

Chapter

1



THE ANATOMY OF WORD CONSTRUCTION

The Essential Elements of the Language of Medicine

LEARNING OUTCOMES

The technical language of medicine has been developed logically from Latin and Greek roots. In fact, the concept of treating patients was pioneered by ancient Greek culture. Medical terms are built from their individual parts, or **elements**, which form the **anatomy** of the word. The information in this chapter will enable you to:

- LO 1.1** Identify the **roots, combining vowels, and combining forms** of medical terms.
- LO 1.2** Understand the importance of **suffixes and prefixes** in forming medical terms.
- LO 1.3** Link word elements together to construct medical terms.
- LO 1.4** Break down or deconstruct a medical term into its elements.
- LO 1.5** Connect the singular and plural forms of medical terms.
- LO 1.6** Verbalize the pronunciation of medical terms by employing the system used in the textbook and the Student Online Learning Center (www.mhhe.com/AllanEss2e).

CASE REPORT 1.1

YOU ARE

... a respiratory therapist working with Tavis Senko, MD, a pulmonologist at Fulwood Medical Center.

YOU ARE COMMUNICATING WITH

... Mrs. Sandra Schwartz, a 43-year-old woman referred to Dr. Senko by her primary care physician, Dr. Andrew McDonald, an internist. Mrs. Schwartz has a persistent abnormality on her chest X-ray. You have been asked to determine her pulmonary function prior to a scheduled bronchoscopy.

THIS SUMMARY OF A CASE REPORT ILLUSTRATES FOR YOU THE USE OF SOME SIMPLE MEDICAL TERMS. MODERN HEALTH CARE AND MEDICINE HAS ITS OWN LANGUAGE. THE MEDICAL TERMS ALL HAVE PRECISE MEANINGS, WHICH ENABLE YOU, AS A HEALTH PROFESSIONAL, TO COMMUNICATE CLEARLY AND ACCURATELY WITH OTHER HEALTH PROFESSIONALS INVOLVED IN THE CARE OF A PATIENT. THIS COMMUNICATION IS CRITICAL FOR PATIENT SAFETY AND THE DELIVERY OF HIGH-QUALITY PATIENT CARE.



LESSON 1.1

The Construction of Medical Words

OBJECTIVES

Your confidence in using and understanding the medical terms in this book will increase as you become familiar with the logic of how these terms are constructed. The information in this lesson will enable you to:

- 1.1.1 Build and construct medical terms using their elements.
- 1.1.2 Select and identify the meaning of essential medical term **roots**.
- 1.1.3 Define the elements **combining vowel** and **combining form**.
- 1.1.4 Identify the **combining vowel** and **combining form** of essential medical terms.
- 1.1.5 Define the elements **suffix** and **prefix**.
- 1.1.6 Select and identify the meaning of the **suffixes** and **prefixes** of essential medical terms.

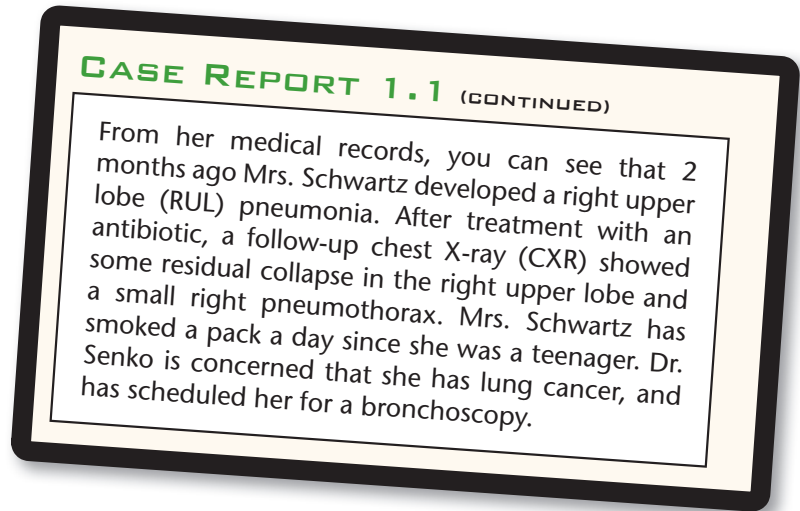
ROOTS

- A **root** is the constant foundation and core of a medical term.
- **Roots** are usually of Greek or Latin origin.
- All medical terms have *one or more roots*.
- A **root** can appear anywhere in the term.
- More than one **root** can have the same meaning.
- A **root** plus a **combining vowel** creates a **combining form**.

Roots (LO 1.1)

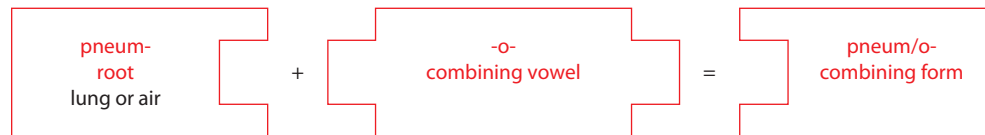
Every medical term has a **root**—the element that provides the core meaning of the word. For example, in Case Report 1.1:

- The word *pneumonia* has the **root pneumon-**, taken from the Greek word meaning *lung* or *air*. The Greek **root pneum-** also means *lung* or *air*. *Pneumonia* is an infection of the lung tissue.
- Dr. Tavis Senko is a *pulmonologist*. The **root pulmon-** is taken from the Latin word meaning *lung*. A *pulmonologist* is a specialist who treats lung diseases.



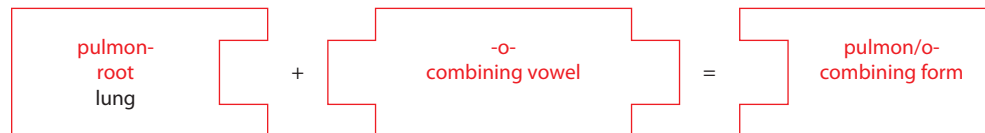
Combining Forms (LO 1.1 and 1.2)

Roots are often joined to other elements in a medical term by adding a **combining vowel**, such as the letter “o,” to the end of the **root**, like *pneum-*, to form *pneum/o-*.



