

Drugs

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Objectives

After study of this chapter you should be able to:

1. Explain the difference between over-the-counter and prescription drugs.
2. List some potential adverse effects of drugs.
3. Explain ways in which drugs can interact.
4. Explain the difference between the generic name and the trade name of a drug.
5. List several drug references.
6. Describe some of the issues involved in the use of herbal medicines.
7. Identify and use word parts pertaining to drugs.
8. Recognize the major categories of drugs and how they act.
9. List some common herbal medicines and how they act.
10. List common routes for drug administration.
11. List standard forms in which liquid and solid drugs are prepared.
12. Define abbreviations related to drugs and their use.
13. Analyze the terminology related to drugs in several case studies.

A drug is a substance that alters body function. Traditionally, drugs have been derived from natural plant, animal, and mineral sources. Today, most are manufactured synthetically by pharmaceutical companies. A few, such as certain hormones and enzymes, have been produced by genetic engineering.

Many drugs, described as over-the-counter (OTC) drugs, are available without prescription. Others require a health care provider's prescription for use. Responsibility for the safety and efficacy of all drugs sold in the United States lies with the Federal Food and Drug Administration (FDA), which must approve all drugs before they are sold.

Adverse Drug Effects

Most drugs have potential adverse effects or side effects that must be evaluated before being prescribed. In addition, there may be contraindications, or reasons not to use a particular drug for a specific individual based on that person's medical conditions, current medications, sensitivity, or family history. Also, while a patient is under treatment, it is important to be alert for signs of adverse effects such as digestive upset, changes in the blood, or signs of allergy, such as hives or skin rashes. Anaphylaxis is an immediate and severe allergic reaction that may be caused by a drug. It can lead to life-threatening respiratory distress and circulatory collapse.

Because drugs given in combination may interact, the prescriber must know of any drugs the patient is taking before prescribing another. In some cases, a combination may result in synergy or potentiation, meaning that the drugs together have a greater effect than either of the drugs acting alone. In other cases, one drug may act as an antagonist of another, interfering with its action. Drugs may also react adversely with certain foods or substances used socially, such as alcohol and tobacco.

Drugs that act on the central nervous system may lead to a psychological or physical substance dependence, in which a person has a chronic or compulsive need for a drug regardless of its bad effects. With repeated use, a person may develop a drug tolerance, whereby a constant dose has less effect and the dose must be increased to produce the original response. Cessation of the drug then leads to symptoms of substance withdrawal, a state that results from reduction or removal of a drug. Certain symptoms are associated with withdrawal from specific drugs.

Drug Names

Drugs may be cited by either their generic or their trade names. The generic name is usually a simple version of the chemical name for the drug and is not capitalized. The trade name (brand name, proprietary name) is a registered trademark of the manufacturer and is written with an initial capital letter. The same drug may be marketed by different companies under different trade names.

Drug Information

In the United States, the standard for drug information is the *United States Pharmacopeia* (USP). This reference is published by a national committee of pharmacologists and other scientists. It contains formulas for drugs sold in the United States and standards for testing the strength, quality, and purity of drugs and standards for the preparation and dispensing of drugs. There is also the *Hospital Formulary*, published by the American Society of Health System Pharmacists, and the *Physicians' Desk Reference*, published yearly by Medical Economics Books, with information supplied by the manufacturers. Another excellent source of up-to-date information on drugs is a community or hospital pharmacist.

Box 8-1 Where Do They Get Those Names?

Drug names are derived in a variety of ways. Some are named for their origin. Adrenaline, for example, is named for its source, the adrenal gland. Even its generic name, epinephrine, informs us that it comes from the gland that is above the kidney. Pitocin, a drug used to induce labor, is named for its source, the pituitary gland, combined with the chemical name of the hormone, oxytocin. Botox, currently injected into the skin for cosmetic removal of wrinkles, is the toxin from the organism that causes botulism, a type of food poisoning. Aspirin (an anti-inflammatory agent), Taxol (an antitumor agent), digitalis (used to treat heart failure), and atropine (a smooth muscle relaxant) are all named for the

plants they come from. For example, aspirin is named for the blossoms of *Spiraea*, from which it comes. Taxol is named for the genus *Taxus*, of the yew from which it comes. Digitalis comes from purple foxglove, genus *Digitalis*. Atropine comes from the plant *Atropa belladonna*.

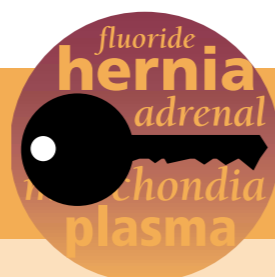
Some names tell about the drug or its actions. The name for Humulin, which is a form of insulin made by genetic engineering, points up the fact that this is human insulin and not a hormone from animal sources. Lomotil reduces intestinal motility and is used to treat diarrhea. The name belladonna is from Italian and means “fair lady,” because this drug dilates the pupils of the eyes, making women appear more beautiful.

Herbal Medicines

For hundreds of years, people have used plants to treat diseases, a practice described as herbal medicine or **phytomedicine**. Many people in industrialized countries are now turning to herbal products as alternatives or complements to conventional medicines. Although plants are the source of many conventional drugs, the active ingredients in these drugs usually are purified, measured, and often modified or synthesized rather than being used in their natural state.

Some issues have arisen with the increased use of herbals, including questions about their purity, safety, concentration, and efficacy. Another issue is drug interactions. Health care providers should ask about the use of herbal remedies when taking a patient’s drug history, and patients should report any herbal medicines they take when under treatment. The FDA does not test or regulate herbal medicines, and there are no requirements to report adverse effects. There are, however, restrictions on the health claims that can be made by the manufacturers of herbal medicines. The U.S. government has established the Office of Dietary Supplements (ODS) to support and coordinate research in this field.

Displays 8-1 through 8-5 (after the word exercises) summarize information on drugs. Display 8-1 outlines the major categories of drugs, with examples cited by both generic and trade names. Display 8-2 lists some common herbal medicines and their uses. Displays 8-3 through 8-5 have information on routes of administration, drug preparations, and injectable drugs. Refer to these displays as needed as you work through Part 3 of the text.



