophysiologic cause is unknown. One problem is uninhibited detrusor contraction associated with motor disorders. Another cause is decreased mobility from an upper motor neuron spinal lesion combined with an inability to stop voiding once the impulse is felt.

Overflow urinary incontinence stems from overdistention of the bladder and eventual overflow of the excessive amount of urine. Usually, this problem results from obstruction at the bladder outlet, as with BPH.

If incontinence is not controlled, it can lead to both psychological and physical problems. The psychological consequences of incontinence are serious. Clients may isolate themselves, and the fear of embarrassment may lead to depression. Incontinence is also a leading cause of nursing home admissions. The physical complications of incontinence include infection, skin breakdown, and permanent voiding dysfunctions.

Clinical Manifestations
The major manifestation of urinary incontinence is involuntary urine loss. Manifestations vary from client to client. An excellent diagnostic tool, the bladder diary, reveals voiding frequency, fluid intake, patterns of urinary urgency, and number and severity of incontinent episodes. The Integrating Diagnostic Testing feature on p. 765 illustrates additional information related to diagnostic testing of urinary incontinence.

OUTCOME MANAGEMENT
Successful management of urinary incontinence requires appropriate diagnostic testing. Treatments include pelvic floor exercises and behavioral interventions, drug therapy, and surgery. The least invasive treatment should be tried first. Many therapies aimed at improving incontinence can be implemented without risk to the client. Success is based on motivation, competency, and willingness to add these changes to one’s lifestyle. Surgery should be performed only when a structural or anatomic defect is found.

The goals of treatment for a client with urinary incontinence include the following:

- Careful evaluation
- Treatment decisions based on the specific abnormalities identified for each client
- Treatment modalities that coordinate with the client’s personality, expectations, environment, and clinical status
- A treatment plan that includes ways to circumvent environmental constraints
- Ability of the client to make an informed choice among treatment options

Medical Management
Many noninvasive, behavior-based therapies may be effective in controlling some types of incontinence. The International Continence Society provide numerous algorithms that detail the diagnosis and treatment of various forms of incontinence. Injectable agents such as Botox are being explored for medical treatment of incontinence.

Pelvic Muscle Exercises
Originally designed for postpartum women, these exercises—commonly known as Kegel exercises—have long been the technique of choice for reducing urinary incontinence. Reports of success range from 30% to 90%. New devices have improved the success rate by fostering the correct use of these exercises. This topic is discussed in the Translating Evidence into Practice feature on p. 766.

Pelvic Floor Reeducation
Biofeedback has been used for clients with incontinence to help them learn to reuse the pelvic floor musculature. Clients are educated to control incontinence by isolating and contracting the pelvic floor muscles. The use of biofeedback has been successful in eliminating incontinence in about 54% to 77% of clients who try it.

Biofeedback provides a “relay-like” system by which the client can visualize the isolation and contraction of
the pelvic floor musculature. Either pressure manometry or electromyographic (EMG) monitoring records the muscle strength or muscle activity.

Clients are taught to use the pelvic floor muscles to override the sense of urgency in an effort to retrain the bladder. They can also be taught to contract the correct muscle group to inhibit urine loss caused by exertion. Biofeedback can also be used to teach clients to relax the pelvic floor if they have problems with urinary retention.

**Electrical Stimulation**

Electrical stimulation of the pelvic floor can be used to inhibit the micturition reflex and to contract the pelvic floor muscles. Delivery of a weak electrical current helps to close the urethra more tightly by direct and reflexogenic contraction of the striated periurethral muscles. Electrical stimulation also helps increase bladder volume through bladder inhibition and stabilized detrusor activity.

The most common method of delivery is by insertion of a vaginal or anal sensor. The procedure can be done
Pelvic Muscle Exercises for Treatment of Urinary Incontinence

Kegel exercises, first introduce by Dr. Arnold Kegel in the 1940s, have been encouraged for clients as a method to treat urinary incontinence. Dr. Kegel reported symptomatic relief of stress and urge incontinence (urge is now usually called overactive bladder) with a daily regimen of pelvic muscle exercise. Over the years, physicians have encouraged clients to perform pelvic muscle exercise as the first-line treatment of urinary incontinence. Over the past 20 years, many nurses have offered continence programs with biofeedback-directed pelvic muscle exercise programs. These instructional rehabilitation programs have repeatedly demonstrated cost-effective care while decreasing or eliminating the manifestations associated with urinary incontinence.

Although surgery and medications have been developed for those with incontinence, the cost and risk associated with surgery and the side effects associated with medications are not treatments chosen by clients. Pelvic muscle exercise has been recommended by the International Continence Society as the first-line treatment for urinary incontinence. It provides improved continence with little risk. Studies have demonstrated that verbal instructions are not adequate in teaching clients correct performance of pelvic muscle exercise. Continence nurses use biofeedback to help clients recognize the specific events that initiate incontinence episodes. Clients are then taught to contract the pelvic floor muscle quickly to eliminate the urgency, frequency, and urine loss associated with overactive bladder. The quick squeezes excite the inhibitory reflex to relax the bladder while the squeezes associated with stress incontinence close the urethra by increasing urethral pressure. During a stress incontinent episode, urine loss is experienced during increased abdominal pressure, for example, while sneezing, coughing, or laughing. To decrease these manifestations, clients are taught to squeeze before the specific exertional activities that precede the incontinent episode. Eventually, clients perform these pelvic muscle contractions automatically to control their incontinence manifestations.

Additionally, these specifically educated continence nurses offer a well-rounded program consisting of emotional support, behavioral interventions, dietary changes, and individualized plans that are specific to each client’s diagnosis and clinical manifestations.

