Study Unit

Prescribers of Drugs

By

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He was the recipient of the Rexall Drug Award as the top student in his graduating class and is a member of the Rho Chi National Honorary Pharmacy Society. He is a member of the American Association for the Advancement of Science, the Society for Neuroscience, the American Society for Pharmacology and Experimental Therapeutics, and the International Association for Dental Research.

Dr. Wynn has published more than 160 research papers as well as textbooks and monographs on the discovery of new drugs and new drug reviews. His research laboratories have contributed to the development of new types of analgesics and anesthetics. He is currently funded by the drug industry and government agencies for the development of new drugs and has been a consultant to the drug industry for over 20 years. He is a consultant to the U.S. Pharmacopeia (Dental Drugs and Products Section) and the Academy of General Dentistry.

Dr. Wynn's primary interest is in teaching pharmacology and pharmacy to students in professional schools, community colleges, and distance education programs. He has presented more than 300 continuing-education courses on the practical aspects of drug therapeutics throughout the United States, Canada, and Europe.

CONTENTS

INSTRUCTIONS

This study unit describes healthcare professionals who are licensed to prescribe medications for the treatment of disease and illness. The most frequent prescriber is the physician, who may be either a general practitioner or a specialist.

In this unit, you'll review the common conditions that each type of physician treats. You'll also review the medications that are prescribed for those conditions. Next, you'll learn about other healthcare providers who are licensed to prescribe drugs. These professionals include dentists, podiatrists, nurse practitioners, physician assistants, and veterinarians. Healthcare professionals who aren't licensed to prescribe medications are also described.

This study unit isn't intended to be a complete list of all conditions treated by physicians and all the medications they prescribe. However, when you complete this study unit, you'll be familiar with many common medications that are used throughout the world today.

Objective

When you complete this study unit, you'll be able to identify the various drugs that treat different conditions and the providers who prescribe them.

SECTION 1: PHYSICIANS AS DRUG PRESCRIBERS

Objective

When you complete this section, you'll be able to identify the conditions that each medical specialist treats and some of the drugs prescribed for them.

INTRODUCTION

The first section of this study unit is the longest, and with reason—it lists and describes the healthcare professionals who are legally allowed to prescribe drugs to their patients. You'll learn about the different conditions that various professionals diagnose as well as the drugs commonly used to treat them.

FAMILY PRACTICE PHYSICIANS

Family practice physicians or *general practitioners* are the traditional "family doctors" who treat patients of all ages for a wide array of medical problems. Family practice physicians are often the first healthcare professionals that patients turn to for treatment, advice, and referrals to specialists.

Some of the typical ailments treated by the family practice physician are nasal congestion, coughs, and the common cold. These are very common illnesses in the general population and are responsible for many days lost from work and school. Family practice physicians also treat respiratory disorders, which include asthma and chronic obstructive pulmonary disease. In both of these conditions, the airway has closed down or has become constricted, thus preventing adequate air intake. The family physician also prescribes medications to treat and eradicate infectious diseases.

The Upper Respiratory System: Nasal Congestion

In the body, the *upper respiratory system* includes the structures in the head and neck that are involved in breathing. These structures are the nose, *sinuses* (nasal cavities), throat, and *larynx* (voice box).

The family practice physician writes many prescriptions for medications to treat nasal congestion. *Nasal congestion* results in a feeling of stuffiness and blockage of the

breathing mechanism through the nose. Initial symptoms are sneezing, stuffiness, runny nose, and postnasal congestion and drip. These symptoms may evolve into chronic nasal or sinus infections.

Nasal decongestants provide temporary relief by getting rid of the excess fluid in the nose that's causing the congestion. These medications constrict the arterioles in the nose, thereby reducing blood flow in the engorged area.

Since the nasal tissue may be inflamed, corticosteroids are used as anti-inflammatories to manage the stuffiness. Corticosteroids exert a marked anti-inflammatory effect on the nasal mucosa when applied *topically*—that is, when applied directly to the particular area that requires treatment. They're used alone or with nasal decongestants.

Nasal decongestants and corticosteroids are dispensed as nasal sprays (Figure 1). The following are some of the most common medications that the family physician will prescribe for the management of nasal congestion:

- Afrin, a nasal decongestant spray
- Sudafed pseudoephedrine tablets
- Beconase, a corticosteroid nasal spray

FIGURE 1—Nasal sprays are prescribed for relief of nasal congestion.

The Upper Respiratory System: The Common Cold and Sinus Congestion

The *common cold* is a diffuse upper respiratory tract infection caused by different types of viruses. It's transmitted between individuals through droplets from one respiratory tract to another.

The family physician may prescribe a variety of remedies to treat the symptoms of the common cold. These remedies usually contain decongestants to relieve nasal stuffiness and sinus congestion and antihistamines to dry the nasal and sinus tissues. Some preparations also contain pain relievers to reduce pain in the sinus cavities.

The following are some common antihistamine preparations that are used to treat symptoms of the common cold:

- Chlorpheniramine (Chlor-Trimeton)
- Diphenhydramine (Benadryl)
- Brompheniramine (Bromfed)
- Clemastine (Tavist)
- NyQuil Cold/Flu Multisymptom Relief (also contains acetaminophen and dextromethorphan)

Pseudoephedrine (Sudafed) and oxymetazoline (Dristan Nasal Spray) are decongestants that may also be used to relieve cold symptoms.

Nasal preparations such as Atrovent (ipratropium) may also be recommended by the physician to reduce *rhinorrhea* (nasal discharge or runny nose).

The Lower Respiratory System: Cough

Many cough symptoms are caused by disorders in the lower respiratory system. This system contains the deeper breathing structures in the chest, including the *trachea* (windpipe) and lungs. Less commonly, a cough may be caused by other diseases in the head or stomach.

There are numerous prescription products and over-the-counter (OTC) products available to treat coughs. Most of them are taken in liquid form as syrups or *elixirs* (aqueous vehicles of water and alcohol). The single most effective ingredient in the prescription products is *codeine,* which is one of the most effective agents to stop coughs. Hydrocodone is also a popular choice among physicians. Hydrocodone and codeine can't be purchased without a prescription.

Many cough syrup preparations contain *expectorants* that increase and *liquefy* (make liquid) the mucous secretions in the respiratory tract, making it easier for the patient to cough up the mucus. Cough preparations may also contain *antihistamines* that dry up secretions, decongestants that reduce swelling in the nasal passages, and flavoring to improve the taste.

Most of the popular anticough preparations that are commonly prescribed by family practice physicians contain one or more of the following ingredients:

- Expectorants, such as guaifenesin
- Antitussives, such as codeine or hydrocodone (both prescription drugs) or dextromethorphan (OTC)
- Antihistamines, such as chlorpheniramine or brompheniramine
- Decongestants, such as pseudoephedrine or phenylephrine

Some popular brand name cough preparations include the following:

- Robitussin (guaifenesin)
- Mucinex (guaifenesin)
- Cheracol cough syrup (codeine and guaifenesin)

The Lower Respiratory System: Asthma and Respiratory Diseases

The patient with *asthma* experiences wheezing and labored breathing. The patient with *chronic obstructive pulmonary disease (COPD)* may have chronic bronchitis, emphysema, or other lung disorders. *COPD* is a general term for this group of diseases that limit the airflow in the respiratory system and produce symptoms that aren't fully reversible.

The most common drugs used today to treat disorders of the lower respiratory system are beta agonists, anticholinergics, corticosteroids, and antileukotrienes. In very simple terms, the *beta agonists* and the *anticholinergics* work by helping the muscles that are wrapped around the airways to relax. In contrast, corticosteroids and *anti-leukotrienes* are anti-inflammatory drugs, which work by reducing swelling and by limiting the production of thick mucus in the airways. The physician may prescribe any of these medicines, or combinations of them, to help a patient breathe more easily.

The following are some of the common drugs that are prescribed for asthma and COPD:

- Atrovent nasal spray (ipratropium), an anticholinergic
- Spiriva (tiotropium), an anticholinergic
- Pulmicort (budesonide), a corticosteroid
- Aerobid (flunisolide), a corticosteroid
- Flovent (fluticasone), a corticosteroid
- Singulair tablets (montelukast), an antileukotriene
- Accolate tablets (zafirlukast), an antileukotriene
- Proventil and Ventolin (albuterol), beta agonists
- Tornalate (bitolterol), a beta agonist
- Serevent (salmeterol), a beta agonist
- Foradil (formoterol), a beta agonist

Bronchodilators are also used to dilate and open the airway to allow better air intake and breathing. They're usually sprayed into the mouth from a small canister and inhaled (Figure 2). These bronchodilators act immediately, and quickly relax the tightened muscles in the airway to allow better air flow. Some bronchodilators are taken as pills to produce longer-lasting effects.

Another form of delivery uses an inhaler device with a capsule of medication that's punctured at the time of use and then mobilized for inhalation.

The following are some of the popular quick-relief or "rescue" bronchodilators prescribed to treat asthma. Note that all of these are classified as short-acting beta agonists:

- Proventil and Ventolin (albuterol)
- Maxair Autoinhaler (pirbuterol)
- Serevent (salmeterol)
- Foradil (formoterol)

Long-term asthma relief is often provided by inhaled corticosteroids, which reduce swelling of the affected airways.

A drug called *theophylline* is sometimes used to treat more serious or long-term lung diseases, such as emphysema and chronic bronchitis. Theophylline causes the muscles in

FIGURE 2—Bronchodilators are usually prescribed to be inhaled.

the airways to relax, making it easier to breathe. It may be given in an intravenous solution, in tablet form, or in a syrup.

The following are some brand-name theophylline drugs that may be prescribed for pulmonary disease:

- Uniphyl
- Theo-24
- Quibron-T

Asthma and other lung diseases may also be treated with nebulizer therapy. A *nebulizer* is a machine that pumps air through a liquid medicine, turning the medicine into a mist or vapor. The vaporized medicine is transferred through plastic tubing to an inhaler, where it's then inhaled by the patient. The nebulizer makes it easier for a patient to inhale medicine into the lungs. It's especially useful for patients who are weak or have difficulty breathing.

Nebulizers are often prescribed for infants, children, and elderly patients with breathing problems. Note that the nebulizer is only a machine, not the medicine itself. The patient will receive a separate prescription from his or her doctor for a medication to use in the nebulizer.

Acute Infectious Disease

Infections resulting from various infectious diseases can occur at any time in people of any age, and most patients with the symptoms of an infection will see their family physician for diagnosis and treatment (Figure 3). Pathogenic bacteria, viruses, fungi, and other microbial organisms can cause infections. Infections can be dangerous and even life-threatening, particularly in infants, children, and elderly people.

FIGURE 3—Family practice physicians prescribe medications for a wide variety of illnesses.

Doctors commonly prescribe drugs called *antibiotics* to combat infections. An *antibiotic* is a chemical compound that either kills or inhibits the growth of microorganisms, such as bacteria and fungi. Depending on the type of infection the patient has, the physician will prescribe a specific antibacterial, antiviral, or antifungal medication in an attempt to eradicate the particular infectious organism.

There are a great many antimicrobials available to treat a great many different infectious agents. You'll encounter many different types of prescriptions from the family physician for the treatment of infections.

