THIRD EDITION

ACQUIRING MEDICAL LANGUAGE

Steven L. Jones, PhD
Andrew Cavanagh, MD

Mc Graw Hill

Acquiring Medical Language

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Steven L. Jones, PhD
Rice University

Andrew Cavanagh, MD
Texas A&M College of Medicine

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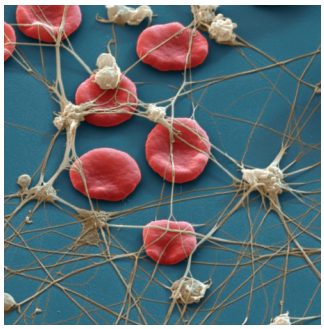

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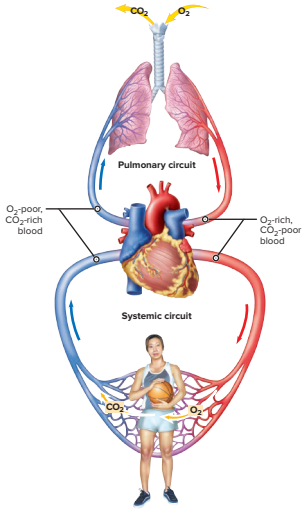

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dedication

To our wives:

Tamber Jones

and

Ashley Cavanagh.

Your devotion, support, encouragement,
and assistance made this book possible.

Steven L. Jones, PhD

Steve holds a BA in Greek and Latin from Baylor University, an MA in Greek, Latin, and Classical Studies from Bryn Mawr College, and a PhD in Classics from the University of Texas at Austin. Steve currently teaches Medical Terminology at Rice University in Houston, Texas. He has held previous faculty appointments at Trinity University, the University of Texas at Austin, Baylor University, and Houston Baptist University. In addition to Medical Terminology, he teaches courses on Latin, Greek, Mythology, Classical Civilization, and Early Christianity.

When not breaking down medical words, Steve enjoys taking road trips with his wife and six children, watching baseball, eating tacos, drinking ice-cold Dr. Pepper, and showing off his parallel-parking skills.



(top left): Steve L. Jones; (top right): Tamber Jones; (bottom): Tamber Jones

Andrew Cavanagh, MD

Andy holds a BS in Genetics from Texas A&M University and an MD from Texas A&M College of Medicine. After completing his residency at Palmetto Health Children's Hospital, he moved to the Austin area. He is currently owner and Chief Medical Officer of Chisholm Trail Pediatrics in Georgetown, Texas. In addition to being board-certified in pediatrics, Andy has served as the pediatric specialty chief for Dell Children's Medical Center and on the board of Dell Children's Medical Center Executive Committee. He is currently clinical assistant professor of pediatrics at the Texas A&M College of Medicine.

When not comforting sick children at work or wrestling with his own three kids at home, Andy enjoys powerlifting, hiking, and making his wife laugh.



(top left): Shane Littleton; (top right): Andy Cavanagh; (bottom): Andy Cavanagh

A Note from the Authors on Why They Wrote This Book

Courtesy of Steve L. Jones & Andy Cavanagh

This book has its beginning in the friendship that Andy and Steve developed while they both lived in Austin, Texas. Andy was beginning his pediatric practice. Steve was completing his doctorate at UT. They had kids the same age and attended the same church. One evening after dinner, while sitting on Andy's back porch, Steve mentioned a new course he had been assigned to teach: Medical Terminology. What started as Steve complaining ended in a game where Andy tried to stump Steve by asking him what various medical words meant. Andy was amazed at how much Steve could figure out just by breaking down words. Steve was astonished to realize that most people–from medical assistants to medical doctors–weren't taught medical language this way. Through this conversation and others like it, Steve and Andy realized three things:

1. Understanding how to break down medical language is an essential skill in the medical field.
2. Having a basic knowledge of the Greek and Latin roots make medical language radically transparent.
3. The current market is lacking a textbook that teaches medical language this way.

This book is their attempt to meet those needs.

New to the Third Edition

1. Standardized Pronunciations: Like any language, Medical Language has dialects which vary regionally. Health care workers across America and around the World all speak the language of medicine in their own unique accent. This sometimes makes teaching and learning pronunciations difficult. We frequently receive emails from users of our books who point out that our books said to pronounce a word one way, but they actually said it a different way. To address this, we have done two things. First, we discuss the nature of dialects and encourage health professionals to speak the language as spoken around them. But more importantly, we have standardized all pronunciations in conformity to *Taber's Cyclopedic Medical Dictionary*. That way, we can ensure that our own Texan dialect of medical terminology doesn't creep into the text.
2. Emphasis on Epidemiology/Public Health: The COVID-19 pandemic has underscored the importance of understanding Epidemiology and Public Health. We thought it appropriate in this new edition to highlight and emphasize terms that relate to Public Health in order to further equip students with the terminology they will need to understand and speak the language of medicine as it relates to this significant dimension of both our health care and our shared public life.

How to Use the Book

The Approach

Acquiring Medical Language, 3e, approaches medical terminology not as words to be memorized but as a language to be learned. If you treat medical terminology as a language and learn how to read terms like sentences, you will be able to communicate clearly as a health care professional and will be a full participant in the culture of medicine. Memorizing definitions is equal to a traveler memorizing a few phrases in another language to help during a brief vacation: it will help a traveler survive for a few days. But if one is going to live in another culture for an extended period of time, learning to speak and understand the language becomes essential.

Acquiring Medical Language, 3e, teaches students to **break down words into their composite word parts.** Instead of only using a dictionary full of terms that need to be memorized, a student equipped with groups of roots, prefixes, and suffixes can easily understand a vast amount of medical terminology.

Acquiring Medical Language, 3e, bridges the gap between the two somewhat disparate fields that make up medical terminology–medicine and second-language acquisition–by providing assistance in language skills to equip health care professionals with the ability to learn and apply a useful skill and not lists of words. It will also equip language professionals with real-world examples that make their knowledge of languages applicable to working in the world of health care.

The process is best illustrated by considering the following word: *pneumonoultramicroscopicsilicovolcanoconiosis.* Memorizing the definition to words like this would seem like an intimidating task. If you break it into its composite parts, you get:

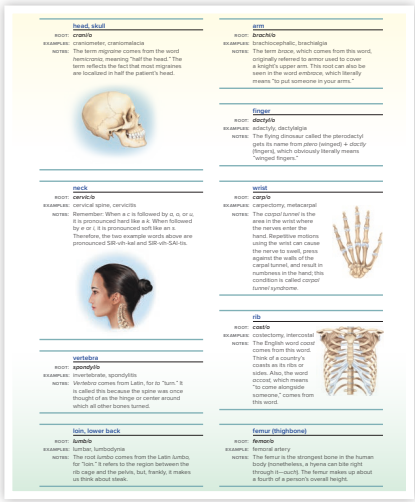
pneumono	/	ultra	/	micro	/	scopic	/	silico	/	volcano	/	coni	/	osis
lung		*extremely*		*small*		*looking*		*sand*		*volcanic*		*dust*		*condition*

Through knowledge of roots and word formation, the meaning becomes transparent: "a condition of the lungs caused by extremely small bits of volcanic sand." Instead of having to memorize a long list of even longer words, a student equipped with the knowledge of roots and how to break apart words can tackle–and not be intimidated by–the most complicated sounding medical terms.

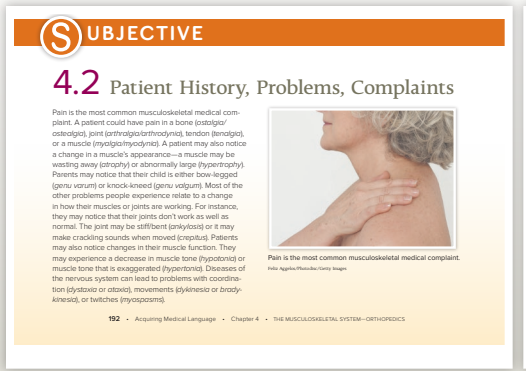
Organization and Key Features

Acquiring Medical Language, 3e, begins with two introductory chapters: Chapter 1, Introduction to Medical Language; and Chapter 2, Introduction to Health Records. Chapters 3 through 13 are dedicated to individual systems of the body and review common roots, words, and abbreviations for each system.