REFERENCES

in a physician’s office or at home. The client inserts the internal device, and the stimulation level is directed at maintaining a synchronous pelvic floor contraction during an on-and-off cycle. See the website for a figure that shows the computerized systems used for biofeedback and electrical stimulation.

Bladder Training and Behavioral Training
The client who uses bladder and behavioral training to address incontinence first voids at short intervals throughout the day—once an hour or less, if necessary. The client then tries to gradually lengthen the time between voiding up to 3 hours. Behavioral training with biofeedback or verbal feedback to teach pelvic floor muscle control showed a 63% to 69% improvement in continence in community-dwelling older women.

Institutionalized clients can also use a form of bladder training. With these clients, health care workers encourage voiding at hourly intervals and give positive feedback. The time between voiding can then be gradually increased to 2 hours.

Medications
Drug therapy for incontinence is guided primarily by the following events. During the bladder filling phase, the detrusor relaxes because of beta-adrenergic activity. At the same time, the bladder outlet contracts in response to alpha-adrenergic stimulation. If these actions are insufficient to keep urine in the bladder, drugs can be prescribed to supplement or replace them. The pharmacologic treatment of urinary incontinence is described in the Integrating Pharmacology feature on p. 767.
Medications for the Treatment of Urinary Incontinence

Medication is often the first treatment offered to clients with incontinence. These medications are diagnosis specific. Overactive bladder is treated with anticholinergic agents such as oxybutynin (Ditropan) and tolterodine (Detrol). Anticholinergics work by increasing the volume in the bladder that can be tolerated before an involuntary bladder contraction occurs, decreasing the strength of the involuntary bladder contraction, and increasing the total bladder capacity. Extended-release formulas of these drugs are available. Additionally, Ditropan has an antispasmodic action as well. It has an inhibitory effect on the smooth muscle of the bladder and has a local anesthetic effect. Tolterodine has an antimuscarinic property that has fewer side effects than other anticholinergics.

Tricyclic antidepressants such as imipramine (Tofranil) and amitriptyline (Elavil) are also often prescribed for overactive bladder as well as for interstitial cystitis. The tricyclics act by increasing the synaptic concentration of serotonin or norepinephrine in the central nervous system. This leads to bladder wall relaxation and increased bladder capacity.

A commonly prescribed medication for incontinence in women is vaginal estrogen. Recent studies have not found oral estrogen to be effective for treatment of incontinence and it is not recommended. Before the menopausal years, the urogenital system is enriched with estrogen receptors that bring an excellent blood supply to the vaginal mucosa. During the perimenopausal years and through the postmenopausal years, the decreasing circulating estrogens lead to atrophic changes of the vagina, urethra, and bladder trigone. As the mucosal layers atrophy, the tissues become less elastic as the urethra loses its ability to close properly. The application of vaginal estrogen increases the circulation, leading to improved function of the lower urogenital system.

Fluid Intake and Dietary Changes
The major nutritional aspect of management involves controlling fluid intake. Decreasing fluid intake, especially after dinner, may help decrease nocturia. For obese clients, weight reduction may help decrease stress incontinence by decreasing pressure against the bladder neck during exertion. The client should also avoid bladder irritants, such as alcohol, chocolate, and caffeinated drinks.

Implement a Bladder Training Program
A successful bladder training program requires patience. The client must accept the program and be a willing and active participant. The first step is to discuss all procedures, expectations, and anticipated outcomes with the client. Do your best to inspire a sense of hope and a positive attitude when discussing the client’s prognosis.

A bladder training program involves (1) adequate fluid intake, (2) accessibility to a toilet, (3) muscle-strengthening exercises, and (4) carefully scheduled voiding times. Implementing the program also requires well-organized teaching guidelines. The client also may need behavioral modification or intermittent catheterization.

Monitor Fluid Intake
Many clients with incontinence reduce their fluid intake to decrease urine production and increase control. Actually, adequate fluid intake and adequate urine production are necessary to stimulate the micturition reflex. Unless the client’s physical status is a contraindication, encourage a daily fluid intake of 0.5 ounce of fluid for every pound of body weight. Carefully space these fluids throughout the day, limiting fluids in the evening to allow longer sleep periods at night. Fluids should be free of caffeine and alcohol, both of which may irritate the bladder.

Teach Kegel Exercises
Performed diligently, Kegel exercises strengthen the pubococcygeal muscle, help resolve stress incontinence, and decrease urgency and frequency. Instruct the client to contract the pelvic floor muscles as if to hold back intestinal gas. Do not ask the client to start and stop the urine stream as a way to isolate the correct muscle group. Stopping and starting the urine stream may cause dysfunction of the micturition reflex and may encourage urinary retention.

Once the client can isolate the correct muscle group, he or she should contract these muscles 10 times in sitting, standing, and lying positions, three times a day, working up to 10-second contractions. Then encourage the client to contract the pelvic floor muscles to learn the urge suppression technique or before any exertion that might cause incontinence. As with any exercise...
program, the program takes a conscious effort and may take months for the muscles to become adequately toned.

**Develop a Voiding Schedule**
At the same time that the client is strengthening pelvic floor muscles, the nurse should develop a voiding schedule with the client. Determine how often the client urinates during the day by asking the client to maintain a voiding record. Depending on the voiding pattern, help the client to the toilet or commode every 30 minutes, increasing the time to 2 hours. As the program progresses, encourage the client to hold the urine longer. This increases voiding intervals, which increases bladder capacity.

**Implement Biofeedback Techniques**
Biofeedback and behavior modification may improve the outcome of the bladder training program. Use biofeedback techniques to help the client regain control over the external urethral sphincter and pelvic floor musculature. An internal probe is placed to measure the pelvic floor muscle activity. As the client contracts the pelvic floor, a visual analog scale or video graphs indicate the activity, strength, and duration of the muscle contraction. The system gives immediate feedback of progress. The therapy can be offered in the practitioner’s office or with the use of a home unit.