The following anti-infective drugs are sometimes prescribed for pharyngitis, scarlet fever, pneumonia, and bronchitis:

- Penicillin VK tablets
- Avelox (moxifloxacin)
- Keflex capsules
- Amoxil, Biomox, Trimox, Wymox (amoxicillin)
- Erythromycin tablets

- Levaquin (levofloxacin)
- Azithromycin

Some forms of pneumonia are treated with the following drugs:

- Amoxicillin and cephalosporins
- Clarithromycin, azithromycin, doxycycline, clindamycin
- Fluoroquinolones (moxifloxacin, gatifloxacin, levofloxacin)

The anti-infective drug metronidazole (brand names Flagyl and Rozex) is sometimes prescribed for yeast infections, peptic ulcer disease, gingivitis (a gum disease), and certain skin infections.

The following medications are effective for treating *systemic fungal infections* (infections that affect the body as a whole):

- Nizoral tablets
- Diflucan tablets
- Sporanox tablets

The antibiotic tetracycline is sometimes used to treat infections of the respiratory tract, sinuses, middle ear, urinary tract, and intestines. However, it's not used as often as it was in the past because some microorganisms have developed resistance to it. Tetracycline is still an effective drug in many situations, though.

> If a drug is no long effective against an infection, the microorganism is said to have developed *resistance* to it. The problem of resistance can occur with many antibiotic drug treatments, and for this reason, physicians are very careful when treating infections with antibiotics.

When an infection is serious or life-threatening, the physician must choose the prescribed drugs very carefully and observe the patient closely to make sure he or she is responding properly to the treatment.

More than 100 years ago, antibiotic medications didn't exist—they hadn't been discovered yet. People who developed infections after injuries, or who contracted common infectious diseases like influenza, often died because there were no medicines that could help them.

Today, patients are lucky to have many different antibiotic medications available. If one drug fails to work for a particular patient's infection, another type of drug can be prescribed. Also, if a patient is allergic to or resistant to a particular drug, the physician can prescribe an alternative. You'll see these drugs prescribed in many combinations and for many different types of diseases.

Self-Check 1

Throughout *Prescribers of Drugs,* you'll be asked to pause and check your understanding of what you've just read by completing a Self-Check exercise. Answering these questions will help you review what you've studied so far. Complete "Self-Check 1" now.

Choose the correct answer.

1. Which type of drug is prescribed by the family doctor to reduce the stuffy nose feeling of nasal congestion?
    a. Antitussive drug
    b. Bronchodilator
    c. Sleeping pill
    d. Nasal decongestant

2. Which type of drug is prescribed to open up a constricted airway in an asthma sufferer?
    a. Antitussive drug
    b. Bronchodilator
    c. Sleeping pill
    d. Nasal decongestant

3. A family doctor may prescribe which antimicrobial medication to treat a yeast infection?
    a. Chlorpheniramine
    b. Tetracycline
    c. Metronidazole
    d. Codeine

(Continued).

Self-Check 1

4. A machine that's used to turn asthma medicine into a mist that can be inhaled by a patient is called a/an

    a. antimicrobial.
    b. anti-infective.
    c. nebulizer.
    d. expectorant.

5. If you dispensed a medicine containing _____, the patient may be using it to treat pharyngitis.

    a. amoxicillin
    b. albuterol
    c. clemastine
    d. codeine

Check your answers with those in the back of this study unit.

ALLERGISTS

The *allergist* is a doctor who specializes in diagnosing and treating allergic reactions. One of the most common allergic reactions is hay fever. *Hay fever* results in unpleasant symptoms such as a runny nose, a red and swollen nose, *hives* (itchy patches on the skin), puffy and teary eyes, and sneezing.

Hay fever is caused by a reaction of a foreign substance such as grass or tree pollen with a specific protein in the body (called an *antibody*) to produce the symptoms. The reaction acts to release a very irritating substance from blood cells called *histamine,* which causes all the effects described. Therefore, the common treatment for hay fever is to use antihistamines to block or prevent the effects of histamine.

Antihistamines that were developed some time ago cause significant drowsiness along with their histamine-blocking action. Some newer types of antihistamines don't cause such drowsiness and are referred to as *nonsedating antihistamines.*

The following antihistamines are popular for the treatment of hay fever:

- Astelin
- Allegra and Alavert
- Benadryl capsules and elixir
- Tavist tablets
- Chlor-Trimeton tablets
- Dimetane tablets
- Seldane tablets
- Hismanal tablets
- Claritin and Clarinex tablets
- Zyrtec tablets

DERMATOLOGISTS

Dermatologists are doctors who diagnose and treat diseases of the skin. Certification of a doctor by the American Board of Dermatology specifies three to four years of specialty training after graduation from a medical school plus a written and oral examination.

Major skin disorders requiring drug therapy from a dermatologist include skin infections and skin inflammation. Skin infections appear in conjunction with skin disorders such as wounds, burns, insect bites, and preexisting fungal infections. Pathogenic bacteria such as the *Staphylococcus* genus are the most common causative agents in skin infections.

Once the dermatologist makes the diagnosis of infection, antibiotic ointments are prescribed to eradicate the organism. Inflammatory skin reactions result in a reddening of the affected area, which is hot, swollen, and painfully sensitive to the touch in a localized area.

Corticosteroid ointments are very effective anti-inflammatories that reduce the inflammatory response within hours after application. In long-term chronic inflammatory skin diseases, systemic corticosteroid tablets are often used in conjunction with topical corticosteroids. The dermatologist will write prescriptions for these topical medicines to effectively treat all three conditions.

Topical antibiotic drugs prescribed by dermatologists are the following:

- Bacitracin ointment
- Neosporin ointment
- Polysporin ointment

Dermatologists prescribe the following topical corticosteroids for skin inflammation:

- Hydrocortisone cream
- Decadron cream
- Synalar cream
- Cordran cream
- Locorten cream
- Valisone cream
- Kenalog cream
- Lidex cream

A common systemic corticosteroid that's prescribed by dermatologists is prednisone.

Fungal infections occur both in the skin and the nails, and in mucocutaneous tissues such as the oral cavity and vagina. Fungal infections of the skin and nails are treated with a combination of topical antifungal creams and antifungal systemic tablets.

Mucocutaneous fungal infections are caused by an organism called *Candida albicans.* This is a yeast-like fungus normally present on the skin and mucous membranes of the mouth, gastrointestinal tract, and vaginal areas. When the patient is compromised by illnesses or the use of antibiotics, the yeast organism often becomes a pathogen and produces a localized fungal infection. This yeast infection is easily treated by a number of antifungal creams.

The antifungal agents listed here are examples of the types of medicines you'll see prescribed by the dermatologist:

- Lotrimin cream
- Gyne-Lotrimin cream
- Mycelex cream
- Monistat 7 cream
- Monistat-Derm cream
- Mycostatin cream
- Griseofulvin tablets
- Nizoral tablets
- Diflucan tablets
- Sporanox tablets

RHEUMATOLOGISTS

Rheumatologists are doctors who diagnose and treat diseases of the joints, muscles, and bones. They commonly treat arthritis, certain autoimmune diseases (such as lupus and fibromyalgia), tendonitis, gout, and osteoporosis.

There are several different types of *arthritis,* a serious disease that causes damage to the joints of the body. Rheumatoid arthritis is a painful disorder characterized by inflammation of the joints and bones, with destructive effects on cartilage and bone tissue. Major symptoms are prolonged morning stiffness, pain on motion, and tenderness and swelling of joints. Rheumatoid arthritis is considered to be a systemic disease in that many joints are affected at the same time, and also because it may have effects on other body parts, such as the lungs and kidneys.

Gouty arthritis, or simply *gout,* is caused by high levels of uric acid in the blood. This is caused by underlying metabolic diseases in the individual and may be affected partly by diet. If uric acid crystals form, they can be deposited in the joints, eventually resulting in inflammation. Attacks of gouty arthritis result in pain and stiffness, frequently in the big toe.

Osteoarthritis is characterized as a more specific form of arthritis because fewer joints are involved. It usually affects the knee joints, hip joints, and finger joints, and is associated with degeneration and distortion of the joint itself. Osteoarthritis can occur from both ordinary aging and simple strain and overuse of the joints (for example, in sports). It can occur in anyone with a joint strain or injury (even young athletes) but is still most common in older people.

Unfortunately, there's no absolute cure for arthritis, so doctors of rheumatology prescribe drugs to treat the symptoms of pain and inflammation. Reducing inflammation in the joints is very important to prevent (or at least delay) permanent damage to the joints, and relieving pain is essential to allow patients to participate in their usual activities. Rheumatologists therefore rely on both anti-inflammatory drugs and painkillers (and combinations of them) to treat the symptoms of the three types of arthritis.

Some of the common drugs that are prescribed for rheumatoid arthritis and osteoarthritis are

- Ibuprofen (Advil or Motrin tablets)
- Naproxen (Aleve, Anaprox, or Naprosyn tablets)
- Etodolac or Lodine
- Diclofenac or Cataflam
- Ketorolac or Toradol
- Oxaprozin or Daypro tablets
- Relafen tablets

- Diflunisal or Dolobid tablets
- Indomethacin or Indocin capsules
- Cortisone and hydrocortisone
- Prednisone

The following drugs are prescribed for gouty arthritis:

- Colchicine tablets
- Indocin capsules
- Benemid tablets
- Zyloprim tablets
- Probenecid

Arthritis is a very common disorder that affects millions of people and there are many drugs available to treat its various forms. You should be very familiar with the names of these commonly prescribed and important drugs.

OPHTHALMOLOGISTS

Ophthalmologists are doctors who specialize in diagnosing and treating diseases of the eye (Figure 4). Ophthalmology was originally a part of the specialty of *otolaryngology*, or eye, ear, nose, and throat (EENT), but it has since developed into a specialty of its own. An eye doctor usually completes three years of specialized training after graduation from medical school, plus one year of active practice. Applicants must then take an examination for certification as an ophthalmologist.

FIGURE 4—Ophthalmologists treat diseases of the eye.

One common eye disease that the ophthalmologist treats and writes prescriptions for is glaucoma. *Glaucoma* is a condition in which fluid builds up inside the eye, causing pressure on the optic nerve. This pressure inside the eye is called *intraocular pressure,* and it can be painful. The pressure must be treated to prevent permanent damage to the optic nerve, which could result in a loss of vision. Drugs in the form of eyedrops are used to relieve the intraocular pressure.

One common drug that the eye doctor will prescribe is an eyedrop called *pilocarpine.* Pilocarpine is a *miotic* (a substance that causes constriction of the pupil) that allows the fluid inside the eye to drain out through the tear duct. This medicine is prepackaged by the manufacturer in small plastic squeeze bottles. The patient squeezes drops of the medication into the eye as instructed by the physician.

Ophthalmologists also treat eye infections and inflammation. Anti-infective agents are applied topically as drops or ointments to treat infections of the conjunctiva and cornea and as ointments for infections of the eyelids. Topical therapy alone is often adequate for superficial infections of these structures. Ointments provide more prolonged contact than solutions but may interfere with vision when used during the daytime.

Most infections of the eyelids and conjunctiva aren't serious. They're often eradicated in a very short period of time by eyedrops containing the proper antibacterial agent to kill the causative organism.

The most common organism causing eye infections is *Staphylococcus aureus.* Infection sometimes has an associated inflammatory component resulting in swollen, tender, and somewhat painful eyelids and conjunctiva. In these conditions, an anti-inflammatory agent is used in combination with the antibacterial agent.

The most effective anti-inflammatory agents are the corticosteroids. In some conditions of the eye, inflammation may be present in the conjunctiva without any associated bacterial infection. In these conditions, the corticosteroid anti-inflammatory agent is administered without need for the antibacterial component.