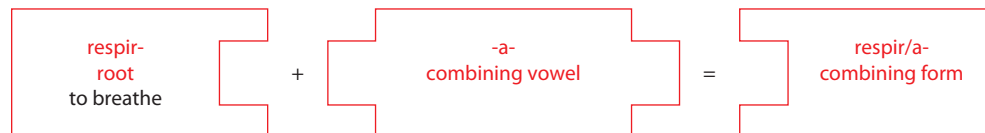
Throughout this book, whenever a term is presented, a **slash (/)** will be used to separate the combining vowel from the **root**. Other examples of this approach are as follows:

- Adding the **combining vowel “o”** to the Latin **root pulmon-** makes the **combining form pulmon/o-**.



Any vowel, “a,” “e,” “i,” “o,” or “u,” can be used as a **combining vowel**.

- The **root respir-** means *to breathe*. Adding the **combining vowel “a”** makes the **combining form respir/a-**.



LESSON 1.1 Suffixes (LO 1.2 and 1.3)

SUFFIXES

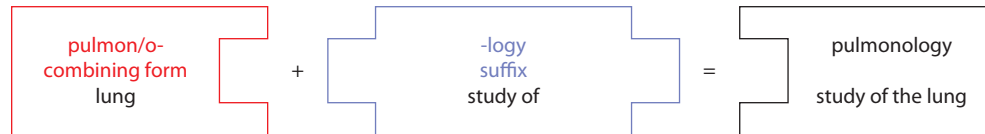
- A **suffix** is a group of letters attached to the end of a **root** or **combining form**.
- A **suffix** changes the meaning of the word.
- If the **suffix** begins with a consonant, it must follow a **combining vowel**.
- If the **suffix** begins with a vowel, no **combining vowel** is needed.
- A few medical terms can have two **suffixes**.
- A **suffix** always appears at the end of a term.
- **Suffixes** that are different can have the same meaning.

A **suffix** is an element added to the end of a **root** or **combining form** to give it a new meaning. You can add different **suffixes** to the same **root** to build new words, all with different meanings. For example:

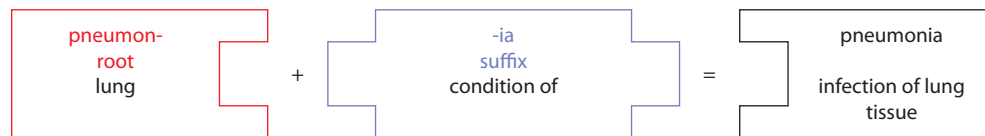
- Add the **suffix -ary** to the **root pulmon-** to create the term **pulmonary**. The **suffix -ary** means *pertaining to or relating to*. The adjective **pulmonary** means *pertaining to the lung*. **Pulmonary circulation** means the *passage of blood through the lungs*.



- Add the **suffix -logy** to the **combining form pulmon/o-** to make the term **pulmonology**. The **suffix -logy** means *study of*. **Pulmonology** is the study of the structure, functions, and diseases of the lungs.



- Add the **suffix -ia** to the **root pneumon-** to make the term **pneumonia**. The **suffix -ia** means *a condition of*. **Pneumonia** is a condition of the lungs that involves an infection of the lung tissue.



- Add the **suffix -ation** to the **root respir-** to make the term **respiration**. The **suffix -ation** means *a process*. Respiration is the process of breathing in and out.



Although most **roots** are specific to body systems and medical specialties, **suffixes** are universal and can be applied to all body systems and specialties.

One user-friendly design concept of this book is that all the information you will need for any given topic is presented on the left-hand page of the two-page spread open in front of you. As part of this, you will find a Word Analysis and Definition (WAD) box on the right-hand side of each two-page spread. This section provides the elements, definition, and pronunciation of every new and repeated significant medical term that appears in the two-page spread.

Review all the terms in the WAD before you start any exercise.

Word	Pronunciation	Elements	Definition	
pulmonary	PULL-moh-NAR-ee	S/ R/	-ary <i>pertaining to</i> pulmon- <i>lung</i>	Pertaining to the lungs
pulmonology	PULL-moh-NOL-oh-jee	S/ R/CF	-logy <i>study of</i> pulmon/o- <i>lung</i>	Study of the lungs, or the medical specialty of disorders of the lungs
pulmonologist	PULL-moh-NOL-oh-jist	S/	-logist <i>one who studies,</i> <i>specialist</i>	Specialist in treating disorders of the lungs
pneumonia	new-MOH-nee-ah	S/ R/	-ia <i>condition</i> pneumon- <i>lung, air</i>	Inflammation of the lung parenchyma (tissue)
pneumonitis (same as pneumonia)	new-moh-NI-tis	S/	-itis <i>inflammation</i>	
respiration	RES-pih-RAY-shun	S/ R/	-ation <i>process</i> respir- <i>to breathe</i>	Process of breathing; fundamental process of life used to exchange oxygen and carbon dioxide
respiratory (adj)	RES-pih-rah-tor-ee	S/	-atory <i>pertaining to</i>	Pertaining to respiration

EXERCISES

Elements: *It is important for you to recognize the identity of an element. Is it a root, combining form, or suffix? This will help you to determine its place in the term when you are building terms.*

A. Build the appropriate medical term to match the definitions given. The placement of the elements is noted for you under the line; each different element is separated on the line. Write the correct elements on the line. The first one is done for you.

- Study of the lungs: _____
pulmon/o / _____
R/CF S
- Pertaining to the lung: _____
R/CF S
- The process of breathing: _____
R/CF S
- Condition of the lung: _____
R/CF S

5. Use any one of the preceding terms in a sentence of your choice—one that is *not* a definition from above.

6. Choose another term from above and use it in patient documentation that you write below.

B. Answers to all questions in this exercise can be found on the two-page spread open in front of you.

- What is another term for inflammation of the lung? _____
- Which term is a body process? _____
- Which suffix can be applied to a specialist? _____

LESSON 1.1 Prefixes (LO 1.2 and 1.3)

PREFIXES

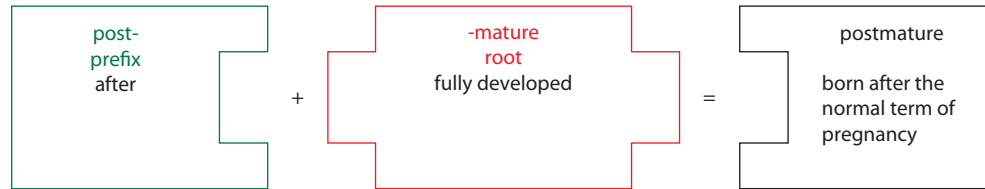
- A **prefix** always appears at the beginning of a term.
- A **prefix** precedes a **root** to change its meaning.
- **Prefixes** can have more than one meaning.
- **Prefixes** never require a **combining vowel**.
- An occasional medical term can have two **prefixes**.
- Not every term has a **prefix**.

