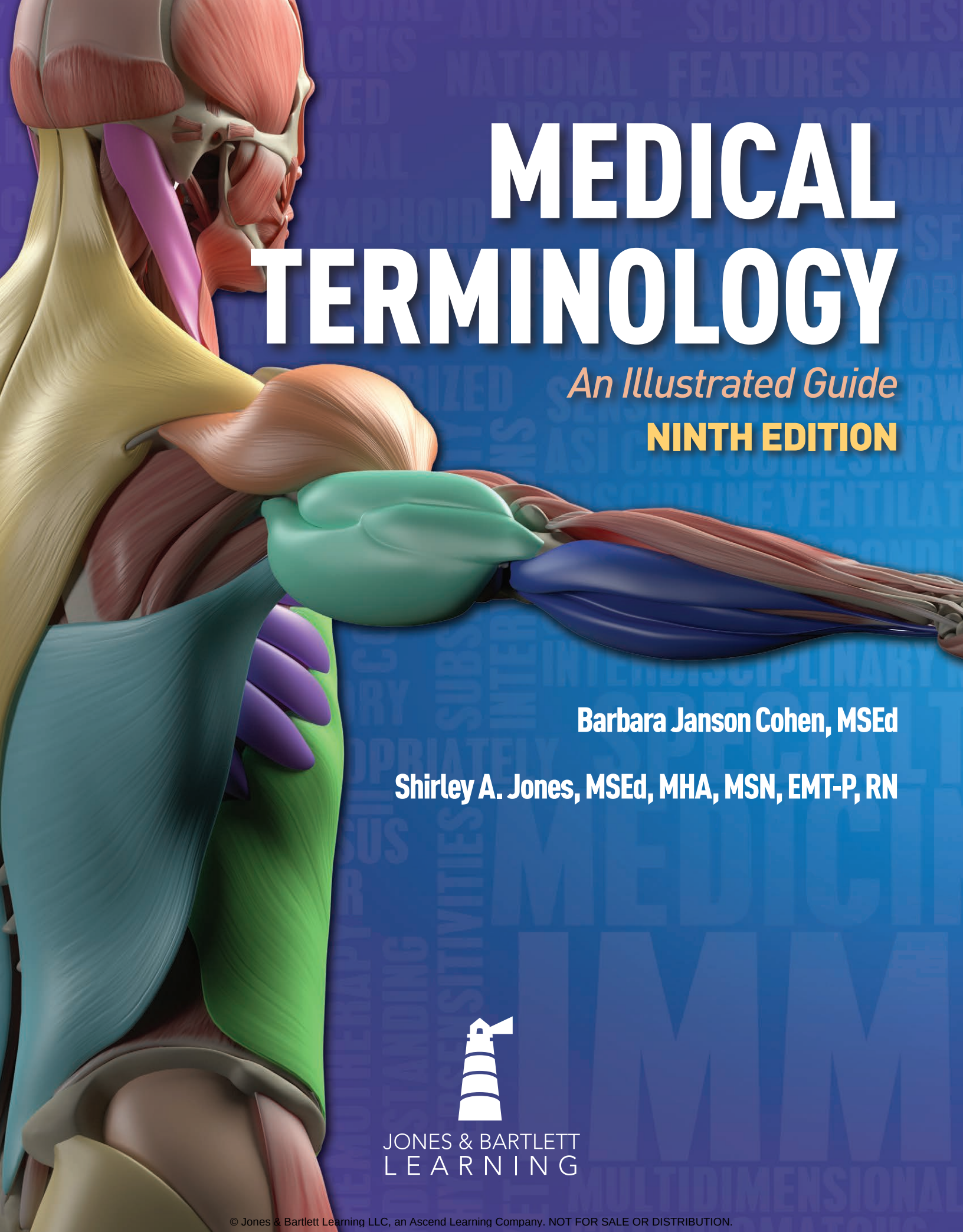

MEDICAL TERMINOLOGY

An Illustrated Guide

NINTH EDITION

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For their ongoing, wholehearted love and support, I dedicate this ninth edition of *Medical Terminology: An Illustrated Guide* to my children, Jocelyn Hooven and Saul Janson.

—Barbara Janson Cohen

I dedicate this book to my parents Vivian and George Jones, to my sister Virginia E. Kelleher, and to Francis, who are all heroes in my life.