Key Terms

anaphylaxis
an-a fi-LAK-sis

An extreme allergic reaction that can lead to respiratory distress, circulatory collapse, and death

antagonist
an-TAG-o-nist

A substance that interferes with or opposes the action of a drug

contraindication <i>kon-tra-in-di-KĀ-shun</i>	A factor that makes the use of a drug undesirable or dangerous
efficacy <i>EF-i-ka-sē</i>	The power to produce a specific result; effectiveness
generic name	The nonproprietary name of a drug, that is, a name that is not privately owned or trademarked; usually a simplified version of the chemical name; not capitalized
potentiation <i>pō-ten-shē-Ā-shun</i>	Increased potency created by two drugs acting together
prescription (Rx) <i>prē-SKRIP-shun</i>	Written and signed order for a drug with directions for its administration
side effect	An undesirable effect of treatment with a drug or other form of therapy
substance dependence	A condition that may result from chronic use of a drug, in which a person has a chronic or compulsive need for a drug regardless of its adverse effects; dependence may be psychological or physical
synergy <i>SIN-er-jē</i>	Combined action of two or more drugs working together to produce an effect greater than any of the drugs could produce when acting alone; also called synergism (<i>SIN-er-jizm</i>)
tolerance	A condition in which chronic use of a drug results in loss of effectiveness and the dose must be increased to produce the original response
trade name	The brand name of a drug, a registered trademark of the manufacturer; written with a capital letter
withdrawal	A condition that results from cessation or reduction of a drug that has been used regularly

TABLE 8-1 Word Parts Pertaining to Drugs

WORD PART	MEANING	EXAMPLE	DEFINITION OF EXAMPLE
SUFFIXES			
-lytic	dissolving, reducing, loosening	anxiolytic <i>ang-zī-ō-LIT-ik</i>	agent that reduces anxiety
-mimetic	mimicking, simulating	sympathomimetic <i>sim-pa-thō-mi-MET-ik</i>	mimicking the effects of the sympathetic nervous system
-tropic	acting on	inotropic <i>in-ō-TROP-ik</i>	acting on the force of muscle contraction (<i>in/o</i> means "fiber")
PREFIXES			
anti-	against	antidote <i>AN-ti-dōt</i>	substance that counteracts a poison

TABLE 8-1 Word Parts Pertaining to Drugs, continued

WORD PART	MEANING	EXAMPLE	DEFINITION OF EXAMPLE
contra-	against	contraceptive <i>kon-tra-SEP-tiv</i>	preventing conception
counter-	opposite, against	countercurrent <i>kown-ter-KUR-ent</i>	flowing in an opposite direction
ROOTS			
alg/o, algi/o, algesi/o	pain	algesic <i>al-JĒ-sik</i>	painful
chem/o	chemical	chemotherapy <i>kē-mō-THER-a-pē</i>	treatment with drugs
hypn/o	sleep	hypnosis <i>hip-NŌ-sis</i>	an altered state with increased responsiveness to suggestion
narc/o	stupor	narcotic <i>nar-KOT-ik</i>	drug that induces stupor
pharmac/o	drug	pharmacy <i>FAR-ma-sē</i>	the science of preparing and dispensing drugs, or the place where these activities occur
pyr/o, pyret/o	fever	antipyretic <i>an-ti-pī-RET-ik</i>	counteracting fever
tox/o, toxic/o	poison, toxin	toxic <i>TOK-sik</i>	poisonous
vas/o	vessel	vasomotor <i>vas-ō-MŌ-tor</i>	pertaining to change in vessel diameter



Identify and define the suffix in each of the following words:

	Suffix	Meaning of Suffix
1. thrombolytic (<i>throm-bō-LIT-ik</i>)	_____	_____
2. parasympathomimetic (<i>par-a-sim-pa-thō-mi-MET-ik</i>)	_____	_____
3. chronotropic (<i>kron-ō-TROP-ik</i>)	_____	_____

Using the prefixes listed in Table 8-1, write the opposite of each of the following words:

4. pyretic	_____
5. indicated	_____
6. inflammatory	_____
7. balance	_____
8. septic	_____
9. conception	_____

Identify and define the root in each of the following words:

	Root	Meaning of Root
10. hypnotic	_____	_____
11. toxicity	_____	_____
12. chemistry	_____	_____
13. narcosis	_____	_____
14. pharmacist	_____	_____

Define each of the following words:

15. vasoconstriction	_____
16. pharmacology	_____
17. gonadotropic	_____
18. antitoxin	_____

ABBREVIATIONS

Drugs and Drug Formulations

APAP	Acetaminophen
ASA	Acetylsalicylic acid (aspirin)
cap	Capsule
elix	Elixir
FDA	Food and Drug Administration
INH	Isoniazid (antitubercular drug)
MED(s)	Medicine(s), medication(s)
NCCAM	National Center for Complementary and Alternative Medicine
NSAID(s)	Nonsteroidal anti-inflammatory drug(s)
ODS	Office of Dietary Supplements
OTC	Over-the-counter
PDR	<i>Physicians' Desk Reference</i>
Rx	Prescription
supp	Suppository
susp	Suspension
tab	Tablet
tinct	Tincture
USP	<i>United States Pharmacopeia</i>
ung	Ointment

Dosages and Directions

ā	Before (Latin, <i>ante</i>)
āā	Of each (Greek, <i>ana</i>)

ac	Before meals (Latin, <i>ante cibum</i>)
ad lib	As desired (Latin, <i>ad libitum</i>)
aq	Water (Latin, <i>aqua</i>)
bid	Twice a day (Latin, <i>bis in die</i>)
c̄	With (Latin, <i>cum</i>)
cc	Cubic centimeter
D/C, dc	Discontinue
ds	Double strength
gt(t)	Drop(s) (Latin, <i>gutta</i>)
hs	At bedtime (Latin, <i>hora somni</i>)
IM	Intramuscular(ly)
IU	International unit
IV	Intravenous(ly)
mcg	Micrograms
mg	Milligrams
LA	Long-acting
NS	Normal saline
p	After, post
pc	After meals (Latin, <i>post cibum</i>)
po	By mouth (Latin, <i>per os</i>)
pp	Postprandial (after a meal)
prn	As needed (Latin, <i>pro re nata</i>)
qam	Every morning (Latin, <i>quaque ante meridiem</i>)
qd	Every day (Latin, <i>quaque die</i>)
qh	Every hour (Latin, <i>quaque hora</i>)
q ____ h	Every ____ hours

ABBREVIATIONS

qid	Four times a day (Latin, <i>quater in die</i>)	SR	Sustained release
qod	Every other day (Latin, <i>quaque [other] die</i>)	ss	Half (Latin, <i>semis</i>)
s̄	Without (Latin, <i>sine</i>)	tid	Three times per day (Latin, <i>ter in die</i>)
SA	Sustained action	U	Unit(s)
SC, SQ, subcu	Subcutaneous(ly)	x	Times

