LESSON ASSIGNMENT

LESSON 3
Urinary System Diseases/Disorders

LESSON ASSIGNMENT
Paragraphs 3-1 through 3-37.

LESSON OBJECTIVES
After completing this lesson, you should be able to:

3-1. Identify the etiology, signs, symptoms, and treatment for urinary tract infections.

3-2. Identify the etiology, signs, symptoms, and treatments for these kidney diseases/disorder.
   a. Acute glomerulonephritis.
   b. Pyelonephritis.
   c. Hydronephrosis.
   d. Acute renal failure.
   e. Chronic renal failure.
   f. Renal tumors.
   g. Polycystic kidney.
   h. Renal calculi.

3-3. Identify the etiology, signs, symptoms, and treatments for abnormalities and obstructions of the ureters.

3-4. Identify the etiology, signs, symptoms, and treatments for these bladder disorders:
   a. Cystitis.
   b. Tumors.

3-5. Identify these disorders of the urethra:
   a. Congenital defects.
   b. Urethritis.
   c. "Straddle Injuries."
   d. Trauma.
3-6. Identify the etiology, signs, symptoms, and treatments for injuries to these organs of the genitourinary system:

a. Kidney injuries.
b. Bladder injuries.
c. Urethral injuries.

3-7. Identify adverse reactions and contraindications that apply to a specific drug treatment for urinary system diseases and disorders.

**SUGGESTION**

After completing the assignment, complete the exercises at the end of this lesson. These exercises will help you to achieve the lesson objectives.
LESSON 3
URINARY SYSTEM DISEASES/DISORDERS

Section I. URINARY TRACT INFECTIONS

3-1. INTRODUCTION

More than 8 million Americans are affected by urinary system related health problems, which means you may deal with many patients with urinary system complaints. The urinary system plays a major part in the fluid and electrolyte balance of the body and with the respiratory system is important in maintaining the blood pH. It is understandable, therefore, that a problem with the urinary system can have serious health consequences.

3-2. ETIOLOGY OF URINARY TRACT INFECTIONS

a. Infecting Microorganisms. The cause of urinary tract infections (UTI) can be traced to the presence of infectious microorganisms located anywhere between the kidneys and the urethral opening. The common pathogens are the gram-negative bacilli, often found in the colon, especially *E. coli*, *klebsiella*, and *proteus*. Microorganisms acquire access to the kidneys by ascension from the lower urinary tract beginning at the urethra. Bacterial infections of the lower urinary tract occur about 10 times more frequently in females than in males. A common cause of urinary tract infection in females is an improper wiping technique.

b. Predisposing Factors. Factors which predispose an individual to UTI include sex, stasis of the urine, instrumentation, and neurogenic bladder.

   (1) Sex of the individual. Urinary tract infections are common because the female urethra is short. Additionally, large numbers of pyogenic bacteria (pus-producing bacteria) inhabit the vaginal vestibule. Urinary tract infections are rare among males less than 50 years old because the male urethra is enclosed in the penis. Ascending UTI infections frequently occur after intercourse.

   (2) Urinary stasis. Urinary stasis is the stoppage of the flow or discharge of urine. This condition may be caused by stones, stricture (an abnormal narrowing of a tubular structure), prostatic enlargement, tumor, or developmental abnormalities. Urinary stasis may occur at any level of the urinary tract. The statis of urine from any cause predisposes toward UTI. About 95 percent of people with catheters for three days develop urinary tract infections.

   (3) Instrumentation. Instrumentation used (such as catheters), diagnostic studies, and therapeutic procedures (such as bladder irrigations) are also causes of urinary tract infections.
Neurogenic bladder. Neurogenic bladder is the term used for any disturbance of the bladder function that is caused by impairment of the nerve supply. Such dysfunction can occur by prolonged urinary stasis in the bladder but is more frequently caused by the use of catheters.

3-3. SIGNS AND SYMPTOMS OF URINARY TRACT INFECTIONS

Pain, a primary symptom associated with urinary tract infection, involves the kidneys, the ureter, and the bladder. Kidney pain will be manifested as a dull ache in the flanks extending along the rib margin toward the umbilicus. (The flank is the side of the body between the ribs and the pelvis.) In the ureter, pain radiates from the costovertebral angle down the course of the ureter to the scrotum or vulva to the inner thighs. During urination, the individual experiences bladder pain that radiates to the distal urethra.

3-4. LABORATORY PROCEDURES FOR URINARY TRACT INFECTIONS

Common laboratory procedures for urinary tract infection include the following: routine analysis, culture sensitivity, blood tests, cystoscopic examination, and X-ray procedures.

a. Routine Analysis. Routine analysis is done to check for abnormalities. A routine analysis includes a check of the following:

(1) Specific gravity for testing the kidney's ability to concentrate urine.

(2) pH-balance to reflect the metabolic status.

(3) Presence of white blood cells, red blood cells, crystals, and casts (a menstruating female will normally have red blood cells present).

(4) Glucose that is indicative of diabetes. Many drugs give false positive tests for glucosuria. Examples of such drugs include Kelflex®, large doses of ascorbic acid, penicillin, Benemid R®, tetracycline, and thiazides.

(5) Odor (a sweet smell) with a presence of acetone is associated with diabetes mellitus, while an unpleasant smell is associated with decomposition or ingestion of certain drugs or foods.

(6) Color and transparency. Pale urine indicates diabetes insipidus. If the urine is milky, there may be fat globules or pus corpuscles present. Reddish urine may indicate the presence of blood pigments, drugs, or food pigments. Greenish urine is indicative of bile pigment, which is associated with jaundice. Brown-black urine may indicate poisoning or hemorrhage.
b. **Specimens.** Culture and sensitivity (clean catch) specimens are taken to determine specific agents in infectious diseases of kidneys, ureters, and bladder. Good cleaning techniques are essential, especially in women. In such cases, void and collect midstream urine in a sterile cup. The patient can be catheterized (in and out catheterization), but this is the last resort because of increased incidence of introducing UTIs with catheterization. Specimens must be sent to the laboratory as soon as possible and refrigerated, if needed.

c. **Additional Procedures.**

   (1) **Blood urea nitrogen (BUN).** This is a blood test to help determine whether the kidneys are clearing the body of waste properly. The body's blood chemistry changes if the nephrons of the kidneys are not removing the body's waste products efficiently. One change in blood chemistry is a rise in the blood urea nitrogen level.

   (2) **Cystoscopic examination.** The cystoscopic examination is a direct method of bladder study and visualization by cystoscopy using a tubular lighted telescopic lens that is passed into the bladder via the urethra. It is used to detect tumors, obtain biopsies, remove calculi (kidney stones), treat lesions, and inspect tissue.

   (3) **X-ray procedures.** X-ray procedures includes the kidney, the ureter, and the bladder (KUB) or flat plate of the abdomen. It shows the position, size, and shape of the kidneys and renal calculi.

