As an important member of the medical team, it’s important to understand how drugs treat illnesses and disorders. In this chapter, you’ll discover how drugs work inside the body and which factors can cause a drug to be more or less effective. You’ll also develop skills to help patients understand what the physician has told them about their medications during an office
visit, as well as what adverse reactions to look for and how to handle such situations.

**Local and Systemic Effects**

Drugs are meant to affect the body in one of two ways:

- locally
- systemically

**DRUGS WITH LOCAL EFFECTS**

Drugs with local effects are used to treat one specific area of the body, for example:

- **Lidocaine (LidoPen Auto-Injector, Xylocaine) injection.** A dentist may give this medication to numb a patient's jaw before filling a cavity in a tooth.
- **Lidocaine patch.** A physician may prescribe this patch to relieve the pain of shingles.
- **Bacillus Calmette-Guérin (BCG) solution.** Physicians prescribe this medication to prevent and treat bladder cancer tumors. A catheter is used to place the BCG solution into the bladder.
- **Corticosteroid creams.** Physicians prescribe these creams to counteract inflammation caused by eczema, a skin rash.
- **Sunblocks.** These over-the-counter (OTC) medications protect the skin against ultraviolet rays.
- **Benzoyl peroxide (Acne-5, Benzac, Desquam-X 10% Wash, Dryox Wash, Exact, Loroxide, Neutrogena Acne Mask).** Physicians often recommend this OTC treatment to treat mild cases of acne.
- **Oxymetazoline hydrochloride (OcuClear, Visine L.R.).** These eye drops help relieve dry eyes.
- **Atropine sulfate (Atropine-1, Atropisol, Isopto Atropine).** Optometrists and ophthalmologists use a form of this drug as eye drops. The drops open, or dilate, the pupil of the eye so the physician can examine the inside of the eye.
- **Lindane.** Physicians may prescribe this insecticide to treat resistant cases of head lice.

Sometimes, however, a drug will have systemic side effects. For example, BCG immunotherapy can result in lung infec-
tion, and lidocaine injections can cause cardiac irregularities. Some medications can have both local and systemic effects, depending on the route of administration.

**DRUGS WITH SYSTEMIC EFFECTS**

Drugs with systemic effects travel through the bloodstream to reach specific body tissues. The body has nine major organ systems. Each system is made up of organs and tissues that work together as a unit. Drugs with systemic effects target specific systems, although they may have effects on other bodily systems as well. The table on page 108 lists the body’s systems and identifies some drugs that target them.

Sunblock is an example of an over-the-counter drug with local effects.

**USING OTHER PEOPLE’S MEDICATIONS**

*I know it’s inappropriate for one person to take another person’s medication, but how do I explain to patients why that is the case?*

Suppose a patient who wants to save money asks you if it’s safe to take medications prescribed for a friend or relative. “After all,” this patient reasons, “I have high blood pressure just like my friend does.”

Of course, you’ll explain to this patient that it’s not safe for him to take someone else’s medications. Each patient’s medical history and condition are unique, and medications are carefully prescribed for each individual’s unique circumstances. In this case, the underlying medical reason why someone has high blood pressure can be different for each person. A drug that helps one person might actually harm another person. For example, some blood pressure medications are diuretics that alter the potassium level in the blood and can cause life-threatening cardiac arrhythmias. Also, a medication that was not prescribed specifically for a particular patient may interact with other medications being taken. Advise the patient to speak with the physician about obtaining the medication and dosage that’s right for him.
## Common Drugs and the Body’s Systems