—Shirley A. Jones

Brief Contents

Contents

Appendices:

Preface

Knowledge of medical terminology is fundamental to a wide variety of healthcare fields. This text is designed to satisfy the basic learning requirements needed to practice in any health career setting. In the course of your training and future careers, you will need to learn thousands of new terms. The job might be overwhelming if not for learning the skills of dividing the words into their component parts. These roots, suffixes, and prefixes appear over and over in different terms but retain the same meanings. Knowing these meanings will help you define and remember a host of words. This process is like using a set of building blocks to assemble different structures. Using a more scientific example, it is like using the four bases in DNA to code for all the amino acids needed to make proteins.

The text opens with a general introduction to word parts and the human body as a whole, followed by an overview of diseases and treatments. Each subsequent chapter on the individual body systems begins with an illustrated overview of the system with definitions of key terms relevant to that system. Tables of word parts and exercises on using them follow. Turning to the abnormal, a section on diseases and treatments is included, followed by definitions of related key terms. The section of enrichment terms includes words and phrases that are "good to know" if time allows or if someone is particularly interested in that specialty. The sequence of the systems chapters follows the same order as that found in traditional anatomy and physiology books. Thus this text easily can be used simultaneously with study of A & P. We have tried to make this text easy to use and full of reinforcing drills. We have also included many phonetic pronunciations so you can recognize technical terms when they are spoken and can comfortably use them yourself. Each chapter is enlivened with a short opening case study. These may have some words and abbreviations that are unfamiliar to you, especially at the start of the text. They are included to spark your interest in the chapter material, and give you a sense of medical situations and language. Don't be concerned if you don't understand them completely. Return to them after you study the chapter, or even later chapters, and see if they are more understandable.

You are probably at the beginning of a long journey to gain accomplishment in your chosen field. We hope that this text will aid you in that endeavor and provide a basis on which to build your career.

—Barbara Janson Cohen
and Shirley A. Jones

Acknowledgments

In our constant quest to improve the quality of *Medical Terminology: An Illustrated Guide*, we rely on the advice and talents of many people. First, we want to acknowledge the observant instructors and students who take the time to suggest improvements in the text. Also we thank the reviewers, who make many valuable suggestions for revisions. As always, we are grateful to the dedicated publishing staff; especially for this edition, Jonathan Joyce, Michael Kerns, Julie Vitale, Jeremiah Kiely, Cody Adams, Leo Gray, and Jennifer Clements.

—Barbara Janson Cohen
and Shirley A. Jones

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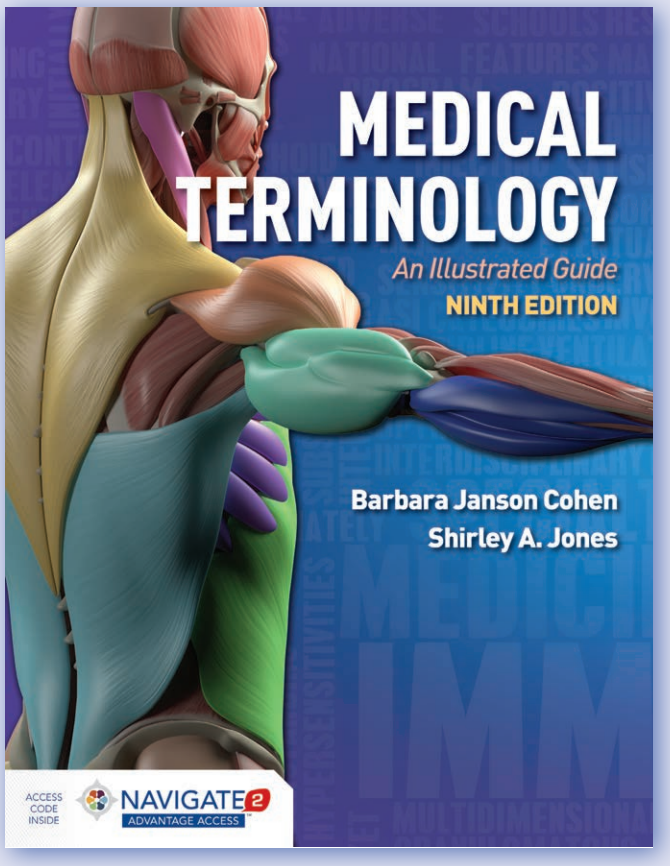
User's Guide

Medical Terminology: An Illustrated Guide, Ninth Edition was created and developed to help you master the language of medicine. The tools and features in the text will help you work through the material presented. Please take a few moments to look through this User's Guide, which will introduce you to the features that will enhance your learning experience.