**Section II. KIDNEY DISEASES AND DISORDERS**

3-5. **GENERAL INFORMATION**

Kidney disorders may be acute or chronic. Acute conditions usually arise suddenly, most frequently as the result of an infection with inflammation of the nephrons. Acute kidney disorders commonly run a course of a few weeks and are followed by complete recovery. Chronic kidney conditions develop slowly. These are often progressive, resulting in the gradual loss of kidney function.
3-6. ACUTE GLOMERULONEPHRITIS

Glomerulonephritis, a form of nephritis (inflammation of the kidneys) in which the lesions involve primarily the glomeruli, is the most common kidney disease. In this disease, antibodies formed in response to streptococci attach themselves to the glomerular membrane and injure this membrane. (Glomeruli are the small, coiled mass of blood capillaries within Bowman's capsule of the kidney.) These damaged glomeruli allow protein, especially albumin, to filter into Bowman's capsule and, ultimately, to appear in the urine (albuminuria). The damaged glomeruli also allow red blood cells to filter into the urine (hematuria). The patient usually recovers without permanent kidney damage. Sometimes, however, particularly in adult patients, the disease becomes chronic with a gradual decrease in the number of functioning nephrons. This condition leads to chronic renal failure.

a. Etiology of Acute Glomerulonephritis. The exact cause of this infection is unknown. What is known is that a glomerulonephritis infection frequently follows other infections, especially those of the upper respiratory tract such as a streptococcal infection. Glomerulonephritis usually occurs in children about one to four weeks after a streptococcal infection of the throat. There is a latent period of five days to six weeks between an infection and the onset of nephritis (inflammation of the kidneys).

b. Signs and Symptoms of Acute Glomerulonephritis. A patient with acute glomerulonephritis may experience the following signs and symptoms:

1. Hypertension (high arterial blood pressure)—mild to severe from sodium retention, water retention, or inappropriate renin release. (Renin is an enzyme released by the kidney into the blood stream, where renin has a part in raising blood pressure when blood pressure is low.)

2. Edema (swelling caused by the retention of fluid)—may be mild to severe.

3. Hematuria (discharge of red blood cells in the urine)—resulting in smoky or coffee-colored urine.

4. Albuminuria—abnormal amount of albumin excreted each day in the urine.

5. Oliguria—abnormally low amount of urine excreted per day.
c. **Treatment of Acute Glomerulonephritis.** There are two goals of treatment of this infection: first, relief of the symptoms and second, prevention of complications. Treatment does not require hospitalization unless oliguria, nitrogen retention, and hypertension are present. Instead, treatment requires supportive care to include the following:

1. **Bed rest.** The patient can gradually resume activities as his symptoms subside.
2. **Fluid and dietary sodium restrictions.**
3. **Correction of electrolyte imbalances (possibly dialysis, although this is rarely necessary).**
4. **Diuretics such as metolazone or furosemide; both will reduce the extracellular fluid overload and help control pain.**
5. **An antihypertensive (an agent that reduces high blood pressure) such as hydralazine.**
6. **Antibiotics administered as needed to prevent secondary infection or transmission of the infection to others.**

**NOTE:** Information regarding this infection is important to know because acute glomerulonephritis may look like one of the treatable genitourinary diseases.

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3-7. **PYELONEPHRITIS**

Pyelonephritis is an inflammation of the kidney pelvis and the tissue of the kidney itself. This is a **renal disease** that may be either **acute** or **chronic**.

a. **Acute Pyelonephritis.** This type of pyelonephritis is fairly common. It can be treated and, if the patient continues to be checked, there probably will not be extensive, permanent damage of the kidneys.

1. **Etiology of acute pyelonephritis.** A bacterial infection causes the inflammation. The bacteria most commonly reach the kidney by ascending along the lining membrane from an infection in the lower part of the urinary tract. The bacterial infection may occur in these ways:

   a. From a congenital weakness at the junction of the bladder and the ureters.

   b. After instrumentation such as catheterization, cystoscopy, or urologic surgery.
(c) From an infection such as septicemia in which bacteria are carried to the kidney by blood.

(d) From an inability to empty the bladder. Patients with tumors, strictures, or benign hypertrophy cannot completely empty the bladder of urine. Bacteria can grow in such an environment.

(2) Incidence of acute pyelonephritis. The incidence of acute pyelonephritis is higher in these groups of people:

(a) Pregnant women. A small percentage of pregnant women develop bacteriuria (bacteria in the urine). If this condition is not treated, about 40 percent of these women develop pyelonephritis.

(b) Sexually active women. There is an increase in the possibility of bacterial contamination.

(c) Diabetic individuals. Some people with diabetes have a neurogenic bladder, a disorder in which the bladder does not empty completely. Bacteria may, then, grow in the urine.

(d) Individuals with other renal diseases. A person whose renal function is not operating properly from other renal diseases has an increased risk of developing pyelonephritis.

(3) Signs and symptoms of acute pyelonephritis. The signs and symptoms of pyelonephritis may be absent or obscured by an associated disease. If signs and symptoms are present, the following are typical:

(a) Urgency, frequency, and burning during urination.

(b) Urine with a fishy odor and cloudy appearance.

(c) Back and flank pain over one or both kidneys, caused by edema.

(d) Chills, fever (102°F or higher), nausea, and vomiting.

(e) Possible abdominal rigidity.

(f) Protein and casts on urinalysis.

NOTE: These symptoms may develop either over a few hours or over a few days. Even without treatment, the symptoms may disappear in a few days, but there may still be a bacterial infection. If so, the symptoms may reappear later.
(4) **Treatment of acute pyelonephritis.** Antibiotic therapy is the center of treatment. Start treatment after the specific infecting organism has been identified from culture and sensitivity studies of the patient's urine. Follow this treatment:

(a) Give antibiotics after urinalysis and culture and sensitivity tests have been performed.

(b) Continue antibiotics for 10 to 14 days. Inform the patient that urine usually becomes sterile in from 48 to 72 hours after he starts taking antibiotics. However, stress the importance of continuing the course of treatment for the full number of days the treatment has been prescribed.

(c) Encourage a fluid intake sufficient to achieve urinary output of more than 2,000 ml per day. While intake of fluid is important, the patient must take care not to consume too much fluid. Two to three liters of fluid should be the limit of fluid consumed by the patient. Intake of more than two or three liters of fluid may decrease the effectiveness of the antibiotics.

(d) Control fever through antipyretics (medication that reduces or relieves fever).

(e) Advise rest.

**NOTE:** Teach patients with a history of urinary tract infections to recognize the signs of infection such as cloudy urine, burning on urination, frequency, and urgency. Early recognition of signs of a possible infection means that the patient can seek early treatment thus preventing severe infection.

b. **Chronic Pyelonephritis.** This type of pyelonephritis is a persistent infection that can scar the kidneys and may lead to chronic renal failure. This more serious disease is frequently seen in patients with urinary tract blockage. Persistent or repeated bacterial infections may cause chronic pyelonephritis. This disease can be effectively treated with antimicrobial medication. It is very important to prevent this infection. Preventive measures include avoiding catheterization and instrumentation and practicing good hygiene.