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<tr>
<th>Body System</th>
<th>Main Organs</th>
<th>Medication</th>
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</thead>
<tbody>
<tr>
<td>Central nervous system</td>
<td>brain and spinal cord</td>
<td>eszopiclone (Lunesta)—a sleeping pill</td>
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<tr>
<td></td>
<td></td>
<td>haloperidol (Haldol)—an antipsychotic drug</td>
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<tr>
<td></td>
<td></td>
<td>diazepam (Diastat, Diazepam Intensol, Valium)—an antianxiety drug</td>
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<tr>
<td>Respiratory system</td>
<td>lungs and breathing passages</td>
<td>ibuprofen (Advil, Motrin, Nuprin)—relieves pain and swelling</td>
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<tr>
<td></td>
<td></td>
<td>pseudoephedrine hydrochloride (Dimetapp, PediaCare Infants’ Decongestant Drops, Sudafed, Triaminic)—relieves nasal congestion</td>
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<tr>
<td></td>
<td></td>
<td>albuterol (Proventil, Ventolin)—treats asthma</td>
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<tr>
<td>Cardiovascular system</td>
<td>heart, veins, arteries</td>
<td>milrinone lactate (Primacor)—for heart failure</td>
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<td></td>
<td></td>
<td>nitroglycerin (Nitro-Bid, Nitro-Dur, Nitrogard)—prevents and relieves angina (chest pain)</td>
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<td></td>
<td></td>
<td>isosorbide mononitrate (Imdur, ISMO, Isotrate ER, Monoket)—prevents angina attacks</td>
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<tr>
<td>Gastrointestinal system</td>
<td>stomach, large and small intestines</td>
<td>carvedilol (Coreg)—controls high blood pressure (hypertension)</td>
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<td></td>
<td></td>
<td>warfarin sodium (Coumadin, Jantoven)—prevents blood clots</td>
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<tr>
<td>Urinary system</td>
<td>kidneys, bladder</td>
<td>omeprazole (Prilosec, Zegerid)—treats stomach ulcers and acid reflux disease</td>
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<td></td>
<td></td>
<td>cinetidine (Tagamet, Tagamet HB)—an antacid</td>
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<tr>
<td>Endocrine system</td>
<td>hormone-releasing glands such as the thyroid, adrenal, and pituitary glands</td>
<td>furosemide (Lasix)—controls fluid buildup from chronic heart failure</td>
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<tr>
<td></td>
<td></td>
<td>tolterodine tartrate (Detrol, Detrol LA)—controls overactive bladder</td>
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<tr>
<td>Reproductive system</td>
<td>vagina, uterus; penis, testicles</td>
<td>rosiglitazone maleate (Avandia)—treats type 2 diabetes</td>
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<td></td>
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<td>somatropin (Genotropin, Genotropin MiniQuick, Humatrope, Norditropin, Nutropin, Nutropin AQ, Saizen, Serostim)—a synthetic human growth hormone</td>
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<td></td>
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<td>levothyroxine sodium (Levothroid, Levoxine, Levoxyl, Novothryox, Synthroid)—a thyroid hormone</td>
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<td></td>
<td></td>
<td>insulins (Humalin R, Humulin 70/30, Lantus)—decrease blood glucose in patients with type 1 or type 2 diabetes</td>
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<td>Immune system</td>
<td>thymus, spleen, lymph nodes</td>
<td>ritodrine hydrochloride (Yutopar)—used to stop premature labor</td>
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<td>tatalafil (Cialis)—treats erectile disorders</td>
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<td>sildenafil (Viagra)—treats erectile disorders</td>
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<td>amoxicillin (Amoxil, Trimox)—treats bacterial infections</td>
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<td></td>
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<td>tetracycline (Achromycin, Sumycin)—a broad-spectrum antibiotic</td>
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<td></td>
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<td>pneumococcal 7-valent conjugate vaccine (Prevnar)—immunizes infants and toddlers against pneumonia</td>
</tr>
<tr>
<td>Musculoskeletal system</td>
<td>the muscles and bones of the skeleton</td>
<td>alendronate sodium (Fosamax)—prevents brittle bones (osteoporosis)</td>
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<tr>
<td></td>
<td></td>
<td>etanercept (Enbrel)—treats inflammation and deformity of the joints caused by rheumatoid arthritis</td>
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</table>
How Drugs Work in the Body

The two most common forms in which medications are given are solid and liquid. Drugs in solid form include tablets and capsules that a patient takes by mouth. Drugs in liquid form can be taken by mouth or given by injection.

Drugs taken by mouth (except liquids) go through three phases after they are swallowed.

- pharmaceutic phase
- pharmacokinetic phase
- pharmacodynamic phase

Drugs swallowed as liquids or given by injection do not have to dissolve. They go through only two phases after they are swallowed.

- pharmacokinetic phase
- pharmacodynamic phase

THE PHARMACEUTIC PHASE—ENTERING THE BODY

Tablets and capsules both go through the pharmaceutic phase. During this phase, the tablet or capsule breaks into small particles in the gastrointestinal tract, where it dissolves and releases the medication into the body.

DO NOT BUY THE “PHARM” ON THESE TERMS!

Break these pharma- words into parts to help yourself remember what they mean.

pharmaco + kinetic
pharmaco + dynamic

- Pharmaco refers to the drug.
- Kinetic refers to motion and movement. Therefore, pharmacokinetic means the drug goes where it’s supposed to go.
- Dynamic refers to force and power. Therefore, pharmacodynamic means the drug does what it’s supposed to do.
During the pharmaceutic phase, drugs in solid form turn into a form the body can take in and use. Drug companies do a great deal of research to get the pharmaceutic phase right.