**Use Behavior Modification**
Behavior modification is a variation of the voiding schedule. This program conditions the bladder to empty when the client attempts to void. The client is encouraged to void by the clock rather than by urge. The initial time between voiding is based on a completed bladder diary before therapy is begun. The time between voiding may be as little as every 30 minutes, with weekly increases of 15 to 30 minutes between. The gradual increase in time between voiding helps to decrease detrusor overactivity and to increase bladder capacity.

**Explore Obstructive Devices**
Obstructive devices are sometimes used for women with stress incontinence and vaginal prolapse (Chapter 39). For example, certain types of vaginal pessaries can reduce incontinence by supporting the descending urogenital angle at the bladder neck. When a pessary is fit properly, the client should be able to void completely without urethral obstruction. Women using such devices should have the dexterity to remove the device for cleaning several times a week or when not in use. If the client is unable to remove the pessary, she should return to the clinic every 3 weeks to have the pessary removed, cleaned, and reinserted, and she should undergo a vaginal inspection for infection and irritation.

**Recommend Counseling**
A mental health consultation may help clients with depression that stems from incontinence. Talking to a counselor can help clients manage the fear of embarrassment, sense of increased dependence, and self-image problems accompanying incontinence. Avoid medications such as antidepressants because of the potential for more bladder dysfunction.

**Use Other Incontinence Products**
**Disposable Pads.** Sometimes none of the measures described are effective. Nursing interventions must then be aimed at protecting the client’s skin, clothing, and bed linen. Adult-sized disposable pads or briefs help protect and increase the social mobility of clients with chronic incontinence. These commercially available undergarments have elastic legs and cellulose padding that draws fluid away from the skin by capillary action. Some brands include an odor-reducing agent.

**Skin Care.** If the skin becomes wet, it must be meticulously cleaned with a pH-balanced cleaner and dried to prevent serious rashes and skin breakdown from maceration and ammonia. The skin should then be carefully moisturized. Indwelling catheters to drain urine should be used only to avoid skin breakdown.

**Condom Systems.** External condom catheter drainage involves placing a thin rubber or plastic sheath over the penis and connecting it to either a leg bag or a bedside drainage bag. When the bladder releases urine, it runs down the tube into the collecting device. Problems include leakage (with or without detachment of the condom), twisting of the condom, and stasis of urine, which can macerate the penis.

Select the correct size of sheath, attaching it to stay in place without compromising circulation to the distal penis. Make sure that the sheath is not too tight, particularly at the ring. You may need to remove some of the client’s pubic hair before preparing the skin. Wash the penis with soap and water and allow it to dry thoroughly to remove skin oils. If appropriate, apply an adhesive paste or commercial skin barrier.

Many commercially prepared condom systems contain a double-sided adhesive liner that is applied to the penis before the condom. Many newer devices are self-adhesive.

When rolling the condom sheath over the penis, allow at least 1.5 cm between the distal end of the penis and the internal end of the sheath. This reduces skin irritation. Make sure that the foreskin is over the glans.

Use only elastic tape to allow for expansion or erection. Apply this tape in a spiral only. To avoid impaired circulation, never encircle the penis completely.
with tape. Frequently monitor the patency of the system, and remove the condom daily to clean and dry the skin.

**Encourage Follow-Up**
The client should be seen at regular intervals to make sure that interventions are adequate and continence is improved. Referral to a continence clinic may sometimes be appropriate to ensure close follow-up of continuing problems. The National Association for Continence and the Simon Foundation for Continence both publish newsletters containing important information for the incontinent client and family. The Management and Delegation feature below discusses delegation of responsibility while caring for clients with urinary incontinence.

### Surgical Management

Surgical procedures are performed only to correct or compensate for anatomic defects leading to incontinence. After an injury to the bladder neck, the surgeon can resuspend the bladder neck and attempt to recreate normal anatomy. Implantation of an artificial sphincter can bring about opening and closing of the urethra to

### Management and Delegation

**Helping Clients with Urinary Incontinence**

Various underlying conditions can result in urinary incontinence. Although women are at greater risk than men, incontinence also affects men. You and the physician assess and evaluate the client to determine the appropriate interventions to manage incontinence, possibly using a bladder record or voiding diary to document patterns and trends. Pelvic muscle rehabilitation, behavior therapy, pharmacologic interventions, and surgical procedures are the recommended treatments. For many, incontinence is an acute problem; for others, it is a chronic one.

Bladder training, assistance with toileting, and providing good skin care are duties that may be delegated to unlicensed assistive personnel. These measures are necessary for improving continence and for keeping clients dry and clean to prevent complications associated with skin irritation and ulceration.

Helping the incontinent client who cannot get out of bed is crucial in preventing skin breakdown and pressure ulcers. Utilizing a bedpan, a bedside commode, or a raised toilet seat may be helpful at times. If the client uses a walking aid to ambulate, ensure that the wheelchair, walker, or cane is near the bed and that the pathway to the bathroom is well lit and clear. Indicate which modality is appropriate for each client.

Instruct unlicensed assistive personnel to:

- Respond promptly to all call lights in their assigned area.
- Closely measure and record urine output. Cloudy, foul-smelling, or dark urine should be reported immediately to you.
- Give each client plenty of time to void. Create privacy by closing the door or pulling the bedside curtain.
- Never scold a client who is wet. The client may be upset or feel ashamed about incontinence.

With bladder training instruction, direct unlicensed assistive personnel to:

- Assist or prompt the client to the bathroom on a scheduled interval, usually every 1 to 2 hours at the beginning of the training period.
- Increase the interval of time to assist or prompt the client to the bathroom as the client begins to achieve dryness.