3-8. **HYDRONEPHROSIS**

Hydronephrosis is distention of the renal pelvis and calyces caused by an accumulation of urine because of an obstruction to the normal urine flow. The obstruction may occur at any level in the urinary tract.
a. **Etiology of Hydronephrosis.** The most common causes include the following:

1. Pregnancy.
2. An enlarged prostate.
3. Kidney stones that have formed in the pelvis and dropped into the ureter.
4. A tumor that presses on a ureter.
5. Scars caused by inflammation.

b. **Signs and Symptoms of Hydronephrosis.** Signs and symptoms vary with the cause of the obstruction. Some patients experience no symptoms or slightly decreased urine output and mild pain.

1. **Severe signs and symptoms.** Patients experiencing severe signs and symptoms may experience:
   
   a. Severe, colicky renal pain or dull, flank pain radiating to the groin.

   b. Gross urinary abnormalities such as hematuria, pyuria, dysuria, alternating oliguria and polyuria, or complete anuria.

   1. Hematuria--discharge of red blood cells in the urine.
   2. Pyuria--pus in the urine.
   3. Dysuria--difficulty or pain in urination.
   4. Oliguria--abnormally low excretion of urine.
   5. Polyuria--abnormally large excretion of urine.
   6. Complete anuria--no urine is excreted.

2. **Additional signs/symptoms.** Included are:

   a. Nausea.
   
   b. Vomiting.
   
   c. Abdominal fullness.
(d) Pain on urination.
(e) Dribbling.
(f) Hesitancy.

NOTE: If the obstruction is only on one side, the pain may be just on one side. That pain will probably be in the flank area.

c. Treatment of Hydronephrosis. The two main goals of treatment are to preserve renal function and prevent infection. Both goals can be achieved by surgical removal of the obstruction. If the surgery is performed within a few weeks, before the kidney is damaged, the patient may recover completely. If the obstruction is not removed, the kidney may be permanently damaged.

3-9. ACUTE RENAL FAILURE

Acute renal failure occurs when the kidneys suddenly fail to function. As a chief organ of the excretory system, the kidney is important in the elimination of some soluble waste products from the body, and the regulation of water and electrolyte balance in the body. Renal failure stops these all-important functions, and disrupts the fine balance of the body's systems. Medical treatment can usually reverse this problem. If medication is unsuccessful, the condition may progress to end-stage renal disease, uremic syndrome, and death.

NOTE: Uremic syndrome is a condition that may appear in a patient who is in the late stages of renal failure. The skin also serves as an excretory organ. When the failed kidneys cannot excrete waste products, the skin excretes these products. This skin excretion causes a white film to form on the skin.

a. Etiology of Acute Renal Failure. Three classifications of acute renal failure are prerenal failure, intrinsic (or parenchymal) failure, and postrenal failure.

   (1) Prerenal failure. Diminished blood flow to the kidneys causes this type of renal failure. The reason for the decreased blood flow may be any of the following:

      (a) Hypovolemia.
      (b) Shock.
      (c) Abdominal fullness.
      (d) Blood loss.
      (e) Sepsis.
(f) Pooling of fluid in ascites or burns.

(g) Cardiovascular disorders such as congestive heart failure and dysrhythmias.

(2) Intrinsic (parenchymal) renal failure. This type of renal failure is caused by damage to the kidneys themselves, the damage usually resulting from acute tubular necrosis. Possible causes of such damage include:

   (a) Sickle-cell disease.

   (b) Acute post-streptococcal glomerulonephritis.

   (c) Acute pyelonephritis.

   (d) Ischemia (lack of blood in the kidneys).

(3) Postrenal failure. Obstruction of urinary flow bilaterally causes this type of renal failure. Possible causes of obstruction include:

   (a) Kidney stones.

   (b) Blood clots.

   (c) Papillae from papillary necrosis.

   (d) Tumors.

   (e) Urethral edema from catheterization.

b. **Signs and Symptoms of Acute Renal Failure.** Early signs of renal failure become more severe if the kidneys do not begin functioning again. The renal failure soon disrupts other body systems. Note the signs and symptoms in the following body systems:

   (1) *Gastrointestinal system.* Anorexia, nausea, vomiting, diarrhea or constipation, stomatitis, bleeding, hematemesis, dry mucous members, uremic breath.

   (2) *Central nervous system.* Headache, drowsiness, irritability, confusion, peripheral neuropathy, convulsions, coma.

   (3) *Integumentary system.* The cutaneous skin layer has these characteristics: dryness, pruritus, pallor, purpura, and, rarely, uremic frost.
(4) **Cardiovascular system.** An early symptom is hypotension. Later, these signs and symptoms occur: hypertension, dysrhythmias, fluid overload, congestive heart failure, systemic edema, and anemia.

(5) **Respiratory system.** Deep or rapid respirations caused by metabolic acidosis and, occasionally, pulmonary edema.

c. **Most Commonly Seen Signs and Symptoms of Acute Renal Failure.** As a 91W30, you are most likely to see these signs and symptoms of renal failure:

   (1) Mental disturbances such as confusion, lethargy, and stupor.

   (2) Less than 30 cc an hour urine output despite replacement.

   (3) Respiratory conditions such as respiratory muscle paralysis.

   (4) Cardiac problems such as tachycardia and dysrhythmias.

   (5) Fever and chills.

d. **Treatment of Acute Renal Failure.** Treatment for acute renal failure in the Intensive Care Unit consists of the following:

   (1) Initiate an IV of 0.9 percent normal saline.

   (2) Check urinary output hourly.

   (3) Restrict 24-hour fluid intake.

   (4) No medications.

   (5) Possible hemodialysis (removal of waste materials/poisons from the blood by means of a hemodialyzer, a piece of equipment commonly called an artificial kidney).

**3-10. CHRONIC RENAL FAILURE**

Chronic renal failure, usually the end result of a gradually progressive loss of renal function, is caused by the gradual loss of nephrons. As more and more nephrons are destroyed, the kidneys gradually lose the ability to perform their normal functions. Without treatment, uremic toxins can accumulate and cause potentially fatal physiologic changes in all the major organ systems of the body.
a. **Etiology of Chronic Renal Failure.** The causes of chronic renal failure include:

1. Chronic glomerular disease such as glomerulonephritis.
2. Chronic infections such as tuberculosis.
3. Vascular diseases such as hypertension.
4. Obstructive processes such as calculi.
5. Collagen diseases such as systemic lupus erythematosus.
6. Endocrine diseases such as diabetic neuropathy.

b. **Signs and Symptoms of Chronic Renal Failure.** Characteristic signs and symptoms of chronic renal failure include:

1. **Dehydration**—excessive loss of body fluid. Dehydration may occur early in renal failure when the kidneys cannot concentrate the urine and large amounts of water are eliminated.