Learning Objectives

After careful study of this chapter, you should be able to:

1. Compare the location and function of smooth, cardiac, and skeletal muscles. ***P190***
2. Describe the typical structure of a skeletal muscle. ***P190***
3. Briefly describe the mechanism of muscle contraction. ***P190***
4. Explain how muscles work together to produce movement. ***P191***
5. Describe the main types of movements produced by muscles. ***P192***
6. List some of the criteria for naming muscles, and give examples of each. ***P192***
7. Identify and use the roots pertaining to the muscular system. ***P197***
8. Describe at least seven disorders that affect muscles. ***P198***
9. Interpret abbreviations pertaining to muscles. ***P204***
10. Analyze several case studies involving muscles. ***PP189, 212***

Case Study: Thomas's Brachial Plexus Injury

Chief Complaint
Thomas, a 16 y/o high school student, had a severe lacrosse accident that resulted in a flail arm. He had sustained right brachial plexus injury and had no recovery. He has continued to take medication for neurologic pain. He was scheduled to see his orthopedic surgeon for a possible brachial plexus exploration.

Examination
The orthopedic surgeon examined Thomas and noted that there had not been any change in his condition since the previous visit. Thomas still had no feeling or motion in his right shoulder or arm. He had atrophy over the supraspinatus and infraspinatus muscles and also subluxation of his shoulder and deltoid atrophy. He had no active motion of the right upper extremity and no sensation. The rest of his orthopedic exam showed full ROM of his hips, knees, and ankles with intact sensation and palpable distal pulses as well as normal motor function. He was diagnosed with a possible middle trunk brachial plexus injury from C7.

Clinical Course
Thomas and his parents had previous discussions with the surgeon and were aware of the prognosis and treatment plan. With middle trunk brachial plexus injury, damage to the subscapular nerve will interrupt conduction to the subscapularis and teres major muscles. Damage to the long thoracic nerve prevents conduction to the serratus anterior muscles. Injury to the pectoral nerves affects the pectoralis major and minor muscles.

Thomas was scheduled for an EMG, nerve conduction studies, and somatosensory evoked potentials (SSEPs). His diaphragm was examined under fluoroscopy to R/O phrenic nerve injury. The results of the diagnostic studies indicated that Thomas had most likely sustained a middle trunk brachial plexus injury. Thomas was scheduled for a brachial plexus exploration with possible bilateral sural (calf) nerve graft, nerve transfer, or gracilis muscle graft from his right thigh.

Case Study Revisited: Once you complete this chapter, please review the case follow-up on p. 205.

Ancillaries *At-A-Glance*

Visit the web resource to access the following resources.

Learning Resources

- eBook
- A&P Module with Heart & Lung Sounds
- Image Bank
- TestPrep
- Animations
- Audio Pronunciation Glossary

Chapter Contents, Objectives, and Pretests

Chapter Opening Case Studies and Objectives help you identify learning goals and familiarize yourself with the materials covered in the chapter. Chapter Pretests quiz students on previous knowledge at the beginning of each chapter. Students should take each Chapter Pretest before starting the chapter and again after completing the chapter in order to measure progress.

Detailed Illustrations

Detailed, full-color drawings and photographs illuminate the chapters. These include clinical photographs and tissue micrographs. The many figures amplify and clarify the text and are particularly helpful for visual learners.

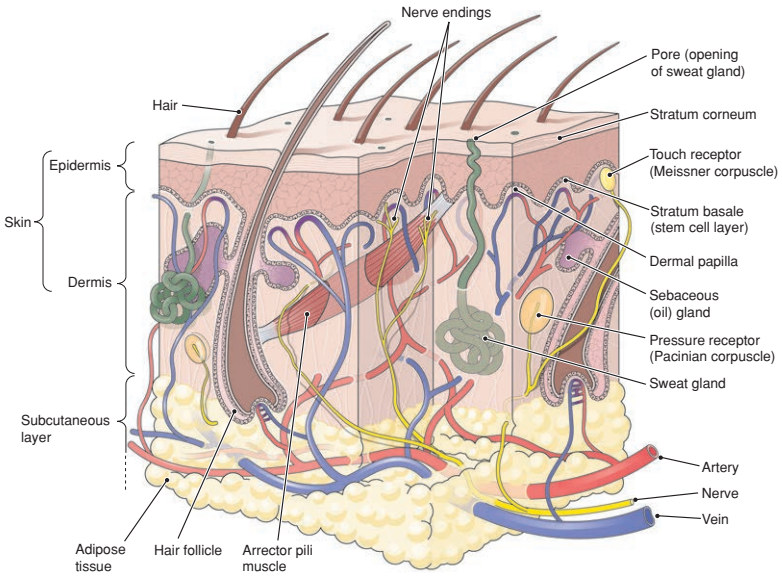


FIGURE 4-1 Cross-section of the skin. The skin layers and associated structures are shown.