- Some tablets are made to dissolve, or break up, in stomach acids.
- Time-release capsules and extended-release capsules are made to dissolve very slowly in the stomach.
- Enteric coated tablets do not break apart until they pass through the stomach and reach the intestines. The enteric coating protects them from being dissolved by stomach acids, but allows them to dissolve in the alkaline environment of the small intestine.

Drugs that are already dissolved do not go through the pharmaceutic phase because they are already in a form the body can use. These medications include liquids that a patient swallows and drugs that are injected into the body.

THE PHARMACOKINETIC PHASE—ENTERING THE BLOODSTREAM

After a patient swallows a pill or capsule, the medication dissolves and then moves into the next phase. That phase is the pharmacokinetic phase, during which the drug becomes available for use in the body. Pharmacokinetics refers to activities involving the drug within the body after it has been administered. One reason why injected medications can take effect so quickly is that they are ready for use immediately as liquids.

Once it’s inside the body, a drug goes through four activities:

- absorption
- distribution
- metabolism
- excretion

Absorption

When the body absorbs a drug, it takes the drug into the bloodstream through the walls of the stomach or intestines. The bloodstream carries the drug to the places in the body that the drug is meant to reach and affect.

The body does not absorb every drug with the same speed. The speed depends on how the drug is given.

- Drugs get absorbed fastest when they are inhaled, injected intravenously (directly into the bloodstream), or administered sublingually (placed under the tongue).
The second-fastest way for a drug to be absorbed into the body is by intramuscular injection, which means by injecting the drug directly into a muscle. The third-fastest way is by subcutaneous injection, which means by injecting the drug below the skin. Other factors besides the method of administration affect how quickly a drug is absorbed. Some drugs dissolve faster than other drugs, and conditions inside the body may also affect how quickly a drug can start to work.

**Distribution**

The bloodstream carries the drug to the target place, the place within the body where the drug is supposed to go. Once the drug reaches the correct site, sometimes only part of the drug is available to do its job. This is called bioavailability. Portions of the drug may not be available because they have been bound to protein in the blood. Sometimes, drugs sent to target areas are not fat soluble, and they can’t cross body tissues around the brain, placenta, or testes.

If the blood level in the body were reduced, as it would be if the patient were bleeding heavily, the medication might not work. Likewise, if the blood level is too high, the drug may have a harmful effect.

**Metabolism**

You probably already know one meaning of the word metabolism. It refers to the process by which the body turns food into energy. Metabolism has another slightly different meaning when it’s applied to medications. When the liver metabolizes a drug, it takes out all the important chemicals the body needs. These chemicals are the drug’s active ingredients. Then, the liver turns what is left into inactive substances that the body can get rid of. Sometimes, the liver can’t metabolize a drug fully. Patients who have liver disease may need lower dosages of a drug.

**Excretion**

The liver gets rid of the inactive leftovers of a drug by sending them to the kidneys. The kidneys get rid of the leftovers in the urine. The name for this process is excretion.

Some medications bypass the liver and go directly through the kidneys and into the patient’s urine. The physician may need to give patients with kidney disease lower dosages of the drug. Physicians may also need to monitor these patients’ kidney (renal) functions to be sure there is no kidney failure.

Some medications bypass both the liver and the kidneys in leaving the body. These drugs are eliminated from the body
through sweat, breast milk, breathing, and feces.

**Half-Life**

The **half-life** of a drug is the time it takes the body to eliminate 50% of the drug.

- If a drug has a short half-life (2 to 4 hours), it may be necessary to administer the drug frequently. Aspirin (Bayer Aspirin, St. Joseph’s Aspirin) and acetaminophen (Tylenol) are two OTC medications that have a short half-life.

- If a drug has a long half-life (21 to 24 hours), it may be administered less often. Many prescription medications generally require only daily dosages to stay effective.

Patients with liver or kidney disease may have problems eliminating a drug. For them, a drug may have a longer half-life. A drug may build up to toxic, or harmful, levels inside these patients because their bodies can’t eliminate the drug fast enough. The physician must adjust dosages and order liver or kidney tests, as needed, to ensure that the medication won’t harm the patient.