DISPLAY 8-1 Common Drugs and Their Actions

CATEGORY	ACTIONS; APPLICATIONS	EXAMPLES	
		GENERIC NAME	TRADE NAME
adrenergics <i>ad-ren-ER-jiks</i> (sympathomimetics <i>[sim-pa-thō-mi-MET-iks]</i>)	mimic the action of the sympathetic nervous system, which responds to stress	epinephrine phenylephrine pseudoephedrine dopamine	Bronkaid Neo-Synephrine Sudafed Intropin
analgesics <i>an-al-JĒ-siks</i> narcotic <i>nar-KO-tik</i>	alleviate pain decrease pain sensation in central nervous system; chronic use may lead to physical dependence	meperidine morphine	Demerol Duramorph
nonnarcotic <i>non-nar-KO-tik</i>	act peripherally to inhibit prostaglandins (local hormones); they may also be anti-inflammatory and antipyretic (reduce fever)	aspirin (acetylsalicylic acid; ASA) acetaminophen (APAP) ibuprofen celecoxib	Tylenol Motrin, Advil Celebrex, Vioxx
anesthetics <i>an-es-THET-iks</i>	reduce or eliminate sensation	local lidocaine procaine general nitrous oxide midazolam	Xylocaine Novocain Versed
anticoagulants <i>an-ti-kō-AG-ū-lants</i>	prevent coagulation and formation of blood clots	heparin warfarin	Coumadin
anticonvulsants <i>an-ti-kon-VUL-sants</i>	suppress or reduce the number and/or intensity of seizures	phenobarbital phenytoin carbamazepine valproic acid	Dilantin Tegretol Depakene
antidiabetics <i>an-ti-dī-a-BET-iks</i>	prevent or alleviate diabetes	insulin chlorpropamide glyburide metformin acarbose	Humulin (injected) Diabinese (oral) Micronase Glucophage Precose

DISPLAY 8-1 Common Drugs and Their Actions, continued

CATEGORY	ACTIONS; APPLICATIONS	EXAMPLES	
		GENERIC NAME	TRADE NAME
antiemetics <i>an-tē-e-MET-iks</i>	relieve symptoms of nausea and prevent vomiting (emesis)	ondansetron dimenhydrinate prochlorperazine scopolamine promethazine	Zofran Dramamine Compazine Transderm-Scōp Phenergan
antihistamines <i>an-ti-HIS-ta-mēnz</i>	prevent responses mediated by histamine: allergic and inflammatory reactions	diphenhydramine brompheniramine loratadine cetirizine	Benadryl Dimetane Claritin Zyrtec
antihypertensives <i>an-ti-hī-per-TEN-sivs</i>	lower blood pressure by reducing cardiac output, dilating vessels, or promoting excretion of water by the kidneys; see also calcium channel blockers, beta blockers, and diuretics under cardiac drugs, below	clonidine prazosin minoxidil losartan captopril (ACE inhibitor; see Chapter 9)	Catapres Minipress Loniten Cozaar Capoten
anti-inflammatory drugs <i>an-tē-in-FLAM-a-tō-rē</i>	counteract inflammation and swelling		
corticosteroids <i>kor-ti-kō-STER-oyds</i>	hormones from the cortex of the adrenal gland; used for allergy, respiratory, and blood diseases, injury, and malignancy; suppress the immune system	dexamethasone cortisone prednisone hydrocortisone fluticasone	Decadron Cortone Deltasone Hydrocortone, Cortef Flonase
nonsteroidal anti-inflammatory drugs (NSAIDs) <i>non-ster-OYD-al</i>	reduce inflammation and pain by interfering with synthesis of prostaglandins; also antipyretic	aspirin ibuprofen indomethacin naproxen diclofenac	Motrin, Advil Indocin Naprosyn, Aleve Voltaren
anti-infective agents	kill or prevent the growth of infectious organisms		
antibacterials <i>an-ti-bak-TĒ-rē-als</i> antibiotics <i>an-ti-bī-OT-iks</i>	effective against bacteria	amoxicillin penicillin V erythromycin vancomycin linezolid gentamycin clarithromycin cephalexin sulfisoxazole tetracycline	Polymox Pen-Vee K Erythrocin Vancocin Zyvox Garamycin Biaxin Keflex Gantrisin Achromycin

DISPLAY 8-1 Common Drugs and Their Actions, continued

CATEGORY	ACTIONS; APPLICATIONS	EXAMPLES	
		GENERIC NAME	TRADE NAME
		ciprofloxacin (acts on ulcer-causing <i>Helicobacter pylori</i>)	Cipro
		isoniazid (INH) (tuberculosis)	Nydrazid
antifungals <i>an-ti-FUNG-gals</i>	effective against fungi	amphotericin B	Fungizone
		miconazole	Monistat
		nystatin	Nilstat
		fluconazole	Diflucan
		itraconazole	Sporanox
antiparasitics <i>an-ti-par-a-SIT-iks</i>	effective against parasites: protozoa, worms	iodoquinol (amebae)	Yodoxin
		quinacrine	Atabrine
antivirals <i>an-ti-VI-rals</i>	effective against viruses	acyclovir	Zovirax
		amantadine	Symmetrel
		zanamivir (influenza)	Relenza
		zidovudine (HIV)	Retrovir
		indinavir (HIV protease inhibitor)	Crixivan
antineoplastics <i>an-ti-nē-ō-PLAS-tiks</i>	destroy cancer cells; they are toxic for all cells but have greater effect on cells that are actively growing and dividing; hormones and hormone inhibitors also are used to slow tumor growth	cyclophosphamide	Cytosan
		doxorubicin	Adriamycin
		methotrexate	Folex
		vincristine	Oncovin
		tamoxifen (estrogen inhibitor)	Nolvadex
cardiac drugs <i>KAR-dē-ak</i>			
antiarrhythmics <i>an-tē-a-RITH-miks</i>	correct or prevent abnormalities of heart rhythm	quinidine	Quinidex
		lidocaine	Xylocaine
		digoxin	Lanoxin
beta-adrenergic blockers (beta blockers) <i>bā-ta-ad-ren-ER-jik</i>	inhibit sympathetic nervous system; reduce rate and force of heart contractions	propranolol	Inderal
		metoprolol	Lopressor
		atenolol	Tenormin
		carvedilol	Coreg
calcium channel blockers <i>KAL-sē-um</i>	dilate coronary arteries, slow heart rate, reduce contractions	diltiazem	Cardizem
		nifedipine	Procardia
		verapamil	Calan
		nitroglycerin	Nitrostat
		isosorbide	Isordil
hypolipidemics <i>hī-pō-lip-i-DĒ-miks</i>	lower cholesterol in patients with high serum	cholestyramine	Questran
		lovastatin	Mevacor

DISPLAY 8-1 Common Drugs and Their Actions, continued

CATEGORY	ACTIONS; APPLICATIONS	EXAMPLES	
		GENERIC NAME	TRADE NAME
	levels that cannot be controlled with diet alone; hypocholesterolemics, statins	pravastatin atorvastatin simvastatin	Pravachol Lipitor Zocor
nitrates <i>NĪ-trāt̄z</i>	dilate coronary arteries and reduce workload of heart by lowering blood pressure and reducing venous return; antianginal	nitroglycerin isosorbide	Nitrostat Isordil
CNS stimulants	stimulate the central nervous system	methylphenidate amphetamine (chronic use may lead to drug dependence)	Ritalin Adderall, Dexedrine
diuretics <i>dī-ū-RET-iks</i>	promote excretion of water, sodium, and other electrolytes by the kidneys; used to reduce edema and blood pressure	bumetanide furosemide mannitol hydrochlorothiazide (HCTZ) triamterene + HCTZ	Bumex Lasix Osmitrol Hydrodiuril Dyazide
gastrointestinal drugs <i>gas-trō-in-TEs-tin-al</i>			
antidiarrheals <i>an-ti-di-a-RĒ-als</i>	treat or prevent diarrhea by reducing intestinal motility or absorbing irritants and soothing the intestinal lining	diphenoxylate loperamide attapulgate atropine	Lomotil Imodium Kaopectate
histamine H ₂ antagonists <i>HIS-ta-mēn</i>	decrease secretion of stomach acid by interfering with the action of histamine at H ₂ receptors; used to treat ulcers and other gastrointestinal problems	cimetidine ranitidine	Tagamet Zantac
laxatives <i>LAK-sa-tivs</i>	promote elimination from the large intestine; types include:		
	stimulants	bisacodyl	Dulcolax
	hyperosmotics (retain water)	lactulose	Constilac, Chronulac
	stool softeners	docusate	Colace, Surfak
	bulk-forming agents	psyllium	Metamucil