Ask unlicensed assistive personnel to:

- Explain when the next bathroom time will be before they leave the room.
- Offer positive reinforcement to the client who can successfully void or asks for assistance to the bathroom to urinate, or has a dry absorbent pad.
- Assist clients with exercises to strengthen pelvic muscles to help minimize incontinence, reinforcing your previous instruction.

Direct unlicensed assistive personnel about which toileting methods to use:

- **Scheduled toileting**: Assist the client to the bathroom every 2 to 4 hours whether or not the client is wet or dry.
- **Prompted voiding**: Check whether the client is wet or dry; ask the client whether he or she needs to void, and help the client to the bathroom if the client answers “yes.”
- **Habit training**: Once the client’s voiding times each day are determined, help the client to the bathroom at the same times each day.

Maintaining clean, dry, and intact skin is necessary to prevent skin breakdown and unnecessary complications associated with wet skin. Instruct unlicensed assistive personnel to provide proper skin care and to identify any changes such as red, excoriated, or tender skin to you. The regimen may include the following:

- Cutting back on evening or night fluid intake to decrease voiding accidents during the night
- Changing disposable wet pads or diapers every time the client is wet
- Using ointments or creams to protect the skin and to serve as a barrier after cleaning the client
- Applying absorbent pads or diapers that are not chafing to the skin

Have unlicensed assistive personnel communicate and report (1) any changes in skin or urine, (2) the client’s inability to follow the toileting plan, and (3) any other questions that arise. You are responsible for assessing, implementing, evaluating, and making all changes to the client’s plan of care.
allow voiding. Other procedures, such as collagen or fat injections, are used to fill or occlude a urethra that cannot close completely.

**Bladder Neck Suspensions**

Bladder neck suspensions restore the normal urethrovésical junction or lengthen and support the urethra. Resuspending the bladder neck allows the urethrovésical junction to function correctly.

The *Burch colposuspension* is a popular surgical procedure for women with stress incontinence. This surgical intervention is a modification of an older procedure known as the MMK (Marshall, Marchetti, Krantz). In the Burch procedure, a surgeon fixes the periurethral tissue to Cooper’s ligament, whereas in the MMK procedure, the surgeon sutures the periurethral tissue to the symphysis pubis. After surgery, a suprapubic catheter must usually be in place for up to 14 days. The drainage system must remain patent because the pressure of a filling bladder can inhibit the healing process.

A *sling procedure* is used for intrinsic sphincter deficiency, a severe type of stress incontinence. Material is placed beneath the urethra to elevate it and to increase urethral compression. The sling material may be synthetic or autologous (from one’s self), such as fascia from another part of the client’s abdomen. There are many variations of the procedure; some present a significant risk of voiding dysfunction and others present risk of rejection of the synthetic material used for urethral support.

One type of *sling procedure* is called a **TVT**, or transvaginal tape. When a TVT procedure is placed in a woman, a synthetic material made of Prolene is loosely positioned under the urethra at the bladder neck. It supports the urethra and bladder neck during the activities that trigger a stress incontinent episode. The procedure is done as an outpatient surgery and the client is often discharged within several hours of completion of the TVT.

Other surgical procedures provide an intact, patent route for the transport of urine. Scar tissue that interferes with normal bladder neck function must be removed.

**Implantation of an Artificial Urinary Sphincter**

Implantation of an artificial urinary sphincter may help some clients achieve continence. This procedure usually is avoided until all other treatments have failed. Figure 34-9 shows a sphincter device, which consists of an inflatable cuff, a reservoir, and a control pump. The surgeon implants the cuff around the bladder neck or urethra, the deflation (or control) pump in the scrotum or labia, and the fluid reservoir in the abdomen.

The cuff keeps the urethra closed until the client manually squeezes the pump. This moves the fluid from the cuff to the reservoir. The bladder then drains. The cuff automatically refills after 3 to 5 minutes, again occluding the urethra.

Candidates for this treatment must not have an obstructed lower urinary tract, detrusor hyperreflexia, or progressive neurologic disease affecting bladder function. Clients must have adequate manual dexterity and motivation to manage the system. Failure of the device poses a long-term risk that the client will need more surgery. Clients must be absolutely compliant, or else the upper tracts of the urinary system can be damaged by obstruction.

**Nursing Management of the Surgical Client**

Nursing care of clients undergoing surgery focuses on maintaining adequate urinary drainage. With bladder suspension, preventing distention is a priority to help avoid excessive pressure on the healing surgical site. During the immediate postoperative period, a bladder training program is initiated to help the client regain detrusor muscle tone. Clamp the catheter for lengthening intervals while urine collects in the bladder, unclamping it periodically to empty the bladder. If the client reports severe pressure, the catheter should be unclamped immediately.

If a suprapubic catheter is used, the client should try to void every 2 to 3 hours. After voiding is attempted, the catheter is drained to measure the residual urine and determine the effectiveness of bladder emptying.

**Self-Care**

The expected outcome is that the client will resume control over bladder function. Many strategies to achieve
continence may be tried, and the client selects what is most comfortable and best able to support preferred activities. Management options can be expensive, such as multiple biofeedback sessions. If continence is achieved with any of the described therapies, however, treatment to achieve continence is cheaper than the purchase of adult briefs for daily use; in addition, the client would be free to engage in desired activities. Teach the client about continence options, and help the client make decisions about treatment options.

**Modifications for Older Clients**

Incontinence is not a normal part of the aging process, but it is a common problem among older adults. Older clients can be treated with any of the previously mentioned treatments. Because older people are more sensitive to many medications, care should be used when drugs are administered.