2. **Edema**—accumulation of fluid in the tissue spaces. This condition may occur late in chronic renal diseases when the kidneys cannot eliminate water in adequate amounts.

3. **Hypertension**—high arterial blood pressure. Hypertension may occur as the result of fluid overload and the increased production of renin.

4. **Anemia**—below normal concentration of hemoglobin in the blood for the patient's age and sex. This condition occurs when the kidneys cannot produce the hormone to activate the production of red bone marrow cells.

5. **Uremia**—if levels of nitrogen waste products in the blood are very high, urea can be changed into ammonia in the stomach and intestine, causing ulcerations and bleeding.
c. **Treatment of Chronic Renal Failure.** There are three basic elements in the goal of medical management of a patient with chronic renal failure. First, maintain the patient's normal body fluid volume and electrolyte balance. Second, reduce the breakdown of tissue in the patient's body. And, third, try to prevent infection until healing occurs. To accomplish all this, a variety of measures are used, including restricting the patient's fluids to 400 ml per day for the average adult. Also included in the management plan are the following:

1. Adjustment of the patient's diet to limit the sources of nitrogen, potassium, phosphate, and sulfate.
2. Vigorous treatment of infection with antibiotics.
3. Treatment of anemia with a transfusion of a small volume of packed, fresh red blood cells.

**3-11. RENAL TUMORS**

Tumors of the kidneys usually grow rather slowly. Occasionally, rapidly invading types of tumors are found. Signs of a renal tumor include blood in the urine and dull pain in the kidney region. Immediate surgery may be necessary to save the patient's life.

**3-12. POLYCYSTIC KIDNEY**

Polycystic kidney disease is an inherited disorder. The disease runs in families. As the name suggests, multiple, bilateral, grapelike clusters of cysts filled with fluid grow in the kidneys. These cysts cause the kidneys to enlarge, compress the kidney tissue, and finally squeeze functioning kidney tissue so that it cannot function any longer. The disease may progress slowly in adults. While polycystic kidney disease cannot be cured, life may be prolonged if associated urinary tract infections and secondary hypertension are controlled.

**3-13. RENAL CALCULI (KIDNEY STONES)**

Renal calculi, more commonly known as kidney stones, are another disorder of the genitourinary system. Substances such as calcium oxalate, calcium phosphate, magnesium ammonium phosphate sometimes separate from the rest of the urine solution and form a solid deposit. These formations can occur anywhere in the urinary tract, but they usually develop in the renal pelvis or the calyces of the kidneys. There may be one kidney stone or several. The size of the stones vary. Kidney stones develop in Americans in the ratio of 1 to 1,000 people. More common in men than women, and rare in children and Blacks, renal calculi occur more frequently in people who live in certain geographic areas: for instance, the Southeastern part of the United States. The reason may be that the hot climate causes the people to become dehydrated, or perhaps the cause is the diet of people in that part of the United States.
a. **Etiology of Renal Calculi.** The exact cause of kidney stones is unknown, but predisposing factors include the following:

(1) **Dehydration.** Production of smaller amounts of urine promotes kidney stones. Less liquid concentrates calculus-forming substances.

(2) **Infection.** Clumps of bacteria, particularly when stasis or obstruction accompanies infection, can serve as a nucleus for calculus formation. Additionally, infected and damaged tissue serves as a site for calculus development.

(3) **Obstruction.** Components of calculus can collect and adhere, forming calculi (stones) in a patient with urinary stasis; for example, an immobile person with a spinal cord injury. An obstruction also promotes infection with an even greater chance of calculus formation.

(4) **Metabolic factors.** Certain metabolic factors may predispose the formation of calculi. Included are hyperparathyroidism, renal tubular acidosis, elevated uric acid (usually with gout), defective metabolism of oxalate, genetic defect in the metabolism of cystine, and excessive intake of vitamin D or dietary calcium. Excessive intake of milk and cheese products can result in too much dietary calcium.

b. **Signs and Symptoms of Renal Calculi.** The signs and symptoms vary with the size, location, and cause of the calculi. Included are the following:

(1) Pain, the key symptom, will be excruciating and intermittent, usually originating in the flank and radiating across the abdomen, and along the course of the ureters into that area of the groin. A stone in the kidney will cause a dull ache in the flanks with pain extending along the rib margin toward the umbilicus. A stone in the ureter causes pain to radiate from the costovertebral angle down the course of the ureter to the scrotum, or vulva to the inner thighs. A stone in the bladder causes pain to radiate to the distal urethra. This pain accompanies micturition (urination).

(2) Chills, fever, and frequent urination are common.

(3) Hematuria, the discharge of red blood cells in the urine, is common.

(4) Pyuria, with or without bacteria, may be present. Pyuria is the presence of pus in the urine.

(5) As a ureter stone is passed into the bladder, the patient will exhibit a stab of pain followed by instant relief. If the stone is passed with urine, it is necessary to attempt to retrieve it so that it may be analyzed.
c. **Treatment of Renal Calculi.** Treatment usually consists of measures to cause renal calculi to pass through and out of the system naturally since 90 percent of these stones are five millimeters in diameter. Additional treatment includes the following:

(1) Hydration—encourage the patient to drink plenty of fluids.

(2) Pain control—give meperidine (Demerol®) or morphine.

(3) **DO NOT** give antispasmodics.

(4) Bedrest and supportive treatment.

**NOTE:** If the calculi are too large to pass through the system naturally, it may be necessary to remove them surgically.

(5) Dietary information—a patient should be taught and urged to follow a diet which will prevent the formation of renal calculi in the future.

**Section III. MANAGEMENT OF KIDNEY DISEASES**

**3-14. DIALYSIS**

a. **General Information.**

(1) Properly functioning kidneys are vital to life. Remember the main functions of the kidneys: maintenance of electrolyte and water balance and excretion of waste products. If the kidneys do not function properly, waste products (such as excess minerals, urea, toxins, and drugs) start to accumulate in the body. These waste products must be removed for the person to continue to live. Dialysis is a technique used to remove waste products from the blood and excess fluids from the body when the kidneys are not functioning normally.

(2) Dialysis is the diffusion of dissolved molecules through a semipermeable membrane. These molecules tend to pass from an area of greater concentration to an area of less concentration. In patients who have defective kidney function, the accumulation of urea and other nitrogen waste products can be reduced by passing the patient's blood through a dialysis machine. Thus, dialysis removes waste products from the bloodstream and restores the patient's electrolyte balance. Dialysis cannot cure renal failure, but dialysis can accomplish some of the renal functions so that the patient continues to live. A patient on dialysis uses either a machine with a semipermeable filtering membrane, or his own peritoneal membrane to cleanse his blood.
b. **Methods of Dialysis.** Two methods of dialysis presently in use are hemodialysis and peritoneal dialysis. Both methods are based on the principle of diffusion of dissolved molecules through a semipermeable membrane.