PRACTICAL POINTS

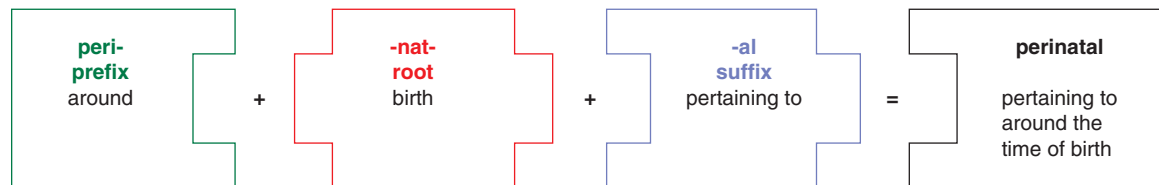
- A **root** can start a term and does not become a **prefix**.
- A **root** can end a term and does not become a **suffix**.
- An example of both of these is **pneumothorax**.

A **prefix** is an element added to the beginning of a **root** or **combining form** to further expand the meaning of a medical term. **Prefixes** usually indicate time, number, color, or location. Examples of **prefixes** defining time are as follows:

- The term **mature** can refer to an infant born after a normal length of pregnancy, between 37 and 42 weeks.
- An infant born before 37 weeks is called **premature**. The **prefix pre-** means *before*. **Premature** means that the infant was born *before 37 weeks*.
- An infant born after 42 weeks is called **postmature**. The **prefix post-** means *after*. **Postmature** means that the *infant was born after 42 weeks*.



- The term **natal** contains the **root nat-** (*birth or born*) and the **suffix -al** (*pertaining to*); it means *pertaining to birth*.
- Add the **prefix pre-** (*before*) to form **prenatal**, which means *the time before birth*.
- Add the **prefix post-** (*after*) to form **postnatal**, which means *the time after birth*.
- Add the **prefix peri-** (*around*) to form **perinatal**, which means *around the time of birth*. This includes the time immediately *before, during, and directly after birth*.



Examples of **prefixes** indicating number are as follows:

- The term **lateral** contains the **root later-** (*side*) and the **suffix -al** (*pertaining to*). **Lateral** means *pertaining to a side of the body*.
- Add the **prefix uni-** (*one*) to form **unilateral**, which means *pertaining to one side of the body only*.
- Add the **prefix bi-** (*two*) to form **bilateral**, which means *pertaining to both sides of the body*.

Examples of prefixes indicating location are as follows:

- The term **gastric** contains the **root gastr-** (*stomach*) and the **suffix -ic** (*pertaining to*). **Gastric** means *pertaining to the stomach*.
- Add the **prefix epi-** (*above*) to form **epigastric**, which means *pertaining to above the stomach*.
- Add the **prefix hypo-** (*below*) to form **hypogastric**, which means *pertaining to below the stomach*.

Examples of **prefixes** indicating size are as follows:

- The **root -cyte** means *cell*.
- Add the **prefix macro-** (*large*) to form **macrocyte**, which means *a large red blood cell*.
- Add the **prefix micro-** (*small*) to form **microcyte**, which means *a small red blood cell*.



LESSON 1.2

Word Analysis and Deconstruction

CASE REPORT 1.2

YOU ARE:

... a medical assistant working in the office of Lokesh Bannerjee, MD, a cardiologist in Fulwood Medical Center.

YOU ARE COMMUNICATING WITH:

... the 70-year-old wife and the 45-year-old son of James Donovan, a 75-year-old man who will be admitted to the hospital's acute care **cardiology** unit.

Dr. Bannerjee has diagnosed Mr. Donovan with an acute myocardial infarction (**AMI**), confirmed by changes in his **electrocardiogram (ECG/EKG)**. One of your tasks is to explain Mr. Donovan's diagnosis and reasons for admission to the hospital to Mrs. Donovan and her son. While Mr. Donovan is waiting to be admitted, he is receiving oxygen through nasal prongs. He is hypotensive, and an intravenous (**IV**) infusion of normal saline has been started. His medical record indicates that he is being seen in the neurology clinic for early dementia.

THE BOLD TERMS IN THE CASE REPORT ARE USED AS EXAMPLES IN THE TEXT AND/OR ARE DECONSTRUCTED IN THE WORD ANALYSIS AND DEFINITION BOX (OPPOSITE PAGE).

OBJECTIVES

When you see an unfamiliar medical term, you can learn its meaning by **deconstructing** it—reducing it to its basic elements. In this lesson you will learn to:

- 1.2.1** Break down or deconstruct a medical term into its elements.
- 1.2.2** Use word analysis to help ensure the precise use of medical terms.
- 1.2.3** Use the word elements to analyze and determine the meaning of the term.
- 1.2.4** Apply the correct pronunciation to medical terms.

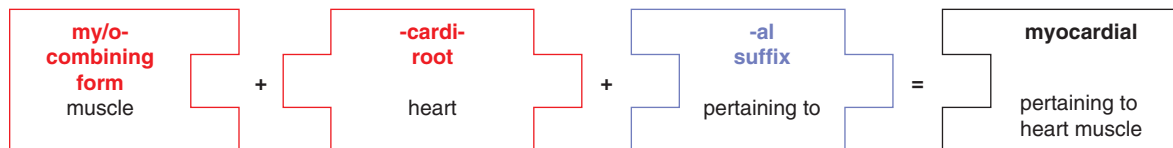
KEYNOTE

- Always begin deconstructing a medical term by identifying its suffix.

Word Deconstruction (LO 1.4)

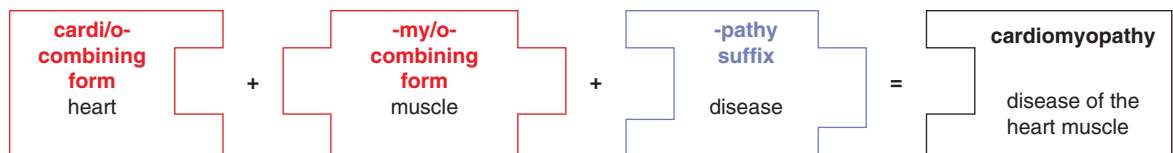
When you see an unfamiliar medical term, first identify the **suffix**. Take the term **cardiologist**. Here, the **suffix** at the end of the word is **-logist**, which means *one who studies and is a specialist in*. This leaves the element **cardilo-**, which is the **combining form** for *heart*. The term **cardiologist** means *a specialist in the heart and its diseases*. It has a **combining form** and a **suffix**.

