

MASTERING HEALTHCARE TERMINOLOGY

8th Edition



Betsy J. Shiland



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MASTERING HEALTHCARE TERMINOLOGY

8th
EDITION

Betsy J. Shiland

MS, RHIA, CCS, CPC, CPB, CPPM

Former Assistant Professor
Allied Health Department
Community College of Philadelphia
Philadelphia, Pennsylvania

With 500 illustrations



Elsevier
3251 Riverport Lane
St. Louis, Missouri 63043

MASTERING HEALTHCARE TERMINOLOGY, EIGHTH EDITION
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ISBN: 978-0-443-37927-7

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Senior Content Strategist: Melissa Rawe
Content Development Manager: Ellen Wurm-Cutter
Senior Content Development Specialist: Linda Woodard
Publishing Services Manager: Catherine Jackson
Senior Project Manager: Rachel E. McMullen
Design Direction: Ryan Cook

Printed in India

Last digit is the print number: 9 8 7 6 5 4 3 2 1



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Contributor and Reviewers

Contributor

Erinn Kao, PharmD, RPh

VP of Operations & MIC, Operations
Rx Outreach, Inc.
St. Louis, Missouri

Previous Edition Reviewers

Randal Beard, MEd, RMA

MCI School of Health Science
ECPI University
Virginia Beach, Virginia

Angela R. Campbell, RHIA, AHIMA

Approved ICD-10-CM/PCS Trainer
Medical Insurance Manager
Eastern Illinois University
Charleston, Illinois
Curriculum Designer, Online Instructor
Health Information Technology Program
Northwestern College
Chicago, Illinois

Michele M. Crase, MT (ASCP) MPH

Instructor
Northern Illinois University
DeKalb, Illinois

Lisa Monique, Hall, MAEd, RhED, BS

Health Educator, CMA
Allen School of Health Sciences
Jamaica, New York

Sandra Hertkorn, LVN

Reimbursement Specialist
Instructor Advanced Coding-Externship
Coordinator
Bryan College Sacramento Campus
Gold River, California

Yvette Kennedy, OD, CBCS

En Visionary I-Care
Garner Charlotte, North Carolina

Ann Lunde, BS, CMT

Waubonsee Community College
Sugar Grove, Illinois

David McBride, BA, MA, RT (R) (CT) (MR)

Program Director
Westmoreland County Community College
Youngwood, Pennsylvania

Barbareta A. Welch McGill, BSN, MSN, DRS, RN

Clinical Instructor
North Carolina Central University
Department of Nursing
Durham, North Carolina

Patricia B. McKeown, AAS, RHIT

Adjunct Instructor
South Plains College
Levelland, Texas

Lisa Mendez, BBE, MEd

Professor
Sheridan College
Oakville, Ontario, Canada

Bharat Mody, MBBS

Instructor
Star Career Academy
Clifton, New Jersey

Teresa Pirone, CNA, LMT

Danbury, Connecticut

Karen K. Smith, MEd, RHIA, CPC

Instructor
University of Arkansas for Medical Sciences
College of Health Professions
Health Information Management Program
Little Rock, Arkansas

Teresa D. Tarkington, CPC, CMRS

Program Lead—Billing and Coding Specialist
Daymar Institute
Murfreesboro, Tennessee

Carole A. Zeglin, MEd, BS, MT, MA (RMA)

Professor/Director Clinical Laboratory, Medical
Assisting, and Phlebotomy Programs
Westmoreland County Community College
Youngwood, Pennsylvania

Preface

Committing to a healthcare career is like deciding to move to a foreign country. Exciting! Except—the inhabitants speak another language. The goal of *Mastering Healthcare Terminology (MHT)* is to help you learn that language. MHT is a result of an analysis of US healthcare statistics resulting in a coverage of the most common healthcare terms describing specific anatomy, conditions and/or procedures in the easiest, most effective manner possible.

Good news! You already have a solid foundation in this subject. Prefixes, suffixes, and word roots make up both the English language and your desired language in healthcare. You just may not be aware of what you know. A student of terminology can develop a sizable vocabulary by learning a large number of additional decodable word parts along with the rules necessary to join them together. Memorizing eponyms, abbreviations, symbols, and other nondecodable terms completes a healthcare professional's vocabulary.

Medical school students use a proven set of methods to master huge amounts of material in a short amount of time. How do they do it? They use a method appropriate to our travel analogy. A visa is a travel document necessary for you to enter and stay in a desired country. For our purposes, the word visa stands for a method of efficiently and effectively learning a new language. MHT is designed with:

- V – varied learning/ a diverse set of exercises in every chapter
- I – interleaved exercises/ a mixture of types of exercises
- S – spaced repetition/ a review of covered material at given intervals
- A – active recall/ a testing of memory by closed book inquiry

The last element, active recall, is made possible by the “chunked” structure of MHT. The division of content into smaller segments encourages you to read a section, CLOSE THE BOOK, and either write or say what you remember. This is an extremely important process that moves the information that you have read, highlighted, or underlined into your memory. Reopen the text, go back, check your understanding, then try the exercises at the end of the section. The exercises test your recognition (the simplest: I know it when I see it), and usage (the hardest: I can recall and apply the content to a higher order of understanding) of the terms and concepts covered.

ORGANIZATION OF THE BOOK

Mastering Healthcare Terminology has been designed for your success. Each feature has been chosen to help you learn this new language quickly and effectively.

To get you started, [Chapters 1 and 2](#) orient you to the basic concepts necessary to learn healthcare terminology. [Chapter 1](#) is focused on word parts and basic building and decoding skills. [Chapter 2](#) explains the organization of the body, as well as positional and directional terms. You will use the material in both of these chapters throughout the remainder of the text.

[Chapters 3 through 14](#) are body system chapters, each organized in the same way. The function of each system is introduced first, followed by the anatomy and physiology. A summary table of common anatomy and physiology word parts for the system functions as an excellent study tool. Once the terms for normal function are covered, pathologic terms, diagnostic techniques, therapeutic interventions, pharmacologic terms, and common abbreviations are presented.

[Chapters 15 and 16](#) cover specialty terminology. [Chapter 15](#) discusses the terminology for mental and behavioral health. [Chapter 16](#) covers cancer terminology for all the body systems. Appendix A discusses the basics of infectious disease, an increasingly necessary topic these days.

The internal structure of each chapter consists of small learning segments or “chunks.” Concepts, terms, and abbreviations for a topic are covered and then immediately followed by exercises that reinforce and assess your understanding and retention of the material. Pathology and procedure terms are organized into tables that include phonetic pronunciations followed by the terms’ component word parts and their meanings. Special boxes alert you to terminology pitfalls. Misspelling a term can cause it to take on an entirely different meaning! Electronic healthcare records, case studies, and engaging end-of-chapter exercises provide you the opportunity to practice the terminology you’ve learned.

FEATURES

We’ve loaded *Mastering Healthcare Terminology* with special features to help you quickly and correctly learn the medical terminology you need to effectively communicate in the clinical setting.

Be Careful! Boxes remind students of potentially confusing look-alike or sound-alike word parts and terms.

Be Careful!

Remember that the ends of the long bones closest to the points of attachment (hips and shoulders) are described as **proximal**, whereas those farthest from the points of attachment (feet and hands) are described as **distal**.

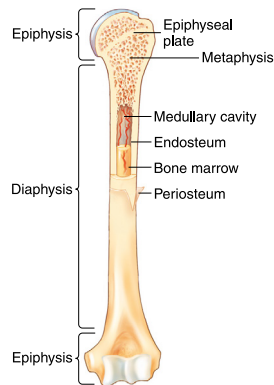


Fig. 3-2 Long bone.

f0015

metaphysis

meta- = change
-physis = growth, nature

periosteum

peri- = surrounding
oste/o = bone
-um = structure

endosteum

endo- = within
oste/o = bone
-um = structure

(*pl.* epiphyses). Underneath the epiphyses are the **epiphyseal** (eh pee FIZZ ee ul) **plates**, which are the areas where bone growth normally occurs. Around the ages from 16 to 25, the plates close, and bone growth stops. The epiphysis and epiphyseal plates together form the **metaphysis** (meh TAFF ih sis).

The outer covering of the bone is called the **periosteum** (pair ee OS tee um), and the inner lining of the bone is known as the **endosteum** (en DOS tee um). These two coverings hold the cells responsible for bone remodeling: osteoblasts and osteoclasts. The shape of a bone enables practitioners to speak very specifically about a particular area on that bone. For instance, any groove, opening, or hollow space is called a **depression**. Depressions provide an entrance and exit for vessels and protection for the organs they hold. Raised or projected areas are called **processes**. These are often areas of attachment for ligaments or tendons. The tables that follow give examples of bone depressions and processes.

Word parts next to their text mentions in the anatomy and physiology section, to demonstrate the origins of terms.

Depression	Combining Form	Meaning/Function	Example
foramen (<i>pl.</i> foramina) foh RAY men	foramin/o	An opening or hole.	foramen magnum, mental foramina
fossa (<i>pl.</i> fossae) FAH sah	foss/o	A hollow or depression, especially on the surface of the end of a bone.	olecranal fossa
sinus (<i>pl.</i> sinuses) SYE nus	sin/o sinus/o	A cavity or channel lined with a membrane (Also called an antrum).	paranasal sinuses

72 Chapter 3

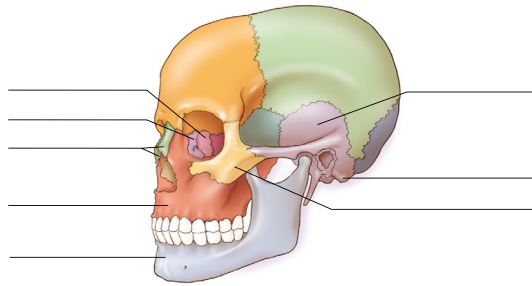
Decode the terms below, using your knowledge of word parts.

17. submandibular _____
18. costochondral _____
19. lumbosacral _____
20. thoracic _____
21. substernal _____

 EXERCISE 5: Bones of the Cranium and Face

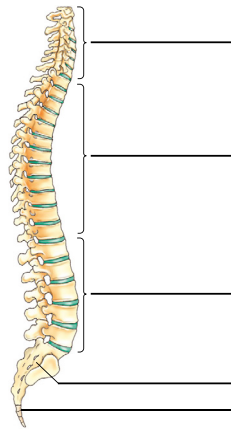
Label the diagram using the terms provided.

temporal bone
mandible
ethmoid bone
mastoid process
lacrimal bone
zygomatic bone
maxilla
nasal bones

 **EXERCISE 6: Bones of the Spine**

Label the diagram using the terms provided.

coccyx
cervical vertebrae
lumbar vertebrae
sacrum
thoracic vertebrae



Labeling exercises help students learn anatomy and the accompanying combining forms.

EXERCISE 16: Congenital Conditions

Build the terms.

Case studies provide students the opportunity to see terminology in use.

cartilage _____

Case Study LeDanton Bradford



LeDanton Bradford is a healthy, well-developed infant with six digits on the ulnar side of his right hand and webbing between the third and fourth digits on his left hand. All the phalanges in the other digits appear to be present and normal. At first his parents are reluctant to correct the abnormalities, but when LeDanton is 6 months old, they sign consents for surgery to correct both disorders.