1. **"Card-Based" Approach:** Each body system chapter opens with a section on word parts for that particular body system. Students are introduced to roots via "cards" with illustrations of body systems that contain the names of body parts, specific word roots related to those parts, a few examples containing the roots, as well as some interesting facts to make the information more memorable. The student is introduced to all relevant information (the root, its meaning, its use) and sees how each root relates to the other roots in the context of the body system, without ever needing to turn the page.
2. **SOAP Note Organization:** After the student is introduced to the important roots for the chapter using cards, the medical terms relevant to the body system are presented using the SOAP note as an organizational framework. SOAP is an acronym used by many health care professionals to help organize the diagnostic process (SOAP is explained more fully in Chapter 2). The terms will be divided under the following headings:



- Subjective: Patient History, Problems, Complaints
- Objective: Observation and Discovery
- Assessment: Diagnosis and Pathology
- Plan: Treatments and Therapies


SUBJECTIVE

4.2 Patient History, Problems, Complaints

Pain is the most common musculoskeletal medical complaint. A patient could have pain in a bone (*ostalgia/ostealgia*), joint (*arthralgia/arthrodynia*), tendon (*tenalgia*), or a muscle (*myalgia/myodynia*). A patient may also notice a change in a muscle's appearance—a muscle may be wasting away (*atrophy*) or abnormally large (*hypertrophy*). Parents may notice that their child is either bow-legged (*genu varum*) or knock-kneed (*genu valgum*). Most of the other problems people experience relate to a change in how their muscles or joints are working. For instance, they may notice that their joints don't work as well as normal. The joint may be stiff/bent (*ankylosis*) or it may make crackling sounds when moved (*crepitus*). Patients may also notice changes in their muscle function. They may experience a decrease in muscle tone (*hypotonia*) or muscle tone that is exaggerated (*hypertonia*). Diseases of the nervous system can lead to problems with coordination (*dystaxia* or *ataxia*), movements (*dykinesia* or *bradykinesia*), or twitches (*myospasms*).

Pain is the most common musculoskeletal medical complaint.
Felix Aggelos/Photodisc/Getty Images

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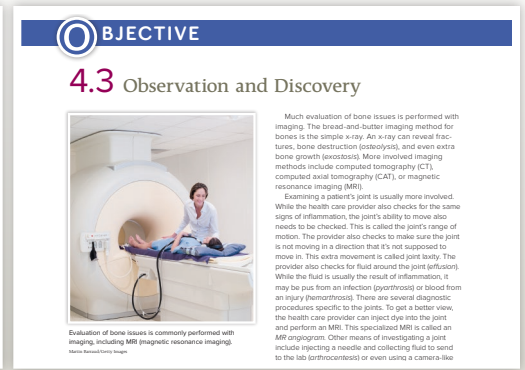
OBJECTIVE

4.3 Observation and Discovery

Much evaluation of bone issues is performed with imaging. The bread-and-butter imaging method for bones is the simple x-ray. An x-ray can reveal fractures, bone destruction (*osteolysis*), and even extra bone growth (*exostosis*). More involved imaging methods include computed tomography (CT), computed axial tomography (CAT), or magnetic resonance imaging (MRI).

Examining a patient's joint is usually more involved. While the health care provider also checks for the same signs of inflammation, the joint's ability to move also needs to be checked. This is called the joint's range of motion. The provider also checks to make sure the joint is not moving in a direction that it's not supposed to move in. This extra movement is called joint laxity. The provider also checks for fluid around the joint (*effusion*). While the fluid is usually the result of inflammation, it may be pus from an infection (*pyarthrosis*) or blood from an injury (*hemarthrosis*). There are several diagnostic procedures specific to the joints. To get a better view, the health care provider can inject dye into the joint and perform an MRI. This specialized MRI is called an *MR angiogram*. Other means of investigating a joint include injecting a needle and collecting fluid to send to the lab (*arthrocentesis*) or even using a camera-like

Evaluation of bone issues is commonly performed with imaging, including MRI (magnetic resonance imaging).
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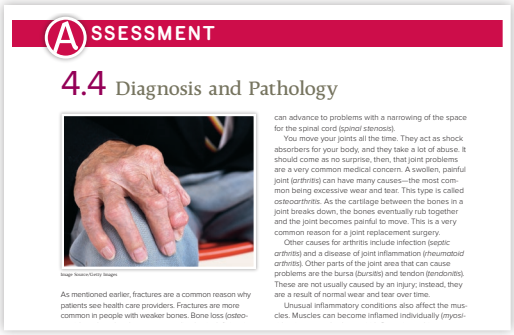


ASSESSMENT

4.4 Diagnosis and Pathology

As mentioned earlier, fractures are a common reason why patients see health care providers. Fractures are more common in people with weaker bones. Bone loss (*osteo-*

can advance to problems with a narrowing of the space for the spinal cord (*spinal stenosis*).

You move your joints all the time. They act as shock absorbers for your body, and they take a lot of abuse. It should come as no surprise, then, that joint problems are a very common medical concern. A swollen, painful joint (*arthritis*) can have many causes—the most common being excessive wear and tear. This type is called *osteoarthritis*. As the cartilage between the bones in a joint breaks down, the bones eventually rub together and the joint becomes painful to move. This is a very common reason for a joint replacement surgery.

Other causes for arthritis include infection (*septic arthritis*) and a disease of joint inflammation (*rheumatoid arthritis*). Other parts of the joint area that can cause problems are the bursa (*bursitis*) and tendon (*tendonitis*). These are not usually caused by an injury; instead, they are a result of normal wear and tear over time.

Unusual inflammatory conditions also affect the muscles. Muscles can become inflamed individually (*myosi-*

PLAN

4.5 Treatments and Therapies

Common procedures for the musculoskeletal system include knee and hip replacements.

stretch in order to heal injuries, or wearing a device used to relieve tension on a joint (*orthotics*). Shoe inserts are a very common type of orthotic.

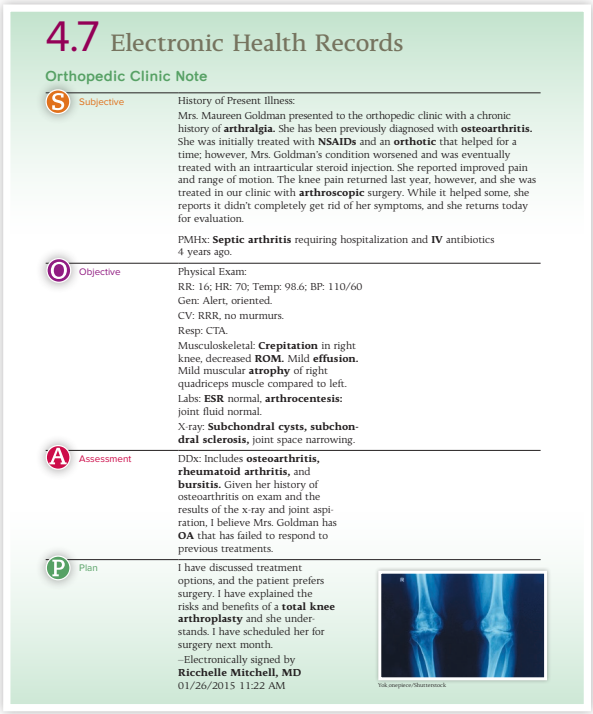
When nonsurgical treatment fails, surgery may be necessary. *Orthopedic* surgery deals with joints and bones. Many of the tools used in orthopedic surgery look like they came from a home improvement store—including drills, saws, and hammers. These tools are used to cut into bone (*osteotomy*), joints (*arthrotomy*), or muscle (*myotomy*). Sometimes they remove part or all of these structures (*osteectomy, arthrectomy, myectomy*).

When defective areas or cancer are present in a bone, the diseased area of bone must be removed before new bone (*graft*) or artificial hardware (*prosthesis*) can be installed. This reconstruction of bone procedure is called *osteoplasty*.

Similar procedures exist for joints. Sometimes, removal of a diseased joint (*arthrectomy*) is necessary, followed by a reconstruction of the joint with a prosthesis (*arthroplasty*). These are common treatments for diseased knees and hips. A less aggressive surgery for

The SOAP note method is a fundamental way of thinking about the language of health care. By building this approach into the framework of the pedagogy, *Acquiring Medical Language, 3e*, prepares future health care professionals to speak the language of medicine.

3. **Realistic Medical Histories:** *Acquiring Medical Language, 3e*, incorporates realistic medical histories in reviewing each chapter's material to expose students to what they can expect in the real world. The student is given an example of an electronic health care record and is asked a series of questions. Though it is not expected that everything in the record will be intelligible to them, the goal is to expose students to the context in which they will see medical terminology. This process will encourage students not to feel intimidated by the prospect of seeing words they are unfamiliar with. We have seen this help students glean information from the chart by using the skills they are acquiring in translating medical terminology.
4. **Practice Exercises:** Each section ends with an abundance of practice exercises, giving students the opportunity to practice and apply what they have just learned. Exercises are grouped into categories: Pronunciation, Translation, and Generation. This progression and repetition allows students to gradually build their skills–and their confidence–as they learn to apply their medical language skills. Abundant Chapter Review exercises, as well as additional labeling and audio exercises, are available through McGraw Hill Connect®.



4.7 Electronic Health Records

Orthopedic Clinic Note

S Subjective

History of Present Illness:

Mrs. Maureen Goldman presented to the orthopedic clinic with a chronic history of **arthralgia.** She has been previously diagnosed with **osteoarthritis.** She was initially treated with **NSAIDs** and an **orthotic** that helped for a time; however, Mrs. Goldman's condition worsened and was eventually treated with an intraarticular steroid injection. She reported improved pain and range of motion. The knee pain returned last year, however, and she was treated in our clinic with **arthroscopic** surgery. While it helped some, she reports it didn't completely get rid of her symptoms, and she returns today for evaluation.

PMHx: **Septic arthritis** requiring hospitalization and **IV** antibiotics 4 years ago.