**THE PHARMACODYNAMIC PHASE—GOING INTO ACTION**

**Pharmacodynamics** are a drug’s actions and effects within the body. The pharmacodynamic phase of a drug is the phase when the drug begins to work. It includes the actions the drug takes

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**KIDNEY FUNCTION IN OLDER AND YOUNGER PATIENTS**

- Kidney function in children is not as developed as it is in adults. Thus, children often need lower dosages of a drug. The physician may also need to order tests to monitor children’s kidney function.

- The kidneys of older adults may not work as well as they did earlier in adulthood. The physician may need to monitor the kidney function of older adult patients closely.
and the effects it has on the body before excretion. When a drug travels through the bloodstream, the whole body is exposed to its possible effects.

- The primary effect of a drug is what the active ingredient in the drug is intended to do. Some possible primary effects are to relieve pain, lower blood sugar, or lower cholesterol.

- All other effects of a drug are secondary effects. Some secondary effects are desirable, whereas others are not. For example, aspirin relieves pain but can also upset the stomach.

Most drugs are designed to work on specific bodily organs or tissues, which are the target sites for the drug. The drugs have their greatest effect on those areas. The drugs usually change how the cells in the target site behave or react.

**DRUG REACTIONS**

Drugs produce many chemical reactions in the body. In Chapter 1, you learned about how the United States Food and Drug Administration (FDA) approves and monitors drugs. During clinical trials and testing, the drug manufacturers try to identify all of the beneficial and harmful effects a drug can have on different groups of people. During the approval stage, the data they gather are given to the FDA for further review. From this research, the FDA and the manufacturer determine who benefits most from taking the drug. An important result of this process is identifying those individuals whom the drug will *not* help and whom it could potentially harm. These findings are listed on the package inserts that accompany medications under the heading *contraindications*.

**CONTRA- WHAT?**

Breaking the word *contraindication* into its word parts can help you decipher its meaning.

- contra = “against”
- indication = “sign”

Contra- has the same meaning—“against”—as in the words *contradict* and *contraception*. A *contraindication* is a “sign against” prescribing the drug.
What Are Contraindications?

Contraindications are the circumstances under which a drug or treatment should not be used. As a clinical medical assistant, you should become familiar with the contraindications of drugs commonly prescribed in your office. Likewise, you need to be aware of special circumstances in patients’ lives that can affect their use of a drug. Be ready to remind the physician about those circumstances if the patient forgets to mention them.

Adverse Reactions

Patients may experience harmful side effects, or adverse reactions, when they take a drug. As a medical assistant, you need to be vigilant, because these undesirable effects are often not predictable. Depending on the patient and the medication,

MAKE SURE THE PHYSICIAN KNOWS

Some patients think that a physician knows or can notice everything important about them. It’s impossible for that to be true.

- Remind the physician if a patient is in recovery from alcohol abuse. The physician can prescribe the patient medications that do not have an alcohol base.
- Certain drugs can be harmful to a fetus. If you know that a patient has been trying to get pregnant, be sure she lets the physician know.
- If you know a new patient has young children at home, be sure the physician knows. Aspirin is safe for most adults to take, but it’s contraindicated in children. Studies have shown a possible link between aspirin use in children and Reye syndrome, a brain disease that can be fatal.
adverse reactions can include any combination of the following. They may:

- be mild, severe, or even life threatening
- happen after the first dose, after several doses, or after many doses
- happen in a predictable way or without warning

**Allergic Reactions**

Patients can be allergic to medications, just as they can be allergic to other substances. An **allergic reaction** happens when the patient’s immune system responds to the drug as if it were
Another name for an allergic reaction is a hypersensitivity reaction.

being invaded by a foreign substance, or antigen. The immune system produces antibodies to combat the invader.

Allergic reactions to drugs usually take time to build up. Remember these facts when you take a patient’s medication history:

- Most allergic drug reactions occur after the patient has received more than one dose of a drug.
- If the patient experiences an allergic reaction after taking a medication for the first time, it’s possible that the patient may have taken the drug at some time in the past but does not remember it.
- Find out how allergies or reactions are flagged in the patients’ charts (that is, the method your office uses, such as a red pen or bright orange sticker).
Signs and Symptoms of Drug Allergies

Look and listen for the following signs and symptoms of drug allergies. Both over-the-counter and prescription drugs can cause them.

- itching
- skin rash
- urticaria (hives)—one or more pale, itchy, pink swellings of the skin that may burn or sting
- dyspnea—difficulty breathing
- wheezing
- cyanosis—a bluish discoloration of the lips, face, fingertips, or other body parts
- swelling of the eyes, lips, or tongue
- sudden loss of consciousness

RESPONDING TO ALLERGIC REACTIONS

What if a patient begins having difficulty breathing shortly after you administer an injection?