1. What is the term that means a condition of extra fingers or toes? _____
2. What is the term that means a condition of webbed fingers or toes? _____
3. A/an _____ is an individual bone in a finger or toe.
4. The little finger is on the ulnar side of the hand.
a. true
b. false
5. What is the prefix that means many? _____

Terms Related to Bone Disease

Term	Word Origin	Definition
osteodynia ahs tee oh DIN ee ah	oste/o bone -dynia pain	Bone pain.
osteitis deformans ahs tee EYE tis dee FOR menz	oste/o bone -itis inflammation deformans misshapen	Misshaped bone resulting from excessive breakdown and formation of bone tissue. Also known as Paget disease .
osteomalacia ahs tee oh mah LAY sha	oste/o bone -malacia softening	Softening of bone caused by loss of minerals from the bony matrix as a result of vitamin D deficiency. When osteomalacia occurs in childhood, it is called rickets .
osteomyelitis ahs tee oh mye eh LYE tis	oste/o bone myel/o bone marrow -itis inflammation	Inflammation and/or infection of the bone and bone marrow.
osteoporosis ahs tee oh poor OH sis	oste/o bone por/o passage -osis abnormal condition	Loss of bone mass, which results in the bones being fragile and at risk for fractures (Fig. 3-11). Osteopenia refers to a less severe bone mass loss (<i>-penia</i> = deficiency).

Pathology and diagnostic terminology presented in tables include pronunciation of terms, word parts, and definition.

Electronic medical records present a variety of actual medical reports in an EHR format.

Medical Record Tamara Littleford

LITTLEFORD, TAMARA B - 566787 Opened by DOATE, MAURICE MD

Task Edit View Time Scale Options Help

As Of 14:54

LITTLEFORD, TAMARA B Age: 41 years Sex: Female Loc: WHC-SMMC
DOB: 04/13/1985 MRN: 566787 FIN: 3506004

Reference Text Browser Form Browser Medication Profile

Orders Last 48 Hours ED Lab Radiology **Assessment** Surgery Clinical Notes Pt. Info Pt. Schedule Task List I & O MAR

Flowsheet: Assessment Level: Physical Exam • Table Group List

Navigator

Physical Exam

Established patient arrives, complaining of stress incontinence and some lower abdominal pain, and she feels her abdomen may have some slight swelling.

On pelvic examination, she does have a slight cystocele. Rectal is normal. Her abdomen may be a little distended, although I am not sure. I will schedule her for a barium enema, and we may need to do a CT scan. I suggested she develop a schedule for the bathroom on a regular basis to see if this controls her stress incontinence. If not, we will recommend urologic evaluation.

Urinalysis shows no signs of infection and no other symptoms apparent for her stress incontinence.

IMPRESSION: Stress incontinence
Abdominal pain, possibly caused by previous history of GI reflux

PROD | MAHAFC | 20 July 2026 | 14:54

EXERCISE 7: Assessment

Using the preceding progress report, answer the following questions.

1. Aside from pain and possibly some swelling, what is this patient's main complaint?

2. What type of herniation does she exhibit?

3. What imaging tests are the doctors considering?

Frequent references to **online games and activities** alert students to opportunities for interactive learning



Click on **Hear It, Spell It** to practice spelling the pathology terms that you have learned in this chapter. To review the pathology terms that you have learned in this chapter, play **Medical Millionaire**.

Age Matters boxes highlight important concepts and terminology for both pediatric and geriatric patients.



Age Matters

Pediatrics

The only significant disorder that occurs during the pediatric years within the urinary system is urinary tract infection (UTI). Other problems of fluid imbalance (which the

kidneys help to control) are dehydration and electrolyte disorders. Examples are hypernatremia and hyponatremia and hypokalemia and hyperkalemia.

Geriatrics

UTIs are also a problem with older adults. As with children, problems of dehydration and electrolyte imbalance affect this age-group. Kidney function may decrease as individuals grow older, and as a result, blood pressure and blood levels of urea will increase. Senior citizens

who lose kidney function are then in need of dialysis, if not a kidney transplant.

Overall, general decreases in muscle tone also may cause problems with bladder function. As a result, stress incontinence in particular may become a concern.

DIAGNOSTIC PROCEDURES

Urinalysis

Urinalysis (UA) is the physical, chemical, and/or microscopic examination of urine. The following table gives examples of the constituents examined and of normal and abnormal findings with their possible interpretations.

Urinalysis

Physical Examination

Appearance (Fig. 6-11)

Normal finding: Clear.

Abnormal finding with interpretation: Cloudiness may indicate a UTI.

Color (Fig. 6-12)

Normal finding: Straw-colored or light amber.

Abnormal findings with interpretations: Lighter color may indicate DI or overhydration. Darker colors may indicate concentrated urine caused by dehydration, drugs, or liver disease.

Quantity

Normal finding: Approximately 1½ L per day.

Abnormal findings with interpretations: Profusion may indicate DI or a variety of other conditions precipitating diuresis. Smaller than normal amounts may be a result of dehydration, blockages, or strictures.

Specific gravity (SG): Measures the ability of the kidneys to regulate the concentration of urine

Normal finding: A reading of 1.015 to 1.025, which is slightly denser than the weight of water.

Abnormal findings with interpretations: Diabetes or kidney damage may be the cause of a low SG.

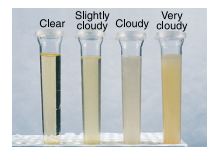


Fig. 6-11 Appearance of urine.

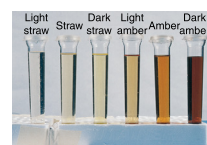


Fig. 6-12 Color of urine.

Continued

Intrachapter exercises throughout each chapter allow for frequent practice

Build a term that means:

11. surgical repair of a joint _____
12. intentional breaking of a bone _____
13. excision of a bunion _____
14. surgical repair of a tendon and muscle _____
15. removal of a meniscus _____
16. surgical repair of a ligament _____

Pharmacology and Complementary and Integrative Medicine are included in each body system chapter.

PHARMACOLOGY

analgesics: Reduce pain. Examples include hydromorphone (Dilaudid), oxycodone (Oxycontin), acetaminophen (Tylenol), and NSAIDs such as naproxen (Anaprox).

antiinflammatories: Reduce inflammation with secondary effects of reducing swelling and pain. Examples include steroidal and nonsteroidal antiinflammatory drugs (NSAIDs). Methylprednisolone (Medrol) is an example of a steroid; ibuprofen (Advil) and celecoxib (Celebrex) are examples of NSAIDs.

bisphosphonates: Inhibit bone loss to treat diseases such as osteoporosis, Paget disease, or bone cancer. Examples include alendronate (Fosamax) and zoledronic acid (Zometa).

disease-modifying antirheumatic drugs (DMARDs): Slow progression of RA while also reducing signs and symptoms. Examples include leflunomide (Arava), etanercept (Enbrel), and infliximab (Remicade).

muscle relaxants: Relieve pain caused by muscle spasms by relaxing the skeletal muscles. Examples include cyclobenzaprine (Flexeril) and carisoprodol (Soma).

COMPLEMENTARY AND INTEGRATIVE MEDICINE

Glucosamine, chondroitin, and methylsulfonylmethane (MSM) are commonly used dietary supplements to support joint health and help alleviate joint pain and stiffness including for patients with osteoarthritis. Glucosamine is involved in cartilage development. Chondroitin may be used to help maintain or improve joint fluids and flexibility. MSM may be used to support joint and muscle health.

Massage therapy is physical manipulation of muscle and soft tissue to help alleviate pain and muscle tension.

Transcutaneous electrical nerve stimulation (TENS) therapy uses mild electrical currents to stimulate nerves through the skin to help alleviate pain and muscle tension.

Review exercises encourage word building and practical use of terminology.

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Wordshop

Prefixes	Combining Forms	Suffixes
a-	arthr/o	-desis
an-	chondr/o	-itis
inter-	cost/o	-lysis
peri-	dactyl/o	-malacia
poly-	my/o	-oma
syn-	myos/o	-osis
	oste/o	-plasia
	phyt/o	-plasty
	rhabdomy/o	-rrhaphy
	spin/o	-um
	spondyl/o	-y
	syndesm/o	
	ten/o	

Build the following terms by combining the preceding word parts. Some word parts may be used more than once. Some may not be used at all. The number in parentheses indicates the number of word parts needed.

Definition	Term
1. structure surrounding bone (3)	_____
2. inflammation of many muscles (3)	_____
3. inflammation surrounding a joint (3)	_____
4. softening of the cartilage (2)	_____
5. condition of many fingers/toes (3)	_____
6. destruction of skeletal muscle (2)	_____
7. abnormal condition of bone growth (3)	_____
8. binding of a joint (2)	_____
9. suture of a muscle (2)	_____
10. condition of joined fingers/toes (3)	_____
11. tumor of cartilage (2)	_____
12. binding of vertebrae together (3)	_____
13. surgical repair of a ligament (2)	_____
14. no formation of cartilage (3)	_____
15. surgical repair of a tendon and a muscle (3)	_____



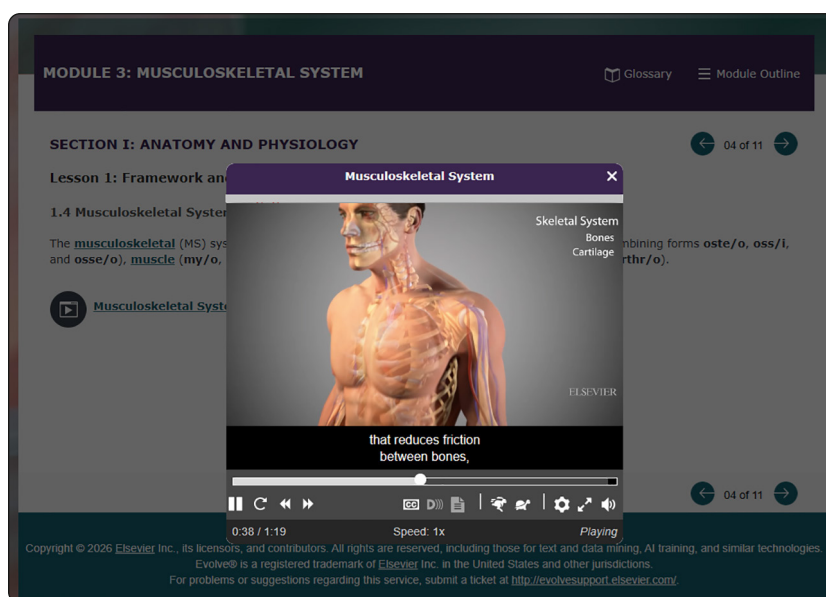
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This online course supplement is accessible only if you have purchased the access code packaged with your book. If you did not purchase the book/access package, ask your instructor for information or visit <http://evolve.elsevier.com/> to purchase.

Instructors interested in *Medical Terminology Online*, please contact your sales rep, call Faculty Support at 1-800-222-9570, or visit <http://evolve.elsevier.com/> for more information.



To the Instructor

You are the most important driving force behind your students' mastery of medical terminology. That's why we have provided you with all the resources you will need to teach this new language to your students:

- A **PowerPoint presentation** includes over 1,000 slides to make teaching from Shiland a breeze. Slides are enhanced with additional images.
- A **test bank** consists of over 4,800 questions. Within the test bank are multiple-choice, fill-in-the-blank, and true/false questions that can be sorted by subject, objective, and type of questions using ExamView.
- **Handouts** can be used for classroom quizzes or homework.
- **Practice exams and gradable quizzes** on the student site can be used for extra credit.
- **TEACH Lesson Plans** help you prepare for class and make full use of the rich array of ancillaries and resources that come with your textbook. TEACH is short for "Total Education and Curriculum Help," which accurately describes how these lesson plans and lecture materials have been providing creative and innovative instructional strategies to both new and experienced instructors to the benefit of their students. Each lesson plan contains:
 - 50-minute lessons that correlate chapter objectives with content and teaching resources
 - Convenient lists of key terms for each chapter
 - Classroom activities and critical-thinking questions that engage and motivate students. Visit <http://evolve.elsevier.com/Shiland/Mastering> for more information.