DISPLAY 8-1 Common Drugs and Their Actions, continued

CATEGORY	ACTIONS; APPLICATIONS	EXAMPLES	
		GENERIC NAME	TRADE NAME
hypnotics <i>hip-NOT-iks</i>	induce sleep or dull the senses; see antianxiety agents (below, under psychotropics)		
muscle relaxants <i>rē-LAK-sants</i>	depress nervous system stimulation of skeletal muscles; used to control muscle spasms and pain	baclofen carisoprodol methocarbamol	Lioresal Soma Robaxin
psychotropics <i>sī-kō-TROP-iks</i>	affect the mind, altering mental activity, mental state, or behavior		
antianxiety agents <i>an-tē-ang-Zī-e-tē</i>	reduce or dispel anxiety; tranquilizers; anxiolytic agents	lorazepam chlordiazepoxide diazepam hydroxyzine alprazolam buspirone	Ativan Librium Valium Atarax Xanax BuSpar
antidepressants <i>an-ti-dē-PRES-sants</i>	relieve depression by raising brain levels of neurotransmitters (chemicals active in the nervous system)	amitriptyline imipramine fluoxetine paroxetine sertraline	Elavil Tofranil Prozac Paxil Zoloft
antipsychotics <i>an-ti-sī-KOT-iks</i>	act on nervous system to relieve symptoms of psychoses	chlorpromazine haloperidol clozapine risperidone olanzapine	Thorazine Haldol Clozaril Risperdal Zyprexa
respiratory drugs			
antitussives <i>an-ti-TUS-sivs</i>	suppress coughing	dextromethorphan	Benlyn DM
bronchodilators <i>brong-kō-dī-LĀ-tors</i>	prevent or eliminate spasm of the bronchi (breathing tubes) by relaxing bronchial smooth muscle; used to treat asthma and bronchitis	albuterol epinephrine metaproterenol salmeterol theophylline montelukast (prevents attacks)	Proventil Sus-Phrine Alupent Serevent Theo-Dur Singulair
expectorants <i>ek-SPEK-tō-rants</i>	induce productive coughing to eliminate respiratory secretions	guaifenesin	Robitussin
mucolytics <i>mū-kō-LIT-iks</i>	loosen mucus to promote its elimination	acetylcysteine	Mucomyst

DISPLAY 8-1 Common Drugs and Their Actions, continued

CATEGORY	ACTIONS; APPLICATIONS	EXAMPLES	
		GENERIC NAME	TRADE NAME
sedatives/hypnotics <i>SED-a-tivs/hip-NOT-iks</i>	induce relaxation and sleep; lower (sedative) doses promote relaxation leading to sleep; higher (hypnotic) doses induce sleep; antianxiety agents also used	phenobarbital zolpidem	Ambien
tranquilizers <i>tran-kwi-LĪZ-ers</i>	reduce mental tension and anxiety; see anti-anxiety agents (above, under psychotropics)		

DISPLAY 8-2 Therapeutic Uses of Herbal Medicines

NAME	PART USED	THERAPEUTIC USES
aloe	leaf	treatment of burns and minor skin irritations
black cohosh	root	reduction of menopausal hot flashes
chamomile	flower	anti-inflammatory, gastrointestinal antispasmodic, sedative
echinacea <i>e-ki-NĀ-shē-a</i>	all	reduction in severity and duration of colds; may stimulate the immune system; used topically for wound healing
evening primrose oil	seed	source of essential fatty acids important for the health of the cardiovascular system; treatment of premenstrual syndrome (PMS), rheumatoid arthritis, skin disorders
flax	seed	source of fatty acids important in maintaining proper lipids (e.g., cholesterol) in the blood
ginkgo	leaf	improves blood circulation in and function of the brain; improves memory; used to treat dementia; antianxiety agent; protects the nervous system
ginseng	root	stress reduction; lowers blood cholesterol and blood sugar
green tea	leaf	antioxidant; acts against cancer of the gastrointestinal tract and skin; oral antimicrobial agent; reduces dental caries
kava	root	antianxiety agent; sedative
milk thistle	seeds	protects the liver against toxins; antioxidant
saw palmetto	berries	used to treat benign prostatic hyperplasia (BPH)
slippery elm	bark	as lozenge for throat irritation; for gastrointestinal irritation and upset; protects irritated skin
soy	bean	rich source of nutrients; protective estrogenic effects in menopausal symptoms, osteoporosis, cardiovascular disease, cancer prevention
St. John's wort	flower	treatment of anxiety and depression; antibacterial and antiviral properties (note: this product can interact with a variety of drugs)
tea tree oil	leaf	nonirritating antimicrobial; used to heal cuts, skin infections, burns
valerian	root	sedative; sleep aid

DISPLAY 8-3 Routes of Drug Administration

ROUTE	DESCRIPTION
absorption	drug taken into the circulation through the digestive tract or by transfer across another membrane
inhalation <i>in-ha-LA-shun</i>	administration through the respiratory system, as by breathing in an aerosol or nebulizer spray
instillation <i>in-stil-LĀ-shun</i>	liquid is dropped or poured slowly into a body cavity or on the surface of the body, such as into the ear or onto the conjunctiva of the eye (Fig. 8-1)
oral <i>OR-al</i>	given by mouth; per os (po)
rectal <i>REK-tal</i>	administered by rectal suppository or enema
sublingual (SL) <i>sub-LING-gwal</i>	administered under the tongue
topical <i>TOP-i-kal</i>	applied to the surface of the skin
transdermal <i>trans-DER-mal</i>	absorbed through the skin, as from a patch placed on the surface of the skin
injection (Fig. 8-2)	administered by a needle and syringe (Fig. 8-3); described as parenteral (<i>pa-REN-ter-al</i>) routes of administration
epidural <i>ep-i-DUR-al</i>	injected into the space between the meninges (membranes around the spinal cord) and the spine
intra-dermal (ID) <i>in-tra-DER-mal</i>	injected into the skin
intra-muscular (IM) <i>in-tra-MUS-kū-lar</i>	injected into a muscle
intra-venous <i>in-tra-VĒ-nus</i>	injected into a vein
spinal (intrathecal) <i>in-tra-THĒ-kal</i>	injected through the meninges into the spinal fluid
subcutaneous (SC) <i>sub-kū-TĀ-nē-us</i>	injected beneath the skin; hypodermic



FIGURE 8-1. Instillation of eye drops into the lower conjunctival sac. (Reprinted with permission from Taylor C, Lillis C, LeMone P. *Fundamentals of Nursing: The Art and Science of Nursing Care*. 4th Ed. Philadelphia: Lippincott Williams & Wilkins, 2001.)