In the term **myocardial**, the **suffix** at the end of the word is **-al**, which means *pertaining to*, as you learned earlier in this chapter. The **combining form my/o-**, which means *muscle*, is at the beginning of the word. The **root -cardi-**, which means *heart*, is in the middle of the word. So, the term **myocardial** means *pertaining to the heart muscle*. It has a **combining form**, a **root**, and a **suffix**.



Changing the **suffix** to **-um**, meaning *a structure*, results in the term **myocardium**, *the structure called the heart muscle*.

The term **cardiomyopathy** contains the **suffix -pathy**, meaning *a disease*, the **combining form cardi/o-**, meaning *the heart*, and the **combining form my/o-**, meaning *muscle*. When you put this all together, the term **cardiomyopathy** means *a disease of the heart muscle*.



The term **ischemia** has the **suffix -emia**, which means *a blood condition*. The **root isch-** means *to block*. **Ischemia** means *a blockage of blood flow*. The term **myocardial ischemia** means *a blockage of blood flow to the heart muscle*—better known as a heart attack.

Changing the **suffix -emia** to **-emic**, which means *pertaining to a condition of the blood*, creates a new term, **ischemic**, that is an adjective. It means *pertaining to a blockage of blood flow*. It has a **root** and a **suffix**.

To help you learn, abbreviations are listed and defined in **Abbreviations boxes** throughout this book.

ABBREVIATIONS

AMI	acute myocardial infarction
CXR	chest x-ray
ECG/ EKG	electrocardiogram
IV	intravenous

Word	Pronunciation	Elements	Definition	
cardiologist	kar-dee-OL-oh-jist	S/ R/CF	-logist <i>one who studies and is a specialist in</i> cardi/o- <i>heart</i> -logy <i>study of</i>	A medical specialist in the diagnosis and treatment of disorders of the heart
cardiology	kar-dee-OL-oh-jee	S/	-logy <i>study of</i>	Medical specialty of diseases of the heart
cardiomyopathy	KAR-dee-oh-my-OP-ah-thee	S/ R/CF R/CF	-pathy <i>disease</i> cardi/o- <i>heart</i> -my/o- <i>muscle</i>	Disease of the heart muscle, the myocardium
diagnosis (noun)	die-ag-NO-sis	P/ R/	dia- <i>complete</i> -gnosis <i>knowledge of an abnormal condition</i>	The determination of the cause of a disease
diagnoses (pl)	die-ag-NO-sees	S/	-tic <i>pertaining to</i>	Pertaining to or establishing a diagnosis
diagnostic (adj) (Note: The "is" in -gnosis is deleted to allow the word to flow.)	die-ag-NOS-tik			
diagnose (verb)	die-ag-NOSE	R/	-gnose <i>recognize an abnormal condition</i>	To make a diagnosis
prognosis (noun)	prog-NO-sis	P/ R/	pro- <i>before, project forward</i> -gnosis <i>knowledge of an abnormal condition</i>	A forecast of the probable course and outcome of a disease
electrocardiogram	ee-lek-troh-KAR-dee-oh-gram	S/ R/CF R/CF	-gram <i>record</i> electr/o- <i>electricity</i> -cardi/o- <i>heart</i>	Record of the heart's electrical signals
infarct	in-FARKT	P/ R/	in- <i>in</i> -farct <i>area of dead tissue</i>	An area of cell death resulting from blockage of its blood supply
infarction	in-FARK-shun	S/	-ion <i>action, condition</i>	Sudden blockage of an artery
ischemia	is-KEY-me-ah	S/ R/	-emia <i>a blood condition</i> isch- <i>to block</i>	Lack of blood supply to tissue
ischemic (adj)	is-KEY-mik	S/	-emic <i>pertaining to a condition of the blood</i>	Pertaining to the lack of blood supply to tissue
myocardial (adj)	MY-oh-KAR-dee-al	S/ R/CF	-al <i>pertaining to</i> my/o- <i>muscle</i>	Pertaining to heart muscle
myocardium	MY-oh-KAR-dee-um	R/ S/	-cardi- <i>heart</i> -um <i>structure</i>	All the heart muscle

EXERCISES

Precision in communication: *In addition to using the precise medical terms and speaking and spelling them correctly, you must use the appropriate form of the term as well.*

A. Reread the WAD entry for diagnosis. *Note that there are singular and plural forms of the term, as well as the noun, adjective, and verb forms. Insert the correct form of the term in the documentation below.*

Note: A noun is a person, place, or thing. Singular: One
A verb denotes action. Plural: More than one
An adjective usually describes something.

- The primary _____ for this patient is myocardial ischemia.
- Dr. Bannerjee is unable to _____ this patient until he receives the lab results.
- The _____ tests have been ordered for this patient first thing in the morning.
- It is possible for this patient to have multiple _____ if there is more than one condition present.

B. Challenge your new knowledge *used in questions 1-4 above.*

- Which sentence contains the verb form of the term? _____
- Which sentence contains the plural form of the term? _____
- Which sentence contains the singular noun? _____
- Which sentence contains an adjective form? _____

LESSON 1.2 Plurals (LO 1.5)

COMMUNICATION

Some medical terms are pronounced the same but spelled differently. For example:

- Both *ilium* and *ileum* are pronounced **ILL**-ee-um. *Ilium* is a bone in the pelvis; *ileum* is a segment of the small intestine.
- Both *mucus* and *mucous* are pronounced **MYU**-kus. *Mucus* is a noun and is the name of a fluid secreted by *mucous* (adjective) membranes that line body cavities.

A medical term may relate to more than one anatomical structure.

- The term *cervical* means relating to a neck in any sense.
- It can pertain to the neck that joins the head to the trunk with the cervical vertebrae.
- It can also pertain to the cervix of the uterus, with its cervical canal.

Some words, when incorrectly pronounced, sound the same. For example:

- The term *prostate*, pronounced **PROS**-tate, refers to the gland at the base of the male bladder. The term *prostrate* means to be physically weak or exhausted, or to lie flat on the ground.
- Train your ear to hear the differences—*reflex* is not *reflux*.