From the Author

My greatest joy as a teacher has been to meet students long after they have finished one of my classes: students now practicing the careers of their choice, which they embarked on so many years before. Students tell me how much they have used what they learned, how glad they are that they took the course, and, finally, how much fun it was. Certainly, healthcare terminology is a serious subject, but there is no reason not to have fun while you are learning. The Evolve website that accompanies this text will allow you to practice all aspects of terminology while playing games that test your knowledge of all that serious stuff. Research shows that you need to be in contact with a new term at least six times to remember it. By attending class, reading the chapters, completing the exercises, and playing the games, you will have easily met that goal.

I am deeply grateful to all the people who have helped me in getting this seventh edition to print. Thanks are due to the following:

- To my past students: for your questions, your enthusiasm, and your drive to accomplish a career in healthcare.
- To **Erinn Kao** for always updating the pharmacology information to keep it current in an ever-changing field. Thank you, Erinn! Much gratitude also goes to Jeanne Robertson, who patiently turned my thoughts into beautiful illustrations for the text.
- I am deeply grateful to **Rachel McMullen** for shepherding the text through the complicated production process. Her skill, patience, and good-will have made this new edition (with its last minute changes) a delight. Many thanks are due to **Ryan Cook** for another beautiful design throughout the text. It's lovely! And, finally, to the best editor ever, **Linda Woodard**, who has been with me from the beginning. She is the reason that this textbook exists, and I can only hope to have her incredible skills and talents for any future editions.
- To my family: brother and sister-in-law, **Thomas** and **Maureen Shiland**, both National Board Certified-teachers, who have provided many discussions and resources that helped me solidify my thinking on the structure of the exercises and games. And most important of all: thanks to my son, **Thomas**, who continues to inspire, encourage, and support me.

Betsy Shiland
shilandb@gmail.com

Introduction to Healthcare Terminology

1

CHAPTER OUTLINE

Derivation of Healthcare Terms

Types of Healthcare Terms

Decoding Terms

Building Terms

Case Study: Debbie Halloran

Case Study: Kate Martin

Singular/Plural Rules

Pronunciation of Unusual Letter

Combinations

Case Study: Harry Chu

Case Study: Medical Terminology Class

Case Study: Medical Terminology Class

Chapter Review

OBJECTIVES

- State the derivation of most healthcare terms.
- Use the rules given to build, spell, and pronounce healthcare terms.
- Use the rules given to change singular terms to their plural forms.
- Recognize and recall an introductory word bank of prefixes, suffixes, and combining forms and their respective meanings.



You'll find fun interactive learning in the Student Resources, including:

- **Tournament of Terminology Game**—answer questions in a multitude of medical terminology categories.
- **Match the Word Parts**—match word parts with definitions.
- **Medical Millionaire Game**—earn a “million dollars” by answering questions about pathology terms.
- **Wordshop**—practice building terms.
- **Hear It, Spell It**—listen to a term, and then spell it correctly.
- **Quick Quizzes and Practice Exams**
- **Flash Cards**—learn word parts and their definitions.
- **Animations**

DERIVATION OF HEALTHCARE TERMS

Healthcare terminology is a specialized vocabulary derived from Greek and Latin word components. This terminology is used by professionals in the medical field to communicate with each other. By applying the process of “decoding,” or recognizing the word components and their meanings and using these to define the terms, anyone will be able to interpret literally thousands of medical terms.

The English language and healthcare terminology share many common origins. This proves to be an additional bonus for those who put forth the effort to learn hundreds of seemingly new word parts. Two excellent and highly relevant examples are the **combining forms** (the “subjects” of most terms) **gloss/o** and **lingu/o**, which mean “tongue” in Greek and Latin, respectively. Because the tongue is instrumental in articulating spoken language, Greek and Latin equivalents appear, not surprisingly, in familiar English vocabulary. The table below illustrates the intersection of our everyday English language with the ancient languages of Greek and Latin and can help us to clearly see the connections. **Suffixes** (word parts that appear at the end of terms) and **prefixes** (word parts that appear at the beginning of terms) also are presented in this table. Special notice should be given to the pronunciation key that is provided directly under the examples: You will have to use your tongue to say them! *Please remember that terminology is spoken as well as written and read.* You must take advantage of the many resources that this text provides if you wish to fully communicate as a healthcare professional.

Ancient Word Origins in Current English and Healthcare Terminology Usage		
Term	Word Origins	Definition
glossary (GLAH sur ee)	gloss/o tongue (Greek) -ary pertaining to	An English term meaning “an alphabetical list of terms with definitions.”
glossitis (glah SYE tiss)	gloss/o tongue (Greek) -itis inflammation	A healthcare term meaning “inflammation of the tongue.”
bilingual (by LIN gwal)	bi- two lingu/o tongue (Latin) -al pertaining to	An English term meaning “pertaining to two languages.”
sublingual (sub LIN gwal)	sub- under lingu/o tongue (Latin) -al pertaining to	A healthcare term meaning “pertaining to under the tongue.”

Did you notice that these healthcare terms use the word origins literally, whereas English words are related to their word origins but are not exactly the same? Fortunately, most healthcare terms may be assigned a simple definition through the use of their word parts.

TYPES OF HEALTHCARE TERMS

Decodable Terms

Decodable terms are those terms that can be broken into their Greek and Latin word parts and given a working definition based on memorizing the meanings of those word parts. Most medical terms are decodable, so learning word parts is important. The word parts are:

- **Combining form:** Word root with its respective combining vowel.
- **Word root:** Word origin.
- **Combining vowel:** A letter sometimes used to join word parts. Usually an “o” but occasionally an “a,” “e,” “i,” or “u.”
- **Suffix:** Word part that appears at the end of a term. Suffixes are used to indicate whether the term is an anatomic, pathologic, diagnostic, or therapeutic intervention term.
- **Prefix:** Word part that sometimes appears at the beginning of a term. Prefixes are used to further define the absence, location, number, quantity, or state of the term.

In our first examples, gloss/ and lingu/ are word roots with an “o” as their combining vowel. Gloss/o and lingu/o are therefore combining forms; -ary, -al, and -itis are suffixes; and bi- and sub- are prefixes. Figs. 1-1 and 1-2 demonstrate the decoding of the terms **glossitis** and **sublingual**. Throughout the text, we will be using combining forms so that you will learn the appropriate combining vowel for that particular term.

Nondecodable Terms

Not all terms are composed of word parts that can be used to assemble a definition. These terms are referred to as **nondecodable terms** (i.e., words used in medicine whose definitions must be memorized without the benefit of word parts). These terms will have a blank space in the word origin tables presented in the text or will include only a partial notation, because the word origins either are not helpful or don’t exist. Examples of nondecodable terms include the following:

- **Cataract:** From the Greek term meaning “waterfall.” In healthcare language, this means progressive opacification of the lens.
- **Asthma:** From the Greek term meaning “panting.” Although this word origin is understandable, the definition is a respiratory disorder characterized by recurring episodes of sudden paroxysmal dyspnea (difficulty breathing).
- **Diagnosis:** The disease or condition that is named after a healthcare professional evaluates a patient’s signs, symptoms, and history. Although the term is built from word parts (dia-, meaning “through,” “complete”; and -gnosis, meaning “state of knowledge”), using these word parts to form the definition of diagnosis, which is “a state of complete knowledge,” really isn’t very helpful.
- **Prognosis:** Similar to *diagnosis*, the term *prognosis* can be broken down into its word parts (pro-, meaning “before” or “in front of”; and -gnosis, meaning “state of knowledge”), but this does not give the true definition of the term, which is “a prediction of the probable outcome of a disease or disorder.”
- **Sequela** (suh KWELL ah): A condition that results from an injury or disease.
- **Acute:** A term that describes an abrupt, severe onset (acu- means “sharp”) to a disease.
- **Chronic:** Developing slowly and lasting for a long time (chron/o means “time”). Diagnoses may be additionally described as being either acute or chronic.
- **Sign:** An objective finding of a disease state (e.g., fever, high blood pressure, rash).
- **Symptom:** A subjective report of a disease (pain, itching).

Other types of terms that are not built from word parts include the following:

- **Eponyms:** Terms that are named after a person or place associated with the term.* Unlike decodable terms, the name or place rarely gives any indication as to the body system, body part, diagnosis, or procedure involved. Throughout your career, you will see that more and more eponyms will



Fig. 1-1 Decoding of the term **glossitis**.

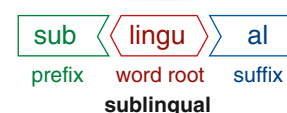
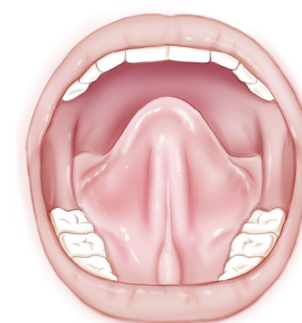


Fig. 1-2 Decoding of the term **sublingual**.

*This text presents terms without the possessive 's. This practice is in accordance with the American Medical Association (AMA) and the American Association of Medical Transcription (AAMT).

have a scientific synonym, and this text gives you both wherever possible. Examples of eponyms with scientific synonyms are:

Fallopian tubes = oviducts, uterine tubes

Hirschsprung disease = congenital megacolon

- **Portmanteaus:** Terms that are combinations of words that are not built from traditional Greek and Latin word parts. Portmanteaus (from an old French word for “suitcases”) are terms that are a combination of parts of two or more words. Familiar English examples are motel (motor and hotel), spork (spoon and fork), and smog (smoke and fog). Medical portmanteaus include:
 - Botox—a combination of the words botulism and toxin.
 - Genome—from gene and chromosome.
 - COVID-19—a combination of *corona*, *virus*, and *disease*, a coronavirus that spread worldwide in 2019.

Abbreviations and Symbols

Abbreviations are terms that have been shortened to letters and/or numbers for the sake of convenience. Symbols are graphic representations of a term. Abbreviations and symbols are extremely common in written and spoken healthcare terminology but can pose problems for healthcare workers. The Joint Commission has published a “DO NOT USE” list of dangerously confusing abbreviations, symbols, and acronyms that should be avoided (see Appendix D). The Institute for Safe Medication Practices has provided a more extensive list. Each healthcare organization should have an official list, which includes the single meaning allowed for each abbreviation or symbol. Examples of acceptable abbreviations and symbols include the following:

- **Simple abbreviations:** A combination of letters (often, but not always the first of significant word parts) and sometimes numbers
 - IM: Abbreviation for “**in**tramuscular” (pertaining to within the muscles)
 - C2: **2**nd cervical vertebra (second bone in neck)
 - SARS-CoV-2: **S**evere **a**cute **r**espiratory **s**yndrome caused by the **c**oronavirus **2** recognized in 2019 by the World Health Organization. SARS-CoV-2 is the name of the virus; COVID-19 is the name of the illness.
- **Acronyms:** Abbreviations that are also pronounceable
 - CABG: **C**oronary **a**rtery **b**ypass **g**raft (a detour around a blockage in an artery of the heart)
 - TURP: **T**ransurethral **r**esection of the **p**rostate (a surgical procedure that removes parts of the prostate through the urethra)
- **Symbols:** Graphic representations of terms
 - ♂ stands for male
 - ♀ stands for female
 - stands for absent
 - ̄ stands for with
 - ̄ stands for without



EXERCISE 1: Derivation of Healthcare Terms and Nondecodable Terms

Match the following types of healthcare terms with their examples.