Any health care professional who administers medications to patients needs to be cautious about allergic reactions. As a medical assistant, you’ll be the backup “eyes and ears” for the physician and other medical staff members.

A patient who begins experiencing difficulty breathing may be having an allergic reaction to the drug. A more serious allergic reaction, anaphylactic shock, is life-threatening. (Anaphylactic shock is a severe allergic reaction that may result in death.) All drug reactions should be taken seriously.

Allergic reactions that occur immediately after a drug has been administered are usually the most serious. That’s one reason why patients are asked to wait for 20 minutes before leaving the office after an injection. It’s important to report any suspected allergic reactions to the physician because the patient may need emergency treatment.

Signs and symptoms of severe allergic reactions are often related to breathing problems and tissue swelling. Check the patient for wheezing, cyanosis, itching, hives, sweating, and swelling of the eyes, lips, mouth, or throat. If you notice any of these symptoms after administering a drug to a patient, alert the physician immediately!
Angioedema
Angioedema is another type of allergic reaction to a medication. Edema is an abnormal build-up of fluid. Patients with angioedema look like they have welts, or ridges, below the skin. The painless welts usually appear around the eyes, lips, mouth, and throat, and sometimes other parts of the body.

Angioedema can be dangerous when the patient’s mouth is affected, because the swelling can block the patient’s airway and cause asphyxia (suffocation). If you notice that a patient has difficulty breathing or has swelling in any part of her body, tell the physician immediately.

Anaphylactic Shock
The most serious allergic reaction a patient may have to a drug is anaphylactic shock. This type of reaction requires immediate medical attention. Anaphylactic shock usually occurs soon after a patient is given a drug to which he is extremely sensitive. Teach yourself to look for the signs and symptoms of anaphylactic shock listed in the table below.

Idiosyncratic Reactions
Sometimes a drug acts on a patient in a way other than the drug manufacturer intended. The response to the drug is unusual and different from what is normally expected. This type of response

<table>
<thead>
<tr>
<th>Signs and Symptoms of Anaphylactic Shock</th>
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</thead>
<tbody>
<tr>
<td><strong>Respiratory system</strong></td>
</tr>
<tr>
<td>- bronchospasm (severe narrowing of the airways into the lungs)</td>
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<tr>
<td>- dyspnea (difficulty breathing)</td>
</tr>
<tr>
<td>- feeling of fullness in the throat</td>
</tr>
<tr>
<td>- cough</td>
</tr>
<tr>
<td>- wheezing</td>
</tr>
<tr>
<td><strong>Cardiovascular system</strong></td>
</tr>
<tr>
<td>- extremely low blood pressure</td>
</tr>
<tr>
<td>- tachycardia (rapid heart rate—greater than 100 beats per minute)</td>
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<tr>
<td>- palpitations (irregular or forceful beating of the heart)</td>
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<tr>
<td>- syncope (fainting)</td>
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<tr>
<td>- cardiac arrest (heart attack)</td>
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<tr>
<td>- urticaria (skin rash)</td>
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<tr>
<td>- angioedema (welts below the skin)</td>
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<tr>
<td>- pruritus (itching)</td>
</tr>
<tr>
<td>- sweating</td>
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<tr>
<td>- nausea</td>
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<tr>
<td>- vomiting</td>
</tr>
<tr>
<td>- abdominal pain</td>
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</tbody>
</table>

| Skin                                    |
| - urticaria (skin rash) |
| - angioedema (welts below the skin) |
| - pruritus (itching) |
| - sweating |
| - nausea |
| - vomiting |
| - abdominal pain |

| Gastrointestinal system                 |
| - abdominal pain |
is called **drug idiosyncrasy**. For example, suppose a patient is given a sleeping pill to relax her and help her sleep. But instead, the drug has the opposite effect, and the patient remains wide awake and shows signs of nervousness and excitement.

Why do some patients have an idiosyncratic response (a response peculiar to that individual) to a drug? It’s not clear. Some researchers speculate that a person’s genetic makeup may make them unable to tolerate certain drugs.

### Drug Tolerance

Some patients build up a tolerance to a drug. **Drug tolerance** is a decreased response to a drug; taking the same dosage no longer has the same effect. These patients may need a larger dosage of the painkiller, sleep medication, or other drug to get the desired results.