**NEUROGENIC BLADDER**

The term *neurogenic bladder* refers to several bladder dysfunctions caused by lesions of the central or peripheral nervous systems (Figure 34-10). Their manifestations depend on the site of the lesion. A neurogenic bladder may involve a combination of one or more nervous system dysfunctions. There are five major types of neurogenic bladder dysfunction:

- **Uninhibited**
- **Sensory paralytic (detrusor muscle hyperreflexia)**
- **Motor paralytic (detrusor muscle areflexia)**
- **Autonomous**
- **Reflex**

Neurogenic bladder dysfunctions may also be classified according to the level of the lesion in the central nervous system.

**Upper motor neuron** lesions occur above the sacral segments of the spinal cord. They produce bladders that are spastic or characterized by exaggerated reflexes (hyperreflexia).

**Lower motor neuron** lesions occur at or below the sacral vertebrae. They produce bladders that are lacking reflexes (areflexic) or tone (atonic).

The incidence of neurogenic bladder dysfunction reflects the incidence and etiology of neurologic injuries or disorders. With certain disorders, a neurogenic bladder may develop in 100% of clients, as with transection of the spinal cord. Clients with conditions such as multiple sclerosis are affected with varying degrees of manifestations.

**Etiology and Risk Factors**

Risk factors for neurogenic bladder disorders include tumors, neurologic disorders, and trauma to the nervous system. Accidents are the only preventable cause of this problem. The uninhibited neurogenic bladder produces “infantile” or uninhibited voiding. The urge to void causes urine to flow. The primary cause is a lesion in the corticoregulatory tracts, as from a stroke or multiple sclerosis. A sensory paralytic bladder results from an interruption in the lateral spinal tracts, as occurs in tabes dorsalis, diabetic neuropathy, and pernicious anemia. Because of the sensory loss, the client cannot sense the bladder filling. This lack of perception leads to atonic bladder, retention with possible overflow incontinence, and upper tract involvement. A motor paralytic bladder is the most uncommon type and is caused by lesions in the motor outflow from vertebrae S2 to S4. Disease processes causing this dysfunction include poliomyelitis, tumor, trauma, spina bifida, and infection. This dysfunction may be temporary if a bacterial or viral infection is the cause. Although there is full sensation of bladder filling, even to the point of pain, the client cannot initiate micturition. Clients with an autonomous neurogenic bladder cannot perceive bladder fullness, or they cannot start and maintain urination without some type of exertional pressure. Retention and incontinence are common.
problems. The autonomous type of dysfunction occurs after destruction of all nerve connections between the bladder and the central nervous system at vertebra S2, S3, or S4 following trauma, inflammatory processes, spinal anesthesia, or malignancy. Transection of the spinal cord above the sacral segments causes a reflex neurogenic bladder. There is no sensation, and the bladder contracts reflexively but does not empty completely.

Pathophysiology
Lesions at the lower motor neuron level of the spinal cord often directly interfere with the reflex arc, leading to inappropriate interpretation of efferent and afferent impulses. When the bladder fills, the message is transmitted through afferent fibers to the brain cortex. The injury keeps these impulses from being correctly interpreted, leading to loss of the micturition reflex. A flaccid bladder with urinary retention is the result.

With upper motor neuron lesions, impulses are not transmitted to or from the lower spinal areas to the cortex. When the bladder distends, no sensation is transmitted. Because the lower cord is intact, activity of the reflex arc can occur. The client would have reflex incontinence as a result.

When the damage is to the cortical area itself, as with a stroke or trauma, the client cannot correctly interpret the impulses that are being transmitted. Unless the client is evaluated and treated appropriately, serious UTIs, skin breakdown associated with incontinence, and even renal failure resulting from chronic overdistention of the bladder are more likely to develop.

Clinical Manifestations
The major clinical manifestation of neurogenic bladder dysfunction is retention with or without incontinence. The client may or may not feel a need to void or feel a sense of bladder distention. The diagnosis is made from the location of neurologic dysfunction.

Preventing Complications
Autonomic dysreflexia is a serious, potentially life-threatening complication affecting clients who have spinal cord injuries. It may occur during bladder training programs if the urinary system or bowel becomes obstructed. The most frequent cause is bladder distention or feces in the rectum, although autonomic dysreflexia can be triggered by visceral distention or stimulation of pain receptors in the skin. This condition results from an excessive autonomic response to normal stimuli and affects primarily clients with upper motor neuron lesions.

The most common manifestations are severe hypertension, bradycardia, a throbbing headache, flushing, diaphoresis above the level of the lesion, blurred vision, nasal congestion, nausea, and pilomotor spasm (“goose bumps”) above the lesion. If left untreated, this problem can lead to retinal hemorrhage, seizures, or stroke. It is important for the client to recognize the earliest manifestations and summon help immediately. Preventing bladder distention is one way to prevent this emergency. If stool is accumulating in the rectum, careful evacuation should be done to avoid either overdistention or overstimulation.

Preventing bladder distention is one way to prevent this emergency. If stool is accumulating in the rectum, careful evacuation should be done to avoid either overdistention or overstimulation.

Medications such as diazoxide (Hyperstat), phenoxybenzamine (Dibenzyline), guanethidine monosulfate (Ismelin), propantheline bromide (Pro-Banthine), phentolamine mesylate (Regitine), and mecamylamine (Inversine) relieve both acute manifestations and the chronic recurrence of episodes.

Nursing Management of the Medical Client

Prevent Autonomic Dysreflexia
Always be prepared for the development of autonomic dysreflexia. If severe hypertension (sometimes 300/180 mm Hg), flushing, and a pounding headache suddenly develop, you must address the manifestations immediately.