Many medical terms form a verb, a noun, a plural, and an adjective, and you have to know them all, as in *diagnose*, *diagnosis*, *diagnoses*, and *diagnostic* (see the WAD on the previous spread).

Many words in the English language allow you to change them from singular to plural by adding an “s.” For medical terms, this rarely happens, as these plurals are formed in ways that were once logical to Greeks and Romans, but now have to be learned by memory in English. Examples of medical terms with Greek and Latin plurals are shown in *Table 1.1*.

Throughout this book, the Greek and Latin plurals of medical terms appear in the Word Analysis and Definition box with the singular medical term, as with the term **diagnosis** in the previous spread.

▼ **TABLE 1.1**
Singular and Plural Forms

Singular Ending	Plural Ending	Examples
-a	-ae	axilla axillae
-is	-es	diagnosis diagnoses
-on	-a	ganglion ganglia
-um	-a	septum septa

Adapted from Kenneth S. Saladin, *Anatomy and Physiology*, 3rd ed., fig. 1.2, p. 21. Copyright ©2004 The McGraw-Hill Companies, Inc. Reprinted with permission.

Pronunciation (LO 1.6)

Being able to pronounce words correctly is essential to effective communication. In the medical world, this concept is especially important. As a health professional, you will routinely use medical terms and your colleagues must be able to understand what you are saying. Correct pronunciation is crucial to patient safety and your ability to provide high-quality patient care.

Throughout this book, the pronunciation of medical terms is spelled out phonetically using modern English forms to show you exactly how the terms are pronounced. The word part to be emphasized is shown in bold, uppercase letters.

For example, **pulmonary** is phonetically written **PUL**-moh-nar-ee, and **pulmonology** is written **PUL**-moh-**NOL**-oh-jee. This illustrates that words derived from the same **root** can have their emphasis placed on different parts of the word, and that the emphasized part can be from different elements. The emphasized syllable **NOL** comes partly from the **combining form** *pulmon/o-* and partly from the **suffix** *-logy*. You can hear glossary terms pronounced correctly by visiting the Student Online Learning Center (www.mhhe.com/AllanEss2e).

Word	Pronunciation	Elements	Definition
axilla axillae (pl) axillary (adj)	AK-sill-ah AK-sill-ee AK-sill-air-ee	S/ R/ -ary pertaining to axill- armpit	Medical term for the armpit Pertaining to the armpit
dementia	dee-MEN-she-ah	S/ P/ R/ -ia condition de- without -ment- mind	Chronic, progressive, irreversible loss of intellectual and mental functions
ganglion ganglia (pl)	GANG-lee-on GANG-lee-ah		Greek <i>a swelling or knot</i> A fluid-filled cyst or a collection of nerve cells outside the brain and spinal cord
ileum ilium ilia (pl)	ILL-ee-um ILL-ee-um ILL-ee-ah		Latin <i>to twist or roll up</i> Latin <i>groin</i> Third portion of the small intestine. Large wing-shaped bone at the upper and posterior part of the pelvis
mucus (noun) mucous (adj) mucosa	MYU-kus MYU-kus myu-KOH-sah	S/ R/ S/ -ous pertaining to muc- mucus -osa full of; like	Greek <i>slime</i> Sticky secretion of cells in mucous membranes Pertaining to mucus or the mucosa Lining of a tubular structure that secretes mucus
prostate prostrate prostration (noun)	PROS-tate pros-TRAYT pros-TRAY-shun		Greek <i>one who stands before</i> Latin <i>to stretch out</i> Organ surrounding the urethra at the base of the male urinary bladder To lay flat or to be overcome by physical weakness and exhaustion
reflex reflux	REE-fleks REE-fluks		Latin <i>bend back</i> Latin <i>backward flow</i> An involuntary response to a stimulus Backward flow
septum septa (pl)	SEP-tum SEP-tah		Latin <i>a partition</i> A thin wall separating two cavities or two tissue masses

EXERCISES

A. Medical language: Many terms in medicine sound and/or look very similar. The difference of only one letter can make a new term. Train your eye and ear to know the difference. Circle the correct choice of terms in the following documentation.

- The patient's nasal (mucus/mucous) membrane is severely infected.
- Schedule this patient for a (prostrate/prostate) exam at his next annual physical.
- The doctor checked the (reflex/reflux) in the patient's knee.
- The patient's (ilium/ileum) was severely fractured in the motor vehicle accident.

B. Plurals: Circle the correct form of the plural in the following sentences.

- Because of additional medical problems needing treatment, this patient's insurance claim form will have multiple (diagnoses/diagnosis).
- Check both (axilla/axillae) for any evidence of enlarged lymph nodes.
- Several (septa/septum) exist in the body—e.g., in the heart and in the nose.
- A cluster of (ganglia/ganglion) has formed on her left wrist.

C. Terminology challenge: Use your knowledge of the new medical terms you have learned in this chapter and answer the following questions.

- The term *cervical* can apply to two different places in the body. Where are they?

- The term *ileum* and *ilium* are pronounced the same but are in two different body systems. Where are they?

LESSON 1.2 Precision in Communication (LO 1.5)

KEYNOTES

- Many words, when they are written or pronounced, have an element that if misspelled or mispronounced gives the intended word an entirely different meaning. A treatment response to the different meaning could cause a medical error or even the death of a patient.
- Precision in written and verbal communication is essential to prevent errors in patient care.
- The medical record in which you document a patient's care and your actions is a legal document. It can be used in court as evidence in professional medical liability cases.

ABBREVIATIONS

IV intravenous

It's important for you to note that being accurate and precise in both your written and verbal communication with your health care team can save someone's life. Each year in the United States, more than 400,000 people die because of drug reactions and medical errors, many of which are the result of poor communication. On the next page, you will find some specific examples of how certain medical terms could be seriously miscommunicated and misinterpreted.

In the above Case Report involving Mr. Donovan, if **hypotension** (low blood pressure) were confused with **hypertension** (high blood pressure), incorrect and dangerous treatment could be prescribed.

- In the word **hypotension**, the **suffix -ion** means *a condition*. The **prefix hypo-** means *below or less than normal*. The **root -tens-** is from the Latin word for *pressure*. **Hypotension** is a condition of below-normal pressure, or low blood pressure.
- In the word **hypertension**, the **prefix hyper-** means *above or more than normal*. **Hypertension** is a condition of above-normal pressure, or high blood pressure.