The ophthalmologist prescribes these drugs either as ophthalmic sterile ointments that come prepackaged in a 3.5 gram (g) tube or as antibiotics in eyedrops that come prepackaged in either 2.5 ml, 5 ml, or 15 ml plastic squeeze bottles. The ointments, being in such a small tube, are usually dispensed by placing the small tube in a larger box and putting the label on the box. The plastic squeeze bottles are usually placed inside a plastic prescription vial with the label placed on the vial.

Eyedrops for the treatment of glaucoma include Timoptic Ocudose (eyedrop dispenser) and Isopto Carpine eyedrops.

Eyedrops used to treat infections include the following:

- Tobrex ointment
- Sulamyd (sulfacetamide) ophthalmic ointment
- Baciguent ophthalmic ointment

- Garamycin ophthalmic ointment
- Ciprofloxacin
- Neosporin ophthalmic ointment
- Polysporin ophthalmic ointment
- Chloromycetin ophthalmic ointment
- Stoxil ophthalmic ointment

Infections may also be treated with Isopto Cetamide drops and Vasosulf drops.

Eye doctors may prescribe the following preparations for eye inflammation associated with infection:

- Neo-Decadron ophthalmic ointment and drops
- Neo-Delta-Cortef ophthalmic ointment and drops
- Cortisporin ophthalmic ointment and drops
- Vasocidin drops
- TobraDex ointment
- Fluorometholone

Self-Check 2

Choose the correct answer.

1. The doctor treating hay fever may prescribe which type of drug to reduce the symptoms of sneezing?
    a. Antibiotic
    b. Sleeping pill
    c. Antihistamine
    d. Bronchodilator

2. Which substance is released from blood cells when a susceptible person inhales pollen?
    a. Histamine
    b. Antibody
    c. Protein
    d. Allergen

3. Dermatologists often treat fungal infections of the skin and nails. Which drugs are often used to treat this condition?
    a. An ointment to reduce inflammation and a systemic corticosteroid
    b. An antihistamine and a topical antibiotic
    c. An ointment applied to the joints
    d. An antifungal cream and antifungal tablets taken systemically

4. Rheumatologists use which two classes of drugs to treat arthritis?
    a. Painkillers and anti-infectives
    b. Anti-infectives and anti-inflammatories
    c. Anti-inflammatories and painkillers
    d. Painkillers and antibiotics

(Continued).

Self-Check 2

5. Ophthalmologists commonly treat _____, in which fluid builds up inside the eye.
    a. glaucoma
    b. gout
    c. arthritis
    d. hay fever

6. If a patient presented symptoms of a red and infected eye, which type of drug will be prescribed by the eye doctor to treat the infection?
    a. A painkiller in a tablet to be swallowed
    b. An antihistamine in eyedrops
    c. An antibiotic in eyedrops
    d. An antibiotic in a tablet to be swallowed

Check your answers with those in the back of this study unit.

ENDOCRINOLOGISTS

Endocrinologists are doctors who diagnose and treat disorders of the endocrine system. These disorders are known as *glandular diseases* because the endocrine system is composed of different glands that secrete hormones.

Lack of hormonal production and secretion by specific glands causes some major disorders of the endocrine system. The lack of estrogen production from the ovaries of middle-aged females is known as *menopause.* The lack of insulin production or secretion from the pancreas is known as *diabetes.* The lack of thyroid hormone production and secretion from the thyroid gland is known as *thyroid disorder.*

Included in the broad field of endocrinology is the use of oral contraceptives to prevent pregnancy. However, as you'll soon learn, oral contraceptives are ordinarily prescribed by gynecologists.

Diabetes

Endocrinologists treat *diabetes mellitus,* which is a disorder that occurs due to a lack of insulin production or secretion from the pancreas. *Insulin* ordinarily is the hormone responsible for the proper utilization of blood sugar by cells in the body. Without insulin, the sugar in the blood doesn't get into cells, and the blood sugar level rises and eventually spills over into the urine. Urinary detection of sugar is a sure diagnostic sign of diabetes.

Diabetes mellitus is classified as either insulin-dependent diabetes (IDDM Type I) or noninsulin-dependent diabetes (NIDDM Type II). IDDM was formerly called *juvenile diabetes* because the age of onset was predominantly before adulthood. Patients with IDDM require insulin to sustain life (Figure 5). Insulin injection is prescribed to treat IDDM in order to replace the insulin that isn't being produced.

FIGURE 5—Insulin-dependent diabetics inject themselves with insulin prescribed by an endocrinologist.

NIDDM was previously known as *maturity onset* or *adult onset diabetes*. In this form of diabetes, insulin is produced by the pancreas but isn't secreted by the gland. Thus, it isn't available in the blood to utilize the blood sugar. Medicines called *oral hypoglycemics* are used to treat this form of diabetes to stimulate the pancreatic secretion of insulin.

Some commonly prescribed oral hypoglycemics are

- Orinase
- Micronase
- Glucotrol
- Glucophage
- Glynase
- Precose
- Amaryl
- Actos

Thyroid Disorders

Endocrinologists treat thyroid disorders. The thyroid hormone principally affects metabolism, growth, and development.

Hypothyroidism is the condition in which thyroid hormone production by the thyroid gland is diminished. Symptoms are tiredness, intolerance to cold, irritability, a sleepy appearance, and dry, rough skin. The treatment is thyroid replacement therapy using either thyroid hormones isolated from the thyroid glands of animals (thyroid tablets), a preparation called *thyroglobulin* (Proloid), or a synthetic thyroid hormone, such as Synthroid.

Endocrinologists treating hypothyroidism will write many prescriptions for the following thyroid replacement drugs:

- Thyroid tablets
- Synthroid tablets
- Levoxyl (levothyroxine sodium) tablets

OBSTETRICIANS AND GYNECOLOGISTS

Before specialization in medicine became popular, obstetrics was one of only three medical divisions—medicine, surgery, and obstetrics. While *obstetrics* focuses on childbirth, *gynecology,* a relatively new specialty, focuses on the care of medical and surgical conditions that apply only to females. The gynecologist usually practices obstetrics also.

The American Board of Obstetrics and Gynecology requires the completion of three years of postgraduate residency training followed by one and one-half years of practice prior to application for certification. Canadian regulations vary by province and territory; in some provinces, residency programs may take up to five years to complete.

Gynecologists spend a great deal of time advising their patients about birth control and methods to prevent pregnancy. Oral contraceptives (OCs) are a very popular method of birth control, and gynecologists prescribe many different brand names, depending on the preference of the patient. Birth control pills are provided as a monthly package of pills to be taken once a day to prevent ovulation. No pregnancy can occur if ovulation doesn't occur.

Because oral contraceptive pills contain various formulations of hormones, they may be prescribed for women for purposes other than pregnancy prevention. In a serious condition called *endometriosis,* the *endometrium* (the inner lining of the uterus) grows abnormally, and can cause pelvic pain, severe bleeding, and infertility.

Oral contraceptives are often prescribed to relieve the symptoms of endometriosis. They may also be prescribed to treat *polycystic ovary syndrome* (an endocrine disorder involving the ovaries), *dysmenorrhea* (painful menstruation), and even severe *acne* (skin inflammation and breakouts).

Oral contraceptives generally contain various combinations and strengths of the hormones estrogen and progestin, or progestin only. These medications are manufactured by many different companies under a wide variety of brand names. However, the drug *ethinyl estradiol* or *EE* (a synthetic form of estrogen) is used in almost all modern oral contraceptives.

The following are some common oral contraceptives dispensed frequently. Note that each of these drugs combines ethinyl estradiol (EE) with another type of hormone:

- Ethinyl estradiol and levonorgestrel (brand names Alesse, Aviane, Levlite, Nordette, Tri-Levlen, Triphasil, Seasonale, Levora, Lybrel)
- Ethinyl estradiol and norethindrone (brand names Loestrin, Microgestin, Necon, Ortho-Novum, Ovcon, Brevicon, Norinyl, Nortrel)
- Ethinyl estradiol and norgestrel (brand names Lo/Ovral, Low-Ogestrel, Ogestrel)
- Ethinyl estradiol and desogestrel (brand names Apri, Desogen, Ortho-Cept, Mircette)
- Ethinyl estradiol and drospirenone (brand name Yasmin)
- Ethinyl estradiol and norgestimate (brand names Ortho-Cyclen and Ortho Tri-Cyclen)
- Ethinyl estradiol and ethynodiol (brand names Demulen and Zovia)

Both gynecologists and endocrinologists treat menopause, which is a condition resulting from decreased estrogen production in older women. Menopause is a natural condition that occurs with aging and isn't generally classified as an illness. However, the uncomfortable symptoms associated with menopause can be severe enough to require medication in some patients. The hormonal changes associated with menopause can also contribute to *osteoporosis* (bone loss that can lead to fractures) and may cause vasomotor symptoms of *hot flashes* (a sensation of heightened body temperature, often accompanied by sweating). Mild depression may also accompany menopause in some women.

Symptoms of menopause may be treated with hormonal treatments that include estrogen and progestin, separately or in combination. The following are some of the common brand names of these drugs:

- Premarin tablets
- Cenestin
- Estrace
- Provera or Amen
- Aygestin

- Prometrium
- Prempro or Premphase
- FemHRT

Supplements of calcium and vitamin D are commonly prescribed to prevent the bone loss related to osteoporosis. However, the following medications may also be prescribed to women to prevent or treat osteoporosis:

- Fosamax tablets
- Actonel
- Evista
- Boniva
- Calcimar
- Aredia
- Miacalcin

GASTROENTEROLOGISTS

Gastroenterologists are doctors who specialize in the treatment of disorders of the *gastrointestinal tract,* which includes the *esophagus* (stomach tube), stomach, intestines, and lower bowel (Figure 6).

FIGURE 6—The gastroenterologist often prescribes a combination of drugs to treat gastric ulcers.

One of the important esophageal disorders that responds to drug treatment is *reflux esophagitis* or *gastroesophageal reflux disease (GERD).* In this disorder, commonly known as *heartburn,* stomach acid spills up into the stomach tube and causes a burning sensation that's felt in the chest region. In extreme cases, the chest pain from GERD may be severe enough to make patients feel like they're having a heart attack. Repeated spills of stomach acid into the esophagus can eventually cause permanent damage to the area.

There are several types of medicines available to treat GERD and related gastrointestinal illnesses. Antacids that contain magnesium, aluminum, or calcium carbonate are taken shortly after eating a meal and can help to neutralize the acid produced by the stomach. Antacids are generally available over the counter.

Some common antacid brands include

- Tums
- Maalox
- Mylanta

Another type of drug, which reduces the secretion of acid in the stomach, is effective in preventing GERD, since there's less acid to spill up into the stomach tube. The drugs that reduce stomach acid are called *H2 receptor antagonists.* The phrase *H2* stands for the histamine "type two" receptor that's responsible for releasing acid from the stomach. When this receptor is blocked by any of the drugs listed below, acid secretion is reduced and the esophageal burning disappears.

The following drugs are the most important H2 antagonists prescribed by gastroenterologists for the relief of heartburn:

- Ranitidine, or Zantac
- Cimetidine, or Tagamet
- Famotidine, or Pepcid
- Nizatidine, or Axid

Note that these drugs are available over the counter without a prescription.

Another important class of drugs used to treat GERD are called *proton pump inhibitors (PPIs).* These drugs work by binding to the cells that produce gastric acid in the stomach and rendering them useless. These medicines are usually taken once per day, and include the following:

- Prilosec and Prilosec OTC
- Nexium
- Aciphex or Pariet
- Protonix
- Prevacid

Another common disease of the gastrointestinal system is the peptic ulcer. A *peptic ulcer* is an open *lesion* (a sore or hole) that appears in the lining of the lower esophagus, stomach, or intestines. Because this type of ulcer is located in areas near stomach acids, they can be extremely painful.