Nursing interventions involve removal of the triggering stimuli by reestablishing urine flow or removing the fecal impaction. Remove any fecal impaction only after a topical anesthetic agent has been inserted into the rectum to avoid further stimulation. In addition, a catheter may be necessary; if one is already in place, restore its patency by irrigation or by removing kinks and obstructions. Monitor the client’s vital signs every 5 minutes, and raise the head of the bed to the semi-Fowler’s position. Administer medications as ordered.
Teach Methods to Stimulate Micturition

Neurogenic bladders are difficult to control, but you can teach many clients how to stimulate the micturition reflex and maintain urination. Assist the client by providing external pressure on the abdomen. The client can lean forward or press on the abdomen. Have the client breathe deeply to push the diaphragm downward. Wearing a corset or girdle can provide an extra source of external pressure. The Valsalva maneuver is another method of increasing intra-abdominal pressure on the urinary bladder.

Another method that helps the client learn to empty the bladder is the Credé maneuver. The client places the fingers over the bladder and presses downward slowly toward the symphysis pubis, as though “milking” the urine out of the urinary system. This should be done with great caution. If the client has sphincter dyssynergia (failure of muscle coordination) or if the sphincter does not readily relax, the Credé maneuver can lead to sphincter damage and may cause ureteral reflux if there is any obstruction of outflow. The Credé maneuver is often combined with intermittent self-catheterization.

The client can use several other methods to initiate and maintain micturition. Locate trigger points on the body (lower abdomen, inner thighs, and pubic area), and explain how to stimulate them by stroking, pinching, or applying ice. Stretching the anal sphincter also relaxes the reflexes of the external urethral sphincter because they are both innervated by the pudendal nerve. The client leans forward while sitting on the toilet and inserts two gloved fingers into the anus. The fingers are then either widened apart or pulled posteriorly. Men must be careful to avoid touching the glans penis, which stimulates the bulbocavernous reflex, contracting the external sphincter.

Perform Intermittent Catheterization

For the treatment of long-term or short-term bladder atony (lack of tone), an intermittent catheterization program is an alternative to indwelling catheterization. A straight urethral catheter is inserted into the bladder at specified intervals, the urine is drained, and the catheter is removed. This may be done in a health care facility or in the client’s home (see a fundamentals’ textbook to review catheterization and see the Bridge to Home Health Care feature on Inserting Urinary Catheters on the website).

Teach Intermittent Self-Catheterization

Clients with bladder atony should be encouraged to learn self-catheterization because it increases independence and mobility. The client or any other person who has been properly educated about the technique may insert the catheter.

Sterile technique is necessary in health care facilities because of the high risk of nosocomial infections. At home, clean technique can be used for catheterization without increasing the rate of UTIs. Clean technique is also easier and less expensive for the client. To reduce the risk of bacteriuria, urinary antisepsics and acidification or bladder irrigation with antibiotics and antiseptics are used with each catheterization.

There are several procedural differences between clean and sterile techniques. For clean technique:

1. Gloves are not worn. The client must perform thorough hand-washing before starting the procedure.
2. A clean (rather than a sterile) catheter is used.
3. The catheter can be washed and reused indefinitely.
4. Lubricant should be used because the urethra is susceptible to traumatic urethritis.

The catheter should be washed thoroughly with mild soap (like Ivory) and water, rinsed, and allowed to air dry. It should be stored in a brown paper bag or other clean container such as a clean dry towel to allow air to dry inside the catheter.

During self-catheterization, the client may sit or stand. When a female client stands, she should separate her legs or place one leg on a toilet seat. After separating the labia, she can use a mirror to find the meatus.

Timing is important for successful catheterization programs. Catheterization should be carried out at specified intervals throughout the day until bedtime. The interval between catheterization is set according to the degree of continence. The average interval for adults is every 3 to 4 hours, but the client usually has to start at intervals of 2 to 3 hours. Clients should use the catheter to remove 350 to 400 ml of urine each time. A client who cannot follow a schedule is not an appropriate candidate for the program.

The amount of fluid intake allowed is under debate. Some programs allow fluid as desired; others restrict fluid intake to varying degrees. This aspect of the program requires systematic investigation. Clinicians generally recommend that the client drink about 250 ml of fluid at about 2-hour intervals. Ingestion of large amounts of fluid within a short period can cause bladder distention and reflux. Most clients are urged to drink up to 2 L of fluid daily at regular intervals.

A catheter-free bladder and absence of bacteriuria indicate a successful intermittent catheterization program. Controversy exists about the treatment of asymptomatic bacteriuria. A successful catheterization program may be due to several factors, including intermittent bladder distention, which causes stimulation of the normal micturition reflex and reactivation of the bladder’s normal antibacterial properties. Other advantages include continence, independence, good hygiene, prevention of complications arising from urinary stasis or a retention catheter, decreased cost, and comfortable sexual relations.
Intermittent catheterization is not a panacea. The program requires the client to assume a great deal of personal responsibility. Some clients are not sufficiently motivated to fulfill the responsibilities involved in self-catheterization. Also, some problems can occur when the client is away from home.

Clients with high resting pressures in the bladder who are incontinent between catheterizations are likely to have difficulty with intermittent self-catheterization. All clients should be evaluated before starting the program. If urodynamic evaluation reveals high resting pressures, anticholinergic medications are administered.

### Surgical Management

Surgery is not the primary treatment option for the client with neurogenic bladder. However, if conservative measures are ineffective in treating the neurogenic bladder, surgical intervention may be necessary. External sphincterotomy or incision of the bladder neck may restore normal bladder emptying. Interrupting innervation to the bladder reflex can aid an uninhibited bladder. Injection of alcohol into the subarachnoid space or rhizotomy (cutting) of the sacral nerves increases bladder capacity by inhibiting reflex bladder contractions, without interfering with normal sphincter function. Sometimes a temporary sacral nerve block is performed before surgery to evaluate the potential candidate. Electrodes may be implanted at thoracic or cervical levels of the spinal epidural space and attached to a percutaneous stimulator. As soon as the client learns to regulate the electrical stimulation properly, the device can be used to inhibit or interrupt reflex bladder contractions.