Patients may, on their own, decide to increase the dose of a medication so they will get relief. Counsel them to follow the
Cumulative Drug Effect

The liver and kidneys are the organs that metabolize and excrete medications from the body. Patients with liver or kidney disease may develop problems with the active ingredients in the drugs they take. They may become unable to fully metabolize and excrete one dose of a medication before they take the next one. A part of the first dose remains active in the body, and a cumulative drug effect may happen. Too much of the drug can build up in the body and cause a harmful reaction.

Toxic Reactions

Drugs are designed to be safe for most patients. However, most drugs can produce toxic, or harmful, reactions under the following circumstances:

- The dosages are too large.
- An unsafe amount of the drug remains in the bloodstream. An amount is unsafe if it’s greater than the therapeutic level, which is the level usually used to treat the patient’s condition.
- The kidneys are not working correctly and can’t excrete the drug in the patient’s urine.

Be aware of the signs and symptoms of toxicity of the drugs that the physicians in your office commonly prescribe.
DRUG INTERACTIONS

Medications work by interacting with the chemistry of the human body to produce their results. They also interact with the things people put into their bodies, including foods and other drugs. As a clinical medical assistant, you need to be aware of these interactions so that you can help to keep patients safe.

Drug–Drug Interactions

The patients you encounter in the medical office probably take more than just the drugs and medications prescribed by the physician. It’s likely that they are also taking over-the-counter medications such as acetaminophen or ibuprofen (Advil, Motrin, Nuprin) for pain; famotidine (Pepcid, Pepcid AC, Pepcid RPD), calcium carbonate (Maalox Antacid Caplets, Oscal, Rolaids Calcium Rich, Tums, Viactiv), or other antacids for heartburn; as well as herbal supplements and vitamins.

DRUG TOXICITY AND PATIENT AWARENESS

As a medical assistant, the short-term and long-term well-being of patients must always be your priority. Remember these facts about drug toxicity.

- Certain drugs can cause toxic reactions in some patients even when the drugs are given at the recommended dose.
- Some toxic effects happen immediately, and some build up over time. They may not be seen for weeks or even months.
- Some toxic drug effects can be reversed depending on the organ involved. For example, liver cells can regenerate, or grow back, after being damaged. Full liver function can be restored.
- There are some toxic drug effects that can’t be reversed. A toxic reaction to streptomycin is an example. Streptomycin, an antibiotic, is used to control infections. However, a toxic reaction to it can do irreversible damage to the eighth cranial nerve and cause hearing loss.

Any medication allergies should be carefully recorded in the patient’s medication history.
for nutrition. They may be taking medications prescribed by other physicians, such as specialists who treat them for chronic diseases. Additionally, they may be taking antibiotics after dental surgery.

Drug–drug interactions occur when one drug interacts with or interferes with the action of another drug. There are scientific terms for these interactions.

- **Synergism** occurs when two drugs work together.
- **Antagonism** is when one drug reduces the effects of the other drug.
- **Potentiation** occurs when one drug increases or prolongs the effects of the other drug.

### Synergistic Drug Reactions

Drug synergism happens when two or more drugs work together to produce an effect that is greater than what each drug would have produced by itself.

Combination medications take advantage of the positive aspects of synergism. For example, a physician or dentist might prescribe acetaminophen mixed with codeine (Tylenol with Codeine No. 3) for pain relief after minor surgery. The acetaminophen enhances the effect of codeine as a pain reliever.

However, negative effects of synergism can occur, such as when tranquilizers are combined with alcohol intake. The increased effects of sedation can lead to severely impaired judgment or death.

### Antagonistic Drug Reactions

When two drugs have an antagonistic effect on each other, one drug interferes with the action of the other drug. Either they cancel each other out, or one drug makes the other drug less powerful.

For example, the drug heparin (Heparin Sodium Injection) is sometimes called a blood thinner because it keeps blood
from clotting. It’s used to treat blood clots and is often used in heart surgery. To treat a heparin overdose, physicians use protamine sulfate. This drug, a heparin antagonist, totally neutralizes, or cancels out, heparin’s effects. Another example is that certain antibiotics may render hormone-based contraceptives ineffective.

**Ask the Professional**

**OBTAINING COMPLETE MEDICATION HISTORIES**

**Q:** I’ve had a difficult time obtaining complete medication histories from patients. Some patients aren’t able to remember all the medications they take. Other patients become offended when I ask about alcohol or recreational drug use. I know it’s my job to gather this information, but what should I do when patients can’t or won’t provide it?

**A:** Encourage patients to be forthcoming and complete. Explain that, because of the harmful nature of certain drug interactions, it’s important for the physician to be aware of all the medications patients are currently taking.