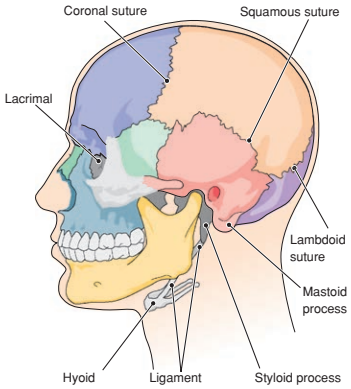


FIGURE 5-2 The skull from the left. An additional cranial bone, the ethmoid (*ETH-moyd*), is visible mainly from the interior of the skull. The hyoid is considered part of the axial skeleton but is not attached to any other bones. The tongue and other muscles are attached to the hyoid.

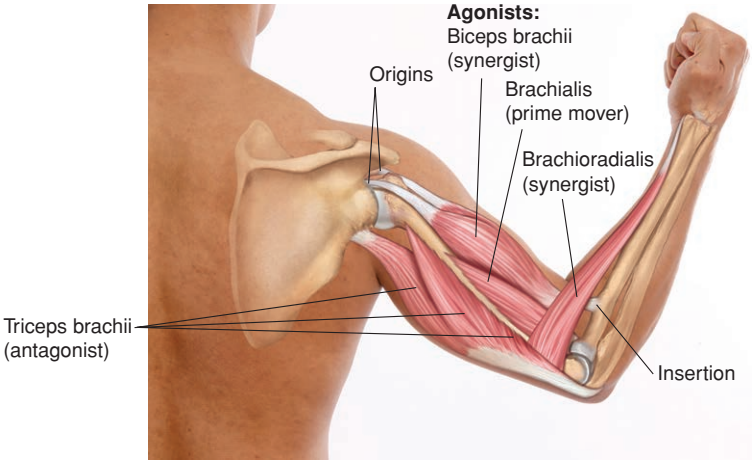


FIGURE 6-4 Muscles work together. When the brachialis, the agonistic prime mover, flexes the arm, the triceps brachii, the antagonist, must relax. Synergists, the biceps brachii and the brachioradialis, assist in this action. When the arm is extended, these muscle actions are reversed. This figure also shows three attachments of the biceps brachii, two origins and one insertion.

Focus on Words boxes

provide historical or other interesting information on select terms within a chapter.

FOCUS ON WORDS

BOX 1-3

Meaningful Suffixes

Suffixes sometimes take on a color of their own as they are added to different words. The suffix *-thon* is taken from the name of the Greek town Marathon, from which news of a battle victory was carried by a long-distance runner. It has been attached to various words to mean a contest of great endurance. We have bike-a-thons, dance-a-thons, telethons, and even major charity fundraisers called thon-a-thons.

The adjective ending *-ish* is used, as in *boyish* or *childish*, to suggest traces of certain characteristics. People tack it onto words to indicate that they are estimates, not right on target, as in *forty-ish* or *blue-ish*. A vague time for a lunch appointment could be *noon-ish*.

In science and medicine, the ending *-tech* is used to imply high technology, as in the company name Genentech, and *-pure* may be added to inspire confidence, as in the naming of the Multi-Pure water filter. The ending *-mate* suggests helping, as in *helpmate*, defined in the dictionary as a helpful companion, more specifically, a wife, or sometimes, a husband. The medical device HeartMate is a pump used to assist a damaged heart. In current terminology, the ending *-ome* refers to the objects in a comprehensive topic of study such as microbiome (total microbiologic population associated with an individual), genome (study of all the genes in an individual), and proteome (the entire protein makeup of an individual).

CLINICAL PERSPECTIVES

BOX 4-1

Medication Patches: No Bitter Pill to Swallow

For most people, pills are a convenient way to take medication, but for some, they have drawbacks. Pills must be taken at regular intervals to ensure consistent dosing, and they must be digested and absorbed into the bloodstream before they can begin to work. For those who have difficulty swallowing or digesting pills, transdermal (TD) patches offer an effective alternative to oral medications.

TD patches deliver a consistent dose of medication that diffuses at a constant rate through the skin into the bloodstream. There is no daily schedule to follow, nothing to swallow, and no stomach upset. TD patches can also deliver medication to unconscious patients, who would otherwise require intravenous drug delivery. TD patches are used in hormone replacement therapy, to treat heart disease, to manage pain, and to suppress motion sickness. Nicotine patches are also used as part of programs to quit smoking.