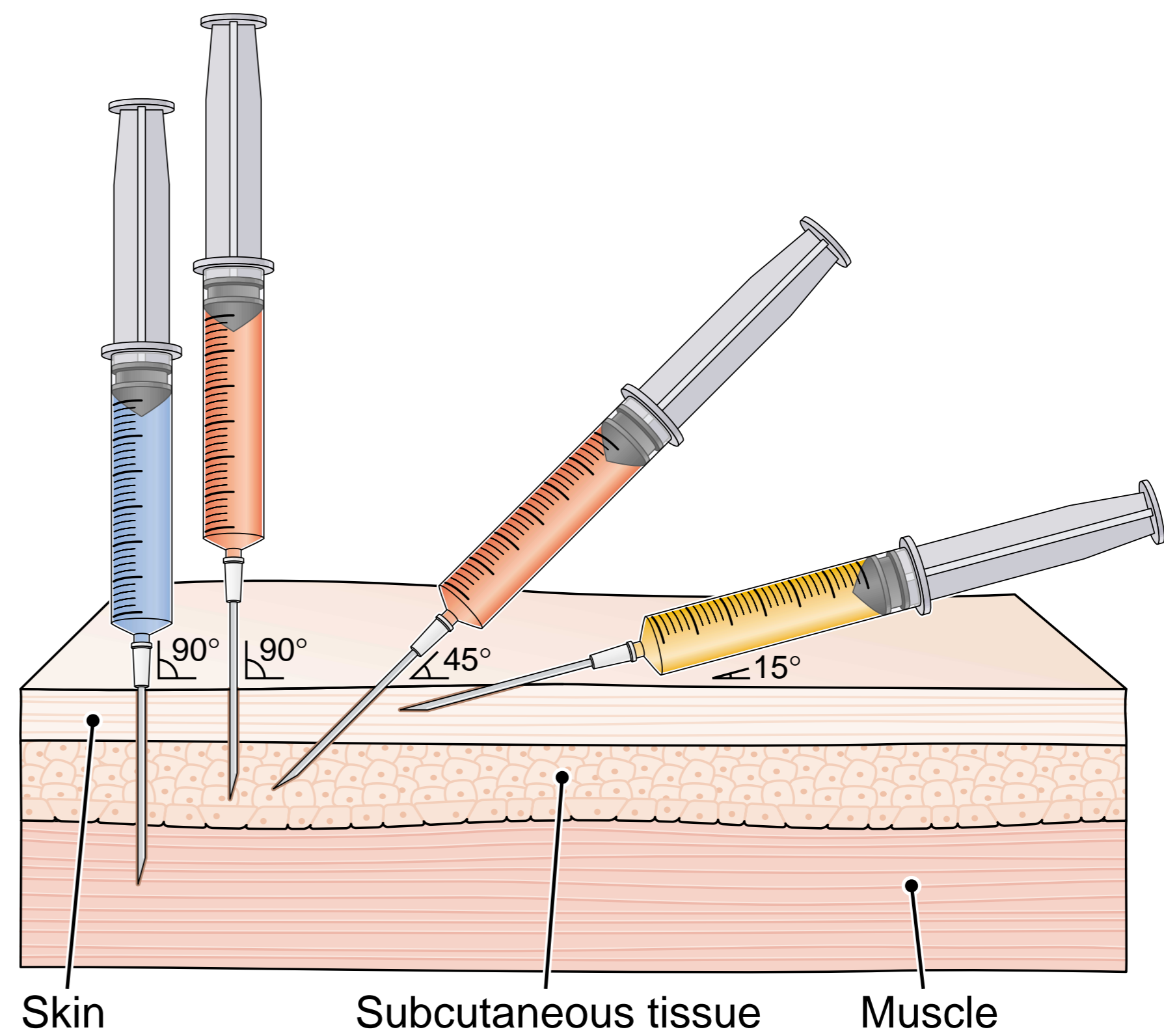


FIGURE 8-2. Comparison of the angles of insertion for intramuscular, subcutaneous, and intradermal injections.