(1) **Hemodialysis.** In this method, a sheet of cellophane functions as the semipermeable membrane in the dialyzer machine. A patient using this method must usually have dialysis two or three times a week. The process is as follows:

(a) Blood leaves the body through an artery.

(b) This arterial blood passes through the machine's blood pump.

(c) Blood is filtered to remove any clots.

(d) Blood passes through the dialyzer machine.

(e) The blood passes into the venous blood line.

(f) Blood is filtered again to remove any clots.

(g) The blood then flows through an air detector.

(h) Finally, the blood returns to the patient through the venous blood line.

(2) **Peritoneal dialysis.** In this method of dialysis, the peritoneum acts as the filtering membrane. Dialyzing fluid is introduced into the peritoneal cavity at intervals. The peritoneum is a large surface area and acts as the diffusing membrane filtering the blood in the peritoneal blood vessels. The dialyzing solution remains in the peritoneal cavity for 15 to 30 minutes. Then the solution is allowed to drain out. The severity of the patient’s condition determines the length of time the dialysis process takes. Time varies from 12 to 36 hours. Those patients with chronic renal disease can learn how to do their own dialysis treatments at home. This permits patients to resume most of their normal activities.
3-15. KIDNEY TRANSPLANTS

A possible solution for a patient with very limited renal function is to have a healthy kidney transplanted into his body. Many hundreds of kidney transplants have been performed successfully during the last several years. The transplant kidney must be from a donor whose tissue is compatible with the patient's tissue. Records show that the likelihood that a transplant will be successful is greatest when a living donor who is closely related to the patient is used. However, organs from deceased donors have proven satisfactory in many cases. The problem of the patient's body rejecting the transplanted kidney is still a major difficulty. Extensive tissue cross-matching is done, and immune-suppressing drugs are used to try to avoid problems with the transplanted kidney. If the patient's body rejects the transplanted kidney, he will have to return to dialysis therapy.

NOTE: Individuals can usually do well with only one kidney. The reason is that the kidneys have a great deal of extra functioning tissue.

Section IV. DISORDERS OF THE URETERS

3-16. URETER ABNORMALITIES/OBSTRUCTIONS

Abnormalities in structure of the ureter include double portions at the kidney pelvis and constricted or abnormally narrow parts called strictures. Narrowing of the ureter, another abnormality, may be caused by abnormal pressure from tumors or other masses outside the ureter. Ureters may be obstructed by stones from the kidneys. If a small stone moves through the ureter, the patient will experience excruciating pain. Ptosis of the kidney (the kidney dropping) can cause the ureter tube to kink.

3-17. TREATMENT OF STONES IN THE URETERS

a. Early Treatment. Early treatment for stones in the ureters was by "barber surgeons" who removed stones in the ureters, operating without anesthesia. These surgeons cut through the patient's skin and muscles of the back to remove stones from the ureters. Termed "cutting for stone," this method was relatively successful even though there was no sterile technique. The reason was because by approaching the stones through the back, the peritoneal cavity was avoided, thus reducing the risk of deadly peritonitis.

b. Present Day Treatment. Modern surgery uses a variety of instruments for removal of stones from the ureter, including endoscopes. Stones in the ureter are removed by the transurethral route. That is, removal is through the urethra and the urinary bladder from the ureter. Entrance through the skin and muscles of the back may be used to remove calculi from the kidney pelvis or from a ureter.
Section V. DISORDERS INVOLVING THE BLADDER

3-18. GENERAL INFORMATION

a. Injury to the bladder is uncommon; nevertheless, it may occur. A full bladder lies in an unprotected position in the lower abdomen. A blow to the lower abdomen can rupture the bladder, making immediate surgical repair necessary. Such injury typically occurs in traffic accidents.

b. Another type of injury that may cause bladder disorders is injury to the spinal cord. Injury to the spinal cord may severely disrupt bladder filling and emptying. The most common causes of such injuries are motorcycle accidents, automobile accidents, and bullet wounds. If the nerves controlling the bladder are damaged in such injuries, the result may be either incontinence or urinary retention.

3-19. CYSTITIS

a. Definition/Signs/Symptoms of Cystitis. Inflammation of the bladder, called cystitis, is ten times as frequent in women as in men. Part of the reason may be that the female urethra is very short compared to the urethra of the male. Bacteria (for example, colon bacilli) ascend from the outside through the urethra into the bladder causing cystitis. The most common symptoms of cystitis are pain, urgency (a feeling of needing to void although the bladder is not full), and frequency of urination.

b. Interstitial Cystitis. Interstitial cystitis is a type of cystitis in which the tissues below the mucosa are inflamed. Symptoms include pelvic pain with discomfort before and after urination. This disease can be diagnosed only with the use of a cystoscope (a kind of endoscope).

c. Etiology of Cystitis. Causes of cystitis can be traced to the following:

   (1) Bladder infection because of the infecting organism ascending through the urethra. Such infections are more common in females, especially after intercourse. In males, cystitis is less common than prostatitis and urethritis.

   (2) Trauma from catheters, stones, or instrumentation.

   (3) Inadequate bladder emptying (urinary retention, dehydration, or outlet obstruction).

d. Signs and Symptoms of Cystitis. Included are the following:

   (1) Frequent, burning, urgency to urinate even when the bladder is not full.

   (2) Cloudy urine caused by the presence of bacteria in the urine.
(3) With a severe infection, chills, fever, nausea, vomiting, and abdominal or low back pain.

(4) Occasionally, no symptoms at all.

e. Treatment of Cystitis. Included are the following:

(1) Urinalysis with culture and sensitivity test, if available.

(2) Systemic treatment with antibacterials such as Macrodantin® and Mandelamine®.

(3) Application of heat locally.

(4) Analgesics and antispasmodics for spasms of smooth muscles of the urinary tract.

NOTE: Cystitis (as well as diabetes) may develop in a person whose resistance to infection is low. The danger in cystitis is that this infection may ascend to other parts of the urinary tract.

3-20. TUMORS OF THE BLADDER

a. Etiology of Tumors of the Bladder. The most prevalent tumors in males over 50 are bladder tumors. They are more common than benign papillomas and various kinds of cancer. About 90 percent of bladder tumors arise from the epithelial lining. Possible causes include:

(1) Toxins, particularly certain aniline dyes. (Many aniline dyes are obtained from coal tar.)

(2) Chronic infestations of schistosomes (blood flukes) in the bladder.

(3) Heavy cigarette smoking.

(4) The presence of urinary stones. These may develop and increase in size within the bladder.
b. **Signs and Symptoms of Tumors of the Bladder.** Included are the following:

1. Hematuria (discharge of red blood cells in the urine) is the most common symptom, occurring early in the tumor’s growth.