Years ago, it was thought that some peptic ulcers were caused by improper diet. However, it's now known that most peptic ulcers are caused by an infection of the bacterium called *Helicobacter pylori.* These bacteria seem to be able to survive in the acid environment of the stomach and can cause the destruction of areas of the stomach wall that results in bleeding ulcers. Eradication of this bacteria has been shown to cure these ulcers. It's been demonstrated that certain antibiotics (such as the drug clarithromycin, or Biaxin) in combination with acid reducers can kill or control the growth of the *H. pylori* bacteria.

The following combination of drugs is prescribed to reduce the symptoms of gastric ulcer and even cure the gastric ulcer when they're given at the same time:

- Biaxin tablets
- Prilosec capsules
- Zantac tablets
- Pepto-Bismol liquid

UROLOGISTS

Urologists treat diseases of the urinary tract, which includes the *kidneys* (the organs that form urine), the *ureters* (the tubes that convey urine to the bladder), and the *urethra* (the structure that drains the urine to the outside of the body).

Urology is also a surgical specialty. Certification by the American Board of Urology requires three years of approved postgraduate training followed by two years of urological practice. Certification is approved upon passing the written and oral examinations. Provincial requirements vary; however, in some provinces and territories, a four-year residency may be required.

Urologists treat both men and women for kidney and bladder stones, cancers of the urinary system, conditions related to infertility, and any other diseases or infections of the urinary system.

Stones, tumors, congenital conditions, or injuries to the urinary system may produce urinary stagnation that invites infection in the urethra. This condition is called *cystitis.*

Because of the prevalence of urinary tract infections treated by the urologist, you'll often see prescriptions for urinary tract antiseptics. Any anti-infective agent that's excreted primarily in the urine is useful in the treatment of urinary tract infections. Primary drugs include amoxicillin, ampicillin, ciprofloxacin, tetracyclines, sulfonamides, and combination products containing trimethoprim and sulfamethoxazole (such as Bactrim or Septra).

The following agents are active against common urinary tract pathogens and, because they're concentrated in the urine, have been classified as urinary tract antiseptics:

- Nitrofurantoin (Furadantin, Macrodantin)
- Nalidixic acid (NegGram)
- Methenamine (Mandelamine)

Sulfa drugs prescribed for urinary tract infections are

- Bactrim
- Septra
- Ciprofloxacin

- Tequin
- Levaquin
- Moxifloxacin
- Noroxin tablets

Urologists treat a condition called *benign prostatic hyperplasia (BPH),* in which the prostate gland is enlarged. These specialists have at their disposal two drugs that are thought to reduce the size of an enlarged prostate gland.

Some of the drugs prescribed for the treatment of prostate problems are

- Prazosin or Minipress
- Flomax
- Proscar
- Hytrin

Self-Check 3

Choose the correct answer.

1. If you received a prescription from a doctor for insulin, the patient would have which disorder of the endocrine system?
    a. Thyroid disorder
    b. Menopause
    c. Gastric ulcers
    d. Diabetes

2. If you fill a prescription for a sulfa drug, it was most likely prescribed by a/an
    a. urologist.
    b. gastroenterologist.
    c. endocrinologist.
    d. ophthalmologist.

3. Birth control pills are prescribed by the gynecologist or endocrinologist to do what?
    a. Release insulin from the pancreas
    b. Inhibit ovulation to prevent pregnancy
    c. Cause the patient to conceive
    d. Reverse a thyroid disorder

(Continued).

Self-Check 3

4. If you dispensed a prescription for Bactrim tablets, the patient would be suffering from which disorder?

    a. Gastric ulcers
    b. A urinary tract infection
    c. Heartburn
    d. Either gastric ulcers or heartburn

5. If you dispensed a prescription for a drug called Zantac, the patient could be suffering from which disorder?

    a. Gastric ulcers
    b. Cystitis
    c. Arthritis
    d. Either gastric ulcers or heartburn

6. For what condition do patients take Synthroid?

    a. Thyroid disorder
    b. Insulin-dependent diabetes
    c. Cystitis
    d. Gastric ulcers

7. If you received a prescription for _____ tablets, the patient is being treated for an enlarged prostate gland.

    a. Bactrim
    b. Penicillin
    c. Zantac
    d. Proscar

8. Why would a gastroenterologist prescribe a drug that kills bacteria to treat ulcers?

    a. Because he or she made a mistake and specified the wrong drug
    b. Many forms of gastric ulcers are caused by a pathogenic bacterial organism.
    c. Treating bacteria is a good way to start a treatment for any disease.
    d. Another drug isn't as effective as an antibiotic alone.

Check your answers with those in the back of this study unit.

ORTHOPEDIC PHYSICIANS

Orthopedic surgery or *orthopedics* is the branch of surgery that deals with injuries and disorders of the musculoskeletal system. Therefore, the orthopedic physician is often called on to perform bone surgery.

Orthopedic doctors treat *fractures* (broken bones) by setting the bones so they'll heal back to their original shape and regain normal function. They may also perform surgeries to place artificial knee joints and hip joints (*prostheses*) in patients who have degenerative joint disease, such as arthritis.

Pain is always involved when broken bones and fractures occur. It's also a normal component of the postoperative period of orthopedic surgery. Many of the prescriptions that you'll see from orthopedic physicians will be for the relief of pain. The orthopedic doctor will prescribe the narcotic codeine-type drugs when the pain is somewhat severe, and the non-narcotic Motrin-type drugs when the pain is less severe (Figure 7).

The four most popular painkillers that are prescribed by orthopedic physicians are

- Vicodin tablets (narcotic)
- Motrin tablets (non-narcotic)
- Toradol injection and tablets (non-narcotic)
- Ultram tablets

FIGURE 7—Orthopedic physicians prescribe painkillers for patients who have had broken bones set.

GENERAL SURGEONS

A *general surgeon* is a physician who specializes in the surgical treatment of the abdominal organs, including the intestines, esophagus, stomach, colon, liver, and gallbladder. The general surgeon isn't merely a doctor who operates, but is a highly trained physician who deals with diseases and injuries that require some sort of surgical treatment. The American Board of Surgery requires four years of specialized surgical residency training before an applicant can be examined for certification by the board.

Typically, most general surgeons focus on surgery for abdominal conditions, traumatic situations, and tumor conditions. However, there's no restriction on their activities, and many general surgeons take on additional fields as their training and interests dictate.

Some surgeons receive further training to specialize as cardiac surgeons, gynecologic surgeons, plastic surgeons, thoracic surgeons, vascular surgeons, urologic surgeons, neurosurgeons, and so on.

Many of the prescriptions you'll see written by a general surgeon will be for medicines to treat post-surgical pain and infections (Figure 8). Pain, or both pain and infection, commonly occur as a result of the healing process after surgery. The types of painkillers prescribed by the surgeon range from very powerful narcotics, such as Demerol, to non-narcotic agents, such as Motrin. Antibiotics are prescribed to prevent or eradicate bacterial infections that may arise as a result of the surgery. Any type of antibiotic from penicillin products to ciprofloxacin may be prescribed.

FIGURE 8—General surgeons commonly prescribe painkillers and antibiotics for their patients.

The following painkillers are commonly prescribed by general surgeons:

- Demerol tablets
- Acetaminophen with codeine tablets
- Acetaminophen with hydrocodone (Vicodin, Lorcet)
- Acetaminophen with oxycodone (Percocet)
- Toradol tablets
- Motrin tablets

General surgeons may also prescribe the following antibiotics to treat postsurgical infection:

- Keflex capsules
- Augmentin tablets
- Clindamycin tablets
- Cipro tablets
- Levaquin
- Erythromycin tablets
- Ceftin tablets

GERIATRICIANS

Geriatricians are physicians who specialize in health care for older patients. Older patients are generally defined as people who are over the age of 65 (Figure 9).

FIGURE 9—Geriatricians provide medical care to senior citizens.

Geriatricians commonly deal with the following issues:

- Heart problems and other cardiovascular disorders
- Arthritic disease
- Diabetes
- Thyroid disorders
- Cancer
- Problems with hearing and eyesight
- *Insomnia* (difficulty in getting proper sleep)
- Nutritional disorders
- Neurological and memory disorders, such as dementia, that are more common in older people
- Any other disorders pertinent to aging

Geriatricians specialize in treating the multiple or combined disease problems that older patients often have. They can develop special care plans that address the healthcare needs of older adults. Many geriatricians act as healthcare managers for their patients and may coordinate care for a patient who sees several different specialist physicians.

Physicians of geriatric medicine may prescribe a wide variety of drugs, many of which have been mentioned in the previous specialties. It's important to note that geriatric patients often have increased sensitivity to medications. Therefore, they may need lower doses of some prescribed drugs. Geriatricians are familiar with the safe use of drugs in their patients and will be able to adjust prescriptions to their needs.

One illness that geriatricians often treat in their older patients is *Alzheimer's disease (AD).* Alzheimer's disease is a serious disease of the brain that results in the deterioration of a person's cognitive (thinking) abilities and memory. It occurs most often in older people, although patients in their 40s and 50s are occasionally affected.

Alzheimer's disease is complex, and its causes aren't completely understood. However, it's important to understand that AD causes actual physical changes in the brain, including the *atrophy* (shrinkage) of brain cells, deposits of sticky substances called *plaques* in the brain tissue, and the creation of tangles in the nerve fibers. The formation of plaques and tangles eventually prevents the brain cells from operating properly, and the person begins to show symptoms of slowed thinking and memory loss. The disease gets worse over time in affected patients, and there's no cure.

One type of drug that has shown some effectiveness in slowing down the progress of Alzheimer's disease is the cholinesterase inhibitor. This drug improves the effectiveness of the chemical acetylcholine in the brain and can lessen some of the symptoms of the disease. These drugs appear to work best in the early and middle stages of Alzheimer's.

Three drugs that may be prescribed for Alzheimer's disease are

- Donepezil (Aricept)
- Galantamine (Razadyne)
- Rivastigmine (Exelon)

A drug that may be prescribed to help in the later stages of Alzheimer's disease is memantine (Namenda).

HOSPITALISTS

Physicians who specialize in the care of patients in hospitals are called *hospitalists* (Figure 10). These physicians generally work only in hospitals and see patients on a daily basis while they're in the hospital for treatment. On-site hospitalists can sometimes provide more effective care for hospitalized patients than primary care physicians, who would need to travel from their private offices to the hospital to check on patients.

FIGURE 10—Hospitalists specialize in the care of patients who are in the hospital for treatment.

A hospitalist may also work with office-based physicians to provide care for a patient, coordinating services with them.

Self-Check 4

Choose the correct answer.