O Objective

Physical Exam:

RR: 16; HR: 70; Temp: 98.6; BP: 110/60

Gen: Alert, oriented.

CV: RRR, no murmurs.

Resp: CTA.

Musculoskeletal: **Crepitation** in right knee, decreased **ROM.** Mild **effusion.** Mild muscular **atrophy** of right quadriceps muscle compared to left.

Labs: **ESR** normal, **arthrocentesis:** joint fluid normal.

X-ray: **Subchondral cysts, subchondral sclerosis,** joint space narrowing.

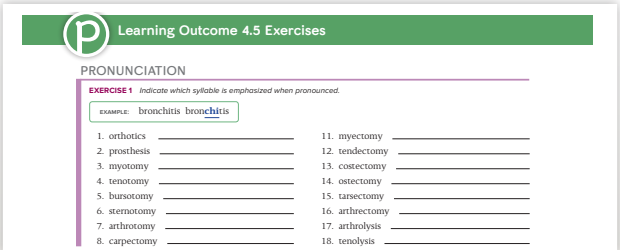
A Assessment

DDx: Includes **osteoarthritis, rheumatoid arthritis,** and **bursitis.** Given her history of osteoarthritis on exam and the results of the x-ray and joint aspiration, I believe Mrs. Goldman has **OA** that has failed to respond to previous treatments.

P Plan

I have discussed treatment options, and the patient prefers surgery. I have explained the risks and benefits of a **total knee arthroplasty** and she understands. I have scheduled her for surgery next month.

–Electronically signed by **Rachelle Mitchell, MD** 01/26/2015 11:22 AM



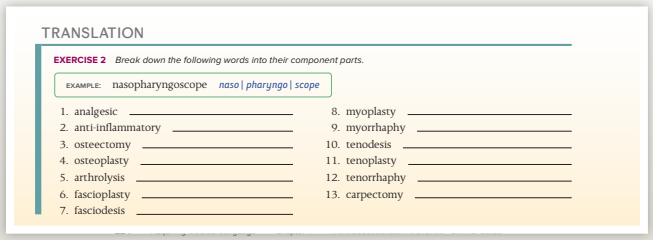
Learning Outcome 4.5 Exercises

PRONUNCIATION

EXERCISE 1 *Indicate which syllable is emphasized when pronounced.*

EXAMPLE: bronchitis bron**chi**tis

1. orthotics
2. prosthesis
3. myotomy
4. tenotomy
5. bursotomy
6. sternotomy
7. arthrotomy
8. carpectomy
11. myectomy
12. tendectomy
13. costectomy
14. ostectomy
15. tarsectomy
16. arthrectomy
17. arthrolysis
18. tenolysis

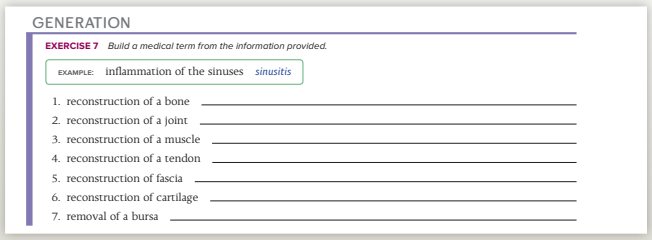


TRANSLATION

EXERCISE 2 *Break down the following words into their component parts.*

EXAMPLE: nasopharyngoscope *naso | pharyngo | scope*

1. analgesic
2. anti-inflammatory
3. osteectomy
4. osteoplasty
5. arthrolysis
6. fascioplasty
7. fasciodesis
8. myoplasty
9. myorrhaphy
10. tenodesis
11. tenoplasty
12. tenorrhaphy
13. carpectomy



GENERATION

EXERCISE 7 *Build a medical term from the information provided.*

EXAMPLE: inflammation of the sinuses *sinusitis*

1. reconstruction of a bone
2. reconstruction of a joint
3. reconstruction of a muscle
4. reconstruction of a tendon
5. reconstruction of fascia
6. reconstruction of cartilage
7. removal of a bursa

To the Instructor

To teach medical terminology as a language, we adopt techniques employed in second-language acquisition. This helps students not just learn the roots, but also adopt a way of thinking and speaking that enables them to communicate using the language of medicine. Cognitive and educational psychologists divide language instruction techniques into two primary categories: contextualized (real-world exercises) and decontextualized (academic/grammar exercises).

Using this framework, some of the techniques employed in *Acquiring Medical Language* include:

1. **Contextualized language techniques (real-world exercises)**
    a. *Link new language to old language.* Pointing out instances of medical terms or roots in everyday use enables the students to connect new information they are studying with information they already possess.
    b. *Use new language in context.* Using the card system to introduce the root words enables students to understand word parts in the context of larger body systems and in relation to other word parts. Using realistic medical charts enables students to see the terms they use not as lists but as parts of a system of communication.
2. **Decontextualized language techniques (academic/grammar exercises)**
    a. *Use repetition.* The students are exposed to roots, prefixes, and suffixes multiple times and in multiple ways. Roots are changed by the addition of prefixes or suffixes. Familiar prefixes and suffixes are applied to new roots. This way, the word components are continuously reinforced.
    b. *Use translation.* Students are asked to provide literal definitions of medical terms, which provides practice in breaking down words into their component parts and determining their meaning.
    c. *Use generation.* Students are asked to produce medical terms based on the literal definition provided. Though this is only an academic exercise, such practice reinforces material learned by reversing the cognitive process of translation.
    d. *Challenge.* Students will be exposed to a handful of longer-than-average terms and asked to break them down into component parts and translate them. A key part of teaching any language is helping students feel comfortable with–not intimidated by–new material. One method is by periodically challenging them to tackle situations that may at first appear overwhelming.

As you use this text, here are some things to keep in mind:

1. **Breakdown Is the Key**–the goals of this approach to medical terminology are to help students internalize the word parts (roots, prefixes, suffixes) and to reinforce the concept that medical terms are not to be memorized but to be translated.
2. **Words Are Practice**–the words in each chapter are a chance to practice breaking down terms into their component parts, identifying the roots, and learning to define the terms using this translation method. Because of that, each chapter contains four classes of words.
    a. *Essential words that break down*–each chapter contains words that are essential for students to know AND that also break down easily using this method. The core of each chapter is words like this. The goal is to show students that the vast majority of medical terms are translatable using the method taught by this book.
    b. *Nonessential words that break down*–each chapter also contains words that are not necessarily essential for students to know or common in the medical field, but break down clearly and are easily translatable using the method taught by this book. We include them as chances to practice the concept of translating medical terms and to show how easy the method is to apply.
    c. *Essential words that it doesn't help to break down*–there are terms that can be broken down but the breakdown doesn't help you understand what the word means. This can happen for a variety of reasons, such as the term describes a symptom rather than the disease, or reflects an outdated way of understanding the disease, or is an ancient term that just means what it means, or is a very recent and technical term and so there are no other words to compare it to. In these cases, even though the method taught by this book may not be ideal in helping to learn these terms, we still provide breakdowns and other notes to help make the information stick in the student's memory.

d. *Essential words that don't break down*–We admit it. This method doesn't work for every word. Some words essential for students to know do not break into word components. They must be memorized. We include those words because they are crucial words for medical professionals to know. Our hope is that the inclusion of these words in the real-life health records and other contextualized learning environments in this book will support students in internalizing these essential terms.

3. **The Use of Roots in Place of Combining Forms**–we understand that it's common practice in medical terminology courses to teach students the difference between roots and combining forms. This is not a part of our approach and you will see that in this book the term *combining form* is absent and the term *root* has been used in its place. Here are the reasons why we decided to do this.

   a. In the real world of medical language, the classifications of root and combining form are nonexistent. The reason for this is that they mean virtually the same exact thing to health care professions in practice. The part of the term that is defined as a combining form can be used interchangeably with root without confusion. Also, word roots are more commonly used outside the world of medical terminology instruction. For our approach, using *root* instead of *combining form* prepares students better by presenting terminology as it is commonly used in broader health professions. If you were to hit Ctrl+F, to find and replace all instances of the word *root* with *combining form* in our text, nothing . . . NOTHING . . . is changed, lost, or unclear to the student.
   b. The importance of combining vowels and forms deals with how they impact pronunciation of terms, not definitions. Some instructors will argue but there is only a minimal difference in meaning, if any. We feel that great confusion is created by insisting on and highlighting the difference, as once a student completes the medical term class, being able to identify a component part as root or combining form is no longer practical. We do recognize this difference between a root and a combining form in Chapter 1 as follows: "When we say that a word part like cardi/o is a root, we aren't speaking precisely. Technically, cardi/o is called a combing form. A combining form is a combination of a root with a combining vowel."
   c. The word *root* is shorter than *combining form* by more than a third of letters (4 letters versus 13 letters). It may sound silly, but to us the purpose of teaching medical terminology is to streamline communication. The use of combining form is an unnecessary complication that doesn't bring value to the learner but may add potential confusion.