- | | | |
|------------------------------|----------------------------|------------------------|
| _____ 1. symbol | _____ 4. eponym | A. CABG |
| _____ 2. decodable term | _____ 5. nondecodable term | B. Alzheimer’s disease |
| _____ 3. simple abbreviation | _____ 6. acronym | C. ♀ |
| | | D. glossitis |
| | | E. C2 |
| | | F. asthma |



Many students find that flash cards help them remember word parts. If this is a strategy that could work for you, now is a great place to start, whether the cards are purchased or handmade. One card will be needed for each word part with the part on one side and the definition on the reverse. The Student Resources that accompany this text provide mobile-optimized flash cards that can be sorted by chapter, by type of word part (prefix, suffix, combining form), and by abbreviation.

DECODING TERMS

Check, Assign, Reverse, and Define Method (CARD Method)

Using Greek and Latin word components to decipher the meanings of healthcare terms requires a simple four-step process—the check, assign, reverse, and define (CARD) method. You need to:

- **Check** for the word parts in a term.
- **Assign** meanings to the word parts.
- **Reverse** the meaning of the suffix to the front of your definition.
- **Define** the term.

Using [Fig. 1-3](#), see how this process is applied to your first patient, Alex.

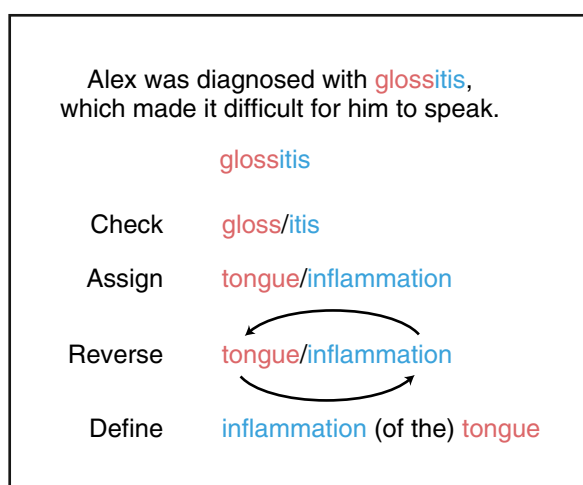


Fig. 1-3 How to decode a healthcare term using the **check, assign, reverse, and define (CARD)** method.

Most of the terms presented in this text appear in standardized tables. The term and its pronunciation appear in the first column, the word origin in the second, and a definition in the third. A table that introduces six healthcare terms that include six different combining forms and suffixes is provided on p. 7. (The use of prefixes will be introduced later.) Success in decoding these terms depends on how well you remember the twelve word parts that are covered in the following table. Once you master these twelve word parts, you will be able to recognize and define many other medical terms that use these same word parts—a perfect illustration of how learning a few word parts helps you learn many healthcare terms. The “wheel of terminology” included in [Fig. 1-4](#) demonstrates how the different suffixes in the table on p. 6 can be added to a combining form to make a variety of terms.

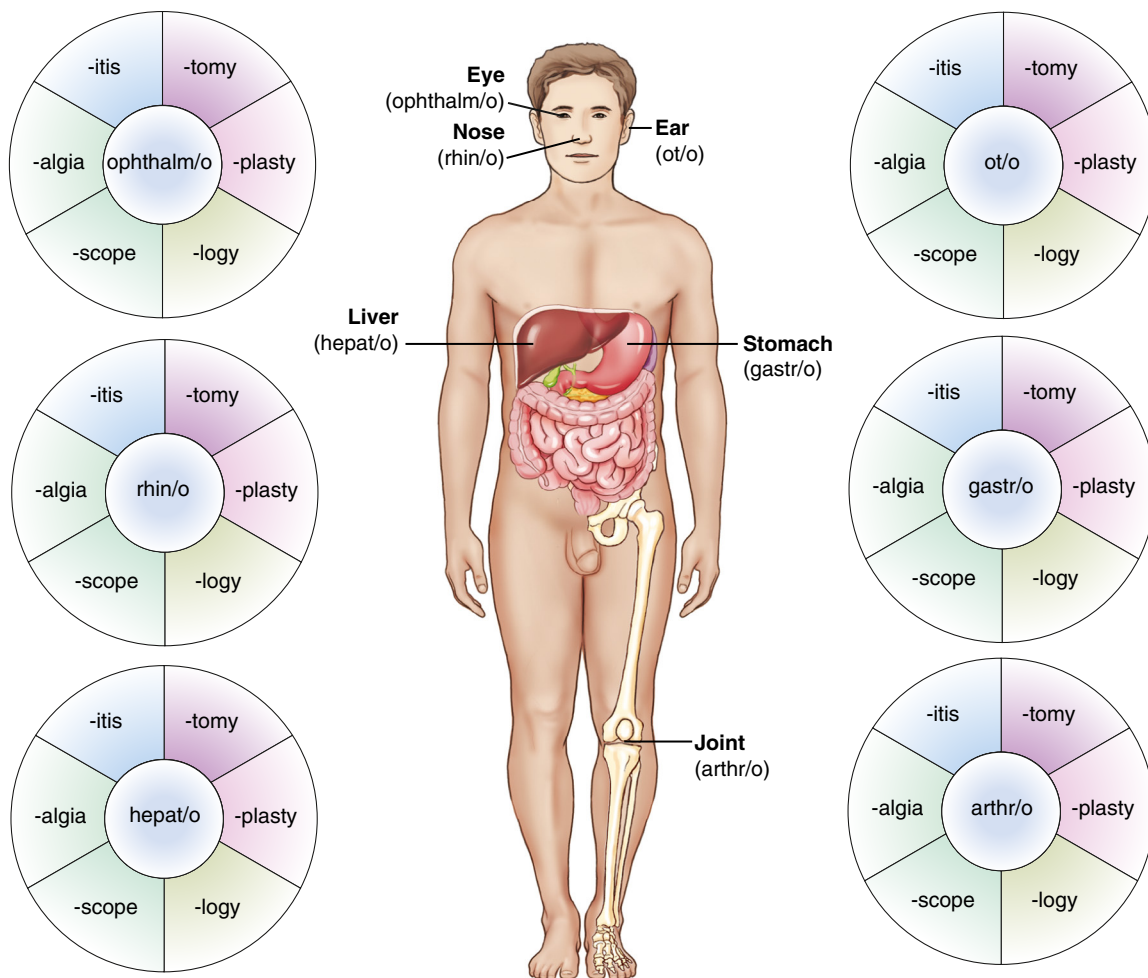


Fig. 1-4 Body parts and their combining forms. Surrounding the figure are “terminology wheels” that show how different suffixes can be added to a combining form to make a variety of terms.

Common Combining Forms and Suffixes

Combining Forms

arthr/o = joint
 gastr/o = stomach
 ophthalm/o = eye
 ot/o = ear
 rhin/o = nose
 hepat/o = liver

Suffixes

-algia = pain
 -tomy = incision
 -scope = instrument to view
 -logy = study of
 -plasty = surgical repair
 -itis = inflammation

The following table demonstrates how terms are presented in this book. Notice that the first column includes the term and its pronunciation. The second column breaks the term down into word parts and their meanings. The third column includes the definition of the term and any synonyms.

Samples of Decodable Terms

Term	Word Origins	Definition
arthralgia ar THRAL jah	arthr/o joint -algia pain of	Pain of a joint. Also called arthrodynia (the suffix -dynia also means pain).
gastrotomy gass TROT uh mee	gastr/o stomach -tomy incision	Incision of the stomach.
ophthalmoscope off THAL muh skohp	ophthalm/o eye -scope instrument to view	Instrument used to view the eye.
otology oh TALL uh jee	ot/o ear -logy study of	Study of the ear.
rhinoplasty RYE noh plass tee	rhin/o nose -plasty surgical repair	Surgical repair of the nose.
hepatitis heh peh TYE tiss	hepat/o liver -itis inflammation	Inflammation of the liver.



EXERCISE 2: Combining Forms

Match the combining forms with their meanings.

- | | | |
|------------------|----------------|---------------|
| _____ 1. ear | _____ 4. eye | A. rhin/o |
| _____ 2. stomach | _____ 5. joint | B. arthr/o |
| _____ 3. nose | | C. ot/o |
| | | D. gastr/o |
| | | E. ophthalm/o |



EXERCISE 3: Suffixes

Match the suffixes with their meanings.

- | | | |
|-----------------------------|-------------------|------------|
| _____ 1. pain | _____ 4. incision | A. -tomy |
| _____ 2. surgical repair | _____ 5. study of | B. -algia |
| _____ 3. instrument to view | | C. -logy |
| | | D. -plasty |
| | | E. -scope |



EXERCISE 4: Decoding the Terms Using Check, Assign, Reverse, and Define

Using the method shown in Fig. 1-3 and the twelve word parts you have just memorized, decode and define these five new terms.

- ophthalmology _____
- otoplasty _____
- gastralgia _____
- arthroscope _____
- rhinotomy _____

BUILDING TERMS

Now that you've seen how terms are decoded, we will discuss how they are built. First, a few rules on how to spell healthcare terms correctly.

Spelling Rules

With a few exceptions, decodable healthcare terms follow five simple rules:

1. If the suffix starts with a vowel, a combining vowel is *not* needed to join the parts. For example, it is simple to combine the combining form **arthr/o** and suffix **-itis** to build the term **arthritis**, which means “an inflammation of the joints.” The combining vowel “**o**” is not needed because the suffix starts with the vowel “**i**.”
2. If the suffix starts with a consonant, a combining vowel *is* needed to join the two word parts. For example, when building a term using **arthr/o** and **-plasty**, the combining vowel is retained and the resulting term is spelled **arthroplasty**, which refers to a surgical repair of a joint.
3. If a combining form ends with the same vowel that begins a suffix, one of the vowels is dropped. The term that means “inflammation of the inside of the heart” is built from the suffix **-itis** (inflammation), the prefix **endo-** (inside), and the combining form **cardi/o**. **Endo-** + **cardi/o** + **-itis** would result in *endocardiitis*. Instead, one of the “i”s is dropped, and the term is spelled **endocarditis**.
4. If two or more combining forms are used in a term, the combining vowel is retained between the two, regardless of whether the second combining form begins with a vowel or a consonant. For example, joining **gastr/o** and **enter/o** (small intestine) with the suffix **-itis** results in the term **gastroenteritis**. Notice that the combining vowel is *kept* between the two combining forms (even though **enter/o** begins with the vowel “e”), and the combining vowel is *dropped* before the suffix **-itis**.
5. Sometimes when two or more combining forms are used to make a medical term, special notice must be paid to the order in which the combining forms are joined. For example, joining **esophag/o** (which means esophagus), **gastr/o** (which means stomach), and **duoden/o** (which means duodenum, the first part of the small intestines) with the suffix **-scopy** (process of viewing) produces the term *esophagogastroduodenoscopy*. An **esophagogastroduodenoscopy (EGD)** is a visual examination of the esophagus, stomach, and duodenum. In this procedure, the examination takes place in a specific sequence (i.e., esophagus first, stomach second, and then the duodenum). Thus the term reflects the direction from which the scope travels through the body (Fig. 1-5).

Suffixes

The body system chapters in this text (Chapters 3 through 14) include many combining forms that are used to build terms specific to each system. These combining forms will not be seen elsewhere, except as a sign or symptom of a particular disorder. **Suffixes**, however, are used over and over again throughout the text. Suffixes usually can be grouped according to their purposes. The tables on pp. 9 to 15 cover the major suffix categories.

