



Basic Word Structure

1

OBJECTIVES IN STUDYING THE MEDICAL LANGUAGE

There are three objectives to keep in mind as you study medical terminology:

1. **Analyze words by dividing them into component parts.** Your goal is to learn the *tools* of word analysis that will make understanding complex terminology easier. Do not simply memorize terms; think about dividing terms into component parts. This book will show you how to separate both complicated and simple terms into understandable word elements. Medical terms are much like jigsaw puzzles in that they are constructed of small pieces that make each word unique, with one major difference: The pieces can be shuffled up and used in lots of combinations to make other words as well. As you become familiar with word parts and learn what each means, you will be able to recognize those word parts in totally new combinations in other terms.
2. **Relate the medical terms to the structure and function of the human body.** Memorization of terms, although essential to retention of the language, should not become the primary objective of your study. A major focus of this book is to *explain* terms in the context of how the body works in health and disease. Medical terms explained in their proper context also will be easier to remember. Thus, the term **hepatitis**, meaning inflammation (**-itis**) of the liver (**hepat**), is better understood when you know where the liver is and how it functions. No previous knowledge of biology, anatomy, or physiology is needed for this study. Explanations in this book are straightforward and basic.
3. **Be aware of spelling and pronunciation problems.** Some medical terms are pronounced alike but are spelled differently, which accounts for their different meanings. For example, **ilium** and **ileum** have identical pronunciations, but the first term, **ilium**, means a part of the hip bone, whereas the second term, **ileum**, refers to a part of the small intestine (Figure 1-1). Even when terms are spelled correctly,

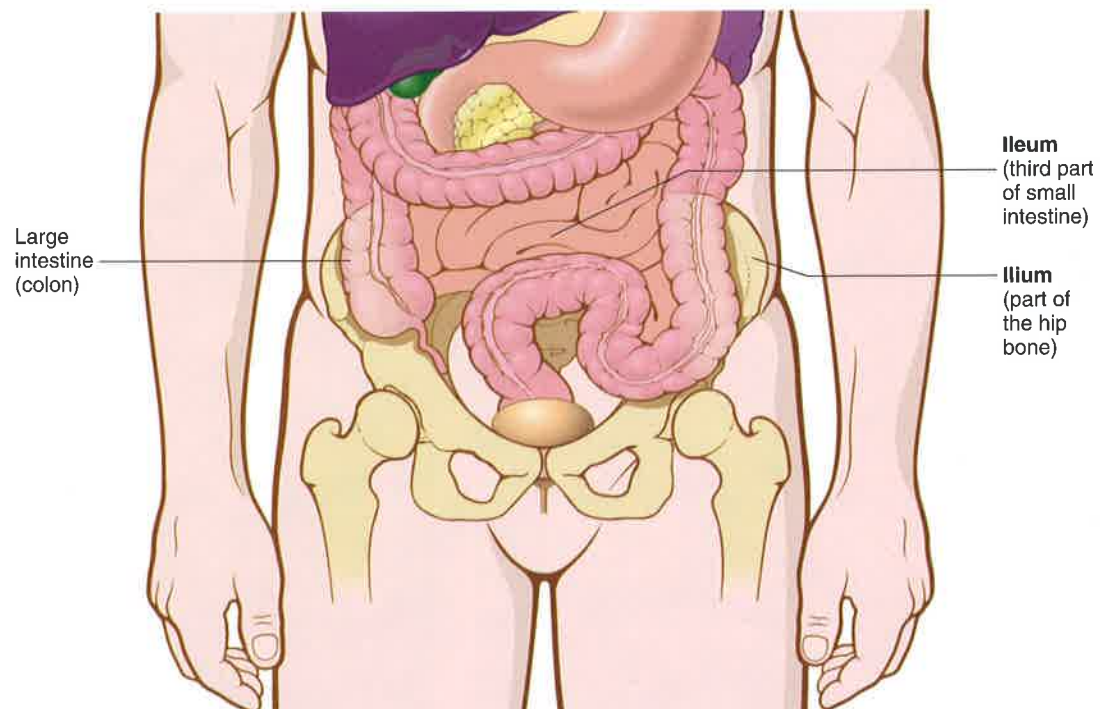


FIGURE 1-1 The terms **ileum** and **ilium** can be confusing because they are pronounced alike and located in the same region of the body.