4. **Pronunciations Are Challenging for Students.**

   a. *We All Speak Differently*–English is an incredibly diverse language with numerous dialects and accents from all over the globe. One consequence of this is that we all speak in slightly different ways. Some of us break words into syllables at slightly different places or pronounce certain syllables differently. With that in mind, the pronunciation guides given in the book should be viewed as guidelines or directions, not universal laws.
   b. *Phonetic Versus Nonphonetic Syllable Breakdowns*–In the exercises, we frequently ask students to break words into syllables. When that happens, students might ask for guidance in doing this. Though we didn't explicitly break words into syllables, the syllable breakdown can be determined by looking at the phonetic pronunciation guide provided for each word. Encourage students to use critical thinking skills to align letters in the term with syllables in the guides.
   c. *For Example: Consider the Word* Salpingoscope. The phonetic pronunciation guide describes it as: sal-PING-goh-skohp. But how does that translate to syllable breakdown? Why is the *g* used in two syllables? Shouldn't it be either sal-pin-go-scope or sal-pingo-scope? Well, a case can be made for either of those two choices. The truth of the matter is that we all say the word slightly differently. The word is most accurately pronounced by leaving a little bit of the *g* in both syllables. Admit it, when you drop the *g* from PIN, you end up saying PIN a little bit differently. We say this not to complicate things but to encourage you to be flexible. We acknowledge that our pronunciation guides aren't etched in stone . . . more like etched in silly putty.

A Note from the Authors: To the Student

The purpose of this program is to equip you with foundational skills as you prepare for a career in health and medicine. As you enter the culture of medicine, you will need to speak the language to understand what is going on around you and to be understood by your colleagues and patients. Though learning medical language can seem a daunting task, it is our hope that this program reduces some of the anxiety that accompanies learning any new language. We hope this program shows you how clear the language of medicine is to understand as you begin to master some key concepts. As you get started, here are some helpful words of advice:

1. *Don't panic.* Immersing yourself in any new language can be intimidating. On occasion you will probably feel overwhelmed, like you are being bombarded with information you don't understand and don't know how to make sense of. Start by trying not to panic. Things always look intimidating when you begin. The water is always coldest when you first jump in. You will get used to it. Be patient. Follow the steps.
2. *Eat the elephant.* Do you know how to eat an elephant? One bite at a time. One of the easiest ways to keep from panicking is to break down things into easily digestible chunks. Don't focus on the total amount of information you have to learn; rather, focus on the bite in front of you.
3. *Practice makes permanent.* The easiest way to master medical language is to practice. You readily absorb what you are repeatedly exposed to. So practice. Repeat. Do it again. The more you do it, the more you will be able to do it, and the more you will enjoy doing it.
4. *Build bridges.* Medical language is everywhere: on TV shows, in the news, in your own life. Look for it. See if you can figure out the meaning of words you hear. Build connections between what you are learning and the world you live in. See how often you encounter these words. The more you practice it, the more it will be burned into your memory.

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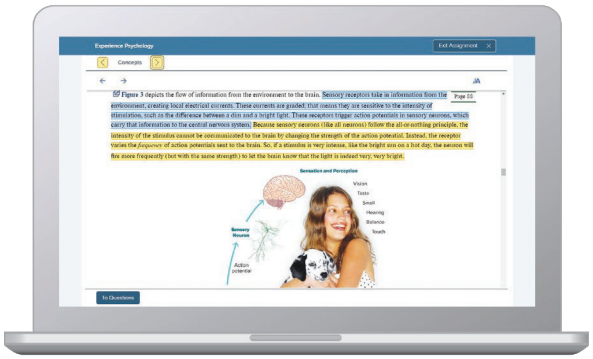

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Ivy Tech Community College

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Introduction to Medical Language

1

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learning outcomes

Upon completion of this chapter, you will be able to:

- **1.1** Summarize the purpose of **medical language**.
- **1.2** Summarize the origins of **medical language**.
- **1.3** Summarize the principles of **medical language**.
- **1.4** Summarize how to pronounce terms associated with **medical language**.
- **1.5** Identify the parts used to build **medical language**.
- **1.6** Summarize how to put together **medical terms**.
- **1.7** Describe how **medical terms** are translated.

Introduction

You've probably had conversations with people who like to use big words. Maybe you've responded with a blank expression and a sarcastic phrase–something like, "Say it in plain language, please!" This happens all the time in health care practices. Communication is frequently complicated when people use "big words" or jargon.

When a patient comes in for treatment, he or she is often bombarded with unfamiliar words. The patient leaves bewildered, wondering what the health care professional just said. Sometimes patients do get up the courage to ask what it all means and health care professionals explain in simpler terms. And patients wonder, "**Well**, why couldn't you have just said that in the first place? Why did you have to use all those big words?"

Talking with a doctor, nurse, or other health care professional can sometimes be bewildering or confusing.

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1.1 The Purpose of Medical Language

Why Is Medical Language Necessary?

"Why did you have to use all those big words?" is a good question. Why is medical language necessary? Following are a few reasons why medical language is both necessary and useful.

First, medical language allows health care professionals to be **clear**. Ours is a multicultural society. Many languages are spoken, each with their own words for illnesses and body parts. By using medical language, health care professionals are able to communicate and understand one another clearly, no matter what their first language is.

Second, medical language allows health care professionals to communicate **quickly**. Think about how this works in English. Instead of saying "a tall thing in the yard with green leaves," we just use the word "tree." Instead of saying "a meal made up of a few slices of meat and cheese, topped with lettuce, mustard, and mayonnaise, and placed between two slices of bread," we just say "sandwich." Instead of having to use valuable time describing the symptoms of a disease or the findings of an examination, a health care professional uses medical language in order to be clear and easily understandable to other health care professionals.

Third, medical language allows health care professionals to **comfort** patients. This reason might seem kind of odd, but it is true. When patients first enter a health care facility, they often don't feel well and are a little confused and worried about what is going on. Using medical language reassures patients that the health care professionals know what is going on and are in control. Sometimes a patient can be calmed and reassured that everything is OK by a health care professional repeating the same symptoms the patient reported—in medical language.

For example, one of us once saw a doctor about a rapid heart rate. The doctor was very reassuring—it was just "tachycardia." The doctor, however, didn't know he was talking to someone who was familiar with medical language. *Tachycardia* breaks down to *tachy* (fast, as in a car's *tachometer* reports the engine's revolutions per minute) + *card* (heart) + *ia* (condition). It literally means "fast heart condition." The doctor was just repeating what he had heard.

Here's another example. Once, a young boy was sick and his doctors performed a series of tests to find out what was wrong. After receiving the test reports, the boy's parents were reassured. The doctors had diagnosed their child with an "idiopathic blood disorder." The diagnosis was enough for them.

Because the doctor had attached a fancy medical term to their son's condition, the parents figured the doctors knew what was wrong and how to treat it. In truth, the doctor hadn't told them anything. *Idiopathic* breaks down to *idio* (private or alone) + *pathic* (disease or suffering). It literally means "suffering alone." The boy's condition was something the doctors had never seen before.

Medical language enables health care professionals to communicate quickly and easily no matter what their specific speciality or native language.

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Medical language is able to reassure patients that health care professionals know what is going on and are in control.

Adam Gault/Science Photo Library/Alamy Stock Photo

Learning Outcome 1.1 Exercises

Additional exercises available in connect®

EXERCISE 1 *Multiple-choice questions. Select the correct answer.*

1. Which of the following is NOT a reason why medical language is necessary and useful?
   a. Medical language allows health care professionals to be clear.
   b. Medical language allows health care professionals to comfort patients.
   c. Medical language allows health care professionals to communicate quickly.
   d. Medical language allows health care professionals to intimidate their patients.
2. Medical language allows health care professionals to be clear because:
   a. few people really understand medical terminology, so at least everyone is speaking the same way
   b. health care professionals are in control of the situation and don't want to scare patients with a language that they could understand
   c. we live in a multicultural society with a variety of languages, and medical language is a way of speaking the same way about the same thing despite your native language
   d. none of these
3. Medical language allows health care professionals to communicate quickly because:
   a. it is a quick way to speak to other health care professionals without taking the time to describe symptoms or examine findings
   b. the patients are usually baffled by the terminology and do not ask additional questions
   c. words with many syllables always communicate more information than words with few syllables
   d. none of these
4. Medical language allows health care professionals to comfort patients because:
   a. it communicates a sense that the health care professionals are in control of the situation
   b. it lets the patients know that the health care professionals are not caught off guard by the symptoms at hand
   c. it lets the patients know that the health care professionals know what is going on
   d. all of these

1.2 The Origins of Medical Language

Where Does It Come From?

Medical language is made up primarily (but not exclusively) of words taken from two ancient languages: Greek and Latin. Other words creep in from other sources, but Greek and Latin serve as the foundation of medical language.

Some of these other sources include:

Eponyms. The word *eponym* is derived from the Greek words *epi* (upon) + *onyma* (name). It literally means "to put your name on something." Thus, an eponym is a word formed by including the name of the person who discovered or invented whatever is being described. Sometimes, in the case of diseases, an eponym is named after the disease's first or most noteworthy diagnosed victim.