Continuous intrathecal baclofen administered through an implanted infusion pump is another method of treating a neurogenic bladder. Baclofen helps decrease spasms and detrusor sphincter dyssynergia. Clients report improvement in bladder compliance and capacity. Finally, if all else fails, urinary diversion may be performed to provide the client with a more manageable urinary system.

### Nursing Management of the Surgical Client

Nursing care of the client undergoing surgery for a neurogenic bladder with either an external sphincterotomy or a revision of the bladder outlet is the same as for any client undergoing bladder surgery. Urine output maintenance is the priority of these clients. A suprapubic or urinary catheter may be needed until healing occurs.

As with the other surgical procedures, focus care on teaching the client self-care. The client needs to learn to regulate electrical stimulation appropriately to inhibit or interrupt the reflex bladder contractions.

Proper care of the implantable infusion pump is another important area of client education. Care of clients undergoing urinary diversion has been discussed under Bladder Cancer.

#### Self-Care

The focus of discharge teaching for the neurogenic bladder client is intermittent self-catheterization. Teach the client and significant others a bladder training program and, possibly, a catheterization program. Assess the client’s ability to understand and perform self-care procedures, and ensure that the client understands the self-catheterization program. Written materials, teaching videos, and diagrams can be used to reinforce the teaching.

Clients need to be assessed in the home setting to make sure they can function as well as in the hospital. A visiting nurse may be included to help in the discharge planning of the self-catheterization or bladder training program. The client’s urinary function should be monitored at regular intervals, including renal function tests and yearly renal ultrasound studies. Teach the client to call the health care provider if manifestations of a UTI develop.

### Modifications for Older Clients

Older clients are more likely to have other medical problems, such as arthritis and visual changes, that can interfere with their ability to use the self-catheterization program. However, they may still be able to use this method if they have adequate help.

#### TRAUMATIC DISORDERS

**BLADDER TRAUMA**

Bladder trauma is defined as a blunt or penetrating injury to the bladder that may cause bladder rupture. Bladder trauma often results from automobile accidents, when the seat belt compresses the bladder. A bladder distended by urine can rupture with a direct blow to the lower abdomen. The bladder may also be punctured by a bullet, knife, bony splinter from a fractured pelvis, or internal medical instrumentation. When the bladder ruptures, urine spills into the peritoneal cavity. Complications of peritoneal urine accumulation from a ruptured bladder are peritonitis and pelvic cellulitis.

#### Clinical Manifestations

Bladder injuries usually produce hematuria and pain low in the abdomen or pain referred to a shoulder. The client also may have trouble voiding. Manifestations of peritonitis may develop as well. Fever is usually present as the peritonitis and pelvic cellulitis continue to develop. If the client has had an injury or blow to the abdomen, suspect bladder injury as the cause of the manifestations.
Medical Management

The first treatment for suspected bladder injury is insertion of an indwelling or suprapubic catheter to monitor for hematuria or urine production and to keep the bladder decompressed during healing. Any injury other than a simple contusion or very small perforation requires surgical repair.

Nursing Management of the Medical Client

Immediately assess for a suspected bladder injury if the client has had blunt trauma to the lower pelvis or abdomen. Closely monitor the client’s urine output for both amount and the presence of hematuria. Report any decrease in urine output in relation to fluid intake to the physician immediately. Careful catheter insertion is necessary for the client with suspected bladder trauma.

Surgical Management

Clients with bladder injuries usually require surgical intervention. After a urethral or suprapubic catheter has been inserted, surgical repair of the damaged bladder wall is performed. The extravasated urine in the perivesical area is drained. It is important to maintain urinary drainage through a patent catheter to promote healing and to avoid the potential development of fistulae or leakage.

Nursing Management of the Surgical Client

Postoperatively, maintain urinary drainage to prevent tension on the sutures in the bladder. A Penrose drain is left in place to allow drainage of any urine remaining in the pelvis. This may necessitate dressing changes.

Because the client may be discharged with an indwelling or suprapubic catheter, teach catheter care to the client and significant others. Assess the client’s self-care abilities to determine a possible need for assistance at home. If the client or significant others cannot care for the catheter, arrange for a home health visit.

Follow-up care is essential after discharge to assess healing. A cystogram may be done before the catheter is removed. If a suprapubic catheter has been placed, the client can begin bladder training before the catheter is removed. If the client has a urethral catheter, the catheter is removed before the client can attempt to void. If clients do not void within 4 to 6 hours after removal, the catheter should be reinserted.

URETHRAL TRAUMA

The urethra as well as the bladder may be injured in a pelvic fracture. Falling astride an object, such as the bar on a boy’s bike, with sudden force to the groin may cause urethral contusion and laceration. Injury may also occur during medical or surgical interventions, may be self-inflicted, or may occur after female genital mutilation (see Chapter 39). Penetrating wounds also cause urethral damage.

Evaluation of urethral damage is indicated if the client cannot void, has an altered urine stream, or has visible blood at the meatus. Even if the client can pass some urine through the urethra, voiding causes urinary extravasation, resulting in swelling of the scrotum or inguinal areas, which can lead to sepsis and necrosis. Blood may appear at the external meatus and may also extravasate into the surrounding tissues, giving the area an ecchymotic appearance.