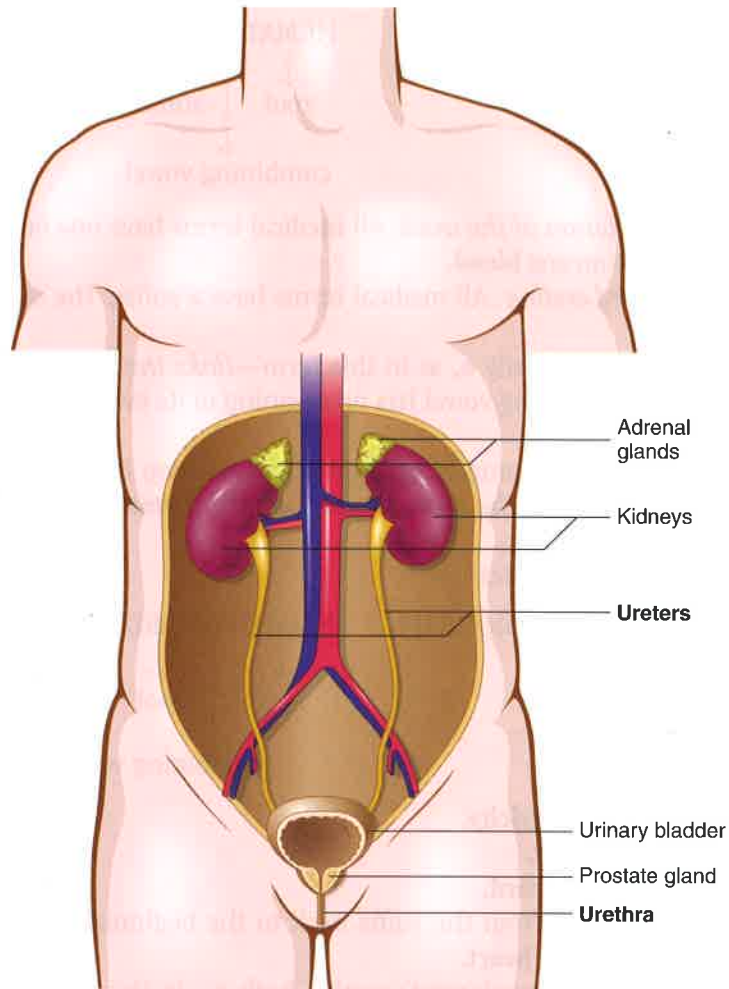


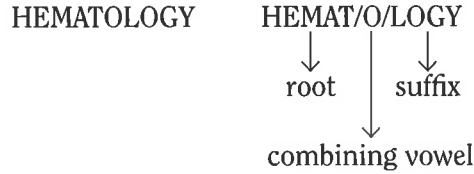
FIGURE 1-2 Urinary system. The terms **urethra** and **ureter** can be confusing because they are both tubes of the urinary system, but the spellings and pronunciations are different. Notice the locations: **two** ureters between the kidneys and urinary bladder and **one** urethra between the urinary bladder and the outside of the body.

they can be misunderstood because of incorrect pronunciation. For example, the **urethra** (ū-RĒ-thrāh) is the tube leading from the urinary bladder to the outside of the body, whereas a **ureter** (ŪR-ĕ-tĕr) is one of two tubes each leading from a single kidney and inserting into the urinary bladder. Figure 1-2 illustrates the difference between the urethra and the ureters.