One famous eponym is Lou Gehrig's disease. The neurological disease was named after the famous New York Yankee first baseman who had this disease. The disease's scientific name is *amyotrophic lateral sclerosis.*

Acronyms. The word *acronym* is derived from the Greek words *acro* (high, end) + *onyma* (name). It literally means "to make a name with the ends." Thus, an acronym is a word made up of the first letters of each of the words that make up a phrase. One example is the diagnostic imaging process called **m**agnetic **r**esonance **i**maging, or MRI. Remember that acronyms are just shorthand—you still need to know what the words mean.

Modern languages. Frequently, words from modern languages creep into the vocabulary of health care professionals. These words tend to come from whatever language happens to be most commonly spoken by the majority of health care professionals. In centuries past, German or French were the most common languages, so they were the foundation of many medical terms. Currently, the fastest-growing and most-used language in the world is English. Thus, English has also contributed a fair number of medical terms.

MRI, which stands for **m**agnetic **r**esonance **i**maging, is an example of an acronym.

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Why Greek and Latin?

Although the three previously mentioned categories have contributed a significant number of words to the language of medicine, Greek and Latin make up its foundation and backbone. Even *eponym* and *acronym* were derived from Greek! But why are Greek and Latin so prevalent? There are at least three reasons why.

Reason 1: The foundations of Western medicine were in ancient Greece and Rome. The first people to systematically study the human body and develop theories about health and disease were the ancient Greeks. The Hippocratic Oath, the foundation of modern medical ethical codes, is named after and was possibly composed by a man named Hippocrates who lived in Greece from about 460 BC to about 370 BC. Hippocrates is widely considered to be the father of Western medicine.

The development of the health care profession began in ancient Greece and continued in ancient Rome. There, Galen, who lived from AD 129 to about AD 217, made some of the greatest advancements of our understanding of the human body, how disease affects it, and how drugs work.

Medical advances began to occur with greater frequency during the scientific revolution, adding to an already existing body of knowledge based on ancient Greek and Latin. In fact, some of the oldest terms have been in use for more than 2,000 years, such as terms

for the skin, because these body parts were more easily viewed and studied.

Reason 2: Latin was the global language of the scientific revolution. The scientific revolution took place from the sixteenth through the eighteenth century. It was a time of enormous discoveries in physics, biology, chemistry, and human anatomy. This period saw a rapid increase in human knowledge thanks to the scientific method, which is a set of techniques developed in this period and still in use today using observation and experimentation for developing, testing, and proving or disproving hypotheses.

Medical research involving many different subjects, people, and places occurred all over Europe. To allow people from England, Italy, Spain, Poland, and elsewhere to talk with one another, Latin became the language of scholarly discussion. It was already the common language of the Holy Roman Empire and Catholic church, so many people already knew it well.

By using Latin to record and spread news of their discoveries, scientists of this time were able to share their new knowledge beyond the borders of their countries. At the same time, the number of medical words that sprang from Latin grew.

Reason 3: Dead languages don't change. "Fine," you think. "The language of medicine is based on Greek and Latin. But why do we keep using it? No one speaks either of these languages anymore. Why don't we just use English?"

The reason we keep using Greek and Latin is exactly that—no one speaks them anymore. All spoken languages change over time. Take the English word *green,* for instance, and its non-color-related meaning. In the past 20 or so years, the word *green* has become understood to mean "environmentally responsible," as in the phrase "green energy." Before that, the term was widely understood to mean something different: "immature or inexperienced," such as "I just started this job, so I am still a little green." Dead languages, which aren't spoken anymore, have an advantage because they don't change. There is no worry that words will change their meaning over time.

The foundations of Western medicine were laid in Greece and Rome.

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Learning Outcome 1.2 Exercises

EXERCISE 1 *True or false questions. Indicate true answers with a T and false answers with an F.*

1. Medical language is made up primarily, but not exclusively, of words taken from two ancient languages: Greek and Latin. ____
2. Some other sources of medical language include eponyms, acronyms, and modern languages. ____
3. An example of an eponym is a medical term named after a famous patient who had the disease. ____
4. MRI is an example of an eponym. ____
5. Acronyms are used to say things more quickly. ____
6. Greek and Latin provide the basis of the language of medicine because Western medicine has its foundations in the Greek and Roman cultures. ____
7. The first people to systematically study the human body and develop theories about health and disease were the ancient Greeks. ____
8. German was the global language of the scientific revolution. ____
9. During the scientific revolution, Latin was used as the language of scholarly discussion in order to allow people across Europe to share their knowledge more quickly despite their different native languages. ____
10. A dead language is a language that people do not like to hear or speak anymore because it is no longer useful to a society. ____
11. Latin and Greek provide an excellent basis for medical terminology because dead languages do not change. ____

1.3 The Principles of Medical Language

How Does It Work?

Don't think of medical language as words to be memorized. Instead, they are sentences to be translated.[1]

Each medical word is a description of some aspect of health care. Think of it this way: If you were taking a trip to another country, you might try to memorize a few key words or phrases. It might be useful to know how to say common things like "Where is the bathroom?" or "How much does this cost?" But if you were going to live in that country for a while, you wouldn't just try to memorize a few stock phrases, you would try to learn the language so you could understand what other people were saying.

The same is true of medical language. If you understand the way the language works, you will be able not only to know the meaning of a few individual words, but also to break down and understand words you have never seen before, and even generate words on your own.

S. Olsson/PhotoAlto

> "**Don't think** of medical language as words to be **memorized**. Instead, they are sentences to be **translated**."[1]

[1] For more on this concept, see Lesley A. Dean-Jones, "Teaching Medical Terminology as a Classics Course," *Classical Journal* 93 (1998): 290–96.

1.4 How to Pronounce Terms Associated with Medical Language

The first step in learning any language is learning correct pronunciation. Like any other language, knowing and understanding medical terminology is useless unless you pronounce the terms correctly. With medical terms, the matter is complicated by two facts: First, many of the words come from unfamiliar languages (and not just any unfamiliar languages, but unfamiliar languages no one speaks anymore). Second, some of the words are really long.

You probably have noticed the way native speakers of a language pronounce certain letters differently. Think of the word *tortilla.* It takes a bit of experience with Spanish to know that two *l*'s placed together (*ll*) is pronounced like a *y*. You say tor-TEE-yah, not tor-TILL-ah. The Spanish word for yellow, *amarillo,* follows this rule. It is pronounced ah-mah-REE-yoh. But the Texas town of the same name is pronounced very differently: am-ah-RIL-oh.

The same is true for medical language. The best way to learn terms is by encountering them in context. Once you get a little experience with the language, you will pick up the unique ways that certain letters are pronounced. In the meantime, below you will find a chart of some commonly mispronounced letters.

Syllable Emphasis

Every medical term is constructed from syllables. Another thing that can affect the way words are pronounced is which syllable or syllables should be stressed, or emphasized. You must always make sure to put the emphasis on the right syllable.

For example, consider that last phrase: *Put the emphasis on the right syllable.* The correct way to pronounce it would be:

PUT the EM-fah-sis on the RAIT SIL-ah-bul.

It would sound funny to say:

PUT the em-FAH-sis on the RAIT si-LAH-bul.

Knowing which syllable to emphasize can seem tricky, but is actually pretty easy. Usually, for the sake of emphasis, the only syllables that you need to focus on are these last three syllables. So, starting at the end of the word, count back three syllables.

Although they are not terribly important to know, there are names for the various syllables in a word:

The last syllable is called the *ultima,* which means "last."

Letter	Sound	Example
c (before *a, o, u*)	k	*cardiac* (KAR-dee-ak) *contra* (KON-trah) *cut* (KUT)
c (before *e, i, y*)	s	*cephalic* (seh-FAL-ik) *cilium* (SIL-ee-um) *cyst* (SIST)
ch	k	*chiropractor* (KAI-roh-PRAK-tor)
g (before *a, o, u*)	g	*gamma* (GAM-mah) *goiter* (GOIT-er) *gutta* (GUT-tah)
g (before *e, i, y*)	j	*genetic* (jen-ET-ik) *giant* (JAI-int) *biology* (bai-AWL-oj-jee)
ph	f	*pharmacy* (FAR-mah-see)
pn	n	*pneumonia* (noo-MOHN-yah)
pt (initial)	t	*pterigium* (teh-RIH-jee-um)
rh, rrh	r	*rhinoplasty* (RAI-noh-PLAS-tee) *hemorrhage* (HEH-moh-rij)
x (initial)	z	*xeroderma* (ZER-oh-DER-mah)

The second-to-last syllable is called the *penult,* which means "almost the last." The prefix *pen-* means "almost." Think of the word *peninsula,* which is a body of land with water on three sides. The word literally translates to "almost an island."

The third-to-last syllable is called the *antepenult.* The literal translation of this word is one of our favorites. *Ante-* means "before," so *antepenult* means "the one before the one that is almost the last." When it comes to emphasizing the right syllable, the basic rule is this: In most words, the emphasis usually falls on the third-to-last syllable (the *antepenult,* if you are keeping track).

Cardiac is split into three syllables: car / di / ac.

Count backward three syllables from the end of the word to figure out which syllable gets emphasized: *car.*

Therefore, the word is pronounced **KAR** / dee / ak.

Cardiology is split into five syllables: car / di / o / lo / gy.