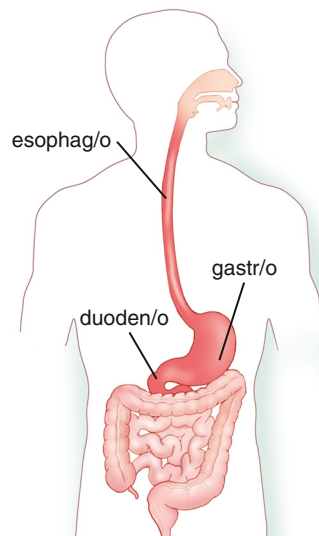


Fig. 1-5 The decoding of the term **esophagogastrroduodenoscopy (EGD)**.

Noun-Ending Suffixes

Noun endings are used most often to describe anatomic terms. Noun endings such as *-icle*, *-ole*, and *-ule* describe a diminutive structure.

Noun-Ending Suffixes				
Suffix	Meaning	Example	Word Origins	Definition
-icle	small, tiny	cuticle	cut/o skin -icle small	Small skin (surrounding the nail).
-is	structure, thing	hypodermis	hypo- under derm/o skin -is structure	Structure under the skin.
-ole	small, tiny	arteriole	arteri/o artery -ole small	Small artery.
-ule	small, tiny	venule	ven/o vein -ule small	Small vein.
-um	structure, thing, membrane	endocardium	endo- within cardi/o heart -um structure	Structure within the heart.
-y	process of, condition	atrophy	a- no, not, without troph/o development -y process of	Process of no development.

Adjective Suffixes

Adjective suffixes such as those listed in the following table usually mean “pertaining to.” For example, when the suffix **-ac** is added to the combining form **cardi/o**, the term *cardiac* is formed, which means “pertaining to the heart.” Remember that when you see an adjective term, you need to see what it is describing. For example, cardiac pain is pain of the heart, and cardiac surgery is surgery done on the heart. An adjective tells only half of the story.

Adjective Suffixes				
Suffix	Meaning	Example	Word Origins	Definition
-ac	pertaining to	cardiac	cardi/o heart -ac pertaining to	Pertaining to the heart.
-al	pertaining to	cervical	cervic/o neck -al pertaining to	Pertaining to the neck.
-ar	pertaining to	valvular	valvul/o valve -ar pertaining to	Pertaining to a valve.
-ary	pertaining to	coronary	coron/o* heart, crown -ary pertaining to	Pertaining to the heart.
-eal	pertaining to	esophageal	esophag/o esophagus -eal pertaining to	Pertaining to the esophagus.
-ic	pertaining to	hypodermic	hypo- below derm/o skin -ic pertaining to	Pertaining to below the skin.
-ous	pertaining to	subcutaneous	sub- under cutane/o skin -ous pertaining to	Pertaining to under the skin.

*Coron/o literally means “crown,” but it is used most frequently to describe the arteries that supply blood to the heart, so the meaning “heart” has been added.

Pathology Suffixes

Pathology suffixes describe a disease process or a sign or symptom. The meanings vary according to the conditions that they describe.

Pathology Suffixes				
Suffix	Meaning	Example	Word Origins	Definition
-algia	pain	cephalgia	cephal/o head -algia pain	Pain in the head.
-cele	herniation	cystocele	cyst/o bladder, sac -cele herniation, protrusion	Herniation of the bladder.
-dynia	pain	cardiodynia	cardi/o heart -dynia pain	Pain in the heart.
-emia	blood condition	hyperlipidemia	hyper- excessive lipid/o fats -emia blood condition	Condition of excessive fats in the blood.
-ia	condition	agastria	a- without gastr/o stomach -ia condition	Condition of having no stomach.
-itis	inflammation	gastroenteritis	gastr/o stomach enter/o small intestine -itis inflammation	Inflammation of the stomach and small intestine.
-malacia	softening	chondromalacia	chondr/o cartilage -malacia softening	Softening of the cartilage.

Pathology Suffixes—cont'd

Suffix	Meaning	Example	Word Origins	Definition
-megaly	enlargement	splenomegaly (Fig. 1-6)	splen/o spleen -megaly enlargement	Enlargement of the spleen.
-oma	tumor, mass	osteoma	oste/o bone -oma tumor, mass	Tumor of a bone.
-osis	abnormal condition	psychosis	psych/o mind -osis abnormal condition	Abnormal condition of the mind.
-pathy	disease process	gastropathy	gastr/o stomach -pathy disease process	Disease process of the stomach.
-ptosis	prolapse, drooping, sagging	hysteroptosis	hyster/o uterus -ptosis prolapse	Prolapse of the uterus.
-rrhage, -rrhagia	bursting forth	hemorrhage	hem/o blood -rrhage bursting forth	Bursting forth of blood.
-rrhea	discharge, flow	otorrhea	ot/o ear -rrhea discharge, flow	Discharge from the ear.
-rrhexis	rupture	cystorrrhexis	cyst/o bladder, sac -rrhexis rupture	Rupture of the bladder.
-sclerosis	abnormal condition of hardening	arteriosclerosis	arteri/o artery -sclerosis abnormal condition of hardening	Abnormal condition of hardening of an artery.
-stenosis	abnormal condition of narrowing	tracheostenosis	trache/o trachea, windpipe -stenosis abnormal condition of narrowing	Abnormal condition of narrowing of the trachea or windpipe.

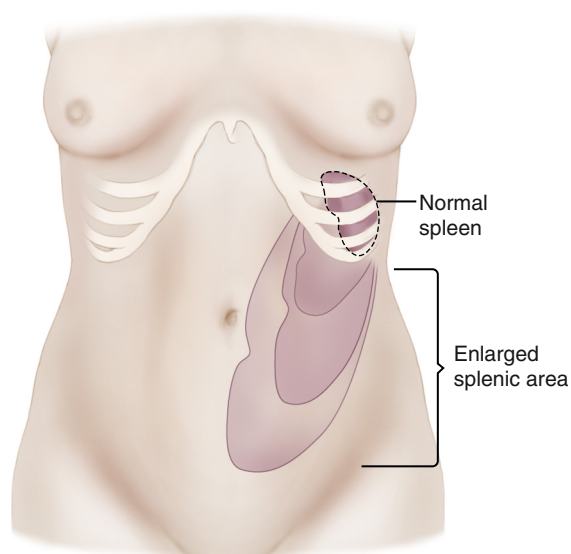


Fig. 1-6 Splenomegaly.

Be Careful!

Don't confuse -malacia, meaning softening, with -megaly meaning enlargement.

Be Careful!

Don't confuse -sclerosis, meaning hardening, with -stenosis, meaning narrowing.

Be Careful!

Don't confuse -rrhage and -rrhagia, meaning bursting forth, with -rrhea, meaning a discharge.



EXERCISE 5: Noun-Ending, Adjective, and Pathology Suffixes

Match the suffixes with their meaning.

- | | | |
|----------------------------|----------------------|---|
| _____ 1. -icle, -ole, -ule | _____ 6. -malacia | A. softening |
| _____ 2. -megaly | _____ 7. -algia | B. abnormal condition of hardening |
| _____ 3. -um | _____ 8. -ptosis | C. pain |
| _____ 4. -ic, -al, -ous | _____ 9. -emia | D. prolapse |
| _____ 5. -cele | _____ 10. -sclerosis | E. small, tiny |
| | | F. blood condition |
| | | G. enlargement |
| | | H. abnormal condition of herniation, protrusion |
| | | I. pertaining to |
| | | J. structure, thing, membrane |

Using the method shown in Fig. 1-3 and the new word parts introduced in the preceding tables, decode and define these five new terms.

11. cardiomegaly _____
12. osteomalacia _____
13. valvulitis _____
14. cephalic _____
15. gastropptosis _____

Diagnostic Procedure Suffixes

Diagnostic procedure suffixes indicate a procedure that helps to determine the diagnosis. Although a few diagnostic procedures also can help to treat a disease, most are used to establish a particular disease or disorder.

Diagnostic Procedure Suffixes				
Suffix	Meaning	Example	Word Origins	Definition
-graphy	process of recording	mammography	mamm/o breast -graphy process of recording	Process of recording the breast.
-metry	process of measuring	spirometry (Fig. 1-7)	spir/o breathing -metry process of measuring	Process of measuring breathing.
-opsy	process of viewing	biopsy	bi/o living, life -opsy process of viewing	Process of viewing living tissue.
-scopy	process of viewing	esophagogastroduodenoscopy	esophag/o esophagus gastr/o stomach duoden/o duodenum -scopy process of viewing	Process of viewing the esophagus, stomach, and duodenum.

Therapeutic Intervention Suffixes

Therapeutic intervention suffixes indicate types of treatment. Treatments may be medical or surgical in nature.

Therapeutic Intervention Suffixes*				
Suffix	Meaning	Example	Word Origins	Definition
-centesis	surgical puncture	amniocentesis	amni/o amnion -centesis surgical puncture	Surgical puncture of the amnion.
-ectomy	removal, resection, excision	tonsillectomy	tonsill/o tonsil -ectomy removal, excision	Removal of the tonsils.
-plasty	surgical repair	rhinoplasty	rhin/o nose -plasty surgical repair	Surgical repair of the nose.
-rrhaphy	suture, repair	splenorrhaphy	splen/o spleen -rrhaphy suture, repair	Suture of the spleen.
-stomy	new opening	colostomy	col/o colon, large intestine -stomy new opening	New opening of the colon or large intestine (Fig. 1-8).
-tomy	incision, cutting	osteotomy	oste/o bone -tomy incision	Incision into the bone.
-tripsy	crushing	lithotripsy	lith/o stone -tripsy crushing	Crushing of stones.



Fig. 1-7 Spirometry.

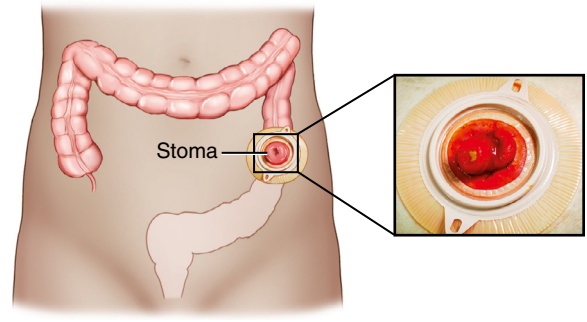


Fig. 1-8 Colostomy.

Instrument Suffixes

Instruments are indicated by yet another set of suffixes. Note the obvious similarities to their diagnostic and therapeutic “cousins.” For example, electrocardiography is a diagnostic procedure that is done to measure the electrical activity in the heart; an electrocardiograph is the instrument that is used to perform electrocardiography.



Be Careful!

Don't confuse **-ectomy**, meaning a removal, with **-stomy**, meaning a new opening or **-tomy**, meaning an incision.

Instrument Suffixes				
Suffix	Meaning	Example	Word Origins	Definition
-graph	instrument to record	electrocardiograph	electr/o electricity cardi/o heart -graph instrument to record	Instrument to record the electricity of the heart.
-meter	instrument to measure	thermometer	therm/o temperature, heat -meter instrument to measure	Instrument to measure temperature.
-scope	instrument to view	ophthalmoscope	ophthalm/o eye -scope instrument to view	Instrument to view the eye.
-tome	instrument to cut	osteotome	oste/o bone -tome instrument to cut	Instrument to cut bone (Fig. 1-9).
-tripter	machine to crush	lithotripter	lith/o stone -tripter machine to crush	Machine to crush stone.
-trite	instrument to crush	lithotrite	lith/o stone -trite instrument to crush	Instrument to crush stone (Fig. 1-10).



Fig. 1-9 Osteotome.