- Intramuscular injection
- Subcutaneous injection
- Intradermal injection

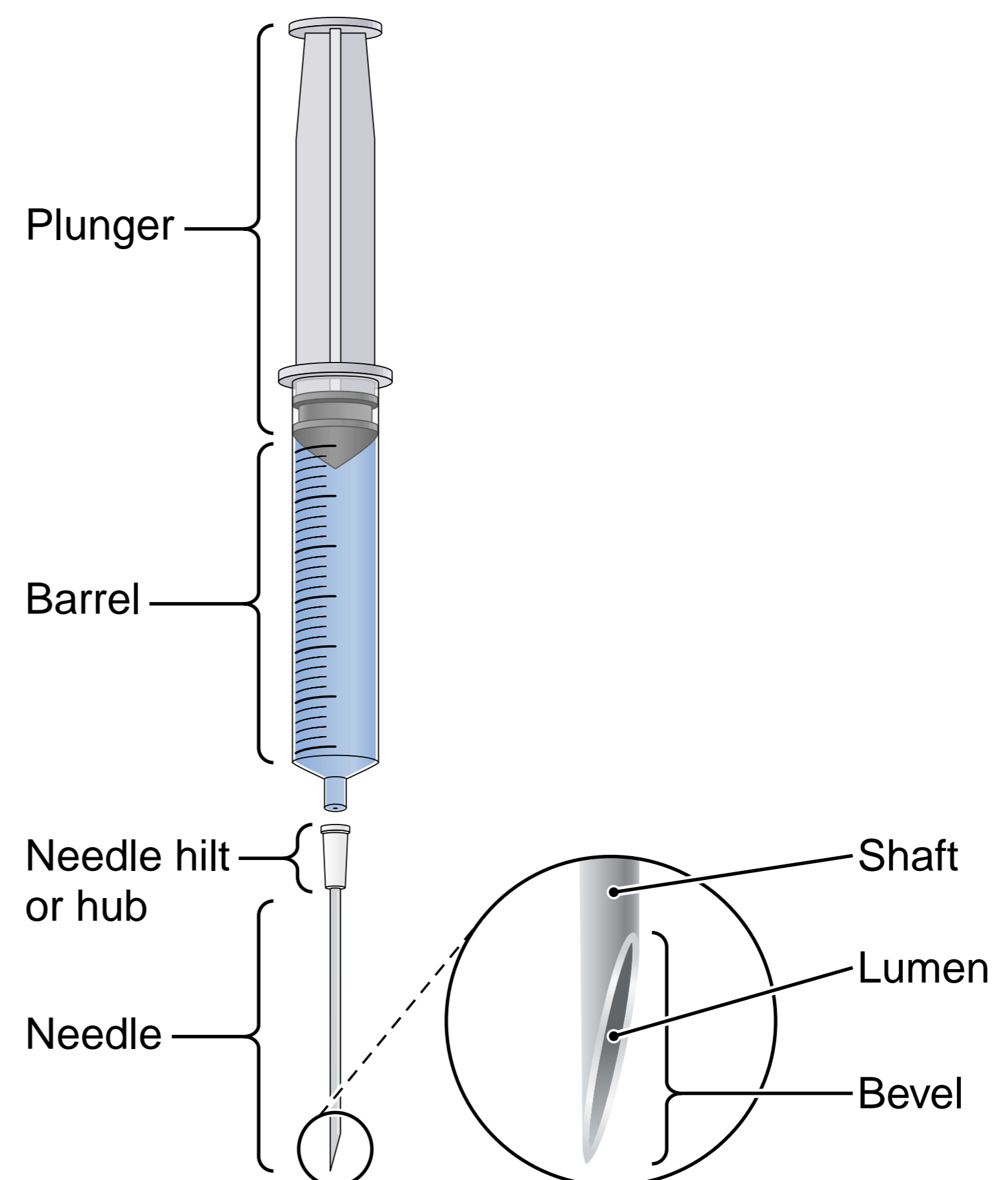


FIGURE 8-3. Parts of a needle and syringe.

DISPLAY 8-4 Drug Preparations

FORM	DESCRIPTION
LIQUID	
aerosol <i>AR-o-sol</i>	solution dispersed as a mist to be inhaled
aqueous solution <i>A-kwē-us</i>	substance dissolved in water
elixir (elix) <i>ē-LIK-sar</i>	a clear, pleasantly flavored and sweetened hydroalcoholic liquid intended for oral use
emulsion <i>ē-MUL-shun</i>	a mixture in which one liquid is dispersed but not dissolved in another liquid
lotion <i>LŌ-shun</i>	solution prepared for topical use
suspension (susp) <i>sus-PEN-shun</i>	fine particles dispersed in a liquid; must be shaken before use
tincture (tinct) <i>TINK-chur</i>	substance dissolved in an alcoholic solution
SEMISOLID	
cream <i>krēm</i>	a semisolid emulsion used topically
ointment (ung) <i>OYNT-ment</i>	drug in a base that keeps it in contact with the skin
SOLID	
capsule (cap) <i>KAP-sūl</i>	material in a gelatin container that dissolves easily in the stomach
lozenge <i>LOZ-enj</i>	a pleasant-tasting medicated tablet or disk to be dissolved in the mouth, such as a cough drop
suppository (supp) <i>su-POZ-i-tor-ē</i>	substance mixed and molded with a base that melts easily when inserted into a body opening
tablet (tab) <i>TAB-let</i>	a solid dosage form containing a drug in a pure state or mixed with a nonactive ingredient and prepared by compression or molding; also called a pill

DISPLAY 8-5 Terms Pertaining to Injectable Drugs

TERM	MEANING
ampule <i>AM-pūl</i>	a small sealed glass or plastic container used for sterile intravenous solutions (Fig. 8-4)
bolus <i>BŌ-lus</i>	a concentrated amount of a diagnostic or therapeutic substance given rapidly intravenously
catheter <i>KATH-e-ter</i>	a thin tube that can be passed into a body cavity, organ, or vessel (Fig. 8-5)
syringe <i>sir-INJ</i>	an instrument for injecting fluid (see Fig. 8-4)
vial <i>VĪ-al</i>	a small glass or plastic container (see Fig. 8-4)

FIGURE 8-4. Ampules, vials, and syringes.
(Reprinted with permission from Taylor C, Lillis C,
LeMone P. Fundamentals of Nursing: The Art and
Science of Nursing Care. 4th Ed. Philadelphia:
Lippincott Williams & Wilkins, 2001.)

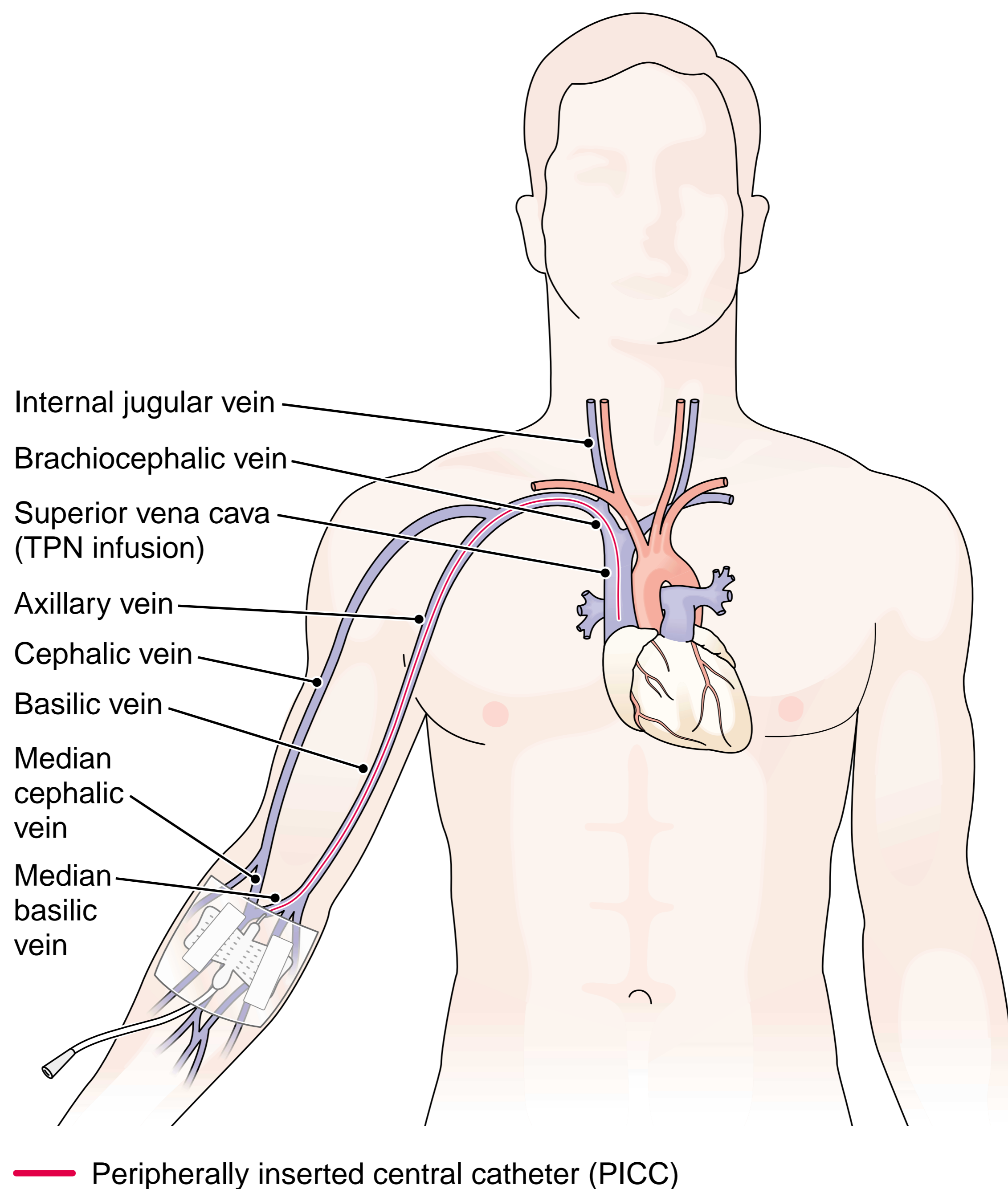


FIGURE 8-5. Placement of a peripherally inserted central catheter (PICC).