Also in the above Case Report, the term **neurology**, the specialty of the nervous system (*see Chapter 10*), can sound very similar to **urology**, the study of the urinary system (*see Chapter 13*). In the urinary system, if a patient's **ureter** (the tube from the kidney to the bladder) were confused with the **urethra** (the tube from the bladder to the outside), the consequences could be serious.

As you can see from the above examples, your ability to correctly identify, spell, and pronounce different medical terms is essential. Being a health professional requires the utmost attention to detail, as a patient's life could be in your hands. Incorrect spelling and poor pronunciation does not only reflect badly on you and your health team—it could also be a matter of life and death.

CASE REPORT 1.2 (CONTINUED)

Mr. Donovan is waiting to be admitted to the hospital and is receiving oxygen through nasal prongs. He is **hypotensive**, and an **intravenous (IV) infusion** of normal saline has been started. According to his medical record, he is being seen in the **neurology** clinic for early dementia.

Word	Pronunciation	Elements	Definition	
cervical (adj)	SER-vih-kal	S/ R/	-al <i>pertaining to</i> cervic- <i>neck</i> Latin <i>neck</i>	Pertaining to the cervix or to the neck region
cervix	SER-viks			Lower part of the uterus
hypertension	HIGH-per-TEN-shun	S/ P/ R/	-ion <i>condition, action</i> hyper- <i>above normal</i> -tens- <i>pressure</i>	Persistent high arterial blood pressure
hypertensive (adj)	HIGH-per-TEN-siv	S/	-ive <i>pertaining to</i>	Pertaining to or suffering from high blood pressure
hypotension	HIGH-poh-TEN-shun	P/	hypo- <i>below normal</i>	Persistent low arterial blood pressure
hypotensive (adj)	HIGH-poh-TEN-siv			Pertaining to or suffering from low blood pressure
infusion	in-FYU-zhun	P/ R/	in- <i>in</i> -fusion <i>to pour</i>	Introduction of a substance other than blood intravenously
transfusion	trans-FYU-zhun	P/	trans- <i>across, through</i>	Transfer of blood or a blood component from a donor to a recipient
intravenous	IN-trah-VEE-nus	S/ P/ R/	-ous <i>pertaining to</i> intra- <i>within, inside</i> -ven- <i>vein</i>	Inside a vein
neurology	nyu-ROL-oh-jee	S/ R/CF	-logy <i>study of</i> neur/o- <i>nerve</i>	Medical specialty of disorders of the nervous system
neurologist	nyu-ROL-oh-jist	S/	-logist <i>one who studies and is a specialist in</i>	Medical specialist in disorders of the nervous system
protocol	PRO-toe-kol		Latin <i>contents page of a book</i>	Detailed plan; in this case, for a regimen of therapy
ureter	you-REE-ter		Greek <i>urinary canal</i> Greek <i>passage for urine</i>	Tube that connects a kidney to the urinary bladder
urethra	you-REE-thrah	S/ R/CF	-logy <i>study of</i> ur/o- <i>urine</i>	Canal leading from the bladder to the outside
urology	you-ROL-oh-jee			Medical specialty of disorders of the urinary system
uterus	YOU-ter-us		Latin <i>womb</i>	Organ in which an egg develops into a fetus
vertebra	VER-teh-brah		Latin <i>bone in the spine</i>	One of the bones of the spinal column
vertebrae (pl)	VER-teh-bree			

EXERCISES

A. Patient documentation: Read the following excerpts from patient charts, and insert the correct medical term from the above Word Analysis and Definition (WAD) box. Always review the WAD before you start the exercise.

- This patient has several badly fractured _____ in his spinal column.
- This patient has nerve damage. Refer him to the department of _____.
- Schedule this patient for an _____ of chemotherapy drugs today.
- This patient has low blood pressure—he is _____ and anemic.
- I am ordering an immediate _____ of 2 units of whole blood for this patient.
- Send this patient for _____ x-rays of his neck immediately.

B. Brain teaser: Challenge yourself to analyze the question and insert the correct answers.

- If a medical specialist in the study of disorders of the nervous system is a neurologist, what is a medical specialist in the study of disorders of the urinary system called?
(Hint: Use your knowledge of suffixes and roots to help you.)
- What element is the difference between high blood pressure and low blood pressure? _____
- What substances go through an infusion? _____
- What substances go through a transfusion that do not go through an infusion? _____



CHAPTER 1 REVIEW

THE ANATOMY OF WORD CONSTRUCTION

CHALLENGE YOUR KNOWLEDGE

A. Prefixes: Prefixes can have more than one meaning, and always appear at the beginning of a medical term. Match the prefix in column 1 to its correct meaning or meanings in column 2.

- | | |
|-----------------|----------------------------|
| 1. peri _____ | A. after |
| 2. de _____ | B. within, inside |
| 3. epi _____ | C. one |
| 4. hyper _____ | D. below normal |
| 5. post _____ | E. around |
| 6. trans _____ | F. in |
| 7. uni _____ | G. above |
| 8. intra _____ | H. large |
| 9. dia _____ | I. above normal |
| 10. pro _____ | J. before |
| 11. hypo _____ | K. two |
| 12. in _____ | L. across, through |
| 13. macro _____ | M. without |
| 14. pre _____ | N. small |
| 15. bi _____ | O. before, project forward |
| 16. micro _____ | P. complete |

B. Grouping opposites: Fill in the chart, and then answer the questions that follow. After you have completed this exercise, use it for study review. Grouping opposite elements or terms into pairs will make them easier to remember.

Element	Meaning of Element	Medical Term Containing This Element	Meaning of the Medical Term
pre	1.	2.	3.
post	4.	5.	6.
epi	7.	8.	9.
hypo	10.	11.	12.
macro	13.	14.	15.
micro	16.	17.	18.
hyper	19.	20.	21.

22. These elements are all (P, R, CF, S) _____.

The meaning of the above elements will help you determine the correct answers to the following questions, even though you have never seen these terms before! Finish this exercise by circling the word or words in questions 9 through 12 that led you to choose the correct element.

23. If a complication occurs after surgery, is it pre or post operative?
 _____ operative
24. Which would be the topmost layer of skin (the one above everything else)—the epidermis or the hypodermis?
 _____ dermis
25. Organisms that are too small to be seen with the naked eye are called _____ scopic.
26. Would too much sugar in the blood be hyperglycemia or hypoglycemia?
 _____ glycemia.