2. Cystitis with frequency, urgency, and pain on urination.

3. Pain above the pubic arch, occurring as the tumor extends beyond the bladder.

c. **Treatment of Tumors of the Bladder.** Cystoscopic examination and biopsies should be done as soon as blood is detected in the urine. Removal of the tumor before it invades the muscle wall gives the best prognosis.

**Section VI. DISORDERS OF THE URETHRA**

3-21. **CONGENITAL DEFECTS**

A variety of congenital defects present at birth may involve the urethra as well as other parts of the urinary tract.

a. The opening of the urethra to the outside may be too small or the urethra itself may be narrowed.

b. Occasionally, an abnormal valve-like structure is located at the point at which the urethra enters the bladder. If this structure is not removed surgically, these valve-like folds of tissue can cause a backpressure of the urine with serious consequences.

c. Occasionally, an abnormal valve-like structure is located at the point at which the urethra enters the bladder. If this structure is not removed surgically, these valve-like folds of tissue can cause a backpressure of the urine with serious consequences.

3-22. **OTHER DISORDERS**

Other disorders to the urethra include:

a. **Urethritis.** Urethritis is the inflammation of the mucous membrane and the glands of the urethra. This disorder is more common in males than in females. Signs and symptoms include burning pain on urination, frequent urination, and pain in the lower abdominal area. Urine may be cloudy, foul smelling, or dark. Urethritis is often caused by gonorrhea, although other bacteria may also be responsible for the infection.
b. "Straddle Injuries." These injuries to the urethra are common in men. The urethra is caught between a hard surface and the pubic arch. This may result in rupture of the urethra.

c. Trauma. In accidents in which the bones of the pelvis are fractured, rupture of the urethra is fairly common. The male urethra, especially, is easily injured in accidents. In these cases, surgical repair of the urethra may be necessary.

Section VII. INJURIES TO ORGANS OF THE GENITOURINARY SYSTEM

3-23. GENERAL INFORMATION

Injuries to the organs of the genitourinary system can be caused by penetrating or perforating wounds, blunt crushing accidents, and surgery. To preserve renal function, it is very important that these injuries are diagnosed and treated promptly.

3-24. KIDNEY INJURIES

Kidney injuries can be caused by bleeding from the renal vein or arteries. The initial cause of the bleeding may have been a blunt injury to the flank.

a. Specific Causes/Signs/Symptoms of Kidney Injuries. Included are the following:

   (1) Wounds to the lower back in the flanks (flank = side of the body between the ribs and the pelvis).

   (2) A history of blows to the flank, hard enough to cause pain.

   (3) Hematuria (discharge of red blood cells in the urine) or ecchymosis (bruises) of the flank.

b. Treatment for Kidney Injuries. Follow this procedure:

   (1) Start an IV.

   (2) Treat the patient for shock.

   (3) Obtain baseline kidney laboratory data such as a complete blood count (CBC differential), urinalysis, urinalysis blood urea nitrogen (BUN) lytes, and urine lytes.
3-25. **BLADDER INJURIES**

Bladder injuries may be caused by blunt or penetrating trauma such as seat belt injury or fractured pelvis.

a. **Signs and Symptoms of Bladder Injuries.** Included are the following:

   (1) Hematuria (discharge of red blood cells in the urine).

   (2) Ecchymosis (bruise) around the pubis or across the lower abdomen.

b. **Treatment for Bladder Injuries.** The treatment for bladder injuries is based on having the bladder rest. The bladder can rest if:

   (1) Catheter drainage is performed.

   (2) Shock is treated, if indicated.

   (3) Surgical repair is done, if necessary.

   (4) Other conditions are treated; for example, a fractured pelvis is splinted or surgically treated.

3-26. **URETRHAL INJURY**

The cause of urethral injury can be traced to pelvic fracture and penetrating wounds to the groin.

a. **Signs and Symptoms of Urethral Injury.** Included are the following:

   (1) Hematuria.

   (2) Escape of urine and blood into the surrounding tissues in the lower groin.

b. **Treatment of Urethral Injury.** Treat as follows:

   (1) Attempt to insert a Foley catheter without forcing.

   (2) Treat any wounds of the external genitalia.
Section VIII. DRUG THERAPY FOR GENITOURINARY DISEASE/DISORDERS

3-27. DRUG THERAPY

A number of medications can be given to treat genitourinary system diseases and disorders. Information about some of these medications is given here. The medications are sulfisoxazole, trimethoprim, cotrimoxazole sulfamethoxazole, ampicillin, tetracycline, nitrofurantoin, methenamine mandelate, and phenazopyridine.

3-28. SULFISOXAZOLE (GANTRISIN®)

Sulfisoxazole is an antibacterial agent used in drug therapy for genitourinary disease and disorders. Sulfonamides are very effective in treating a wide variety of first-time infections. The dosage for sulfisoxazole is a loading dose of gm by mouth, followed by 1-2 gm by mouth four times a day for a period of 10 to 14 days.

a. Adverse Reactions to Sulfisoxazole. Included are the following:

(1) Nausea and vomiting.
(2) Pain, arthralgia, joint pain.
(3) Crystalluria (presence of crystals in the urine).
(4) Renal damage.
(5) Liver damage.
(6) Serious blood dyscrasias (general morbid condition of the blood).

b. Contraindications for Sulfisoxazole. Generally, sulfonamides are contraindicated for recurrent and chronic urinary tract infections. These drugs are not recommended for long-time use because they alter fecal flora thus increasing the risk of resistant infection. Sulfonamides should be avoided in the following patients:

(1) Pregnant women at term and nursing mothers. (This drug passes through the placenta and is excreted in the milk.)
(2) Individuals with impaired renal or hepatic function.
(3) Patients with hemolytic anemia (anemia from abnormal destruction of red blood cells in the body).
(4) Individuals hypersensitive to sulfonamides.

NOTE: When sulfonamides are used, it is necessary for the patient to maintain an adequate fluid intake in order to avoid crystalluria (the presence of crystals in the urine).

3-29. TRIMETHOPRIM AND COTRIMOXAZOLE SULFAMETHOXAZOLE (BACTRIM®, SEPTRA®)

Either of these medications may be indicated for the treatment of chronic urinary tract infections evidenced by persistent bacteria, frequent recurrent infections or infections associated with urinary tract complications such as obstruction. The dosage of trimethoprim and cotrimoxazole is 800 mg twice a day for 10 to 14 days. DO NOT USE these medications with patients with hepatic and renal dysfunction if the patients have adverse reactions to these medications. Contraindications are the same as for the medication Gantrisin® (paragraph 3-28a).

3-30. AMPICILLIN (PENBRITIN®, POLYCILLIN®, OMNIPEN®)

These are clinically indicated, broad-spectrum antibiotics that are effective in treating genitourinary infections. The dosage of an ampicillin drug is 25 to 500 mg every six hours for 10 to 14 days. Adverse reactions to ampicillin are limited to sensitivity phenomena. The contraindications of this drug are those known individuals who are sensitive to penicillin.