If a patient is unable to remember which medications he’s taking, start by asking him for a complete listing of the physicians, dentists, and other health care professionals he is seeing. This may help the patient recall which physicians prescribed his medications. Next, if the patient can’t think of the names of the drugs he takes, have the patient or a family member collect the patient’s prescription and OTC medications in a plastic bag and bring them to the patient’s next appointment. Finally, ask the patient when he takes each medication and whether he has adjusted drug dosages on his own. Explain that the physician needs to know whether the patient has been taking his medication the correct way.

If a patient is uncomfortable with discussing his alcohol or drug use, gently remind him that the information will remain confidential. Explain that the physician needs to know this information because alcohol and certain drugs can interact with medications. However, harmful interactions can be avoided if the physician has thorough and accurate information about the patient’s medication history.
Patients sometimes need to be warned about antagonistic reactions. For example, a patient who is taking the antibiotic tetracycline (Achromycin, Sumycin) by mouth should be warned not to use antacids because they decrease the effectiveness of tetracycline.

**Food–Drug Interactions**

The foods we eat also affect how drugs act in the body. Foods, like drugs, contain chemicals that affect us. The caffeine in soft drinks and coffee is a stimulant. The glucose in Halloween candy can cause a “sugar rush” in trick-or-treaters. Candy can also be used as a medical therapy. Patients with type 1 diabetes who are experiencing hypoglycemia (low blood sugar levels) are told to suck on some hard candy to quickly treat the condition.

Patients need to know about any interactions between the foods they eat and the medications the physician prescribes. They may need to adjust their diets in order to get the most from their medications. By being aware of these issues, you’ll be able to provide patients with the correct information.

### MORE ABOUT FOOD-DRUG INTERACTIONS

Learn as much as you can about the medications commonly prescribed by the physician you assist. Here is some information about several common medications.

<table>
<thead>
<tr>
<th>Food Caution</th>
<th>Drug Name</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not take with dairy products.</td>
<td>doxycycline (Vibramycin)</td>
<td>Antibiotic (tetracycline)</td>
</tr>
<tr>
<td></td>
<td>tetracycline hydrochloride (Achromycin, Sumycin)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>oxytetracycline (Terramycin)</td>
<td></td>
</tr>
<tr>
<td>Do not take with fruit juice.</td>
<td>nafcillin (Unipen, Nalpen)</td>
<td>Antibiotic (penicillin)</td>
</tr>
<tr>
<td></td>
<td>ampicillin (Omnipen, Princpen)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>cloxacillin (Tegopen)</td>
<td></td>
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<tr>
<td></td>
<td>penicillin G benzathine (Bicillin L-A)</td>
<td></td>
</tr>
</tbody>
</table>
**Certain medications should be taken with food to avoid upset stomach.**

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### When an Empty Stomach Is Best

Medicine taken on an empty stomach gets absorbed into the bloodstream faster than when food is in the stomach. Some medications are most effective when they are taken on an empty stomach. For example, food may interfere with the body’s absorption of the antibiotics ampicillin (Principen) and nafcillin (Unipen).

### When Food Is the Key

Always know about a drug’s peculiarities. Some medications irritate the stomach and cause nausea, vomiting, or epigastric irritation (irritation in the upper central part of the abdomen). The following medications can be taken with food to make an upset stomach less likely:

- ibuprofen (Motrin, Advil, Nuprin)—an analgesic and anti-inflammatory drug
- amoxicillin (Amoxil)—an antibiotic
- verapamil (Calan)—a heart medication

Other drugs, when taken with certain foods, produce enhanced effects in the body. For example, orange juice helps increase the body’s absorption of iron.

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<table>
<thead>
<tr>
<th>Food Caution</th>
<th>Drug Name</th>
<th>Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Do not take with caffeine.</td>
<td>ciprofloxacin (Cipro)</td>
<td>Antibiotic (fluoroquinolone)</td>
</tr>
<tr>
<td>Do not take with tyramine-rich foods:</td>
<td>phenelzine (Nardil)</td>
<td>monoamine oxidase (MAO)</td>
</tr>
<tr>
<td>avocados</td>
<td>tranycypromine (Parnate)</td>
<td>inhibitors</td>
</tr>
<tr>
<td>bananas</td>
<td>isoniazid (Nydrazid)</td>
<td>Antituberculars</td>
</tr>
<tr>
<td>raisins</td>
<td></td>
<td></td>
</tr>
<tr>
<td>cheese</td>
<td></td>
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<tr>
<td>chocolate</td>
<td></td>
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<tr>
<td>yeast</td>
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<td></td>
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<tr>
<td>wine</td>
<td></td>
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<tr>
<td>salami/pepperoni</td>
<td></td>
<td></td>
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<tr>
<td>bologna</td>
<td></td>
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<tr>
<td>hot dogs</td>
<td></td>
<td></td>
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<tr>
<td>sausage</td>
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<tr>
<td>beer</td>
<td></td>
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<tr>
<td>sour cream</td>
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<tr>
<td>yogurt</td>
<td></td>
<td></td>
</tr>
<tr>
<td>fava or broad beans</td>
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</tbody>
</table>