C. **Elements** will always remain your best clue to understanding a medical term. The following terms have one element underlined and bolded—define that element and define the term. Fill in the blanks.

1. cardi**my**opathy element defined: _____
 term defined: _____
2. **is**chemia element defined: _____
 term defined: _____
3. myocardi**um** element defined: _____
 term defined: _____
4. **c**ervical element defined: _____
 term defined: _____
5. hyperten**sion** element defined: _____
 term defined: _____
6. **tr**ansfusion element defined: _____
 term defined: _____
7. **ne**urologist element defined: _____
 term defined: _____
8. **b**ilateral element defined: _____
 term defined: _____
9. **g**astric element defined: _____
 term defined: _____
10. **in**travenous element defined: _____
 term defined: _____



D. Identify and define the elements in this chart. Then give an example of these elements in a medical term from this chapter. Fill in the chart.

Element	Identify as P, R, CF, or S	Define Element	Medical Term Containing This Element
uro	1.	2.	3.
tens	4.	5.	6.
later	7.	8.	9.
nat	10.	11.	12.
cervic	13.	14.	15.
gram	16.	17.	18.

E. Roots/Combining Forms: The meaning of the R/CF is given in column 1. Match the meaning to the correct term containing that R/CF in column 2.

- | | |
|------------------------------|-----------------|
| _____ 1. chest | A. dementia |
| _____ 2. armpit | B. microcyte |
| _____ 3. heart | C. hypertension |
| _____ 4. nerve | D. prognosis |
| _____ 5. birth | E. neurologist |
| _____ 6. pressure | F. pneumothorax |
| _____ 7. knowledge | G. infarct |
| _____ 8. mind | H. myocardial |
| _____ 9. area of dead tissue | I. axillary |
| _____ 10. cell | J. perinatal |

Use any two terms from column 2 in patient documentation of your choice.

11. _____

12. _____

F. Suffixes: A suffix always appears at the end of a term. Fill in the correct definition of all the suffixes that have appeared in this chapter, and answer the question.

Suffix	Meaning of Suffix
ic	1.
al	2.
logist	3.
logy	4.
pathy	5.
tic	6.
gram	7.
ion	8.
emia	9.
emic	10.
um	11.
ary	12.
ia	13.
ous	14.
ive	15.

16. What is the most frequent meaning that appears in this list of suffixes? _____

Remember: More than one element can have the same meaning.

G. Difference between: If you really understand a term, you can explain it to someone else. Briefly explain these terms to a patient, in language he or she can understand.

1. transfusion: _____

2. infusion: _____

3. diagnosis: _____

4. prognosis: _____



H. Spelling demons: *The following terms from this chapter are particularly difficult to spell and pronounce. Correct pronunciation and spelling of medical terms is the mark of an educated professional. Circle the correct spelling, and then check (✓) that you have practiced the pronunciation. Remember that pronunciations are on the Student Online Learning Center (www.mhhe.com/AllanEss2e).*

			Pronunciation ✓
1. diagnosis	diagnossis	diagnosis	_____
2. infart	infarct	infarrct	_____
3. isscemia	iskchemia	ischemia	_____
4. miocardium	myocardeum	myocardium	_____
5. axila	axilla	axeila	_____
6. septtum	siptum	septum	_____
7. dementia	dimentia	dementea	_____
8. intraveinous	intravenous	intravinous	_____
9. vertebrae	vertebrae	vertebray	_____
10. pnumothorax	pneumothorax	pneumonthorax	_____

I. Latin and Greek terms *do not deconstruct into the elements of prefix, root, combining form, and suffix the way most medical terms do. You just have to know them for what they are. Test yourself by matching the literal or defined meaning in column 1 with the correct Latin or Greek term in column 2.*

_____ 1. armpit	A. ganglion
_____ 2. one who stands before	B. mature
_____ 3. bend back	C. prostrate
_____ 4. neck	D. reflex
_____ 5. backward flow	E. mucus
_____ 6. slime	F. ileum
_____ 7. wing-shaped bone in pelvis	G. axilla
_____ 8. fluid-filled cyst	H. reflux
_____ 9. ripe	I. cervical
_____ 10. third portion of small intestine	J. ilium

J. Terminology challenge.

- Write the precise medical language for what, in layperson's terms, is called a "heart attack":

K. Keynotes contain useful information and will often be the source of test questions. All the answers for this exercise on medical term elements can be found in Keynotes earlier in this chapter. For each statement, circle T (true) or (F) false. If the statement is false, rewrite the statement so that it is true on the lines below.

- | | | |
|---|---|---|
| 1. A suffix changes the meaning of a term. | T | F |
| 2. Different suffixes can have the same meaning. | T | F |
| 3. The core foundation of every term is a root or combining form. | T | F |
| 4. Every term must have a prefix. | T | F |
| 5. If the suffix begins with a consonant, it must follow a root. | T | F |
| 6. A root plus a combining vowel equals a combining form. | T | F |
| 7. A medical term will never have more than one suffix. | T | F |
| 8. A prefix always comes at the beginning of the term. | T | F |
| 9. Combining forms can precede a suffix. | T | F |
| 10. Always begin deconstructing a term by identifying the root. | T | F |

Corrected statements: _____

L. Build medical terms in this exercise. The first column in the chart below presents statements relating to the terms you will build. Look for clues in the statement words that will help you select the elements from the list. Build the term by inserting the correct elements in the appropriate columns (some elements you will use more than once, and some you will not use at all). The first term has been built, and the elements highlighted, to help you understand.

To complete the exercise, use any one of the terms in a brief sentence that is not a definition.

- | | | | | | | | | | |
|----------|---------|--------|---------|---------|---------|-------|-----------|--------|----------|
| pneum/o- | -cyte | -logy | trans- | -ic | -thorax | -um | macro- | gastr- | -tension |
| -emia | isch- | -logy | cardio- | -mature | bi- | peri- | -ation | -al | respir- |
| -my/o- | -pathy | intra- | -later- | -nat- | post- | hypo- | pulmon/o- | epi- | card/i- |
| neur/o- | cervic- | | | | | | | | |

Statement	Prefix	Root/CF	Suffix
air in the chest		pneum/o-, -thorax	
1. the heart muscle			
2. pertaining to around the time of birth			
3. large red blood cell			
4. pertaining to both sides of the body			
5. study of the lung			

6. Sentence: _____



M. Layperson's language: Patients may request that you "translate" medical language into language they can more easily understand. Practice communicating the correct information with this exercise. If there are abbreviations in the sentence, "translate" them as well.