Chapter Review 8-1

Match the following terms and write the appropriate letter to the left of each number:

- | | |
|----------------------------|---|
| _____ 1. antitussive | a. promoting excretion of water |
| _____ 2. diuretic | b. agent that destroys cancer cells |
| _____ 3. sedative | c. cough suppressant |
| _____ 4. antiemetic | d. inducing relaxation |
| _____ 5. antineoplastic | e. relieving nausea |
| _____ 6. vasodilation | a. extremely high body temperature |
| _____ 7. adrenergic | b. movement in an opposite direction |
| _____ 8. psychotropic | c. widening of a vessel |
| _____ 9. hyperpyrexia | d. sympathomimetic |
| _____ 10. countertransport | e. acting on the mind |
| _____ 11. synergy | a. a small glass vial |
| _____ 12. emulsion | b. an instrument for injecting fluid |
| _____ 13. ampule | c. a mixture of liquids |
| _____ 14. expectorant | d. agent that induces coughing |
| _____ 15. syringe | e. combined action of two or more drugs |
| _____ 16. tid | a. as needed |
| _____ 17. qam | b. by mouth |
| _____ 18. prn | c. without |
| _____ 19. $\bar{3}$ | d. three times a day |
| _____ 20. po | e. every morning |

Multiple choice: Select the best answer and write the letter of your choice to the left of each number.

- _____ 21. Another term for trade name is:
- indicated name
 - generic name
 - prescription name
 - chemical name
 - brand name
- _____ 22. An analgesic is used to treat:
- diarrhea
 - arrhythmia

- c. psychosis
- d. pain
- e. thrombosis

- _____ 23. A drug that is administered topically is:
- a. swallowed
 - b. injected
 - c. applied to the skin
 - d. placed under the tongue
 - e. inserted with a catheter
- _____ 24. Drug administration by injection is described as:
- a. partial
 - b. instilled
 - c. encapsulated
 - d. a bolus
 - e. parenteral
- _____ 25. Nitrates, beta blockers, and calcium channel blockers are used to treat disorders of the:
- a. liver
 - b. brain
 - c. spleen
 - d. heart
 - e. spinal cord

Fill in the blanks:

26. When a drug has lost its effect at a constant dose, the patient has developed _____.
27. Pharmacokinetics is study of the action and behavior of _____.
28. A hypnogenic agent is one that induces _____.
29. Phytomedicine is the practice of treating with _____.
30. A transdermal route of administration is through the _____.
31. Toxicology is the study of _____.

Define each of the following words:

- 32. mucolytic _____
- 33. psychotropic _____
- 34. bronchodilation _____
- 35. sublingual _____

Opposites. Write a word that has the opposite meaning of each of the following words:

- 36. convulsant _____
- 37. indicated _____
- 38. act _____
- 39. coagulant _____
- 40. vasodilation _____

Word building. Write a word for each of the following definitions:

41. Counteracting fever _____
42. Dissolving blood clots (root *thromb/o*) _____
43. One who prepares, sells, or dispenses drugs _____
44. One who studies poisons _____

Define each of the following abbreviations:

45. Rx _____
46. IM _____
47. USP _____
48. ad lib _____
49. mg _____
50. NSAIDs _____
51. FDA _____

Word analysis. Define each of the following words, and give the meaning of the word parts in each. Use a dictionary if necessary.

52. chronotropic (*kron-ō-TROP-ik*) _____
- a. chron/o _____
- b. trop _____
- c. -ic _____
53. adrenergic (*ad-ren-ER-jik*) _____
- a. adren/o _____
- b. erg/o _____
- c. -ic _____

Case Studies

Case Study 8-1: Cardiac Disease and Crisis

P.L., who has a 4-year history of heart disease, was brought to the emergency room by ambulance with chest pain that radiated down her arm, dyspnea, and syncope. Her routine meds included: Lanoxin to slow and strengthen her heart beat, Inderal to support her heart rhythm, Lipitor to decrease her cholesterol, Catapres to lower her hypertension, nitroglycerin prn for chest pain, Hydro-DIURIL to eliminate fluid and decrease the workload of her heart, Diabinese for her diabetes, and Coumadin to prevent blood clots. She also took Tagamet for her stomach ulcer and several OTC preparations, including an herbal sleeping potion that she mixed in tea, and Metamucil mixed in orange juice every morning for her bowels. Shortly after admission, P.L.'s heart rate deteriorated into full cardiac arrest. Immediate resuscitation was instituted with cardiopulmonary resuscitation (CPR), defibrillation, and a bolus of IV epinephrine. Between shocks she was given a bolus of lidocaine and a bolus of diltiazem plus repeated doses of epinephrine every 5 minutes. P.L. did not respond to resuscitation. On the death certificate, her primary cause of death was listed as cardiac arrest. Multiple secondary diagnoses were listed, including polypharmacy.

Case Studies, continued

Case Study 8-2: Inflammatory Bowel Disease

A.E., a 19-year-old college student, was diagnosed at the age of 13 with Crohn disease, a chronic inflammatory disease that can affect the entire gastrointestinal tract from mouth to anus. A.E.'s disease is limited to his large bowel. During a 9-month period of disease exacerbation, he took oral corticosteroids (prednisone) to reduce the inflammatory response. He experienced many of the drug's side effects, but has been in remission for 4 years. Currently, A.E.'s condition is managed on drugs that reduce inflammation by suppressing the immune response. He takes Pentasa (mesalamine) 250mg 4 caps po bid. Pentasa is of the 5-ASA (acetylsalicylic acid or aspirin) group of anti-inflammatory agents, which work topically on the inner surface of the bowel. It has an enteric coating, which dissolves in the bowel environment. He also takes 6-mercaptopurine (Purinethol) 75 mg po qd and a therapeutic vitamin with breakfast. A.E. may take acetaminophen for pain but must avoid NSAIDs, which will irritate the intestinal mucosa (inner lining) and cause a flare-up of the disease.