1. If you saw _____ tablets prescribed by a general surgeon, you would suspect that the patient had pain during the healing process.

    a. Motrin
    b. Premarin
    c. Halcion
    d. Keflex tablets

(Continued)

Self-Check 4

2. A geriatrician treats what general category of patients?

    a. Men only
    b. Women only
    c. Senior citizens
    d. Children

3. The general surgeon prescribes medication to treat pain and infection. Which of the following combinations might you dispense for a patient who has had surgery?

    a. Demerol tablets and Halcion tablets
    b. Toradol tablets and Cipro tablets
    c. Halcion tablets and Vicodin tablets
    d. Penicillin VK tablets and Augmentin tablets

4. Which drug may be prescribed by the orthopedic doctor after resetting a fractured bone and placing the bone in a cast?

    a. Motrin tablets
    b. Proscar tablets
    c. Halcion tablets
    d. Augmentin tablets

5. The drug Aricept would be prescribed for which condition?

    a. Infertility
    b. Insomnia
    c. Alzheimer's disease
    d. Postoperative infection

6. Which drug is an antibiotic used by the general surgeon to treat postsurgical infections?

    a. Codeine
    b. Butisol tablets
    c. Motrin tablets
    d. Erythromycin tablets

Check your answers with those in the back of this study unit.

NEUROLOGISTS

Neurologists are doctors who treat disorders of the brain and the central nervous system. They function mainly as diagnosticians and don't perform surgery. However, neurologists are responsible for the care of patients with brain vascular disease, migraine headaches, epilepsy, multiple sclerosis, muscular dystrophy, and brain and spinal cord tumors. A *neurosurgeon* performs surgery on the brain and spinal cord.

The American Board of Psychiatry and Neurology certifies neurologists and psychiatrists. The board requires neurologists to complete two years of residency and two years of practice before applying for certification. Provincial requirements vary; however, in some provinces and territories, a four-year residency may be required.

One of the major disorders of the brain is epilepsy, which takes many forms. *Grand mal epilepsy,* also known as *tonic-clonic epilepsy,* is associated with seizures that cause the victim to fall to the ground, become unconscious, and experience major muscle spasms. *Petit mal epilepsy,* also known as *absence epilepsy,* is associated with brief blackouts in children. *Partial epilepsy,* also known as *temporal lobe seizures,* is associated with brief seizures with or without unconsciousness.

The drugs most frequently prescribed by the neurologist to treat the many forms of epilepsy are the following:

- Gabapentin, or Neurontin
- Levetiracetam, or Keppra
- Lamotrigine, or Lamictal
- Dilantin
- Phenobarbital or phenobarbitone
- Tegretol
- Topamax

A headache is one of the most common symptoms that people experience and may be precipitated by emotional stress, fatigue, and illness (Figure 11). In some cases, there may be no apparent underlying cause for headache pain. In other cases, chronic recurrent headache may be associated with neurological disorders.

Migraine headache is one type of neurologic headache. It's characterized by recurring attacks of steady throbbing pain associated with nausea and vomiting. Attacks may be induced by noise, anxiety, the consumption of certain foods, or a woman's menstrual cycle. Many migraines appear to have no cause. A *migrainous prodromal aura* (a premonition of an oncoming migraine attack), which consists of visual, sensory, and motor reactions, immediately precedes a migraine attack.

FIGURE 11—Severe headache is a common condition treated by the neurologist.

Cluster headache is another type of neurological disorder. This type of headache is related to migraine and appears as a 30- to 40-minute excruciating, non-throbbing pain in the frontal or temporal region in a series of clusters or closely spaced attacks.

Muscle-contraction headaches account for the largest percentage of headaches for which doctors are consulted. This type of headache is called *tension* or *nervous headache* and may be precipitated by emotional factors. These headaches aren't as severe as migraines but last for a longer period of time.

Trigeminal neuralgia can lead to severe headache. The headache is thought to be a result of the underlying disease, although the cause of trigeminal neuralgia is unknown.

Neurologists prescribe specific drugs for each of these types of headaches to ease the pain during the attack, to try to prevent the attack, and to try to shorten the duration of the attack.

Drugs dispensed in a pharmacy for treatment of migraine headache include the following:

- Inderal tablets
- Imitrex subcutaneous injection
- Imitrex tablets
- Cafergot (a member of the ergot drug family)

Some drugs prescribed by neurologists for tension headache include

- Fiorinal (butalbital and aspirin)
- Fioricet (butalbital and acetaminophen)
- Valium
- Metaxalone, or Skelaxin (a muscle relaxant)

Some of the drugs prescribed by neurologists for the treatment of trigeminal neuralgia headache are the same as those used to treat epilepsy (for example, Tegretol tablets).

PSYCHIATRISTS

Psychiatry is the branch of medical science that deals with the origin, prevention, diagnosis, and treatment of mental and emotional disorders.

Psychiatrists are licensed doctors of medicine. They treat major mental illnesses including psychosis, schizophrenia, depression, and bipolar disorder (manic depression), and commonly prescribe medications to their patients.

Psychologists specialize in the study of human behavior. They generally hold a doctorate or master's degree in psychology. Psychologists are usually involved in experimental work in collaboration with psychiatrists or other doctors. The clinical psychologist is trained to diagnose and treat various mental problems.

This field of practice is specified in different ways by various provincial licenses. Psychologists and clinical psychologists don't require a medical degree and neither is allowed to write prescriptions.

Psychosis

A *psychosis* is a serious mental disorder that's characterized by a gross impairment of personality, a loss of contact with reality, and a deterioration of normal social functioning. A person may suffer from psychosis as a result of a physical brain injury or due to an underlying mental illness. A person with a psychosis may have a distorted capacity to process information, an inability to draw logical conclusions, and impaired judgment. He or she may experience hallucinations and delusions, and may become violently aggressive or severely overexcited.

The following are some drugs that the psychiatrist may prescribe to treat various types of psychosis:

- Risperidone, or Risperdal
- Aripiprazole, or Abilify
- Olanzapine, or Zyprexa

- Quetiapine, or Seroquel
- Clozapine, or Clozaril
- Chlorpromazine, or Thorazine
- Thioridazine, or Mellaril
- Haloperidol, or Haldol

Schizophrenia

Schizophrenia is a serious mental illness that's characterized by impairments in concept formation and the perception of reality. A person suffering from schizophrenia may exhibit bizarre delusions, become incoherent, and experience visual or auditory hallucinations. He or she may have a history of major depressive or manic episodes and a persistence of symptoms for at least six months. The person's work performance and personal relationships may deteriorate, and he or she will often be unable to perform normal self care (eating, dressing, and so on).

In general, the person with schizophrenia exhibits a major personality change along with a withdrawal from social contacts and the surfacing of a different, delusional type personality. In the catatonic form of schizophrenia, there's a complete lack of communication from the affected individual.

Symptoms of schizophrenia are usually treated with a variety of antipsychotic medications. These medications may be used in varying combinations and dosages. The prescribing psychiatrist may need to adjust an individual patient's medications and dosages frequently to produce the desired result without excessive side effects.

The following are some medications prescribed for symptoms of schizophrenia:

- Abilify
- Clozaril
- Geodon
- Haloperidol, or Haldol
- Mellaril
- Prolixin
- Risperdal
- Seroquel
- Thorazine
- Zyprexa

Depression

Clinical depression (also known as *depressive disorder*) is one of the most common disorders in North America. While the term *depression* is often casually used to refer to a general state of unhappiness or low mood, the term *clinical depression* refers to a state of intense sadness or despair that has become severe enough to interfere with a person's daily living activities and social functioning. In other words, while most of us occasionally feel unhappy or dissatisfied, a person who is experiencing true clinical depression has an illness that may need treatment by a physician.

Depression may include a loss of interest or pleasure in all (or almost all) usual activities and pastimes. Some or all of the following symptoms may be present in a depressed person:

- An inability to experience pleasure in usual activities
- Feelings of helplessness
- Indecisiveness and an inability to concentrate
- Agitation
- Insomnia
- Loss of appetite
- Fatigue or loss of energy
- Persistent thoughts of suicide

In the brain, substances called *neurotransmitters* help to control a person's moods. These neurotransmitters include serotonin and norepinephrine. In a depressed person, these substances aren't processed correctly in the brain and there's a reduction in their effects. In very general terms, the drugs that are prescribed for depression act to restore normal brain chemistry by increasing or extending the action of norepinephrine and serotonin. When the drugs work properly, the person may experience an improvement in mood.

Depression is a very common illness, but its exact causes are unknown. Research has confirmed that depressive episodes can be triggered by (or made worse by) a variety of factors, including

- Genetic predisposition
- Underlying illnesses
- Hormonal imbalances
- Lack of sleep
- *Malnutrition* (poor diet)
- Stressful life events, such as the death of a loved one

It's very important to note that suicide occurs in as many as 15 percent of depressed patients. Alcoholism and substance abuse are also common problems for depressed people who don't receive treatment. For these reasons, it's critical that depression be treated and that patients take their medications properly.

The following are some of the common drugs that psychiatrists prescribe to treat depression:

- Prozac
- Zoloft
- Paxil
- Lexapro
- Remeron
- Cymbalta
- Effexor
- Wellbutrin

Bipolar Disorder

Bipolar disorder, formerly called *manic depression,* is a condition in which patients experience both manic episodes and depressive episodes. In bipolar disorder, a person experiences recurring episodes of mood disturbance that range from severe depression to mania.

In *mania* or a manic state, the person has an extremely elevated mood, high energy, and unusual thought patterns. The person's mood may quickly switch from depressed to manic or vice versa. The length of each phase can last from a few days to several months, and many bipolar people will experience several episodes per year.

One family of drugs that's especially effective in the treatment of bipolar disorder is the lithium compounds. *Lithium* has the ability to smooth out the bouts of depression and mania to a manageable level.

The following drugs are prescribed by psychiatrists for bipolar disorder:

- Lithium carbonate (Eskalith)
- Lithium carbonate (Lithane)
- Lithium carbonate (Lithobid)
- Lithium citrate (Cibalith-S)
- Divalproex sodium (Depakote)
- Carbamazepine (Tegretol)

In addition, antidepressants and antipsychotics may be prescribed as needed for individual patients.

Anxiety and Sleep Disorders

The day-to-day pressures of earning a living, raising a family, finding a job, and attempts at living a busy, productive life all contribute to feelings of anxiety. *Panic disorder,* a form of anxiety, is characterized by sudden, spontaneous, unexplained anxiety with feelings of terror and a flight response. *Generalized anxiety disorder* is persistent anxiety over a period of one month or more.

Sleep disorders are conditions in which an individual either can't fall asleep, has difficulty obtaining a full night's sleep, or has poor sleeping habits. They may occur in patients who have psychological problems, but they can also occur in otherwise healthy people. Thus, both psychiatrists and family practice physicians commonly prescribe tranquilizers to counteract anxieties and prescribe sleeping pills to counteract sleep disorders.

The following tranquilizers are effective in treating anxiety conditions:

- Valium tablets
- Xanax tablets
- Lorazepam (Ativan)

These sleeping pills are prescribed to treat sleep disorders:

- Halcion tablets
- Flurazepam (Dalmane)
- Temazepam (Restoril)
- Zolpidem (Ambien)
- Lunesta
- Sonata
- Rozerem

Self-Check 5

Choose the correct answer.

1. A psychiatrist would prescribe _____ tablets to treat schizophrenia.
    a. Lithium
    b. Prozac
    c. Tegretol
    d. Prolixin

2. Which drug is one of the classic phenothiazine drugs used in psychiatry to treat psychoses?
    a. Lithium tablets
    b. Prozac tablets
    c. Thioridazine tablets
    d. Prolixin tablets

3. Which family of drugs is especially effective in the treatment of bipolar disorder?
    a. Lithium compounds
    b. Prozac tablets
    c. Thorazine tablets
    d. Prolixin tablets

4. Neurologists often prescribe which drug to treat tension headache?
    a. Tegretol tablets
    b. Cafergot tablets
    c. Dilantin capsules
    d. Fiorinal tablets

5. Two different neurological disorders for which Tegretol tablets are prescribed are
    a. migraine headache and tension headache.
    b. migraine headache and cluster headache.
    c. epilepsy and trigeminal neuralgia headache.
    d. epilepsy and cluster headache.