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Factors Influencing Drug Responses

Every patient is an individual from a medical point of view. This means that all patients will not react to the same drug in exactly the same way. These are some of the factors that influence an individual’s response to a drug:

- age
- weight
- gender
- pre-existing disease or condition

AGE

A patient’s age can affect how well a drug can do its intended job. Infants and children usually require smaller doses of a medication than adults need. Furthermore, some drugs are not even tested for use in children. The kidneys, liver, and other organs are immature in children, which affects a child’s ability to metabolize, or take what it needs from, a drug.

Elderly patients may also require smaller doses of a drug, although this may depend on the type of drug. For instance,
an elderly patient may need a smaller dose of a sleeping aid than a 20- or 30-year-old patient. Both, however, will require the same sized dose of an antibiotic.

WEIGHT

The dosages for medications are generally calculated for a person of average weight, or 150 pounds in both men and women. If a patient weighs significantly more or less than 150 pounds, the physician may adjust the dosage to produce the desired effect.

GENDER

The patient’s gender may affect how some drugs work. A female patient may require a smaller dose of some

CLOSER LOOK

MULTIPLE MEDICATIONS AND ADVERSE REACTIONS

Elderly patients are often treated for more than one long-term, or chronic, medical condition. These patients may be taking a variety of medications to keep their conditions under control. They may be receiving medications from several specialists as well as from their primary care physician. Polypharmacy, or the taking of multiple drugs, is common in elderly patients. The danger of polypharmacy is that it increases the risk of adverse reactions.

As a medical assistant, you should encourage elderly patients who are starting a new treatment plan to be very explicit with each physician about all of the medications they are taking. Also, patients should be encouraged to use only one pharmacist who has a history of their past medication use.
medications than a male patient because of differences in the makeup of their bodies. Adult men and women differ in the average amount of body fat they have and in the ratio of body mass to body water.

**PRE-EXISTING DISEASE OR CONDITION**

The presence of liver or kidney disease in a patient may also affect a physician’s decision to prescribe a specific drug. Disease in these organs can prevent a patient from metabolizing a drug or excreting it through the kidneys.

Pregnancy can also affect the physician’s choice of medications because the drugs may pass into the bloodstream of the unborn child, injuring the fetus. If you’re aware that a patient is pregnant or might become pregnant, remind her to tell the physician immediately.

- Drugs are meant to affect the body either locally or systemically. Drugs with local effects affect only one spot or part of the body. Drugs with systemic effects, such as high blood pressure medications, travel through the bloodstream to reach specific body tissues or target sites.

- The body absorbs a drug by taking it into the bloodstream through the walls of the stomach or intestines. The bloodstream distributes the drug by carrying it to the target site.

- When the liver metabolizes a drug, it takes out the active ingredients and turns what is left into inactive substances that the body can get rid of through the kidneys in a process called excretion.

- Reasons a drug might be contraindicated include the drug’s known adverse reactions, allergic reactions caused by the drug, harmful cumulative effects, and possible toxic reactions in certain individuals.

- Angioedema and anaphylactic shock are two serious allergic reactions. When a patient experiences angioedema, the eyes, lips, or tongue may become swollen. Symptoms of anaphylactic shock can include difficulty breathing, irregular or rapid heart rate, fainting, skin rash, sweating, and vomiting. Both types of allergic reactions require immediate medical attention.
• Synergistic drug reactions occur when two drugs together produce an effect that is greater than what each drug would have produced by itself. Antagonistic drug reactions occur when one drug interferes with the action of another drug, canceling it out or making it less powerful.

• Age, weight, gender, and pre-existing diseases or medical conditions, including pregnancy, can affect a patient’s response to a drug. Dosages may need to be adjusted to meet each patient’s specific circumstances.

• Drugs also interact with foods. Some medications need to be taken with food to avoid irritating the stomach. Others should be taken on an empty stomach because food interferes with their absorption. Some drugs interact with certain foods that lessen or cancel the drugs’ effects.