3-31. TETRACYCLINE (CYCLOPAR®)

This broad-spectrum antibiotic is effective against gram-positive and negative bacteria, certain mycoplasma, rickettsiae, and protozoa. The dosage is 250 mg by mouth every six hours for 10 to 14 days.

a. Adverse Reactions to Tetracycline. Adverse reactions to this drug include the following:

(1) Gastrointestinal disturbance.

(2) Skin rash.

(3) Renal toxicity.

(4) Hypersensitivity to the drug.

b. Contraindications to Tetracycline. Contraindications are those known to patients who have tetracycline hypersensitivity. Use of this drug should be watched during pregnancy. The drug may cause discoloration of the teeth, enamel hypoplasia (failure of the enamel of the teeth to develop completely), and bone growth inhibition.
3-32. **NITROUFURANTOIN (MACRODANTIN®)**

This drug, a synthetic antibacterial agent, is used as a short-time preventive measure and also in long-term suppressive therapy for individuals with chronic urinary tract infections. The dosage of this drug is 5 to 100 mg four times a day for a three-day period. After this period, the urine is sterile. This medication is a urinary antiseptic. That is, nitroufurantoin is an agent that kills or prevents the growth of microorganisms when applied to living tissue.

a. **Possible Adverse Reactions.** Included are the following:

   (1) **Gastric disturbances.** The patient may experience nausea, vomiting, and diarrhea. To lower gastric irritation, give the medication with milk. The severity of the reaction is related to the strength of the medication dose.

   (2) **Hypersensitivity reactions.** The patient may experience pulmonary pneumonitis. Signs and symptoms of this condition may disappear when the drug is discontinued.

b. **Contraindications to Nitrofurantoin.** Included are the following:

   (1) **Anuria** (patient of average adult size voids less than 100 ml of urine daily).

   (2) **Oliguria.**

   (3) **Renal impairment.**

   (4) **Pregnancy.**

   (5) **Infants of less than one month.**

   (6) **Known sensitivity to nitrofurantoin.**

3-33. **METHENAMINE MANDELATE (MANDELAMINE®)**

This drug is clinically indicated as a prophylactic and suppressive treatment of bacteriuria via urine acidification. The dosage of this drug is 1 gm four times a day for three days after the urine is sterile. Adverse reactions to the drug include the following:

a. **Mild gastric irritation.**

b. **Inflammation of the urinary tract in higher doses.**

c. **Hypersensitivity reaction such as a rash.**
NOTE: DO NOT give this drug to a patient is who is taking Bactrim® or Septra®. Methenamine works best in an acidic urine. If sulfonamides are administered at the same time, a precipitate will form caused by the basic nature of the sulfonamides.

3-34. PHENAZOPYRIDINE (PYRIDIUM®)

Phenazopyridine is an analgesic (an agent to relieve pain). This medication is clinically indicated for pain associated with urinary tract irritation or infection. The medication is excreted in the urine where it acts as a local anesthetic on mucosa. This drug helps relieve the patient of pain and burning during urination. Also relieved is the patient's feeling of needing to urinate too frequently and urgently. The recommended dosage for adults is 100 to 200 mg by mouth four times a day after meals for three days, if the pain is relieved. The drug may alter clinistix or Tes-tape results. Clinitest tabs must be used if urinalysis is needed. Adverse reactions to this medication include:

a. Headache.

b. Rash.

c. Pruritus.

d. Occasional gastrointestinal disturbances.

e. Staining of contact lenses has been reported.

f. At overdose levels, hemolytic anemia (anemia from abnormal destruction of red blood cells in the body) and renal and hepatic toxicity.

NOTE: Warn patients that this drug will color the urine red to orange and can stain fabrics.

Section IX. THE EFFECTS OF AGING

3-35. GENERAL INFORMATION

A number of biologic changes that are influenced by hereditary and environmental factors occur in the aging. Some changes are physiologic, changes that occur because of normal wear and tear over the years. Other changes are the result of disease or the person's life-style. It is important to remember that each individual ages in his own unique way. This accounts for the wide variation of changes in the aging population.
3-36. GENITOURINARY SYSTEM CHANGES

A number of changes in the genitourinary system occur as the body ages. Look at these changes.

a. Even without kidney disease, aging causes the kidneys to lose some of their ability to concentrate urine. With aging, progressively more water is needed to excrete the same amount of waste. Therefore, it is necessary for older persons to drink more water than young people. Older people eliminate larger amounts of urine (polyuria) even at night (nocturia).

b. Beginning at about age 40, there is a decrease in the number and size of the nephrons. Often, more than 50 percent of the nephrons are lost before age 80.

c. There may be an increase in blood urea nitrogen (BUN) without serious symptoms.

d. The elderly are more susceptible than young people to infections of the urinary system.

e. Childbearing may have caused damage to the musculature of the pelvic floor. Years later, this damage may cause urinary tract problems.

f. Enlargement of the prostate, common in older men, may cause obstruction and back pressure in the ureters and kidneys. If an enlarged prostate condition is untreated, it will cause permanent damage to the kidneys.

g. Age changes may predispose a person to incontinence, but age changes do not cause a person to be incontinent. Most elderly persons (60 percent of those residing in nursing homes and up to 90 percent of those living independently) have no incontinence.

3-37. CLOSING

All the systems of the body are important. The body has developed the ability to protect itself by being able to compensate and function well with only one kidney. Looking at that compensatory mechanism, it is even more devastating when kidney failure occurs, and the person must rely on dialysis. Early awareness of such problems can eliminate or prevent many diseases, which attack the kidneys. An individual can survive without a bladder, but the quality of life will be drastically changed. Use your assessment skills to obtain early treatment for diseases of the genitourinary system, preventing those diseases from progressing to more serious levels.

Continue with Exercises

Return to Table of Contents
EXERCISES, LESSON 3

INSTRUCTIONS. Answer the following exercises by writing the answer in the space provided.

After you have completed all of these exercises, turn to "Solutions to Exercises" at the end of the lesson and check your answers. For each exercise answered incorrectly, reread the material referenced with the solution.

1. Urinary tract infections are caused by _________________________________.
   They are located anywhere between the ____________________________
   and the _________________________________.

2. List four factors that predispose an individual to urinary tract infections.
   a. __________________________________________________________.
   b. __________________________________________________________.
   c. __________________________________________________________.
   d. __________________________________________________________.

3. The term neurogenic bladder is used to refer to any __________________________
   _________________________________.

4. The primary symptom of a urinary tract infection is ________________________.

5. Laboratory analysis of urine indicates the following:
   a. Pale urine indicates ____________________________________________.
   b. Greenish urine indicates  ________________________________________,
   c. Brown-black urine indicates  _____________________________________
       or  __________________________________________________________.
6. Glomerulonephritis is an inflammation of the kidneys in which antibodies formed in response to streptococci attach themselves to the ________________.