Check your answers with those in the back of this study unit.

PEDIATRICIANS

The term *pediatrics* covers medical care in children, from birth through puberty (Figure 12). Pediatric care includes attention to nutrition and growth (mental and physical), immunization against infectious diseases, and the management of acute and chronic illnesses.

Specialty certification by the American Board of Pediatrics requires medical school graduates to complete three years of graduate pediatric training followed by two years of pediatric practice. The candidate must then pass written and oral examinations. Provincial requirements vary; however, in some provinces and territories, a four- to five-year residency may be required.

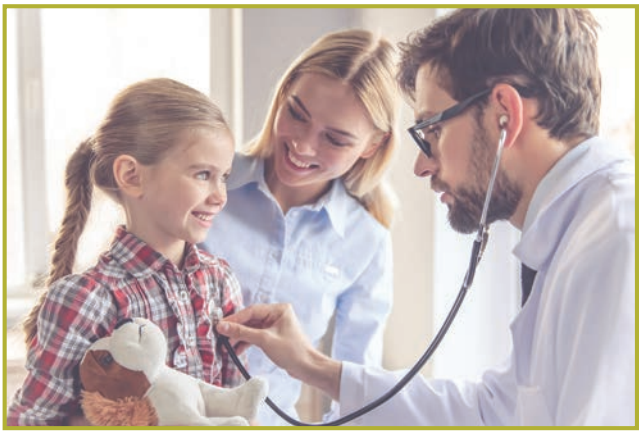

FIGURE 12—Pediatricians specialize in providing medical care for children.

One of the most common groups of drugs that the pediatrician will prescribe is the penicillin family. You'll dispense many types of penicillin products in dose forms that are easy for children to take, such as liquids and chewable tablets. These dose forms come in flavors like bubble gum, cherry, and other flavors to appeal to young patients.

Penicillins are prescribed frequently by pediatricians because of the many ear and throat infections diagnosed in children. These infections are usually caused by bacteria that can be eradicated very easily by some form of penicillin.

The following is a list of popular penicillin products prescribed by pediatricians:

- Amoxil chewable tablets
- Pen-Vee K suspension
- Amcill suspension
- Augmentin suspension and chewable tablets

In some cases, the infectious bacteria in ear and throat infections in children may be somewhat resistant to penicillin VK and the pediatrician will prescribe a type of antibiotic other than a penicillin VK. The more common antibiotics that are prescribed in place of these penicillins follow:

- Keflex suspension
- Ceclor suspension

- Pediamycin suspension and chewable tablets
- Augmentin suspension and chewable tablets
- Biaxin tablets
- Suprax tablets
- Ceftin tablets

CARDIOLOGISTS

Cardiologists are doctors who treat diseases of the heart (Figure 13). The major diseases of the heart that are treatable with drugs are as follows:

- *Congestive heart failure,* in which the heart fails to pump blood adequately
- *Arrhythmia,* in which the heart beats in abnormal rhythm or skips beats
- *Angina,* in which the heart exhibits intense pain due to lack of oxygen
- *Clot formation (embolism),* in which a blood clot causes blockage of the arteriole system of the heart muscle
- *Arteriosclerosis* (commonly called *hardening of the arteries*), caused by high blood cholesterol

FIGURE 13—Cardiologists treat the major diseases of the heart.

Heart doctors have a wide variety of drugs at their disposal to treat each of these conditions. In congestive heart failure, *digitalis* (a cardiac glycoside) is used to improve the muscular contraction of the heart muscle. This drug can induce what seems to be a miraculous reversal of heart failure and can dramatically improve the cardiovascular health of the patient.

For arrhythmia, drugs known as *antiarrhythmics* can be used to regulate the erratic beating of the heart.

In angina, a lack of blood flow to the heart muscle in the arteries of the heart causes severe pain that may feel like a heart attack. The blood flow in these arteries can be improved with nitroglycerin tablets and other drugs that dilate the arteries to allow increased blood flow. Drugs that cause the heart to work less hard are also useful in the treatment of angina.

Blood clots in the arteries of the heart can cause a shutdown of cardiac circulation, eventually leading to death. Drugs that prevent blood clot formation are called *anticoagulants*.

High cholesterol levels in the blood can be treated by drugs that block the formation of cholesterol in the liver. Thus, less cholesterol is available to produce arteriosclerosis.

Drugs prescribed by cardiologists to reverse congestive heart failure are Digoxin or Lanoxin and Digitoxin.

Drugs that can help an abnormal heart rhythm to return to normal are

- Amiodarone
- Adenosine, or Adenocard
- Quinidine
- Verapamil
- Metoprolol, or Lopressor
- Digoxin, or Lanoxin
- Sotalol, or Betapace

Drugs that dilate blood vessels are

- Nitroglycerin tablets or skin patches
- Procardia tablets
- Cardizem tablets

Drugs that slow down the workload of the heart are

- Propranolol, or Inderal
- Tenormin
- Metoprolol, or Lopressor

A cardiac patient may also be prescribed an anticoagulant drug to prevent the formation of blood clots. A popular anticoagulant is warfarin, with the brand names of Coumadin and Jantoven.

The following are some drugs that lower blood cholesterol:

- Mevacor tablets
- Zocor tablets
- Lopid tablets

Hypertension is the technical term for high blood pressure. In the human body, the blood pressure is the amount of force exerted by the blood against the inner walls of the blood vessels as it circulates. If this pressure is too strong, it can cause damage to the blood vessels and lead to serious illnesses.

Hypertension, if left untreated, can lead to long-term damage of organs such as the heart and kidneys, lead to stroke, and eventually result in a shorter life expectancy. High blood pressure is also a significant risk factor for the development of major cardiovascular complications, including congestive heart failure and coronary heart disease.

A person's blood pressure can be measured with a device called a *sphygmomanometer* (blood pressure meter) by applying an inflatable cuff to the upper arm. A resting blood pressure reading of 120/80 (spoken as "one twenty over eighty") is considered to be normal or healthy. A healthy person's blood pressure reading will often be higher than 120/80 if he or she is exercising or under stress. However, a resting blood pressure reading that's significantly higher than 120/80 may indicate hypertension.

Unfortunately, hypertension is a very common condition that affects millions of people in North America. It's usually treated by cardiologists or by family practice physicians. However, there are also physicians called *hypertension specialists* who specialize in treating hypertension. Hypertension specialists will usually be found in major medical centers or teaching hospitals.

Sometimes, high blood pressure can be reduced by a combination of exercise, low-fat diet, weight loss, and lowered salt intake. If these modifications in lifestyle aren't completely successful in restoring normal blood pressure, then drug therapy may be added to the regimen.

There are several ways that drugs can act to treat hypertension. *Diuretic drugs* reduce the amount of fluid in the cardiovascular system through the process of *diuresis* (elimination of sodium and water by the kidneys). Less fluid in the cardiovascular system results in lower blood pressure.

A second method is to *dilate* (open up) the arteries, which will result in a reduction of blood pressure. One type of drug that dilates the blood vessels is the *ACE inhibitor* (short for *angiotensin converting enzyme inhibitor*). Another type of drug that relaxes the heart muscles and the blood vessels is the *calcium channel blocker (CCB).* These drugs slow the heart rate, dilate the blood vessels, and reduce the heart's output.

Another way to treat hypertension is to slow down the heartbeat and reduce the contraction force of the heart, thus causing less blood volume from the heart to pass into the blood vessels. Less blood volume in the blood vessels will result in a reduction of blood pressure. Drugs that slow down the heart rate and reduce the volume of the heart's output are called *beta receptor antagonists,* or simply *beta-blockers.*

As a pharmacy assistant, you'll be dispensing many prescriptions written to treat hypertension. There are dozens of antihypertensive drugs on the market today.

Drugs prescribed to cause dilation of the arteries are

- Nifedipine, or Procardia tablets
- Diltiazem, or Cardizem
- Nitroglycerin sublingual tablets
- Enalapril, or Vasotec tablets

Some common diuretic drugs that are prescribed to cause loss of sodium and water from the kidneys are

- Hydrochlorothiazide (abbreviated HCT or HCTZ)
- Chlorothiazide, or Diuril
- Chlorthalidone, or Hygroton
- Indapamide, or Lozol
- Methyclothiazide, or Enduron
- Metolazone, or Zaroxolyn
- Furosemide, or Lasix
- Dyazide tablets
- Bumetanide, or Bumex
- Amiloride, or Midamor
- Spironolactone, or Aldactone
- Triamterene, or Dyrenium

Some common beta-blocker drugs that are prescribed to reduce the strength of contractions of the heart are

- Propranolol, or Inderal
- Metoprolol, or Lopressor
- Atenolol, or Tenormin
- Acebutolol, or Sectral
- Bisoprolol, or Zebeta
- Nadolol, or Corgard
- Timolol, or Blocadren

The following are some common ACE inhibitors:

- Benazepril, or Lotensin
- Captopril, or Capoten
- Fosinopril, or Monopril
- Lisinopril, or Prinivil
- Quinapril, or Accupril
- Ramipril, or Altace

The following are some common calcium channel blockers:

- Amlodipine, or Norvasc
- Felodipine, or Plendil
- Isradipine, or DynaCirc
- Nicardipine, or Cardene
- Verapamil, or Verelan

Self-Check 6

Choose the correct answer.

1. A group of drugs that the pediatrician will often prescribe to treat ear and throat infections is known as
    a. phenothiazines.
    b. antihistamines.
    c. antitussives.
    d. penicillins.
2. Cardiologists prescribe which drugs to prevent arteriosclerosis?
    a. Antiarrhythmics
    b. Anticoagulants
    c. Drugs to lower cholesterol
    d. Artery vasodilators
3. An example of a beta-blocker drug for angina is
    a. Inderal tablets.
    b. Nitroglycerin tablets.
    c. Coumadin tablets.
    d. Lopid tablets.

(Continued).

Self-Check 6

4. Which drug is prescribed as an anticoagulant?
    a. Coumadin tablets
    b. Lopid tablets
    c. Inderal tablets
    d. Nitroglycerin tablets

5. Which drug is called a diuretic and used to lower high blood pressure?
    a. Digitalis
    b. HCTZ (hydrochlorothiazide)
    c. Procardia tablets
    d. Vasotec tablets

6. Which drug causes dilation of the arteries to lower high blood pressure?
    a. Digitalis
    b. HCTZ (hydrochlorothiazide)
    c. Procardia tablets
    d. Keflex suspension

Check your answers with those in the back of this study unit.

SECTION 2: OTHER HEALTHCARE PRACTITIONERS AS PRESCRIBERS

Objective

When you complete this section, you'll be able to identify healthcare providers other than physicians who are licensed to prescribe drugs.

INTRODUCTION

Physicians aren't the only professionals in the healthcare field who can prescribe drugs. This section of your study unit explores other healthcare providers who are legally permitted to prescribe medications and other remedies to patients.

DENTAL PRESCRIBERS

In dentistry, drugs can play an important part in a patient's overall care. Dentists prescribe many types of medications for pain, to treat infection, and to treat oral diseases. Dentistry consists of a number of specialties, and some dental specialists prescribe more drugs than others.