Case Study 8-3: Asthma

E.N., a 20-year-old asthmatic woman, visited the preadmission testing unit one week before her cosmetic surgery to meet with the nurse and anesthesiologist. Her current meds included several bronchodilators, which she takes by mouth and by inhalation, and a tranquilizer that she takes when needed for nervousness. She sometimes receives inhalation treatments with Mucomyst, a mucolytic agent. On E.N.'s preoperative note, the nurse wrote:

Theo-Dur 1 cap tid.

Flovent inhaler 1 spray (50 mcg) each nostril bid.

Ativan (lorazepam) 1 mg po bid.

Albuterol—metered dose inhaler 2 puffs (180 mcg) prn q4-6h for bronchospasm and before exercise.

E.N. stated that she has difficulty with her asthma when she is anxious and when she exercises. She also admitted to occasional use of marijuana and ecstasy, a hallucinogen and mood-altering illegal recreational drug. The anesthesiologist wrote an order for lorazepam 4 mg IV 1 hour preop. The plastic surgeon recommended several herbal products to complement her surgery and her recovery. He ordered a high-potency vitamin 3 tabs with breakfast and dinner to support tissue health and healing. He also prescribed Bromelain, an enzyme from pineapple, to decrease inflammation, 1 po qid 3 days before surgery and postoperatively for 2 weeks. Arnica Montana was prescribed to decrease discomfort, swelling, and bruising; 3 tabs sublingual tid the evening after surgery and for the following 10 days.

CASE STUDY QUESTIONS

Multiple choice: Select the best answer and write the letter of your choice to the left of each number.

- _____ 1. P.L.'s nitroglycerine is ordered: prn SL. This means:
- as needed, under the tongue
 - at bedtime, under the tongue
 - as needed, on the skin
 - by mouth, on the skin
 - by mouth, under the skin

Case Studies, continued

- _____ 2. P.L. took several OTC preparations. OTC means:
- on the cutaneous
 - off the cuff
 - over the counter
 - do not need a prescription
 - c and d
- _____ 3. P.L.'s herbal sleeping potion was mixed into tea and taken at bedtime. The dissolved mixture is called a(n) _____ and is taken at _____.
- elixir and QAM
 - emulsion and bid
 - suspension and hs
 - aqueous solution and hs
 - aqueous solution and QAM
- _____ 4. During P.L.'s resuscitation, epinephrine was given in an IV bolus. This means it was administered:
- intrathecally in a continuous drip
 - parenterally in a topical solution
 - intravenously in a continuous drip
 - intravenously in a rapid concentrated dose
 - intrathecally in a rapid concentrated dose
- _____ 5. P.L. had a secondary diagnosis of polypharmacy. This means that she:
- used more than one drug store
 - had polyps
 - used more prescription than OTC drugs
 - had a toxic dose
 - used many different drugs
- _____ 6. A.E. takes several drugs to prevent or act against his inflammatory response. These agents are called _____ drugs.
- contrainflammatory
 - counterinflammatory
 - anti-inflammatory
 - corticosteroids
 - NSAIDs
- _____ 7. A.E. presented with several untoward results or risks from the corticosteroid therapy. These sequelae are called:
- contraindications
 - side effects
 - antagonistic effects
 - exacerbations
 - synergy states

Case Studies, continued

- _____ 8. A.E. takes four 250-mg capsules of Pentasa po bid. How many capsules does he take in one day?
- 2,000
 - 1,000
 - 4
 - 8
 - 12
- _____ 9. A.E. must avoid NSAIDs; therefore, these drugs are _____ in inflammatory bowel disease.
- contraindicated
 - indicated
 - complementary
 - synergistic
 - prescriptive
- _____ 10. E.N. used a mucolytic drug when needed. This drug's action is to:
- increase secretions
 - decrease spasm
 - calm anxiety
 - decrease mucus secretions
 - simulate mucus
- _____ 11. E.N.'s Flovent inhaler is indicated as 1 spray of 50 mcg in each nostril bid. How many micrograms (mcg) does she get in 1 day?
- 100 mcg
 - 200 mcg
 - 250 mcg
 - 500 mcg
 - 5,000 mcg
- _____ 12. The Ativan that E.N. takes for nervousness is a(n) _____ drug.
- anxiolytic
 - potentiating
 - antiemetic
 - analgesic
 - bronchodilator
- _____ 13. The anesthesiologist ordered lorazepam (Ativan) to be given IV preop to decrease anxiety and to smooth E.N.'s anesthesia induction. The complementary way that lorazepam and anesthesia work together is called:
- antagonistic
 - complementary medicine
 - parasympathomimetic
 - tolerance
 - synergy

Case Studies, continued

- _____ 14. Bromelain and Arnica Montana are herbal products that can be described as all of the following except:
- phytopharmaceutical
 - alternative
 - herbal
 - complementary
 - chronotropic
- _____ 15. Arnica Montana was prescribed 3 tabs SL tid. How many tabs would E.N. take in 1 day?
- 6
 - 9
 - 12
 - 21
 - 33
- _____ 16. Flovent is administered as an inhalant. The form in which the drug is prepared is called a(n) _____.
- emulsion
 - elixir
 - aerosol
 - suspension
 - unguent

CHAPTER 8 Answer Section

Answers to Chapter Exercises

EXERCISE 8-1

- lytic; lysing, destroying, loosening
- mimetic; mimicking, simulating
- tropic; acting on
- antipyretic
- contraindicated
- anti-inflammatory
- counterbalance
- antiseptic
- contraception
- hypn/o; sleep
- tox, toxic/o; poison
- chem/o; chemical
- narc/o; stupor
- pharmac/o; drug
- narrowing of a blood vessel

- the study of drugs
- acting on the gonads (sex glands)
- working against or counteracting a toxin (poison)

Answers to Chapter Review 8-1

- c
- a
- d
- e
- b
- c
- d
- e
- a
- b
- e
- c
- a
- d

15. b
16. d
17. e
18. a
19. c
20. b
21. e
22. d
23. c
24. e
25. d
26. tolerance
27. drugs
28. sleep
29. plants
30. skin
31. toxins, poisons
32. loosening or dissolving mucus
33. acting on the mind
34. widening of a bronchus
35. under the tongue
36. anticonvulsant
37. contraindicated
38. counteract
39. anticoagulant
40. vasoconstriction
41. antipyretic
42. thrombolytic
43. pharmacist
44. toxicologist
45. prescription
46. intramuscular(ly)
47. *United States Pharmacopeia*
48. as desired
49. milligrams
50. nonsteroidal anti-inflammatory drugs
51. Food and Drug Administration
52. acting on rate, as of the heart
 - a. time
 - b. acting on
 - c. pertaining to
53. Activated by or secreting adrenaline (epinephrine)
 - a. adrenaline
 - b. work
 - c. pertaining to

Answers to Case Study Questions

1. a
2. c
3. d
4. d
5. e
6. c
7. b
8. d
9. a
10. d
11. b
12. a
13. e
14. e
15. b
16. c