- 1. The pulmonologist read the patient's CXR and diagnosed a cancer in her RUL.

- 2. The patient's past medical history includes pneumonia and pneumothorax, as well as problems with her ileum.

- 3. Because of her diabetes, this patient must be seen for closely supervised prenatal and postnatal care.

N. Plurals: Because many medical terms are directly from Greek or Latin, they do not form their plurals just by adding "s" as happens in English. In this exercise, you are given the singular form of five terms. Choose one of the endings to form the correct plural of each term (some endings you will use more than once, and some you will not use at all).

ae es ides ges ies era a

Singular Plural

- 1. diagnosis _____
- 2. axilla _____
- 3. ganglion _____
- 4. septum _____
- 5. vertebra _____

O. Partner exercise: Ask your study partner to close his or her text. Dictate the following sentences to your partner, and then ask him or her to write the sentences and show them to you. Check your partner's sentences against the text below. The sentence is not correct unless every word is present and everything is spelled correctly. When you have finished checking your partner's answers, close your book and ask your partner to dictate the sentences to you and you write them down.

- 1. Mr. Donovan's chest pain is caused by myocardial ischemia, and an intravenous infusion has been started.
- 2. In addition to his hypotension, the record notes that Mr. Donovan is also being seen in the neurology clinic for dementia.
- 3. Mr. Donovan's physician has diagnosed an acute myocardial infarction based on a diagnostic electrocardiogram.

P. Proofread the following sentences for errors in fact or spelling. Underline any misspelled terms or errors in fact in a sentence; then rewrite the incorrect sentences correctly on the lines below. There is only one sentence that is entirely correct.

1. An acute myocardial infraction can be confirmed by an EGK.
2. Patients with chest pain could possibly have myocardeal ischemic.
3. An electrocardiogram is a diagnostic tool to check for possible heart attack.
4. The pulmonologist ordered an IV transfusion of saline and nasal oxygen.
5. Mr. Donovan's dimentia may be a complicating factor in the treatment for his heart attack.

Rewrites: _____

Q. Chapter challenge: Read all the possible choices before you circle the correct answer.

1. Which answer best describes *pulmono* and *pneumo*?
 - a. They are both roots and mean *chest*.
 - b. They are both combining forms but have different meanings.
 - c. One is a root, and the other is a combining form.
 - d. They are both combining forms and mean lung.
 - e. One is a suffix, and the other is a prefix.
2. Based on their *elements*, pick the pair of terms that logically belong together:

a. reflex and urology	d. ganglia and ganglion
b. pulmonology and pulmonologist	e. multilateral and epigastric
c. prostate and prostrate	
3. Which two sets of terms have prefixes denoting numbers?

a. hypotension and hypertension	d. pericardial and perinatal
b. premature and postmature	e. epigastric and hypogastric
c. bilateral and unilateral	
4. The body system concerned with air or breathing is the _____, and an organ in that system is the _____.

a. urinary	ureter
b. musculoskeletal	ilium
c. respiratory	lung
d. cardiovascular	heart
e. digestive	stomach



R. Chapter challenge: Read all the possible choices before you circle the correct answer.

- The terms *myocardial* and *myocardium* both refer to the:
 - lung
 - hip
 - pelvis
 - heart
 - blood
- The prefix in *intravenous* means:
 - across
 - around
 - within
 - two
 - before
- Which pair of terms do not deconstruct into word elements?
 - axillary and axilla
 - pulmonologist and pulmonology
 - ileum and ilium
 - respiration and pulmonary
 - cervix and cervical
- Circle the only choice that does not contain a combining form:
 - pneumothorax
 - pulmonology
 - pneumonia
 - myocardial
 - cardiomyopathy
- The medical term for “armpit” is:
 - septum
 - mucosa
 - axilla
 - ganglion
 - ilium
- Brain teaser: Circle the terms used to describe newborn babies’ development.
 - unilateral and bilateral
 - epigastric and hypogastric
 - premature and postmature
 - perigastric and perinatal
 - prenatal and postnatal
- The term *cardiomyopathy* has a suffix meaning:
 - condition
 - disease
 - action
 - structure
 - pertaining to
- Which pair contains terms that are both diagnoses?
 - pneumothorax and pulmonologist
 - cervix and ureter
 - pulmonology and pneumonia
 - reflux and reflex
 - pneumonia and pneumothorax

7. Which word element appears at the beginning of the term?
- a. root
 - b. combining vowel
 - c. combining form
 - d. suffix
 - e. prefix

S. **Case Report challenge:** *Now that you are more comfortable with the terms in this chapter, you can apply that knowledge and briefly answer the questions about the case report.*

CASE REPORT 1.1

YOU ARE a respiratory therapist working with Tavis Senko, MD, a pulmonologist at Fulwood Medical Center.

YOU ARE COMMUNICATING WITH

Mrs. Sandra Schwartz, a 43-year-old woman referred to Dr. Senko by her primary care physician, an internist. She has a persistent abnormality on her chest x-ray. You have been asked to determine her pulmonary function prior to a scheduled bronchoscopy.

From her medical records, you see that 2 months ago Mrs. Schwartz developed a right upper lobe (RUL) pneumonia. After treatment with an antibiotic, a follow-up chest x-ray (CXR) showed some residual collapse in the right upper lobe and a small right pneumothorax. Mrs. Schwartz has smoked a pack a day for many years. Concerned that she has lung cancer, Dr. Senko has scheduled her for bronchoscopy.

1. What type of specialist is Dr. Senko? _____
2. What sign did Mrs. Schwartz have that meant she needed to see a specialist?

3. What disease or condition is in Mrs. Schwartz's past medical history?

4. Give a brief definition of the condition in question 3 above: _____
5. What diagnostic test did Mrs. Schwartz have done? _____
6. What part of Mrs. Schwartz's lung shows residual collapse? _____
7. What procedure has Dr. Senko scheduled for Mrs. Schwartz? _____
8. Based on her past medical history, history of smoking, and current diagnostic findings, what is a probable diagnosis for Mrs. Schwartz? _____

Congratulations! You are on your way to learning medical terminology.