The two most common complications of urethral trauma are (1) development of urethral strictures and (2) risk of impotence in men. Impotence occurs because the corpora cavernosa of the penis, blood vessels, or nerves supplying this area are damaged.

Proper management of urethral injuries is controversial. Clinicians generally agree that urinary drainage must first be established with either a urethral or a suprapubic catheter. Some physicians suggest an immediate primary surgical repair of the urethra. Others prefer to wait 2 to 3 weeks to see whether the urethra will heal around the urethral catheter without surgery. During any waiting period, the client must be monitored for developing infection and continuing extravasation of urine.

URETERAL TRAUMA

The ureters are located deep within the abdomen and are protected by the spine and surrounding musculature. Thus most ureteral trauma takes place accidentally during surgery. Perforation or tearing may occur during manipulation of intraureteral catheters or other instruments. The ureters may be occluded by ligating sutures or a misplaced clamp, or they may be transected during pelvic surgery. Many surgeons insert ureteral stents before pelvic procedures to easily identify the ureters and prevent trauma. Gunshot and stab wounds may also traumatize the ureters. On occasion, blunt trauma from a car accident can tear these structures.

Trauma is often not discovered until a clinical manifestation develops, such as hematuria, flank pain, or the presence of extravasated urine. As the urine seeps out into the tissues, pain may occur in the lower abdomen and flank. As extravasation continues, there may be sepsis, paralytic ileus, a palpable intraperitoneal mass, and the appearance of urine in an external wound. IVP and ultrasonography are the most definitive means of diagnosis.

Surgical intervention is used to repair the defect, preferably with end-to-end anastomosis. More radical procedures may be needed, such as cutaneous ureterostomy, transureteroureterostomy, and reimplantation.
The surgeon may use prosthetic ureteral implants. A nephrectomy is performed if obstruction or sepsis causes severe renal damage. It is essential to treat sepsis aggressively. Significant extravasation of urine may necessitate that the surgeon open the abdomen and drain the urine.

**CONGENITAL ANOMALIES**

A congenital anomaly of the bladder is extrophy of the bladder that develops when the symphysis pubis fails to close in utero. The lower anterior abdominal wall and anterior bladder wall are absent, allowing the bladder to protrude through the defective abdominal wall. These conditions are often treated with urinary diversion in childhood, but additional revisions may be needed as the child grows. Children who have had a diversion may be candidates for continent reservoir revisions.

Although congenital anomalies of the ureter are uncommon, several types are described:

1. **Ectopic ureter** occurs when a ureter follows an abnormal course or has an abnormal distal opening. It is the most common congenital ureteral anomaly. An ectopic ureter occurs as a result of the abnormal embryologic development of the ureter. During micturition, this anomaly often results in a back-flow of urine. Misplacement of the meatus (hypospadias and epispadias) is discussed in Chapter 38.

2. ** Duplicate ureters**, arising from the same renal pelvis, may develop when the ureters on one side unite at some point; both may open in the normal portion of the trigone or both may open into the urethra or vagina. This anomaly is not usually recognized unless a radiographic study is done for another reason. Pyelonephritis develops, and an evaluation reveals the anomaly. Surgical intervention is usually not necessary unless complications occur.

3. **Abnormal dilation of the ureter (megaureter)** is characterized by dilation and pouching of the ureteral wall just adjacent to the vesicoureteral junction. Resulting manifestations are seen as reflux or obstructive effects, which predispose the client to recurrent UTIs.

4. **Congenital ureteropelvic obstruction** occurs at the junction of the renal pelvis and the ureter. This anomaly is usually bilateral. A mild obstruction may never cause manifestations of a urinary tract disorder. As long as the kidney produces urine at a rate less than 6 ml/min, the ureter can generally handle the flow; however, urine production greater than this rate causes urinary stasis in the kidney, which results in hydronephrosis. If the condition is symptomatic, treatment consists of surgical repair of the narrowed section at the ureteropelvic junction.

**CONCLUSIONS**

Urinary system disorders can be extremely problematic for clients. Nurses play a major role in the diagnosis, prevention, and treatment of these disorders. Many of the disorders of the urinary system are chronic or become chronic problems, leading to renal disease or incontinence. Some of the manifestations of these disorders can drastically alter the client’s self-concept and lifestyle. Problems of the lower urinary tract may become life-threatening, and the nurse must ensure that the client receives prompt and adequate treatment of disorders within the lower urinary system.

**THINKING CRITICALLY**

1. A 28-year-old newlywed woman has been experiencing pain and burning with urination for the past 24 hours. This is the third episode of urinary manifestations she has had in the past 3 months. What is the probable cause of the urinary manifestations? What further information do you need to assess her problem? What can you do to help her treat this problem and prevent further difficulties?

Factors to Consider. For what urinary tract problems does the client’s status as a newlywed place her at risk? Which tests would help differentiate an infectious problem from a noninfectious one?

2. The client had a radical cystectomy with formation of an Indiana pouch 12 hours ago. He has a catheter in place, which has drained 10 ml in the last hour. The stoma is a very pale pink. His vital signs are elevated from their preoperative levels. His pulse rate is 100 beats/min, and his temperature is slightly increased. What actions would be appropriate at this point in the client’s care?

Factors to Consider. Is the client’s urine output within expected limits? What color should a fresh stoma normally be?

3. A 69-year-old man with diabetes mellitus is admitted with severe left flank pain, nausea, vomiting, and diarrhea. His abdomen is soft and only slightly tender. His urinalysis reveals increased red blood cells, and his KUB shows a large staghorn calculus in the left kidney with hydronephrosis of the left kidney. What would be a priority assessment for this client?

Factors to Consider. What other diagnostic tests should be done? What are the treatment options for large renal stones?

Discussions for these questions can be found on the website.

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