Count backward three syllables from the end of the word to figure out which syllable gets emphasized: *o.*

Therefore, the word is pronounced kar / dee / **AW** / loh / jee.

It gets tricky when a word remains unchanged except for the addition or subtraction of only a few letters. Two good examples are the words *colonoscopy* and *colonoscope*.

Colonoscopy is split into five syllables: co / lon / o / sco / py.

Count backward three syllables from the end of the word to figure out which syllable gets emphasized: *o.*

Therefore, the word is pronounced koh / lon / **AW** / skoh / pee.

Colonoscope is split into four syllables: co / lon / o / scope.

Count backward three syllables from the end of the word to figure out which syllable gets emphasized: *lon.*

Therefore, the word is pronounced koh / **LAWN** / oh / skohp.

Notice how easy it is to spot the pronunciation change if you focus on counting backward from the end of the word?

As with any rule, there are countless exceptions and technicalities. That said, the easiest way to master pronunciation is not to learn countless rules, but instead to *practice pronouncing words.* Learn this one rule—let's call it the three-syllable rule—and make sure you take note of the pronunciations offered throughout the chapters. Don't just read them silently! Pronounce the words out loud. The more times you practice saying a word, the more comfortable and natural you will feel when you have to use it for real.

But make sure you are pronouncing correctly. Practice does *not* make perfect; practice makes permanent. Whatever you do over and over will be cemented in your brain, so make sure you do it right. *Perfect* practice makes perfect.

Learning Outcome 1.4 Exercises

EXERCISE 1 *Identify the correct pronunciation for the underlined syllable.*

EXAMPLES: thora**co**centesis *answer: koh (the c is hard because it is followed by an **o**)*
thora**cen**tesis *answer: sin (the c is soft because it is followed by an **i**)*

_____	1. **gut**	a. jut	b. gut
_____	2. di**git**	a. jit	b. git
_____	3. **gag** reflex	a. jag	b. gag
_____	4. dermatolo**gy**	a. jee	b. gee
_____	5. **gen**eticist	a. jen	b. gen
_____	6. **go**nad	a. joh	b. goh
_____	7. colla**gen**	a. jen	b. gen
_____	8. **phar**macist	a. par	b. far
_____	9. **cu**ticle	a. kyoo	b. suh
_____	10. **cor**nea	a. kor	b. sor
_____	11. **cath**eter	a. kath	b. sath
_____	12. on**co**logy	a. kaw	b. saw
_____	13. geneti**cist**	a. kist	b. sist
_____	14. pharma**cist**	a. kist	b. sist
_____	15. **cys**tic fibrosis	a. kis	b. sis
_____	16. **cho**lera	a. kawl	b. chohl
_____	17. psy**cho**sis	a. koh	b. choh
_____	18. pneumato**cele**	a. keel	b. seel
_____	19. **rheu**matoid arthritis	a. roo	b. rhee-yoo
_____	20. **pneu**matocele	a. noo	b. puh-noo
_____	21. **pte**rion	a. teh	b. puh-teh
_____	22. **xer**osis	a. zeh	b. ex-eh
_____	23. en**ceph**alitis	a. kep	b. sef
_____	24. **cirrho**sis	a. kir-hoh	b. sir-oh

EXERCISE 2 *Indicate which syllable is emphasized when pronounced.*

EXAMPLE: bronchitis bron**chi**tis

1. cholera _____
2. cornea _____
3. cuticle _____

Learning Outcome 1.4 Exercises

4. catheter _____
5. collagen _____
6. anemia _____
7. oncology _____
8. optometry _____
9. rheumatoid _____
10. geneticist _____
11. dermatology _____
12. psychotherapist _____

1.5 Parts Used to Build Medical Language

Just as any language has nouns, verbs, and adjectives, the language of medicine is made up of three main building blocks: roots, suffixes, and prefixes. Medical language is constructed by combining a root with a suffix and often a prefix.

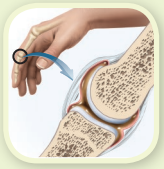
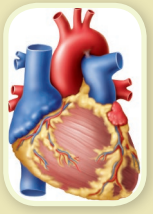
Root—foundation or subject of the term
Suffix—ending that gives essential meaning to the term
Prefix—added to the beginning of a term when needed to further modify the root

Common Roots

A root is the foundation of any medical term. Roots function like nouns in the language of medicine. It is the base, or subject, of a word—it is what the word is about. Most roots refer to things like body parts, organs, and fluids.

There are a few types of roots in medical language. In the roots that follow, notice that a slash divides the last letter from the rest of the word (as in *arthr/o*). The final letter in these roots is called a *combining vowel*; these are discussed in detail later in the chapter. For now, just know that the final letter occurs in some words and not in others. Whenever possible, the examples provided include both words that use a combining vowel and words that don't. Don't worry about what the example words mean. This is just to get you used to seeing the roots in context.

Some meanings have only one potential root.

Root	Definition	Examples
arthr/o AR-throh	joint	*arthroscope, arthritis* 
cardi/o KAR-dee-oh	heart	*cardiology, pericardium* 
enter/o EN-ter-oh	small intestine	*enteropathy, dysentery* 
gastr/o GAS-tro	stomach	*gastrointestinal, gastritis* 

Root	Definition	Examples
hepat/o he-PAH-toh	liver	*hepatology, hepatitis* 
neur/o NUR-oh	nerve	*neurology, neuralgia* 

Some meanings have a few similar-sounding potential roots. Why? Some suffixes just sound better when attached to another root. Look at the examples in the chart below and switch the roots around—*hematorrhage* and *hemoma.* The meanings are the same, but they sure sound funny.

Root	Definition	Examples
hem/o HEE-moh	blood	*hemorrhage* 
hemat/o heh-MAH-toh		*hematoma*

Some meanings have a couple of potential roots that are completely different but mean the same thing. This is because one word comes from Greek and the other comes from Latin. Normally, however, one of the roots is much more commonly used than the other. As shown below, *myo* is used much more often than *musculo.*

Root	Definition	Examples
my/o MAI-oh	muscle	*myocardial, myalgia*
muscul/o MUS-kyoo-loh		*musculoskeletal, muscular* 

Some meanings have several potential roots that mean the same thing. Some are similar, and some are completely different. These are basically a combination of the two previous categories. These meanings each have a couple of similar roots *as well as* at least one root from Greek and one from Latin.

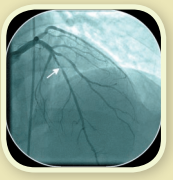
Question: Why doesn't each meaning have only one potential root?

Answer: The main reason multiple roots are available is to provide *options*. Some suffixes simply sound better or are easier to say when they are combined with one root rather than another.

Root	Definition	Examples
angi/o AN-gee-oh	vessel (most commonly refers to blood vessel, but can also refer to other types of vessels as well)	*angioplasty, angiectomy*  Inok/Getty Images
vas/o VAS-oh		*vasospasm, vasectomy*
vascul/o VAS-kyoo-loh		*vasculopathy, vasculitis*
derm/o DER-moh	skin	*dermoscopy, dermis* 
dermat/o der-MAH-toh		*dermatology, dermatitis*
cutane/o kyoo-TAY-nee-oh		*subcutaneous*
pneum/o NOO-moh	lung	*pneumotomy* 
pneumon/o noo-MAW-noh		*pneumonia, pneumonitis*
pulmon/o PUL-maw-noh		*pulmonologist, cardiopulmonary*

GENERAL-PURPOSE ROOTS

This list contains roots that will recur often in multiple chapters. It is important to learn these roots now.

Root	Definition	Examples
gen/o JIN-oh	creation, cause	*pathogenic*
hydr/o HAI-droh	water	*hydrophobia, dehydration*  Brian Hagiwara/Brand X Pictures/Getty Images
morph/o MOR-foh	change	*morphology*
myc/o MAI-koh	fungus	*dermatomycosis*
necr/o NEH-kroh	death	*necrosis*
orth/o OR-thoh	straight	*orthodontist*
path/o PAH-thoh	suffering, disease	*pathology*
phag/o FAY-goh	eat	*aphagia*
plas/o PLAH-soh	formation	*hyperplasia*
py/o PAI-oh	pus	*pyorrhea, pyemia*
scler/o SKLEH-roh	hard	*scleroderma*
sten/o STIH-noh	narrowing	*stenosis*  kalus/Getty Images
troph/o TROH-foh	nourishment, development	*trophology, hypertrophy*
xen/o ZEE-noh	foreign	*xenograft*

Common Suffixes

A *suffix* is a word part placed at the end of a word. The word *suffix* literally means "to attach (fix) after or below (sub, which if you say it fast starts to sound like suff)." As roots function as nouns, so suffixes function as verbs in the language of medicine. They describe something the root is doing, or something that is happening to the root.

There are many types of suffixes in medical language. In general, they can be divided into two basic groups: simple and complex.

SIMPLE SUFFIXES

These suffixes (as their name suggests) are basic and are used to turn a root into a complete word.

Adjective. These suffixes turn the root they follow into an adjective. Thus, they all mean "pertaining to," or something similar to that.