TD patches must be used carefully. Drug diffusion through the skin takes time, so it is important to know how long the patch must be in place before it is effective. It is also important to know when the medication's effects disappear after the patch is removed. Because the body continues to absorb what has already diffused into the skin, removing the patch does not entirely remove the medicine. There is also a danger that patches may become unsafe when heated, as by exercise, high fever, or a hot environment, such as a hot tub, heating pad, or sauna. When heat dilates the capillaries in the skin, a dangerous increase in dosage may result as more medication enters the blood.

A recent advance in TD drug delivery is iontophoresis. Based on the principle that like charges repel each other, this method uses a mild electrical current to move ionic drugs through the skin. A small electrical device attached to the patch uses positive current to "push" positively charged drug molecules through the skin and a negative current to push negatively charged ones. Even though very low levels of electricity are used, people with pacemakers should not use iontophoretic patches. Another disadvantage of these patches is that they can move only ionic drugs through the skin.

Clinical Perspectives boxes focus on body processing, as well as techniques used in clinical settings.

HEALTH PROFESSIONS

BOX 13-2

Dental Hygienist

Dental hygienists focus primarily on dental health maintenance and preventive dental care. They examine patients' dentition and periodontium (supporting structures of the teeth); take radiographic images; and perform oral prophylaxis using hand and ultrasonic instruments to remove deposits, such as calculus, stains, and plaque. They may also apply fluorides to prevent caries. They work independently or along with a dentist to administer local anesthesia and nitrous oxide sedation and to do oral screenings, polish restorations, remove sutures, apply dental sealants, and perform periodontal procedures. Dental hygienists must be knowledgeable about safety concerning x-ray equipment, anesthesia, and infectious diseases. They wear safety glasses, surgical masks, and gloves to protect themselves and their patients. A major component of the dental hygienist's work is patient education for maintenance of good oral health. They may give instruction on nutrition and proper oral care, such as brushing, flossing, and the use of antimicrobial rinses.

Most dental hygiene programs award an associate degree; some offer bachelor's or master's degrees. The higher degrees are required for research, teaching, or practice in public or school health facilities. The professional program requires 1 year of college-level prerequisite courses. The curriculum includes courses in radiography, dental anatomy, pharmacology, head and neck anatomy, and other health- and dental-related sciences. Additional material on the legal and ethical aspects of dental hygiene practice and extensive clinical training are included in the program. After graduation, dental hygienists must be licensed in their states by passing clinical and written examinations administered by the American Dental Association's (ADA) Joint Commission on National Dental Examinations.

Almost all hygienists work in dental offices. One advantage of this field is scheduling flexibility and the opportunity for part-time work. Job prospects are good; dental hygiene is among the fastest growing occupations. Benefits vary with place of employment. For additional information, contact the American Dental Hygienists' Association at adha.org.

Health Professions boxes focus on a variety of health careers, showing how the knowledge of medical terminology is applied in future careers.

FOR YOUR REFERENCE

BOX 1-2

Silent Letters and Unusual Pronunciations

Letter(s)	Pronunciation	Example	Definition of Example
ch	k	chemical *KEM-ih-kal*	pertaining to the elements and their interactions (root *chem/o* means "chemical")
dys	dis	dysfunction *dis-FUNK-shun*	difficult or abnormal (dys-) function
eu	u	euphoria *u-FOR-e-ah*	exaggerated feeling of well-being (*eu-* means "true" or "good")
gn	n	gnathic *NATH-ik*	pertaining to the jaw (gnath/o)
ph	f	phantom *FAN-tom*	illusion or imaginary image
pn	n	pneumonia *nu-MO-ne-ah*	inflammation of the lungs (pneumon/o)
ps	s	pseudonym *SU-do-nim*	false name (-nym)
pt	t	ptosis *TO-sis*	dropping, downward displacement
rh	r	rhinoplasty *RI-no-plas-te*	plastic repair of the nose (rhin/o)
x	z	xiphoid *ZI-foyd*	pertaining to cartilage attached to the sternum (from Greek *xiphos*, meaning "sword")

For Your Reference boxes provide supplemental information for terms within a chapter.