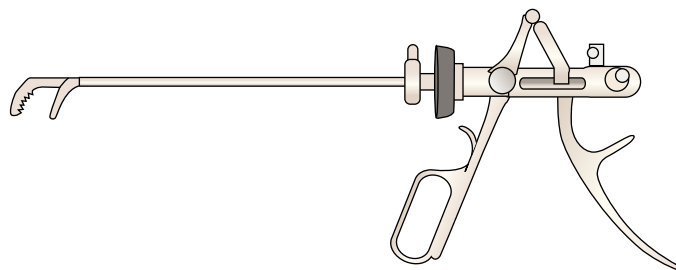


Fig. 1-10 Lithotrite.

Specialty and Specialist Suffixes

Specialties and specialists require yet another category of suffixes. Someone who specializes in the study of the heart would be called a *cardiologist*. **Cardi/o** means “heart” and **-logist** means “one who specializes in the study of.”

Specialty and Specialist Suffixes				
Suffix	Meaning	Example	Word Origins	Definition
-er	one who	polysomnographer	poly- many, much, excessive, frequent somn/o sleep graph/o record -er one who	One who records many (aspects of) sleep.
-iatrician	one who specializes in treatment	geriatrician	ger/o old age -iatrician one who specializes in treatment	One who specializes in treatment of old age (patients).

Specialty and Specialist Suffixes—cont'd				
Suffix	Meaning	Example	Word Origins	Definition
-iatrics	treatment	pediatrics	ped/o children -iatrics treatment	The treatment of children.
-iatrist	one who specializes in treatment	psychiatrist*	psych/o mind -iatrist one who specializes in treatment	One who specializes in treatment of the mind.
-iatry	process of treatment	psychiatry	psych/o mind -iatry process of treatment	Process of treatment of the mind.
-ist	one who specializes	dentist	dent/i teeth -ist one who specializes	One who specializes in the teeth.
-logist	one who specializes in the study of	psychologist†	psych/o mind -logist one who specializes in the study of	One who specializes in the study of the mind.
-logy	study of	neonatology	neo- new nat/o born, birth -logy study of	The study of the newborn.

*A psychiatrist holds a medical degree.

†A psychologist usually has a master's or a doctoral degree.



EXERCISE 6: Diagnosis, Therapy, Instrument, and Specialty/Specialist Suffixes

Match the suffixes with their meanings.

- | | | |
|------------------|------------------|--|
| _____ 1. -tome | _____ 6. -scope | A. removal, resection |
| _____ 2. -logy | _____ 7. -scopy | B. new opening |
| _____ 3. -graphy | _____ 8. -ectomy | C. instrument to view |
| _____ 4. -meter | _____ 9. -tomy | D. process of viewing |
| _____ 5. -logist | _____ 10. -stomy | E. instrument to cut |
| | | F. instrument to measure |
| | | G. incision, cutting |
| | | H. process of recording |
| | | I. study of |
| | | J. one who specializes in the study of |

Using the method shown in Fig. 1-3 and the new word parts introduced in the preceding tables, decode and define these five new terms.

11. osteologist _____
12. spirometer _____
13. hysteroscopy _____
14. cystoscope _____
15. splenectomy _____

Case Study Debbie Halloran



Debbie is a returning student who has decided on health information management (HIM) as a career. She decides to spend her time reviewing suffixes. She quickly learns that -ia means condition and -itis means inflammation, because they are parts of terms she's heard before. However, she has never heard terms that use the suffixes -sclerosis,

-malacia, -ptosis, -rrhaphy, or -trite. Can you guess the right answers?

1. What does -sclerosis mean?

- abnormal condition of softening
- abnormal condition of hardening
- prolapse, drooping, sagging
- enlargement

2. What does -malacia mean?

- abnormal condition of softening
- abnormal condition of hardening
- prolapse, drooping, sagging
- enlargement

3. What does -ptosis mean?

- abnormal condition of softening
- abnormal condition of hardening
- prolapse, drooping, sagging
- enlargement

4. What does -rrhaphy mean?

- new opening
- suture, repair
- process of viewing
- instrument to crush

5. What does -trite mean?

- new opening
- suture, repair
- process of viewing
- instrument to crush

Prefixes

Prefixes modify a medical term by indicating a structure's or a condition's:

- Absence
- Location
- Number or quantity
- State

Sometimes, as with other word parts, a prefix can have more than one meaning. For example, the prefix **hypo-** can mean "below" or "deficient." To spell a term with the use of a prefix, simply add the prefix directly to the beginning of the term. No combining vowels are needed!

Prefixes

Prefix	Meaning	Example	Word Origins	Definition
a-	no, not, without	apneic	a- without pne/o breathing -ic pertaining to	Pertaining to without breathing.
an-	no, not, without	anophthalmia	an- without ophthalm/o eye -ia condition	Condition of without an eye.
ante-	forward, in front of, before	anteversion	ante- forward vers/o turning -ion process of	Process of turning forward.
anti-	against	antibacterial	anti- against bacteri/o bacteria -al pertaining to	Pertaining to against bacteria.

Prefixes—cont'd				
Prefix	Meaning	Example	Word Origins	Definition
dys-	abnormal, difficult, bad, painful	dystrophy	dys- abnormal -trophy process of nourishment	Process of abnormal nourishment.
endo-, end-	within	endoscopy	endo- within -scopy process of viewing	Process of viewing within.
epi-	above, upon	epigastric	epi- above gastr/o stomach -ic pertaining to	Pertaining to above the stomach.
hyper-	excessive, above	hyperglycemia	hyper- excessive glyc/o sugar, glucose -emia blood condition	Blood condition of excessive sugar.
hypo-	below, deficient	hypoglossal	hypo- below gloss/o tongue -al pertaining to	Pertaining to below the tongue.
inter-	between	intervertebral	inter- between vertebr/o vertebra, backbone -al pertaining to	Pertaining to between the backbones.
intra-	within	intramuscular	intra- within muscul/o muscle -al pertaining to	Pertaining to within the muscle.
neo-	new	neonatal	neo- new nat/o birth, born -al pertaining to	Pertaining to a newborn.
par-	near, beside	parotid	par- near ot/o ear -id pertaining to	Pertaining to near the ear.
para-	near, beside, abnormal	paraphilia	para- abnormal phil/o attraction -ia condition	Condition of abnormal attraction.
per-	through	percutaneous	per- through cutane/o skin -ous pertaining to	Pertaining to through the skin, as in a nephrolithotomy (Fig. 1-11).
peri-	surrounding, around	pericardiocentesis	peri- surrounding cardi/o heart -centesis surgical puncture	Surgical puncture of the heart to remove fluid from the pericardium (Fig. 1-12).
poly-	many, much, excessive, frequent	polyneuritis	poly- many neur/o nerve -itis inflammation	Inflammation of many nerves.
post-	after, behind	postnatal	post- after nat/o birth, born -al pertaining to	Pertaining to after birth.

Continued

Prefixes—cont'd

Prefix	Meaning	Example	Word Origins	Definition
pre-	before, in front of	prenatal	pre- before nat/o birth, born -al pertaining to	Pertaining to before birth.
sub-	under, below	subhepatic	sub- under hepat/o liver -ic pertaining to	Pertaining to under the liver.
trans-	through, across	transurethral	trans- through urethr/o urethra -al pertaining to	Pertaining to through the urethra.

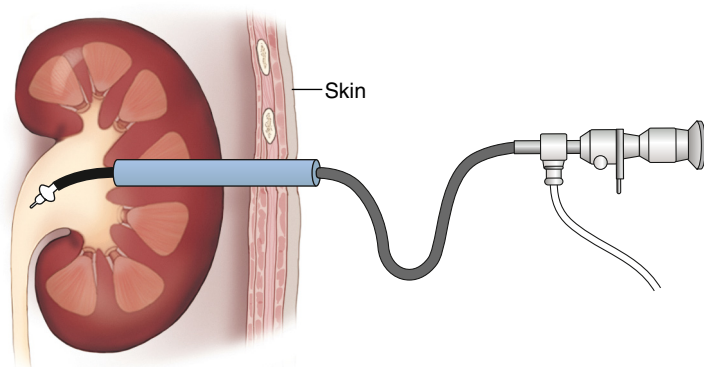


Fig. 1-11 Percutaneous nephrolithotomy.

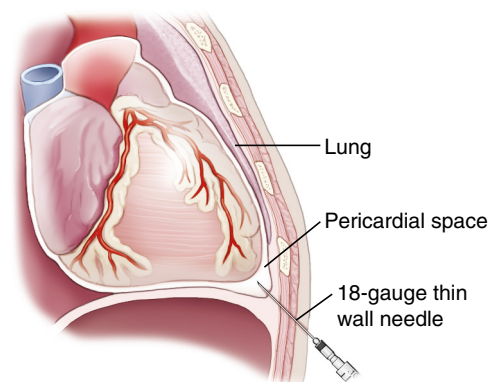


Fig. 1-12 Pericardiocentesis for aspiration of pericardial fluid from the pericardium.

⊗ Be Careful!

Don't confuse **inter-**, meaning between, with **intra-**, meaning within.

⊗ Be Careful!

Don't confuse **ante-**, meaning forward, with **anti-**, meaning against.

⊗ Be Careful!

Don't confuse **per-**, meaning through, with **peri-**, meaning surrounding, and **pre-**, meaning before.

⊗ Be Careful!

Don't confuse **hyper-**, meaning excessive or above, with **hypo-**, meaning below or deficient.



EXERCISE 7: Prefixes

Match the prefixes with their meanings.

- | | | |
|-----------------|-----------------|--------------------------------------|
| _____ 1. anti- | _____ 6. dys- | A. under, below |
| _____ 2. inter- | _____ 7. intra- | B. above, excessive |
| _____ 3. poly- | _____ 8. peri- | C. against |
| _____ 4. ante- | _____ 9. sub- | D. bad, difficult, painful, abnormal |
| _____ 5. hyper- | _____ 10. per- | E. within |
| | | F. many |
| | | G. through |
| | | H. between |
| | | I. forward |
| | | J. around, surrounding |

Using the method shown in *Fig. 1-3* and the new word parts introduced in the preceding tables, decode and define these five terms.

11. subhepatic _____
12. pericardium _____
13. dyspneic _____
14. percutaneous _____
15. hypoglycemia _____

Case Study *Kate Martin*



Kate realizes how important it is to memorize as many prefixes as she can. She concentrates especially hard on those prefixes that are so similar to one another. See if you can get the right answers to these confusing prefixes.

1. What is the prefix that means *between*?
 - a. *inter-*
 - b. *intra-*
 - c. *peri-*
 - d. *pre-*
2. What is the prefix that means *near, beside, abnormal*?
 - a. *par-*
 - b. *para-*
 - c. *per-*
 - d. *peri-*
3. What is the prefix that means *near, beside (but not abnormal)*?
 - a. *par-*
 - b. *para-*
 - c. *per-*
 - d. *peri-*
4. What is the prefix that means *above, upon*?
 - a. *endo-*
 - b. *hypo-*
 - c. *sub-*
 - d. *epi-*
5. What two prefixes mean *within*?
 - a. *endo-, intra-*
 - b. *epi-, inter-*
 - c. *ante-, per-*
 - d. *peri-, trans-*

SINGULAR/PLURAL RULES

Because most healthcare terms end with Greek or Latin suffixes, making a healthcare term singular or plural is not always done the same way as it is in English. The following table gives the most common singular/plural endings and the rules for using them. Examples of unusual singular/plural endings and singular/plural exercises will be included throughout the text.