Suffix	Definition	Examples
-ac ak	pertaining to	*cardiac*
-al al		*skeletal*
-ar ar		*muscular*
-ary ar-ee		*pulmonary*
-eal ee-al		*esophageal*
-ic ik		*medic*
-tic tik		*neurotic*
-ous us		*subcutaneous*

Noun. All of these suffixes turn the root they are added to into nouns.

Suffix	Definition	Examples
-ia ee-ah	condition	*pneumonia*
-ism ih-zum		*autism*
-ium ee-um	tissue, structure	*pericardium*
-y ee	condition, procedure	*hypertrophy*

Diminutive. When added to a root, these suffixes transform a term's meaning to a smaller version of the root. In English, for example, the suffix *-let* is diminutive. A *booklet* is a "little book." In Spanish, the suffix *-ita* is diminutive. *Casa* is the Spanish word for *house*, so *casita* therefore means "little house."

Suffix	Definition	Examples
-icle ik-el	small	*ventricle*
-ole ohl		*arteriole*
-ule yool		*pustule*
-ula yoo-lah		*uvula*

COMPLEX SUFFIXES

Complex suffixes aren't necessarily more difficult to understand than simple suffixes. They just have more parts. Sometimes, these suffixes are referred to as compound or combination suffixes because the suffixes themselves are put together from other suffixes, roots, and prefixes.
Following is an example.

> The suffix *-y* means "condition" or "procedure." When combined with *tom/o*, a root meaning "to cut," the result is the complex suffix *-tomy*, which means "a cutting procedure" or "incision."
>
> *tom/o* (cut) + *-y* (process) = *-tomy* = a cutting procedure or incision
>
> But you can take it a step further. If you add the prefix *ec-* to *-tomy*, you will create the complex suffix -ectomy, which means "to cut out" or "to surgically remove something."
>
> *ec-* (out) + *tom/o* (cut) + *-y* (process) = *-ectomy* = a cutting out procedure or surgical removal

Though it is useful to understand how complex suffixes are able to be broken down into smaller parts, throughout this book, we will keep the complex suffixes together and provide a single definition for their meaning instead of breaking them down further.

Following are lists of some categories of complex suffixes. Some complex suffixes are professional terms.

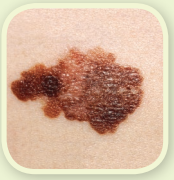
Suffix	Definition	Examples
-iatrics ee-AH-triks	medical science	*pediatrics*  Rido/Shutterstock
-iatry AI-ah-tree		*psychiatry*
-iatrist EE-ah-trist	specialist in medicine of	*psychiatrist*
-ist ist	specialist	*dentist*
-logist loh-jist	specialist in the study of	*psychologist*  Don Hammond/Design Pics
-logy loh-jee	study of	*psychology*

Some complex suffixes describe symptoms, diseases, or conditions that are either mentioned by patients or diagnosed by health professionals.

symptoms, diseases, and conditions

Suffix	Definition	Examples
-algia AL-jah	pain	*myalgia*
-dynia DIN-ee-ah or DAI-nee-ah		*gastrodynia*
-cele SEEL	hernia (a bulging of tissue into an area where it doesn't belong)	*hydrocele*

symptoms, diseases, and conditions *continued*

Suffix	Definition	Examples
-emia EEM-ee-ah	blood condition	*leukemia*  Steve Gschmeissner/Science Photo Library RF/ Photo Researchers/Science Source
-iasis AI-ah-sis	presence of	*lithiasis*
-itis AIT-is	inflammation	*arthritis*
-lysis LIH-sis	loosen, break down	*hemolysis*
-malacia mah-LAY-shee-ah	abnormal softening	*osteomalacia*
-megaly MEG-ah-lee	enlargement	*hepatomegaly*
-oid OYD	resembling	*keloid*
-oma OH-mah	tumor	*melanoma*  National Cancer Institute (NCI)
-osis OH-sis	condition	*thrombosis*
-pathy pah-thee	disease	*myopathy*
-penia PEE-nee-ah	deficiency	*leukopenia*
-ptosis puh-TOH-sis	drooping	*nephroptosis*
-rrhage RIJ	excessive flow	*hemorrhage*
-rrhagia RAY-jee-ah		*menorrhagia*
-rrhea REE-ah	flow	*diarrhea*
-rrhexis REK-sis	rupture	*metrorrhexis*
-spasm spazm	involuntary contraction	*myospasm*

Some complex suffixes describe tests and treatments performed by health professionals. Although it is convenient to place tests and treatments in the same category and label them as "procedures," it is important to distinguish between the two. A *test* is a *procedure done to gain more information in order to diagnose a problem.* A *treatment* is a *process done after a diagnosis to fix a problem.*

tests

Suffix	Definition	Examples
-centesis sin-TEE-sis	puncture	*amniocentesis*
-gram gram	written record	*cardiogram*  Stockbyte/Getty Images
-graph graf	instrument used to produce a record	*cardiograph*
-graphy grah-fee	writing procedure	*cardiography*
-meter meet-er	instrument used to measure	*cephalometer*
-metry meh-tree	process of measuring	*cephalometry*
-scope skohp	instrument used to look	*arthroscope*
-scopy skoh-pee	process of looking	*arthroscopy*

treatments

Suffix	Definition	Examples
-desis DEE-sis	binding, fixation	*arthrodesis*
-ectomy EK-toh-mee	removal	*vasectomy* 
-pexy PEK-see	surgical fixation	*retinopexy* 
-plasty PLAS-tee	reconstruction	*rhinoplasty*
-rrhaphy rah-fee	suture	*herniorrhaphy*
-stomy stoh-mee	creation of an opening	*colostomy*
-tomy toh-mee	incision	*dermotomy*

SINGULARS AND PLURALS

In English, the most common way to turn a word from singular to plural is to add an *s*. The plural of *bag* is *bags,* for example. But there are other ways too. The plural of *goose* is *geese*. The plural of *mouse* is *mice*. The plural of *ox* is *oxen*. The plural of *sheep* is *sheep*.

The same is true for medical terms. Because medical words come from different languages, singular words become plural in a variety of ways.

Singular	Plural	Examples	
-a	*-ae*	*vertebra* *larva*	*vertebrae* *larvae*
-ax	*-aces*	*thorax*	*thoraces*
-ex	*-ices*	*cortex*	*cortices*
-ix	*-ices*	*appendix*	*appendices*
-is	*-es*	*neurosis* *diagnosis*	*neuroses* *diagnoses*
-ma	*-mata*	*sarcoma* *carcinoma*	*sarcomata* *carcinomata*
-on	*-a*	*spermatozoon* *ganglion*	*spermatozoa* *ganglia*
-um	*-a*	*datum* *bacterium* *ovum*	*data* *bacteria* *ova*
-us	*-i*	*nucleus* *alveolus* *thrombus*	*nuclei* *alveoli* *thrombi*
-y	*-ies*	*biopsy* *myopathy*	*biopsies* *myopathies*

Common Prefixes

A *prefix* is a word part placed at the beginning of a word. The word *prefix* literally means "to attach (fix) before (pre)." Prefixes function like adjectives in the language of medicine. They supply additional information as needed. In the same way that not every sentence has an adjective, not every medical term has a prefix.

There are many types of prefixes in medical language. Following are a few examples.

NEGATION PREFIXES

Some prefixes negate things:

negation		
Prefix	**Meaning**	**Examples**
a- ay	not	*aphasia*
an- an		*anemia*
anti- ANT-ih	against	*antibiotics*
contra- KON-trah		*contraceptive*
de- dee	down, away from	*dehydration*

TIME OR SPEED PREFIXES

Some prefixes describe time or speed:

time/speed

Prefix	Meaning	Examples
ante- AN-tee	before	*antepartum*
pre- pree		*precondition*
pro- proh	before, on behalf of	*probiotic*  Bob Coyle/McGraw Hill
brady- BRAH-dih or BRAY-dih	slow	*bradycardia*
tachy- TAH-kih	fast	*tachycardia*
post- pohst	after	*postpartum*
re- ree	again	*rehabilitation*

DIRECTION OR POSITION PREFIXES

Some prefixes describe direction or position:

direction/position

Prefix	Meaning	Examples
ab- ab	away	*abduct*
ad- ad	toward	*adrenaline*
circum- SIR-kum	around	*circumcision*
peri- PER-ee		*pericardium*
dia- DAI-ah	through	*diagnostic*
trans- tranz		*translate*
e- eh	out	*evoke*
ec- ek		*ectopic*
ex- eks		*exhale*

direction/position *continued*

Prefix	Meaning	Examples
ecto- EK-toh	outside	*ectoderm*
exo- EK-soh		*exoskeleton*
extra- EKS-trah		
en- en	in, inside	*enema*
endo- EN-doh		*endocrine*
intra- IN-trah		*intravenous*  mmmx/123RF
epi- EH-pee	upon	*epididymus*
sub- sub	beneath	*subcutaneous*
inter- IN-ter	between	*intercostal*