The following sections describe the dental specialties that are recognized by the American Dental Association (ADA) and the Canadian Dental Association (CDA), and list some of the medications you'll fill and dispense from these dental prescribers. These specialties all require certification by a board of examiners and reviewers. In general, these specialties require two to five years of postgraduate training after graduation from an accredited dental school. After completion of the postgraduate program in the given specialty, certification can be approved after passing a written and oral examination given by the specialty board.

ORTHODONTISTS AND PROSTHODONTISTS

Orthodontists and prosthodontists account for the least drug use in the treatment of the dental patient. *Orthodontists* specialize in the diagnosis of *malocclusion* (misalignment of the upper jaw to the lower jaw and the misalignment of associated teeth and mouth

structures). They correct the misalignments by repositioning the crooked teeth with braces and other appliances. *Prosthodontists* specialize in making and fitting *dentures* (false teeth) for patients who have lost some or all of their teeth.

Orthodontists will occasionally prescribe drugs that act to dry the inside of the mouth (reduce saliva formation) in order to be better able to place orthodontic appliances on the teeth. Prosthodontists may occasionally prescribe a cream or ointment to treat gum irritation caused by ill-fitting dentures.

PERIODONTISTS

Periodontists are dental specialists who study and treat gum disease. They diagnose the causes of gum disease and treat the disease with improvement in oral hygiene, drug therapy, and surgery. As a result, periodontists will prescribe many types of antibiotics to treat gum disease and analgesics to reduce pain after periodontal surgery.

ENDODONTISTS

Endodontists are dentists who treat disorders of the *tooth pulp,* which is located inside the tooth and extends into the canals inside the root of the tooth. These canals carry the nerves and the blood supply that provides the tooth with nutrients. Occasionally, the tooth pulp canal becomes infected with bacteria, causing severe inflammation and pain that results in a classic “toothache.”

Instead of removing the offending tooth from the mouth, endodontists save the tooth by removing the inflamed tissue from the canal and inserting a soothing material into the canal. This procedure is referred to as a *root canal.* Endodontists will prescribe painkillers and anti-inflammatories to reduce the pain prior to the root canal procedure. They may also prescribe antibiotic medicines to reduce the infection in the root canal.

ORAL AND MAXILLOFACIAL SURGEONS

Oral and *maxillofacial surgeons* perform surgery on the oral cavity and associated facial structures. These surgeries include *tooth extractions* (removing teeth), resetting the jaw for better *occlusion* (bite alignment), trauma surgeries, repairs to facial deformities, and the removal of head and neck tumors.

Oral and maxillofacial surgeons often prescribe painkillers to treat postoperative pain. They also prescribe antibiotics to treat bacterial infections of the oral cavity. Occasionally, these practitioners will prescribe tranquilizers and sedatives to relax the patient prior to surgery.

PEDIATRIC DENTISTS

Pediatric dentistry is the specialty that provides dental care to children and adolescents. Very few drugs are ever prescribed by pediatric dentists because much of the dental treatment for their patients deals with routine checkups and restoration of teeth destroyed by cavities. Occasionally, fluoride preparations are prescribed for children who live in areas without fluoridated water. Fluoridated water has been shown to prevent cavities in children and adults.

GENERAL PRACTICE DENTISTS

The dentist in general practice provides dental care ranging from teeth cleaning, to restorative procedures on teeth, to minor surgery such as simple extractions, to simple root canal procedures, and simple orthodontic treatments.

These dentists prescribe many types of medications, including painkillers (*analgesics*), antibiotics, tranquilizers and sedatives, and anti-inflammatories. Occasionally, the dentist will be required to prescribe an antibiotic for the patient who has a history of rheumatic fever or heart infection. The antibiotic is given to the patient before dental treatment as a protection against any damaging bacteria getting to the heart from the mouth during dental procedures. Three antibiotics that are prescribed by general practice dentists are amoxicillin, erythromycin, and clindamycin.

ORAL MEDICINE/ORAL PATHOLOGY SPECIALISTS

These dentists are specialists who treat diseases of the head and neck and the soft tissues of the oral cavity. They're thought of as the "doctors of the mouth." They diagnose and treat oral pain and jaw pain; bacterial, fungal, and viral infections of the mouth; and ulcerations of the soft tissues and tongue. These specialists also diagnose and treat head and neck cancer.

To treat these disorders, many different types of medications are prescribed by these practitioners. These drugs include analgesics to reduce pain, antibiotics to eradicate infections caused by bacteria, antifungal medicines, antiviral medicines, agents to help heal mouth ulcers, and drugs to treat cancer.

Painkillers frequently prescribed by dentists are

- Motrin tablets
- Vicodin tablets
- Tylenol with codeine tablets

Antibiotics frequently prescribed by dentists are

- Penicillin VK tablets
- Amoxicillin tablets
- Erythromycin tablets
- Clindamycin tablets
- Flagyl tablets
- Tetracycline capsules

Antifungals frequently prescribed by dentists are

- Nizoral tablets
- Diflucan tablets
- Mycelex troches

Antivirals frequently prescribed by dentists are Zovirax capsules.

Other drugs frequently prescribed by dentists are

- Valium for tranquilization
- Kenalog for denture irritation
- Pro-Banthine to dry the mouth

PODIATRISTS

Podiatrists are trained to treat medical problems of the feet. Doctors of podiatry graduate from schools of podiatric medicine that offer a four-year curriculum after graduation from a four-year baccalaureate college.

Podiatry deals with the examination, diagnosis, treatment, and prevention of diseases affecting the foot. Podiatrists therefore write prescriptions for medications to treat foot disorders. Disorders of the foot include foot pain, circulatory disorders, nerve disorders, skin and toenail disorders, tumors and cysts, arthritic and inflammatory disorders, and trauma. As a pharmacy assistant, you'll see many types of medicines prescribed by podiatrists.

Medicines to treat foot pain are

- Aspirin-type analgesics
- Motrin/Advil-type analgesics
- Codeine-type analgesics

Medicines to treat bacterial infections of the foot are penicillins and other types of antibiotics.

Medicines to treat inflammatory conditions (arthritic pain) of the foot are Motrin tablets and Indocin capsules.

Medicines as topical rubs to treat general conditions of the foot are

- Antibiotic ointments
- Antifungal ointments
- Corticosteroid ointments
- Steroid-antibiotic combination ointments
- Enzyme preparations

Medicines used as soaks for the feet include Domeboro. The podiatrist may also prescribe wet dressings and soaks with antibacterial agents such as Betadine or chlorhexidine gluconate.

NURSE PRACTITIONERS

The *nurse practitioner (NP)* is a registered nurse with a graduate degree in nursing. The NP is trained to provide a full range of primary care services in a community setting, such as diagnose illnesses, perform diagnostic tests, and prescribe medication.

The American Nurses Association described the functions of the NP in the original Nurse Training Act of 1971 to be, in part, "obtaining a health history; assessing health-related status; entering a person into the healthcare system; sustaining and supporting persons who are impaired, infirm, or ill, and during programs of diagnosis and therapy; managing a medical care regimen for acute and chronically ill patients within established standing orders."

> According to **GraduateNursingEDU.org,** the first nurse practitioner program in Canada began in 1967.

Permission for the nurse practitioner to write prescriptions is controlled by each state. Today, nurse practitioners in all 50 of the United States have at least some authority to write prescriptions. In Canada, nurse practitioners are licensed in every province. Nurse practitioners are able to prescribe medication in most provinces and can even prescribe controlled drugs in some provinces.

Standing orders are medical guidelines of patient care for specific diseases such as hypertension, diabetes, and *pharyngitis* (sore throat). These guidelines are usually established by a committee of the faculty of a medical school.

A typical standing order includes the definition and *etiology* (cause) of the disease, clinical features of the disease, and laboratory values for diagnosis and treatment procedures, including appropriate medicines to be prescribed. Depending on the state in which the NP practices, he or she may write and sign prescriptions on standing orders of the doctor or may need to have the prescription signed by a supervising physician.

Some typical prescriptions written by NPs are for penicillin or erythromycin as an anti-infective for sore throat, HCTZ (hydrochlorothiazide) as a diuretic for high blood pressure, and insulin for diabetes.

PRACTITIONERS OF ALTERNATIVE MEDICINE

Alternative medicine is defined as any method of healing or treating disease that's not part of the conventional or traditional medical system in North America. Some areas of alternative medicine include *chiropractic* (manipulating the spine and musculoskeletal system), *naturopathic medicine* (the use of good nutrition and natural remedies to heal the body), *herbalism* (the use of plant-based remedies), and traditional Chinese medicine. *Complementary medicine* refers to certain practices of alternative medicine that may be used along with mainstream medical treatments.

Practitioners of alternative medicine is trained to provide services in their chosen field, but they aren't licensed physicians. Therefore, practitioners of alternative medicine are not authorized to write prescriptions for any of the drugs found in a traditional pharmacy. However, practitioners of alternative medicine may suggest or recommend the use of plant-based remedies or dietary supplements to their clients. Plant-based remedies and herbal supplements can be purchased over the counter, without a prescription, in health food stores, herb shops, and vitamin stores (Figure 14).

FIGURE 14—Practitioners of alternative medicine may suggest herbal remedies to their clients.

It's important to be aware that alternative medicine is a complex and controversial topic. Most alternative treatments haven't been tested in a laboratory (or simply can't be tested), and there's little scientific evidence to support their effectiveness. Therefore, many scientists and licensed physicians don't support the use of alternative treatments because they haven't been proven to work.

However, some physicians don't object to the use of alternative treatments as long as the treatment does no harm and their patients feel they benefit from it. Alternative treatments may help to reduce stress and make the patient feel better, and some physicians may allow their use for this purpose.

For example, a cancer patient who is being treated with surgery and traditional chemotherapy may want to try aromatherapy to reduce stress. (In the practice of *aromatherapy,* pleasant-smelling herbal or floral extracts are used to promote feelings of health and well-being.) On review, the physician judges that the procedure is harmless and won't have an impact on the patient's usual medical treatment, so the patient is allowed to receive the aromatherapy.

On the other hand, it's important to be aware that herbal remedies (and even ordinary vitamin supplements) can interact with prescription drugs. Plant-based remedies aren't harmless; they can cause dangerous drug interactions, result in allergic reactions, or prevent drugs from working properly. For this reason, physicians take a cautious approach to alternative remedies, and usually ask their patients to report any herbal remedies or dietary supplements they're using.

Community and hospital pharmacies don't ordinarily stock herbal remedies or dietary supplements. Furthermore, as a pharmacy assistant, you won't be dispensing remedies prescribed by practitioners of alternative medicine. However, because of the popularity of these remedies, it's a good idea for you to be aware of them and familiar with some of their names.

The following are some of the more popular herbal remedies and supplements and their suggested uses:

- Echinacea for symptoms of the common cold
- Ginkgo biloba to improve memory and mental alertness
- Eucalyptus oil as a natural insect repellent
- Garlic to mildly lower total cholesterol levels and blood pressure
- Peppermint tea for stomach upset
- Aloe vera juice for mild cuts, burns, and eczema
- Ginseng as a general energy tonic

VETERINARIANS

Veterinarians are specialists who are trained to diagnose and treat illness and disease in animals. To obtain a degree in veterinary medicine, the candidate must attend a four-year veterinary school after completing a four-year college undergraduate program. Veterinarians prescribe many types of drugs to treat animal disease (Figure 15).