7. List three signs/symptoms of acute glomerulonephritis.
   a. ________________.
   b. ________________.
   c. ________________.

8. Pyelonephritis is an inflammation of the ________________.

9. List four groups of people in which the incidence of acute pyelonephritis is high.
   a. ________________.
   b. ________________.
   c. ________________.
   d. ________________.

10. A patient with acute pyelonephritis should encouraged to achieve a urinary output of more than ________________.

11. Hydronephrosis is ________________ caused by ________________.
12. The treatment for hydronephrosis is ______________________________
______________________________________________________________.

13. List three types of acute renal failure and their causes.
   a. __________________________________________________________
      __________________________________________________________.
   b. __________________________________________________________
      __________________________________________________________.
   c. __________________________________________________________
      __________________________________________________________.

14. The three basic elements in the goal of medical management of a patient with chronic renal failure are:
   a. __________________________________________________________
   b. __________________________________________________________
   c. __________________________________________________________

15. List two signs/symptoms of renal tumors.
   a. __________________________________________________________
   b. __________________________________________________________

16. Polycystic kidney is an inherited kidney disorder. What occurs?
    ____________________________________________________________.

17. Another name for renal calculi is ________________________________.
18. Possible causes of renal calculi. Infection are obstruction, metabolic factors, and 

19. List three signs and symptoms of renal calculi.
   a. __________________________________________________________.
   b. __________________________________________________________.
   c. __________________________________________________________.

20. Dialysis is diffusion of dissolved molecules through a 
   __________________________________________________________.

21. What does dialysis do? ___________________________________________
   __________________________________________________________.

22. List two methods of dialysis.
   a. __________________________________________________________.
   b. __________________________________________________________.

23. Cystitis is an __________________________________________________
   __________________________________________________________.

24. Tumors of the bladder are most common in males over the age of ________.

25. Two signs/symptoms of cystitis are:
   a. __________________________________________________________.
   b. __________________________________________________________.
26. List four causes of tumors of the bladder.
   a. __________________________________________________________.
   b. __________________________________________________________.
   c. __________________________________________________________.
   d. __________________________________________________________.

27. "Straddle injuries," common in men, are caused by ______________________
    __________________________________________________________.

28. List two signs/symptoms of kidney injuries.
   a. __________________________________________________________.
   b. __________________________________________________________.

29. The basic treatment for bladder injuries is to ______________________
    __________________________________________________________.

30. List two possible causes of urethral injury.
   a. __________________________________________________________.
   b. __________________________________________________________.

31. Pregnant women at term should not be given Sulfisoxazole, a medication
    effective in treating genitourinary disease, because ______________________
    __________________________________________________________.
32. Tetracycline, a broad-spectrum antibiotic, may have a negative effect on teeth. List two effects.
   a. ____________________________________________________________.
   b. ____________________________________________________________.

33. Phenazopyridine, an analgesic, can have an effect on contact lenses. What is that effect? __________________________________________
   ____________________________________________________________

34. Why should older people drink more water than young people?
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________
   ____________________________________________________________

Check Your Answers on Next Page
SOLUTIONS TO EXERCISES, LESSON 3

1. Infectious organisms.
   Kidneys.
   Urethral opening.  (para 3-2a)

2. Sex of the individual (females are at greater risk for UTIs).
   Urinary stasis.
   Instrumentation.
   Neurogenic bladder.  (para 3-2b(1) - (4))

3. Disturbance of the bladder function caused by impairment of the nerve supply.
   (para 3-2b(4))

4. Pain.  (para 3-3)

5. a. Diabetes insipidus.
    b. Bile pigment, which is associated with jaundice.
    c. Poisoning or hemorrhage.  (para 3-4a(6))

6. Glomerular membrane and injure this membrane.  (para 3-6)

7. You are correct if you listed any three of the following:
   Hypertension.
   Edema.
   Hematuria.
   Albuminuria.
   Oliguria.  (para 3-6b(1) - (5))

8. Kidney pelvis and the tissue of the kidney itself.  (para 3-7)

   Sexually active women.
   Diabetic individuals.
   Individuals with other renal diseases.  (para 3-7a(2)(a) - (d))

10. 2,000 ml per day.  (para 3-7a(4)(c))

11. Distention of the renal pelvis and calyces
    An accumulation of urine caused by an obstruction to the normal urine flow.
    (para 3-8)

12. Surgical removal of the obstruction.  (para 3-8c)
13. Prerenal failure is caused by diminished blood flow to the kidneys.

Intrinsic (parenchymal) renal failure is caused by damage to the kidneys themselves, the damage usually resulting from acute tubular necrosis.

Postrenal failure is caused by obstruction of urinary flow bilaterally.

14. Maintain the patient's normal body fluid volume and electrolyte balance. Reduce the breakdown of tissue in the patient's body. Try to prevent infection until healing occurs.


16. Multiple, bilateral, grapelike clusters of cysts filled with fluid grow in the kidneys.


18. Dehydration.

19. You are correct if you listed any three of the following:
   - Pain.
   - Pyuria.
   - Chills, fever, and frequent urination are common.
   - Hematuria.
   - Stab of pain followed by instant relief.


22. Hemodialysis.
   Peritoneal dialysis.

23. Inflammation of the bladder that is ten times as frequent in women as in men.

24. 50.
25. You are correct if you listed any two of the following:
Frequent burning urgency to urinate (although the bladder is not full).
Chills
Nausea.
Fever.
Vomiting.
Abdominal pain.
Low back pain.
Cloudy urine.
Occasionally, no symptoms at all. (para 3-19d(1) - (4))

26. Toxins.
Chronic infestations of schistosomes (blood flukes) in the bladder.
Heavy cigarette smoking.
Presence of urinary stones. (para 3-20a(1) - (3))

27. The urethra being caught between a hard surface and the pubic arch. (para 3-22b)

28. You are correct if you listed any two of the following:
Wounds to the lower back in the flanks
A history of blows to the flank, hard enough to cause pain.
Hematuria.
Ecchymosis. (para 3-24a(2) - (3))

29. Have the bladder rest. (para 3-25b)

30. Pelvic fracture.
Penetrating wound to the groin. (para 3-26)

31. This drug passes through the placenta to the fetus. (para 3-28b(1))

32. You are correct if you listed any two of the following:
Discoloration of teeth.
Enamel hypoplasia (failure of the enamel of the teeth to develop completely).
Bone growth inhibition. (para 3-31b)

33. Phenazopyridine can stain contact lenses. (para 3-34e)

34. With aging, progressively more water is needed to excrete the same amount of waste. Therefore, it is necessary for older persons to drink more water than young people. Older people eliminate larger amounts of urine (polyuria) even at night (nocturia). (para 3-36a)