SIZE OR QUANTITY PREFIXES

Some prefixes describe size or quantity:

size/quantity

Prefix	Meaning	Examples
bi- bai	two	*bilateral*
hemi- HEH-mee	half	*hemiplegia*
semi- SEH-mee		*semilunar*
hyper- HAI-per	over	*hyperthermia*
hypo- HAI-poh	under	*hypothermia*
macro- MAH-kroh	large	*macrotia*
micro- MAI-kroh	small	*microdontia*

size/quantity *continued*

Prefix	Meaning	Examples
mono- MAW-noh	one	*monocyte*
uni- YOO-nih		*unisex*
oligo- AW-lih-goh	few	*oligomenorrhea*
pan- pan	all	*pancytopenia*
poly- PAW-lee	many	*polygraph*
multi- MUL-tee		*multicellular*

GENERAL PREFIXES

Some prefixes are general:

other

Prefix	Meaning	Examples
con- kon	with, together	*congestion*  Wavebreakmedia/iStockphoto/Getty Images
syn- sin		*syndrome*
sym- sim		*symmetry*
dys- dis	bad	*dysentery*
eu- yoo	good	*euphoria*

Learning Outcome 1.5 Exercises

EXERCISE 1 *Match the root on the left with its definition on the right.*

_____ 1. neur/o	a. heart
_____ 2. cardi/o	b. joint
_____ 3. arthr/o	c. liver
_____ 4. gastr/o	d. nerve
_____ 5. hepat/o	e. small intestine
_____ 6. enter/o	f. stomach

EXERCISE 2 *Translate the following roots.*

1. neur/o _____
2. cardi/o _____
3. arthr/o _____
4. gastr/o _____
5. hepat/o _____
6. enter/o _____

EXERCISE 3 *Underline and define the root in the following terms.*

1. cardiology _____
2. neurology _____
3. gastroscope _____
4. arthroscopy _____
5. enterology _____
6. hepatology _____

EXERCISE 4 *Identify the roots for the following definitions.*

1. heart _____
2. joint _____
3. nerve _____
4. stomach _____
5. liver _____
6. small intestine _____

EXERCISE 5 *Match the root on the left with its definition on the right. Some definitions will be used more than once.*

_____ 1. muscul/o	a. blood
_____ 2. dermat/o	b. blood vessel
_____ 3. derm/o	c. lung
_____ 4. vascul/o	d. muscle
_____ 5. vas/o	e. skin
_____ 6. pneumon/o	
_____ 7. pneum/o	
_____ 8. pulmon/o	
_____ 9. my/o	
_____ 10. angi/o	
_____ 11. hemat/o	
_____ 12. hem/o	
_____ 13. cutane/o	

Learning Outcome 1.5 Exercises

EXERCISE 6 *Translate the following roots.*

1. muscul/o _____
2. dermat/o _____
3. derm/o _____
4. vascul/o _____
5. vas/o _____
6. pneumon/o _____
7. pneum/o _____
8. pulmon/o _____
9. my/o _____
10. angi/o _____
11. hemat/o _____
12. hem/o _____
13. cutane/o _____

EXERCISE 7 *Underline and define the root in the following terms.*

1. muscular _____
2. vascular _____
3. pulmonary _____
4. dermatology _____
5. hematology _____
6. myospasm _____
7. vasospasm _____
8. angiogram _____
9. dermopathy _____
10. hemostatic _____
11. percutaneous _____
12. vasectomy _____
13. pneumonectomy _____
14. cardiomyopathy (2 roots) _____
15. cardiopulmonary (2 roots) _____

EXERCISE 8 *Identify the roots for the following definitions.*

1. muscle (2 roots) _____
2. blood (2 roots) _____
3. skin (3 roots) _____
4. lung (3 roots) _____
5. blood vessel (3 roots) _____

Learning Outcome 1.5 Exercises

EXERCISE 9 *Match the root on the left with its definition on the right.*

_____ 1. gen/o	a. change
_____ 2. necr/o	b. creation, cause
_____ 3. xen/o	c. death
_____ 4. morph/o	d. nourishment, development
_____ 5. troph/o	e. eat
_____ 6. plas/o	f. foreign
_____ 7. sten/o	g. formation
_____ 8. phag/o	h. narrowing

EXERCISE 10 *Translate the following roots.*

1. hydr/o _____
2. orth/o _____
3. necr/o _____
4. myc/o _____
5. py/o _____
6. xen/o _____
7. path/o _____
8. scler/o _____
9. phag/o _____

EXERCISE 11 *Underline and define the roots in the following terms.*

1. morphology _____
2. dysplasia _____
3. hypertrophic _____
4. teratogenic _____
5. mycosis _____
6. craniostenosis _____
7. angiosclerosis (2 roots) _____
8. pyarthrosis (2 roots) _____

Learning Outcome 1.5 Exercises

EXERCISE 12 *Identify the roots for the following definitions.*

1. water _____
2. creation, cause _____
3. pus _____
4. straight _____
5. fungus _____
6. suffering, disease _____
7. hard _____
8. formation _____

EXERCISE 13 *Match the suffix on the left with its definition on the right. Some definitions will be used more than once.*

_____	1. -ium	a. condition
_____	2. -icle	b. pertaining to
_____	3. -ous	c. tissue, structure
_____	4. -ac	d. small
_____	5. -ia	
_____	6. -eal	

EXERCISE 14 *Translate the following suffixes.*

1. -y _____
2. -ism _____
3. -al _____
4. -ic, -tic _____
5. -ar, -ary _____
6. -ole, -ule, -ula _____

EXERCISE 15 *Break down the following words into their component parts.*

EXAMPLE: nasopharyngoscope *naso | pharyngo | scope*

1. cardiac _____
2. gastric _____
3. neurotic _____
4. skeletal _____
5. esophageal _____
6. muscular _____
7. pulmonary _____
8. cutaneous _____
9. arteriole _____
10. pneumonia _____
11. cardiovascular _____

Learning Outcome 1.5 Exercises

EXERCISE 16 *Underline and define the suffix in the following terms.*

1. cardiac _____
2. gastric _____
3. neurotic _____
4. skeletal _____
5. esophageal _____
6. muscular _____
7. pulmonary _____
8. cardiovascular _____
9. cutaneous _____
10. arteriole _____
11. ventricle _____
12. pustule _____
13. uvula _____
14. pneumonia _____
15. autism _____
16. pericardium _____
17. hypertrophy _____

EXERCISE 17 *Translate the following terms.*

ROOTS: skelet/o *skeleton* esophag/o *esophagus* arteri/o *artery*

1. cardiac _____
2. gastric _____
3. neurotic _____
4. skeletal _____
5. esophageal _____
6. muscular _____
7. pulmonary _____
8. cutaneous _____
9. arteriole _____
10. pneumonia _____
11. cardiovascular _____

Learning Outcome 1.5 Exercises

EXERCISE 18 *Identify the suffixes for the following definitions.*

1. tissue, structure _____
2. condition, process _____
3. condition (three possible options) _____
4. small or any suffix that makes the root a diminutive, or smaller version, of the root (choose three of the four possible options) _____
5. pertaining to (or any suffix that makes a root into an adjective) (choose four of the eight possible options) _____

EXERCISE 19 *Match the suffix on the left with its definition on the right. Some definitions will be used more than once.*

_____	1. -logy	a. medical science
_____	2. -logist	b. specialist
_____	3. -ist	c. specialist in the medicine of
_____	4. -iatrist	d. specialist in the study of
_____	5. -iatry	e. study of
_____	6. -iatrics	f. medicine of

EXERCISE 20 *Translate the following suffixes.*

1. -logy _____
2. -logist _____
3. -ist _____
4. -iatrist _____
5. -iatry _____
6. -iatrics _____

EXERCISE 21 *Break down the following words into their component parts.*

EXAMPLE: sinusitis *sinus | itis*

1. cardiology _____
2. cardiologist _____
3. pathology _____
4. pathologist _____
5. psychology _____
6. psychologist _____
7. dentist _____
8. psychiatry _____
9. psychiatrist _____
10. pediatrics _____

Learning Outcome 1.5 Exercises

EXERCISE 22 *Underline and define the suffix in the following terms.*

1. cardiology _____
2. cardiologist _____
3. pathology _____
4. pathologist _____
5. psychology _____
6. psychologist _____
7. dentist _____
8. psychiatry _____
9. psychiatrist _____
10. pediatrics _____

EXERCISE 23 *Fill in the blanks.*

EXAMPLE: cardiologist *specialist in the study of the heart*

1. **psychiatry:** _____ **of the mind (psych/o = mind)**
2. **psychiatrist:** _____ **of the mind (psych/o = mind)**
3. **psychology:** _____ **of the mind (psych/o = mind)**
4. **psychologist:** _____ **of the mind (psych/o = mind)**

EXERCISE 24 *Identify the suffixes for the following definitions.*

1. specialist _____
2. specialist in the study of _____
3. study of _____
4. specialist in the medicine of _____
5. medical science (two suffixes) _____

EXERCISE 25 *Match the suffix on the left with its definition on the right. Some definitions will be used more than once.*

_____	1. -oid	a. deficiency
_____	2. -iasis	b. drooping
_____	3. -cele	c. flow
_____	4. -penia	d. hernia
_____	5. -rrhea	e. loosen, break down
_____	6. -lysis	f. presence of
_____	7. -ptosis	g. resembling
_____	8. -rrhexis	h. rupture