Rules for Using Singular and Plural Endings				
If a Term Ends in:	Form the Plural by:	Singular Example	Plural Example	Plural Pronounced as:
-a	dropping the -a and adding -ae	vertebra (a bone in the spine) VUR tuh brah	vertebrae VUR tuh bray	Long a, e, or i, depending on the term
-is	dropping the -is and adding -es	arthrosis (an abnormal condition of a joint) ar THROH sis	arthroses ar THROH seez	seez
-ix or -ex	dropping the -ix or -ex and adding -ices	appendix ap PEN dicks	appendices ap PEN dih seez	seez
-itis	dropping the -itis and adding -itides	arthritis (inflammation of a joint) ar THRY tiss	arthritis ar THRIH tih deez	deez
-nx	dropping the -nx and adding -nges	phalanx (a bone in the fingers or toes) FAY lanks	phalanges fuh LAN jeez	ng (an as in plan) and jeez
-um	dropping the -um and adding an -a	endocardium (the structure inside the heart) en doh KAR dee um	endocardia en doh KAR dee ah	ah
-us	dropping the -us and adding an -i	digitus (a finger or toe) DIJ ih tus	digiti DIJ ih tye	eye
-y	dropping the -y and adding -ies	therapy (a treatment) THAIR ah pee	therapies THAIR ah peez	eez



EXERCISE 8: Plurals

Change the singular terms to plural using the rules given in the preceding table.

- esophagus (the tube joining the throat with the stomach) _____
- larynx (the voice box) _____
- fornix (an arched structure) _____
- pleura (the sac surrounding the lungs) _____
- diagnosis _____
- myocardium _____
- cardiomyopathy _____
- hepatitis _____

Pronunciation of Unusual Letter Combinations			
Spelling	Pronunciation	Term	Meaning
eu	you	e uthyroid yoo THIGH royd	Good, healthy thyroid function.
ph	f (fill)	ph alanx FAY lanks	One of the bones of the fingers or toes.
pn	n (no)	p neumonitis noo moh NYE tis	Inflammation of the lungs.
ps	s (sort)	ps ychology syeh KALL uh jee	Study of the mind.
pt	t (top)	pt osis TOH sis	Prolapse, drooping.
rh, rrh	r (row)	rh initis rye NYE tis	Inflammation of the nose.
x	z (zoo)	x eroderma zeer oh DUR mah	Condition of dry skin.



EXERCISE 9: Pronunciation of Unusual Letter Combinations

<i>If you hear a term starting with the sound and it's not under that letter in the dictionary:</i>	<i>Try looking for it under _____ in the dictionary.</i>
<i>z</i>	
<i>f</i>	
<i>n</i>	
<i>u</i>	
<i>t</i>	
<i>s</i>	

Common Combining Forms

Combining Form	Meaning	Combining Form	Meaning
arteri/o	artery	lith/o	stone
arthr/o	joint	mamm/o	breast
bacteri/o	bacteria	muscul/o	muscle
bi/o	living, life	my/o	muscle
cardi/o	heart	nat/o	birth, born
cephal/o	head	neur/o	nerve
cervic/o	neck, cervix	ophthalm/o	eye
chondr/o	cartilage	oste/o	bone
col/o	large intestine, colon	ot/o	ear
coron/o	crown, heart	path/o	disease
cut/o	skin	ped/o	child
cutane/o	skin	phil/o	attraction
cyst/o	bladder, sac	pne/o	breathing
dent/i	tooth	psych/o	mind
derm/o	skin	rhin/o	nose
duoden/o	duodenum	somn/o	sleep
electr/o	electricity	spir/o	breathing
enter/o	small intestine	splen/o	spleen
esophag/o	esophagus	therm/o	heat, temperature
gastr/o	stomach	tonsill/o	tonsil
gloss/o	tongue	trache/o	trachea, windpipe
glyc/o	glucose, sugar	troph/o	nourishment
hem/o	blood	urethr/o	urethra
hepat/o	liver	valvul/o	valve
hyster/o	uterus	ven/o	vein
lingu/o	tongue	vers/o	turning
lipid/o	lipid, fat	vertebr/o	backbone, vertebra



Prepare for quizzes and exams by practicing using the **Quick Quizzes** and **Practice Exam** in the Student Resources.



To access **Focus on the Medical Record**, please scan the QR code with a mobile device.

Case Study Harry Chu



Harry is a new healthcare student who thinks he might want to become a physician's assistant. He likes to practice decoding terms. What does the combining form mean in each of the following terms?

1. *Cystocele* means herniation of the _____.
2. *Ophthalmology* is the study of the _____.
3. *Otalgia* is pain in the _____.
4. *Osteoma* is a tumor in a _____.
5. *Hepatitis* is inflammation of the _____.
 - a. stomach
 - b. gallbladder
 - c. mouth
 - d. liver

Case Study Medical Terminology Class



Jed, Taylor, Alan, and Jessica are enrolled in a hybrid medical terminology course, and they come to the classroom only 1 day a week. Today their instructor has assigned a group activity to practice building terms. Here are some of the terms that they have been assigned to build:

1. *Inflammation of a joint* _____
2. *Study of the heart* _____
3. *Process of viewing within* _____
4. *Pertaining to above the stomach* _____
5. *Pertaining to beside the nose* _____

Case Study Medical Terminology Class



As important as it is to be able to read medical terminology, it's just as important to pronounce it correctly in a clinical setting. Misunderstanding or mispronouncing medical terms is unprofessional and can be dangerous when it leads to errors in medical records or treatment for patients.

Jed, Alan, Taylor, and Jessica practice "speaking med term" to one another.

1. *Jed sees the term pneumonia. Which of the following is the correct pronunciation?*
 - a. puh noo MOH nee uh
 - b. noo MOH nee uh
 - c. noo moh NYE uh
2. *Alan has difficulty remembering how to pronounce ptosis, the term that means prolapse or drooping. Is it:*
 - a. TOH sis
 - b. puh TOH sis
 - c. TAH sis
3. *Xeroderma means condition of dry skin. How should Jessica pronounce it?*
 - a. ex oh DUR muh
 - b. zeer AH dur muh
 - c. zeer oh DUR muh

Chapter Review

Match the word parts to their definitions.

Word Part Definitions

Prefixes

a-

anti-

dys-

inter-

intra-

par-

para-

per-

peri-

poly-

pre-

sub-

Definition

1. _____ between
2. _____ through
3. _____ near, beside
4. _____ within
5. _____ against
6. _____ no, not, without
7. _____ surrounding, around
8. _____ abnormal
9. _____ before, in front of
10. _____ many, much, excessive, frequent
11. _____ under, below
12. _____ abnormal, difficult, painful, bad

Suffixes

-ar

-dynia

-ectomy

-graphy

-ia

-itis

-logy

-meter

-oma

-osis

-pathy

-plasty

-rrhage

-rrhaphy

-rrhea

-scopy

-stenosis

-stomy

-tomy

-tripter

Definition

13. _____ pain
14. _____ discharge, flow
15. _____ narrowing
16. _____ tumor, mass
17. _____ instrument to crush
18. _____ inflammation
19. _____ bursting forth
20. _____ process of viewing
21. _____ study of
22. _____ incision, cutting
23. _____ surgical repair
24. _____ removal, resection, excision
25. _____ process of recording
26. _____ instrument to measure
27. _____ suture
28. _____ new opening
29. _____ abnormal condition
30. _____ disease process
31. _____ pertaining to
32. _____ condition

Wordshop

Prefixes	Combining Forms	Suffixes
an-	arteri/o	-al
endo-	cardi/o	-algia
epi-	cephal/o	-ectomy
hypo-	col/o	-graphy
neo-	enter/o	-ia
par-	gastr/o	-ic
per-	hepat/o	-id
peri-	hyster/o	-itis
poly-	nat/o	-logy
pre-	ophthalm/o	-megaly
sub-	ot/o	-scope
trans-	rhin/o	-scopy
	somn/o	-stomy
	splen/o	-um

Build the following terms by combining the earlier word parts. Some word parts may be used more than once. Some may not be used at all. The number in parentheses indicates the number of word parts needed.

Definition	Term
1. condition of without an eye (3)	_____
2. pertaining to near the ear (3)	_____
3. pertaining to under the liver (3)	_____
4. inflammation of the stomach and small intestines (3)	_____
5. instrument to view the ear (2)	_____
6. structure surrounding the heart (3)	_____
7. new opening of the colon (2)	_____
8. process of recording an artery (2)	_____
9. process of viewing within (2)	_____
10. removal of the uterus (2)	_____
11. the study of (many) sleep (3)	_____
12. pertaining to before birth (3)	_____
13. pain in the head (2)	_____
14. pertaining to above the stomach (3)	_____
15. enlargement of the spleen (2)	_____

2

Body Structure and Directional Terminology

CHAPTER OUTLINE

Organization of the Human Body

Case Study: Samantha Weil

Anatomic Position and Surface

Anatomy

Positional and Directional Terms

Medical Record: John Greco

Body Cavities

Abdominopelvic Regions

Abdominopelvic Quadrants

Planes of the Body

Medical Record: Elise Duncan

Case Study: Elena Novoyenko

Case Study: Timothy Federko

Chapter Review

Medical Record: Alex McConnell

OBJECTIVES

- Recognize and use terms associated with the organization of the body.
- Recognize and use terms associated with positional and directional vocabulary.
- Recognize and use terms associated with the body cavities.
- Recognize and use terms associated with the abdominopelvic regions and quadrants.
- Recognize and use terms associated with planes of the body.



For interactive learning, go to the Shiland Student Resources and click on:

- **Match the Word Parts** to review body structure and directional word parts.
- **Wordshop** to practice term building.
- **Tournament of Terminology** to test your knowledge of body structure and directional terminology terms.

*Click on **Chapter at a Glance** for a list of key word parts and terms for this chapter.*

ORGANIZATION OF THE HUMAN BODY

The human body and its general state of health and disease may be understood by studying the various **body systems**, such as the digestive and respiratory systems. Each body system is composed of different **organs**, such as the stomach and lungs. These organs are made up of combinations of **tissues**, such as epithelial and muscular tissue, which in turn are composed of various **cells** that have very specialized functions.

All of these levels of organization are involved in a continual process of sensing and responding to conditions in the organism's environment. A negative change at one level of one system may cause a reaction throughout the entire body. **Homeostasis** (hoh mee oh STAY sis) is the normal dynamic process of balance needed to maintain a healthy body. When the body can no longer compensate for trauma or pathogens, disease, disorder, and dysfunction result.

Cells

The smallest unit of the human body is the **cell**. Most cells contain a number of structures that are the same, regardless of their particular function (liver cells, lung cells, brain cells, bone cells). The structures within the cell are referred to as **organelles**. They include structures that form a boundary between the cell and the space surrounding it (**cytoplasm**), structures that break down substances no longer needed in the cell (**lysosomes**), structures that are the site of protein formation (**ribosomes**), and those that convert nutrients into energy (**mitochondria**). The control center of the cell is called the **nucleus**, and it is here that the majority of genetic information is located. Most cells have one nucleus, but red blood cells have none and certain bone cells may have more than one. Although there are a number of different types of cells, all of them share certain characteristics—one of them being **metabolism** (muh TAB boh lih zum). Metabolism is the act of converting energy by continually building up substances by **anabolism** (an NAB boh lih zum) and breaking down substances by **catabolism** (kuh TAB boh lih zum) for use by the body. Metabolism can be described as an equation:

$$\text{Metabolism} = \text{Anabolism} + \text{Catabolism}$$

See Fig. 2-1 for an illustration of a cell and the corresponding Cell Parts table that follows for a brief description of the pictured organelles and their functions.