Table 2-1 Roots for Cells and Tissues

Root	Meaning	Example	Definition of Example
morph/o	form	polymorphous *pol-e-MOR-fus*	having many forms
cyt/o, -cyte	cell	cytologist *si-TOL-o-jist*	one who studies cells
nucle/o	nucleus	nuclear *NU-kle-ar*	pertaining to a nucleus
kary/o	nucleus	karyotype *KAR-e-o-tipe*	picture of a cell's chromosomes organized according to size (FIG. 2-10)
hist/o, histi/o	tissue	histocompatibility *his-to-kom-pat-ih-BIL-ih-te*	tissue similarity that permits transplantation
fibr/o	fiber	fibrosis *fi-BRO-sis*	abnormal formation of fibrous tissue
reticul/o	network	reticulum *reh-TIK-u-lum*	a network
aden/o	gland	adenoma *ad-eh-NO-mah*	tumor (-oma) of a gland
papill/o	nipple	papilla *pah-PIL-ah*	projection that resembles a nipple
myx/o	mucus	myxadenitis *miks-ad-eh-NI-tis*	inflammation (-itis) of a mucus-secreting gland
muc/o	mucus, mucous membrane	mucorrhea *mu-ko-RE-ah*	increased flow (-rhea) of mucus
somat/o, -some	body, small body	chromosome *KRO-mo-some*	small body that takes up color (dye) (chrom/o)

Word Part Tables present roots, prefixes, and suffixes covered in each chapter in an easy-to-reference format (with examples of their use in medical terminology). Word Part Knowledge aids in the learning and understanding of common terminology.

Exercises are designed to test your knowledge before you move to the next learning topic that follows each table.

Exercise 13-3

Complete the exercise. To check your answers go to Appendix 11.

Use the suffix *-ic* to write a word for the following definitions.

1. pertaining to the liver _____
2. pertaining to the gallbladder _____
3. pertaining to the pancreas _____

Use the suffix *-graphy* to write a word for the following definitions.

4. radiographic study of the liver _____
5. radiographic study of the gallbladder _____
6. radiographic study of the bile ducts _____
7. radiographic study of the pancreas _____

Use the suffix *-lithiasis* to write a word for the following definitions.

8. condition of having a stone in the common bile duct _____
9. condition of having a stone in the pancreas _____

Fill in the blanks.

10. Inflammation of the liver is called _____.
11. The word biligenesis (*bil-ih-JEN-eh-sis*) means the formation of _____.
12. A cholelith (*KO-le-lith*) is a(n) _____.
13. Choledochotomy (*ko-led-o-KOT-o-me*) is incision of the _____.
14. Cholecystectomy (*ko-le-sis-TEK-to-me*) is removal of the _____.
15. Hepatomegaly (*hep-ah-to-MEG-ah-le*) is enlargement of the _____.
16. Cholangitis (*ko-lan-JI-tis*) is inflammation of a(n) _____.
17. Pancreatolysis (*pan-kre-ah-TOL-ih-sis*) is dissolving of the _____.

Terminology *Key Terms*

The terms listed below are emphasized in this chapter. Knowing them will help you organize and prioritize your learning. These boldface terms are also found, collectively, with all chapter key terms in the Glossary.

Disease

acute *ah-KUTE*	Sudden, severe; having a short course
benign *be-NINE*	Not recurrent or malignant, favorable for recovery, describing a tumor that does not spread (metastasize) to other tissues
carcinoma *kar-sih-NO-mah*	A malignant neoplasm composed of epithelial cells (from Greek root carcino, meaning "crab") (adjective: carcinomatous)
chronic *KRON-ik*	Of long duration, progressing slowly
cyst *sist*	An abnormal filled sac or pouch; used as a root meaning a normal bladder or sac, such as the urinary bladder or gallbladder (root: cyst/o)
edema *eh-DE-mah*	Accumulation of fluid in the tissues, swelling; adjective: edematous (eh-DE-mah-tus) (see FIG. 3-2)
etiology *e-te-OL-o-je*	The cause of a disease
Gram stain	A laboratory staining procedure that divides bacteria into two groups: gram positive, which stains purple, and gram negative, which stains red
hernia *HER-ne-ah*	Protrusion of an organ through an abnormal opening; commonly called a rupture (FIG. 3-4)
immunity *ih-MU-nih-te*	All our defenses against infectious disease
inflammation *in-flah-MA-shun*	A localized response to tissue injury characterized by heat, pain, redness, and swelling
lesion *LE-zhun*	A distinct area of damaged tissue, an injury or wound

Terminology Tables-Key Terms outline the key terms emphasized in the chapter and can be used as a learning and study tool.

Terminology Tables-Enrichment Terms provide you with more challenging terms to expand your knowledge.