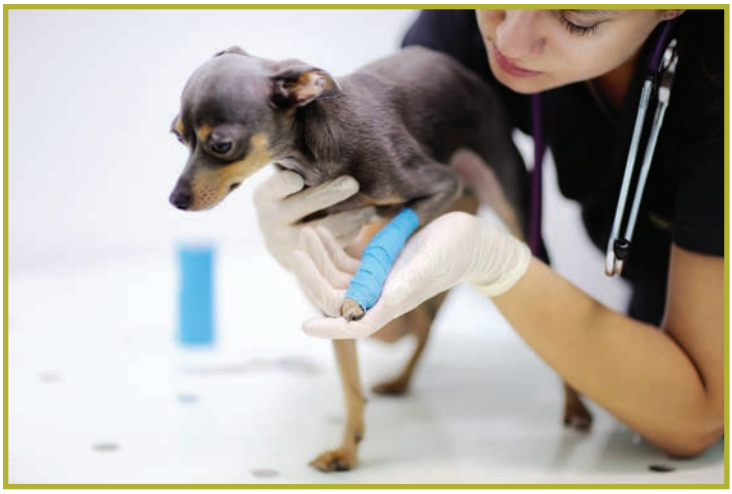

FIGURE 15—Veterinarians prescribe medications for animals, both household pets and farm livestock.

Self-Check 7

Choose the correct answer.

1. Which healthcare professionals *can't* legally write prescriptions in every state?
    a. Podiatrists and periodontists
    b. Homeopathic physicians and veterinarians
    c. Nurse practitioners
    d. Nurse practitioners and general practice dentists

2. Which of the following herbal remedies is commonly suggested for the relief of minor burns?
    a. Echinacea
    b. Peppermint tea
    c. Garlic
    d. Aloe vera juice

3. A periodontist would prescribe which type of medicine to treat gum disease?
    a. Antibiotic
    b. Codeine-type analgesic
    c. Anti-inflammatory cream such as corticosteroid
    d. A drug to dry the mouth

4. An endodontist may prescribe which medication(s) to treat toothache?
    a. Painkillers and anti-inflammatories
    b. Tranquilizers
    c. Anti-inflammatory cream such as corticosteroid
    d. A drug to dry the mouth

5. Which specialized dentists—or "mouth doctors"—treat diseases of the head and neck and soft tissues of the mouth?
    a. Family dentists
    b. Oral medicine/oral pathology specialists
    c. Pediatric dentists
    d. Prosthodontists

Check your answers with those in the back of this study unit.

SECTION 3: HEALTHCARE PROFESSIONALS WITH PRESCRIPTION-WRITING RESTRICTIONS

Objective

When you complete this section, you'll be able to name prominent healthcare professionals who aren't licensed to write prescriptions.

INTRODUCTION

In this final section of your study unit, you'll learn about several healthcare professionals who provide treatment for patients. However, for the most part, they're not legally allowed to prescribe medications. Those that are allowed are restricted in their ability to do so.

CHIROPRACTORS

Chiropractic treatment is a system of healing based upon the theory that disease results from a lack of normal nerve function. The chiropractor employs scientific manipulation and specific adjustment of body structures like the spinal column and utilizes physical therapy when necessary. Drugs aren't a part of chiropractic treatment.

PHYSICIAN ASSISTANTS (PAs)

Physician assistants (PAs) are members of the healthcare team who work with, and under the supervision of, physicians. They provide medical services as assistants to physicians. They're trained to obtain pati ent medical histories, perform comprehensive physical examinations, order diagnostic tests, perform routine medical procedures, develop patient management plans, and are trained in patient counseling.

In 39 states and the District of Columbia, physician assistants may write prescriptions. This trend is anticipated to continue, allowing physician assistants to write prescriptions in most states. In Canada, PAs are practicing in the provinces of Ontario and Manitoba. They work under the supervision of a physician and have limited authority to write prescriptions.

NURSES

Nurses provide comprehensive patient care and treatment. However, they aren't allowed to prescribe medications except to a limited extent as a nurse practitioner.

PHARMACISTS

Pharmacists are experts in pharmacology and keep current with advances in drug therapy. Their role is to dispense medications upon the request of a prescriber and to provide expertise to the patient in the proper use of the medication. A few states have passed legislation allowing some limited prescribing by pharmacists. For the most part, however, pharmacists aren't allowed to prescribe medications.

PHARMACY TECHNICIANS

Pharmacy technicians aren't legally allowed to prescribe medications. They dispense medications under supervision of the pharmacist, but they don't prescribe medications.

DENTAL HYGIENISTS

Dental hygienists complete a two-year or four-year training program in dental hygiene and function in the important role of prevention of oral disease. Although they're licensed by a governing board to diagnose oral disease and counsel patients in oral hygiene, prescription writing must legally be performed by the dentist.

DENTAL ASSISTANTS

Dental assistants assist the dentist in the delivery of dental care but aren't trained to diagnose oral disease or to provide direct dental treatment. Therefore, they have no legal authority to prescribe drugs.

Self-Check 8

Choose the correct answer.

1. A few states have granted limited authority for which healthcare professionals to write prescriptions?
    a. Pharmacy technicians
    b. Dental hygienists
    c. Chiropractors
    d. Pharmacists

2. Which professionals are licensed to diagnose oral disease but aren't licensed to write prescriptions?
    a. Dental hygienists
    b. Dental assistants
    c. Chiropractors
    d. Pharmacy technicians

3. Which of the following is a practice based on a theory that disease results from lack of normal nerve function and that medications aren't needed to restore health?
    a. Chiropractic
    b. Osteopathy
    c. Dentistry
    d. Pharmacy

4. Which of the following professionals is allowed to write prescriptions in 39 states and the District of Columbia?
    a. Nurse
    b. Physician assistant
    c. Pharmacist
    d. Dental hygienist

Check your answers with those in the back of this study unit.

SELF-CHECK ANSWERS

Self-Check 1

1. d. Nasal decongestants provide temporary relief by getting rid of the excess fluid in the nose that's causing the congestion.
2. b. Bronchodilators are used to dilate and open the airway to allow better air intake and breathing.
3. c. The anti-infective drug metronidazole (brand names Flagyl and Rozex) is sometimes prescribed for yeast infections, as well as peptic ulcer disease, gingivitis (a gum disease), and certain skin infections.
4. c. A nebulizer is a machine that pumps air through a liquid medicine, turning the medicine into a mist or vapor. The vaporized medicine is transferred through plastic tubing to an inhaler, where it's then inhaled by the patient.
5. a. Amoxil, Biomox, Trimox, Wymox (amoxicillin) is an anti-infective drug sometimes prescribed for pharyngitis.

Self-Check 2

1. c. The common treatment for hay fever is to use antihistamines to block or prevent the effects of histamine.
2. a. Contact with a foreign substance such as grass or tree pollen can cause an allergic reaction, which releases a very irritating substance from blood cells called histamine.
3. d. Fungal infections of the skin and nails are treated with a combination of topical antifungal creams and antifungal systemic tablets.
4. c. Rheumatologists rely on anti-inflammatory drugs and painkillers to treat the symptoms of the three types of arthritis.
5. a. Glaucoma is a condition in which fluid builds up inside the eye, causing pressure on the optic nerve.
6. c. Most eye infections are often eradicated in a very short period of time by eye-drops containing the proper antibacterial agent to kill the causative organism.

Self-Check 3

1. d. Endocrinologists treat diabetes mellitus, which is a disorder that occurs due to a lack of insulin production or secretion from the pancreas.

2. a. Urologists prescribe sulfamethoxazole drugs (such as Bactrim or Septra) to treat urinary tract infections.
3. b. Birth control pills are provided as a monthly package of pills to be taken once a day to prevent ovulation. No pregnancy can occur if ovulation doesn't occur.
4. b. Bactrim is a sulfa drug prescribed for urinary tract infections.
5. d. Ranitidine, or Zantac, is prescribed by gastroenterologists for the relief of heartburn as well as to reduce the symptoms of gastric ulcer and even cure the gastric ulcer.
6. a. Endocrinologists treating hypothyroidism will write prescriptions for Synthroid tablets, which are thyroid replacement drugs.
7. d. Proscar is one of the drugs prescribed for the treatment of prostate problems.
8. b. Bacteria called *Helicobacter pylori* are able to survive in the acid environment of the stomach and can cause the destruction of areas of the stomach wall that results in bleeding ulcers. It's been demonstrated that certain antibiotics (such as the drug clarithromycin, or Biaxin) in combination with acid reducers can kill or control the growth of the *H. pylori* bacteria.

Self-Check 4

1. a. Motrin tablets are commonly prescribed by general surgeons to treat pain.
2. c. Geriatricians are physicians who specialize in health care for older patients. Older patients are generally defined as people who are over the age of 65.
3. b. Toradol tablets are one of the painkillers are commonly prescribed by general surgeons. Cipro tablets would help treat postsurgical infection.
4. a. Motrin tablets are one of the most popular painkillers prescribed by orthopedic physicians.
5. c. Donepezil (Aricept) is one of the drugs that may be prescribed for Alzheimer's disease.
6. d. General surgeons may prescribe erythromycin tablets to treat postsurgical infection.

Self-Check 5

1. d. A psychiatrist would prescribe Prolixin tablets to treat schizophrenia.
2. c. Thioridazine, or Mellaril, is one of the drugs that the psychiatrist may prescribe to treat various types of psychosis.

3. a. One family of drugs that's especially effective in the treatment of bipolar disorder is the lithium compounds. Lithium has the ability to smooth out the bouts of depression and mania to a manageable level.
4. d. Fiorinal (butalbital and aspirin) is one of the drugs prescribed by neurologists for tension headache.
5. c. Some of the drugs prescribed by neurologists for the treatment of trigeminal neuralgia headache (also known as cluster headache) are the same as those used to treat epilepsy (for example, Tegretol tablets).

Self-Check 6

1. d. Penicillins are prescribed frequently by pediatricians because of the many ear and throat infections diagnosed in children. These infections are usually caused by bacteria that can be eradicated very easily by some form of penicillin.
2. c. Arteriosclerosis is caused by high blood cholesterol. Therefore, drugs that lower cholesterol would help prevent this type of heart disease.
3. a. Inderal is one of the common beta-blocker drugs that are prescribed to reduce the strength of contractions of the heart.
4. a. A popular anticoagulant is warfarin, with the brand names of Coumadin and Jantoven.
5. b. Hydrochlorothiazide (abbreviated HCT or HCTZ) is one of the common diuretic drugs that are prescribed to cause loss of sodium and water from the kidneys.
6. c. Drugs prescribed to cause dilation of the arteries include Procardia tablets.

Self-Check 7

1. c. Depending on the state in which the nurse practitioner practices, he or she may write and sign prescriptions on standing orders of the doctor or may need to have the prescription signed by a supervising physician.
2. d. Aloe vera juice may be recommended for mild cuts, burns, and eczema.
3. a. Periodontists will prescribe many types of antibiotics to treat gum disease and analgesics to reduce pain after periodontal surgery.
4. a. Endodontists will prescribe painkillers and anti-inflammatories to reduce the pain prior to the root canal procedure (the classic "toothache").
5. b. Oral medicine/oral pathology specialists treat diseases of the head and neck and the soft tissues of the oral cavity. They're thought of as the "doctors of the mouth."

Self-Check 8

1. d. A few states have passed legislation allowing some limited prescribing by pharmacists. For the most part, however, pharmacists aren't allowed to prescribe medications.
2. a. Although dental hygienists are licensed by a governing board to diagnose oral disease and counsel patients in oral hygiene, prescription writing must legally be performed by the dentist.
3. a. Chiropractic treatment is a system of healing based upon the theory that disease results from a lack of normal nerve function.
4. b. In 39 states and the District of Columbia, physician assistants may write prescriptions.