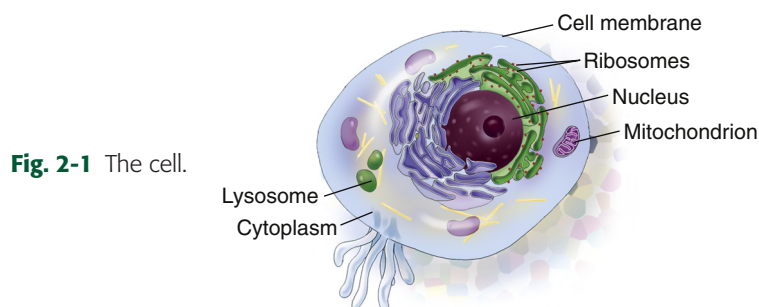


Fig. 2-1 The cell.

cell = cyt/o, -cyte

homeostasis

home/o = same
-stasis = controlling

metabolism

meta- = change, beyond
bol/o = throwing
-ism = state of

anabolism

ana- = up, apart
bol/o = throwing
-ism = state of

catabolism

cata- = down
bol/o = throwing
-ism = state of

Cell Parts

Cell Part	Word Origin	Function
cytoplasm SYE toh plaz um	cyt/o cell -plasm formation	Holds the organelles of the cell.
lysosome LYE soh sohm	lys/o dissolving -some body	Organelle that serves a digestive function for the cell.
ribosome RYE boh sohm	rib/o ribose -some body	Site of protein formation; contains ribonucleic acid (RNA).

Continued

Cell Parts—cont'd

Cell Part	Word Origin	Function
mitochondrion (<i>pl.</i> mitochondria) mye toh KAHN dree un	mitochondri/o mitochondria -on structure	Converts nutrients to energy in the presence of oxygen.
nucleus (<i>pl.</i> nuclei) NOO klee us	nucle/o nucleus -us structure	Contains most of the genetic information, controls cell growth and replication, regulates cell metabolism, and is the site of RNA synthesis.

tissue = hist/o

stromal = strom/o

parenchymal

par- = near

en- = in

chym/o = juice

-al = pertaining to

epithelial

epi- = upon

thel/e = nipple

-al = pertaining to

muscle = my/o

nervous = neur/o

organ = viscer/o

myocardium

my/o = muscle

cardi/o = heart

-um = structure

endocardium

endo- = within

cardi/o = heart

-um = structure

Tissues

Tissue is a group of similar cells from the same origin that together carry out a specific function. There are four major categories of **tissue**. Within each type, the tissue either is supportive (**stromal** [STROH mull]) tissue, or does the actual work (**parenchymal** [pair EN kuh mull] tissue) of the organ. For example, parenchymal nerve cells are the neurons that conduct the nervous impulse. Neuroglia are stromal nerve cells that enhance and support the functions of the nervous system. The four types of tissue include the following:

Epithelial (eh puh THEE lee ul): Acts as an internal or external covering for organs (e.g., the outer layer of the skin or the lining of the digestive tract). Note that the derivation of the term includes a combining form for the nipple (thel/e). Originally the term *epithelium* was used to describe the membrane covering the nipple. Later the usage was expanded to include all of the surface membranes whether they were on the skin or mucosal membrane surfaces that communicate with the outside of the body.

Connective: Includes a variety of types, all of which have an internal structural network. Examples include bone, blood, and fat.

Muscular: Includes three types, all of which share the unique property of being able to contract and relax. Examples include heart muscle, skeletal muscle, and visceral muscle.

Nervous: Includes cells that provide transmission of information to regulate a variety of functions (e.g., neurons [nerve cells]).

Organs

Organs, also referred to as **viscera** (VIH sur ah) (*sing.* viscus), are arrangements of various types of tissue that accomplish specific purposes. The heart, for example, is made up of muscle tissue, called **myocardium** (mye oh KAR dee um), and it is lined with epithelial tissue known as **endocardium** (en doh KAR dee um). Organs are grouped within body systems but do have specific terms to describe their parts.

Parts of Organs

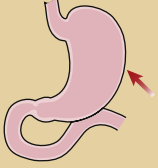
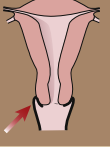
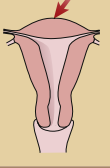
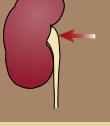
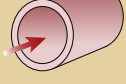
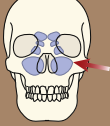
Organs can be divided into parts and have a set of terms that describe these various parts. See the table on p. 30.

Point of Interest



Mitochondrial DNA

Genes contain deoxyribonucleic acid (DNA), which contains the genetic information used to synthesize proteins. Most of the DNA resides in the nucleus, but a small amount is in the mitochondria. The mitochondrial DNA (mtDNA) is passed through the mother only, hence its use as a tool to track diseases through the mother's side of the family instead of through both parents.

Parts of Organs			
	Term	Combining Form	Definition
	apex (<i>pl.</i> apices) A pecks	apic/o	The pointed extremity of a conical structure.
	body (<i>corporis</i>) KOR por iss	corpor/o som/o somat/o	The largest or most important part of an organ.
	fornix (<i>pl.</i> fornices) FOR nicks	fornic/o	Any vaultlike or arched structure.
	fundus (<i>pl.</i> fundi) FUN dis	fund/o	The base or deepest part of a hollow organ that is farthest from the mouth of the organ.
	hilum (<i>pl.</i> hila) HYE lum	hil/o	Recess, exit, or entrance of a duct into a gland, or of a nerve and vessels into an organ.
	lumen (<i>pl.</i> lumina) LOO min	lumin/o	The space within an artery, vein, intestine, or tube.
	sinus (<i>pl.</i> sinuses) SYE nus	sin/o, sinus/o	A cavity or channel in bone, a dilated channel for blood, or a cavity that permits the escape of purulent (pus-filled) material. Antrum (<i>pl.</i> antra) and sinus are synonyms.
	vestibule VES tih byool	vestibul/o	A small space or cavity at the beginning of a canal.



EXERCISE 1: Intracellular Functions

Match each cell part with its function.

- | | | |
|-----------------------|--------------------|--|
| _____ 1. mitochondria | _____ 4. lysosomes | A. directs and replicates the cell |
| _____ 2. ribosomes | _____ 5. cytoplasm | B. watery solution within cell, holds organelles |
| _____ 3. nucleus | | C. contain enzymes to digest material |
| | | D. responsible for energy production |
| | | E. synthesize proteins |

EXERCISE 2: Types of Tissue

Match the characteristics of the tissue with its type.

- | | | |
|--------------------------------|--|---------------|
| _____ 1. contracts tissue | _____ 3. has an internal structural network | A. nervous |
| _____ 2. transmits information | _____ 4. is an internal/external body covering | B. epithelial |
| | | C. muscular |
| | | D. connective |

EXERCISE 3: Organ Parts

Match the combining forms with their meanings.

- | | | |
|------------------|---------------------|--|
| _____ 1. fund/o | _____ 5. vestibul/o | A. cavity/channel in bone/organ |
| _____ 2. lumin/o | _____ 6. fornic/o | B. pointed extremity of conical structure |
| _____ 3. sin/o | _____ 7. hil/o | C. archlike structure |
| _____ 4. apic/o | _____ 8. corpor/o | D. base or deepest part of a hollow organ |
| | | E. entrance/exit/recess for ducts/vessels |
| | | F. space within an artery or tube |
| | | G. largest, most important part of organ, body |
| | | H. small space at the beginning of a canal |

EXERCISE 4: Pertaining to Organ Parts

Fill in the blanks with the definitions of the following terms.

1. intraluminal _____
2. hilar _____
3. periapical _____
4. antral _____
5. nuclear _____
6. cytoplasmic _____
7. extracorporeal _____
8. vestibular _____
9. fundal _____

Fill in the blank with the correct organ part.

10. Fatty deposits may form in the _____ (space within) of the arteries, resulting in atherosclerosis.
11. Hector had a stone that was obstructing urine flow at the level of the _____ (exit/entrance) of the right kidney.
12. The x-rays showed a blunted _____ (tip) of the left lung.
13. The _____ (largest part) of the stomach was described as inflamed.
14. The paranasal _____ (cavities in bone) were completely blocked.

Case Study Samantha Weil



Samantha Weil, a medical terminology student with three teenagers, read the section about naming organ parts with interest and thought, “Wow, I thought this would be really boring, but I think I actually recognize some of these terms:

Fundus: I remember that when I was pregnant, my OB would measure the height of the fundus of my uterus.

Apex: I’ve seen the term *apex* used when referring to the top of a hill, but I didn’t realize that it actually meant a point and could be at the top or the bottom of a structure, like the apex of the heart, which is actually the bottom of the heart.

Vestibule: My grandmother always referred to the vestibule of her house, where she kept her umbrellas and we left our boots. It was that little area between the

outside and inside doors of her house. I guess I can picture the vestibule of an ear now.

Sinus: Interesting. I thought sinuses were only in the skull, but now I know they are in my heart too.

Corporis: When I read that the body of an organ can also be called its *corporis*, the term sounded like the word “corpse” to me. And that certainly *is* a body!

1. The base or deepest part of a hollow organ that is farthest from the mouth of an organ is called the _____?
2. A cavity or channel in bone, a dilated channel for blood, or a cavity that permits the escape of purulent material is called a _____?
3. The pointed extremity of a conical structure is the _____?
4. The largest or most important part of an organ is the _____?
5. A small space or cavity at the beginning of a canal is a _____?

Body Systems

The organs of the body systems work together to perform certain defined functions. For example, movement is a function of the musculoskeletal system. Although each system has a number of functions, one must remember that the systems interact, and problems with one system can affect the function of other systems. For example, in the condition called *secondary hypertension*, disease in one body system (usually the lungs) causes a pathologic increase in blood pressure in the cardiovascular system. This hypertensive pressure is secondary to the primary cause (lung disease). Once the disorder of the initial system resolves, the hypertension disappears.

The table on p. 33 lists each body system and its function.

Be Careful!

Do not confuse **my/o**, the combining form for muscle, and **myel/o**, the combining form for spinal cord or bone marrow.

Body Systems	
Body System	Function(s)
musculoskeletal muss kyoo loh SKELL uh tul	Support, movement, protection
integumentary in teg yoo MEN tuh ree	Cover and protection
gastrointestinal gass troh in TESS tih nul	Nutrition
urinary YOOR ih nair ee	Elimination of nitrogenous waste
reproductive	Reproduction
blood/lymphatic/immune lim FAT tick	Transportation of nutrients/waste, protection
cardiovascular kar dee oh VASS kyoo lur	Transportation of blood
respiratory RESS pur ah tore ee	Delivers oxygen to cells and removes carbon dioxide
nervous/behavioral NER vus	Receive/process information
special senses	Information gathering
endocrine EN doh krin	Effects changes through chemical messengers



EXERCISE 5: Body Systems and Functions

Match the body systems with their functions.

- | | |
|--|---------------------------------|
| _____ 1. information gathering | A. integumentary |
| _____ 2. delivers oxygen to cells and removes carbon dioxide | B. gastrointestinal |
| _____ 3. reproduction | C. male reproductive |
| _____ 4. cover and protection | D. musculoskeletal |
| _____ 5. transportation of nutrients/waste, protection | E. endocrine |
| _____ 6. effects changes through chemical messages | F. special senses |
| _____ 7. receive/process information | G. blood, lymphatic, and immune |
| _____ 8. nutrition | H. respiratory |
| _____ 9. transportation of blood | I. female reproductive |
| _____ 10. support, movement, protection | J. nervous |
| _____ 11. elimination of nitrogenous waste | K. urinary |
| | L. cardiovascular |