Terminology *Enrichment Terms*

The terms listed below expand on the key terms to increase your knowledge of this chapter topic.

amino acids *ah-ME-no*	The nitrogen-containing compounds that make up proteins
anabolism *ah-NAB-o-lizm*	The type of metabolism in which body substances are made; the building phase of metabolism
catabolism *kah-TAB-o-lizm*	The type of metabolism in which substances are broken down for energy and simple compounds
collagen *KOL-ah-jen*	A fibrous protein found in connective tissue
cortex *KOR-tex*	The outer region of an organ
glycogen *GLI-ko-jen*	A complex sugar compound stored in liver and muscles and broken down into glucose when needed for energy
interstitial *in-ter-STISH-al*	Between parts, such as the spaces between cells in a tissue
medulla *meh-DUL-lah*	The inner region of an organ, marrow (root: medull/o)
parenchyma *par-EN-kih-mah*	The functional tissue of an organ
parietal *pah-RI-eh-tal*	Pertaining to a wall, describes a membrane that lines a body cavity
soma *SO-mah*	The body
stem cell	An immature cell that has the capacity to develop into any of a variety of different cell types, a precursor cell

Terminology Tables-Abbreviations are listed for common terms.

Terminology *Abbreviations*

The abbreviations listed below are emphasized in this chapter. These are also found, collectively, with all chapter abbreviations in Appendix 2.

ACE	Angiotensin-converting enzyme	**GFR**	Glomerular filtration rate
ADH	Antidiuretic hormone	**GU**	Genitourinary
ARF	Acute renal failure	**IVP**	Intravenous pyelography
ATN	Acute tubular necrosis	**IVU**	Intravenous urography
BUN	Blood urea nitrogen	**K**	Potassium
CAPD	Continuous ambulatory peritoneal dialysis	**KUB**	Kidney–ureter–bladder (radiography)
CCPD	Continuous cyclic peritoneal dialysis	**Na**	Sodium
CMG	Cystometrography; cystometrogram	**PEP**	Protein electrophoresis
CRF	Chronic renal failure	**SG**	Specific gravity
EPO	Erythropoietin	**Tm**	Maximal transport capacity
ESRD	End-stage renal disease	**UA**	Urinalysis
ESWL	Extracorporeal shock-wave lithotripsy	**UTI**	Urinary tract infection

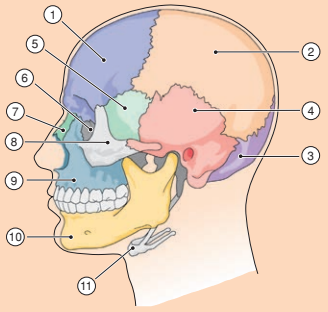
Chapter Review Exercises are designed to test your knowledge of the chapter material and appear at the end of each chapter.

SKULL FROM THE LEFT

Write the name of each numbered part on the corresponding line.

Frontal
Hyoid
Lacrimal
Mandible
Maxilla
Nasal
Occipital
Parietal
Sphenoid
Temporal
Zygomatic

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____
8. _____
9. _____
10. _____
11. _____

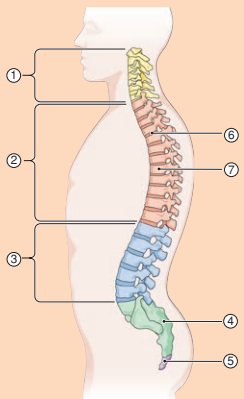


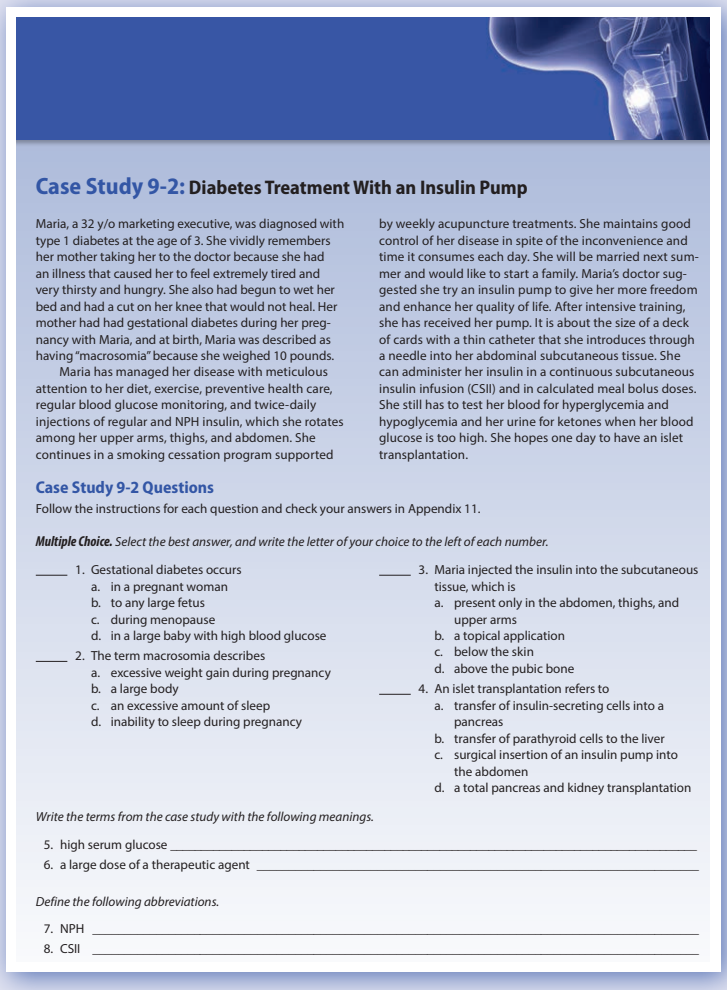
VERTEBRAL COLUMN

Write the name of each numbered part on the corresponding line.

Body of vertebra
Cervical vertebrae
Coccyx
Intervertebral disk
Lumbar vertebrae
Sacrum
Thoracic vertebrae

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____
7. _____





Case Study 9-2: Diabetes Treatment With an Insulin Pump

Maria, a 32 y/o marketing executive, was diagnosed with type 1 diabetes at the age of 3. She vividly remembers her mother taking her to the doctor because she had an illness that caused her to feel extremely tired and very thirsty and hungry. She also had begun to wet her bed and had a cut on her knee that would not heal. Her mother had had gestational diabetes during her pregnancy with Maria, and at birth, Maria was described as having "macrosomia" because she weighed 10 pounds.

Maria has managed her disease with meticulous attention to her diet, exercise, preventive health care, regular blood glucose monitoring, and twice-daily injections of regular and NPH insulin, which she rotates among her upper arms, thighs, and abdomen. She continues in a smoking cessation program supported by weekly acupuncture treatments. She maintains good control of her disease in spite of the inconvenience and time it consumes each day. She will be married next summer and would like to start a family. Maria's doctor suggested she try an insulin pump to give her more freedom and enhance her quality of life. After intensive training, she has received her pump. It is about the size of a deck of cards with a thin catheter that she introduces through a needle into her abdominal subcutaneous tissue. She can administer her insulin in a continuous subcutaneous insulin infusion (CSII) and in calculated meal bolus doses. She still has to test her blood for hyperglycemia and hypoglycemia and her urine for ketones when her blood glucose is too high. She hopes one day to have an islet transplantation.

Case Study 9-2 Questions

Follow the instructions for each question and check your answers in Appendix 11.

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

____ 1. Gestational diabetes occurs
   a. in a pregnant woman
   b. to any large fetus
   c. during menopause
   d. in a large baby with high blood glucose

____ 2. The term macrosomia describes
   a. excessive weight gain during pregnancy
   b. a large body
   c. an excessive amount of sleep
   d. inability to sleep during pregnancy

____ 3. Maria injected the insulin into the subcutaneous tissue, which is
   a. present only in the abdomen, thighs, and upper arms
   b. a topical application
   c. below the skin
   d. above the pubic bone

____ 4. An islet transplantation refers to
   a. transfer of insulin-secreting cells into a pancreas
   b. transfer of parathyroid cells to the liver
   c. surgical insertion of an insulin pump into the abdomen
   d. a total pancreas and kidney transplantation

Write the terms from the case study with the following meanings.

5. high serum glucose _____
6. a large dose of a therapeutic agent _____

Define the following abbreviations.

7. NPH _____
8. CSII _____

Case Studies and Case Study Questions at the end of every chapter present terminology in the context of a medical report. These are an excellent review tool because they test your cumulative knowledge of medical terminology and put terminology into a real-world context.

Instructor, Student and Learning Resources

For the Instructor

Qualified instructors will receive a full suite of instructor resources, including the following:

- Slides in PowerPoint format
- Testbank in LMS compatible format
- Lesson Plans

For the Student

- eBook
- Anatomy & Physiology Review Module with Heart & Lung Sounds
- Animations
- TestPrep

Learning Resources

- eBook
- A&P Module with Heart & Lung Sounds
- Image Bank
- TestPrep
- Animations
- Audio Pronunciation Glossary