WORD ANALYSIS

Studying medical terminology is very similar to learning a new language. At first, the words sound strange and complicated, although they may stand for commonly known disorders and terms. For example, **cephalgia** means “headache,” and an **ophthalmologist** is an “eye doctor.”

Your first job in learning the language of medicine is to understand how to divide words into their component parts. Logically, most terms, whether complex or simple, can be broken down into basic parts and then understood. For example, consider the following term:



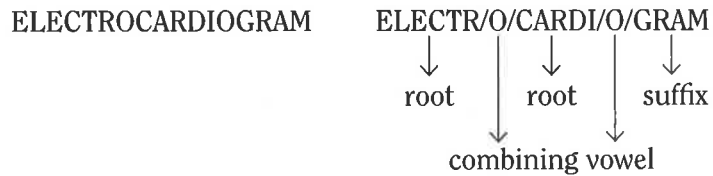
The **root** is the *foundation of the word*. All medical terms have one or more roots. For example, the root **hemat** means **blood**.

The **suffix** is the *word ending*. All medical terms have a suffix. The suffix **-logy** means **process of study**.

The **combining vowel**—usually **o**, as in this term—*links the root to the suffix or the root to another root*. A combining vowel has no meaning of its own; it joins one word part to another.

It is useful to read the meaning of medical terms *starting from the suffix and then going back to the beginning of the term*. Thus, the term **hematology** means **process of study of blood**.

Here is another familiar medical term:



The root **electr** means **electricity**.

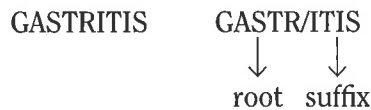
The root **cardi** means **heart**.

The suffix **-gram** means **record**.

The entire word (reading from the suffix back to the beginning of the term) means **record of the electricity in the heart**.

Notice that there are two combining vowels—both **o**—in this term. The first o links the two roots **electr** and **cardi**; the second o links the root **cardi** and the suffix **-gram**.

Try another term:

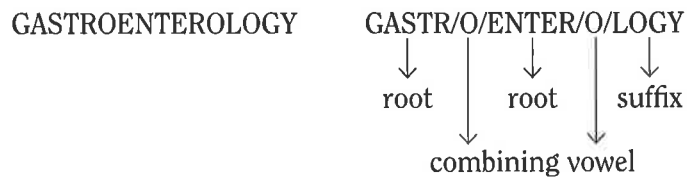


The root **gastr** means **stomach**.

The suffix **-itis** means **inflammation**.

The entire word, reading from the end of the term (suffix) to the beginning, means **inflammation of the stomach**.

Notice that the combining vowel, o, is missing in this term. This is because the suffix, **-itis**, begins with a vowel. The combining vowel is dropped before a suffix that begins with a vowel. It is retained, however, between two roots, even if the second root begins with a vowel. Consider the following term:



The root **gastr** means **stomach**.

The root **enter** means **intestines**.

The suffix **-logy** means **process of study**.

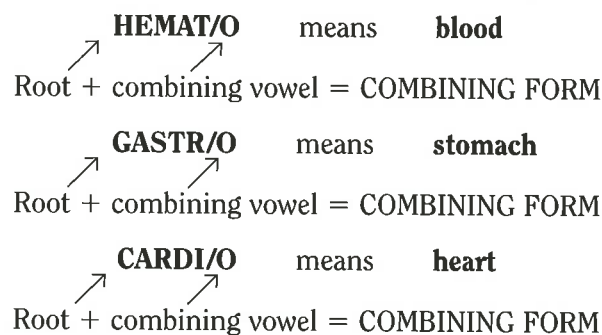
The entire term means **process of study of the stomach and intestines**.

Notice that the combining vowel is used between **gastr** and **enter**, even though the second root, **enter**, begins with a vowel. When a term contains two or more roots related to parts of the body, anatomic position often determines which root goes before the other. For example, the stomach receives food first, before the small intestine—so the word is formed as **gastroenterology**, not “enterogastrology.”

In summary, remember three general rules:

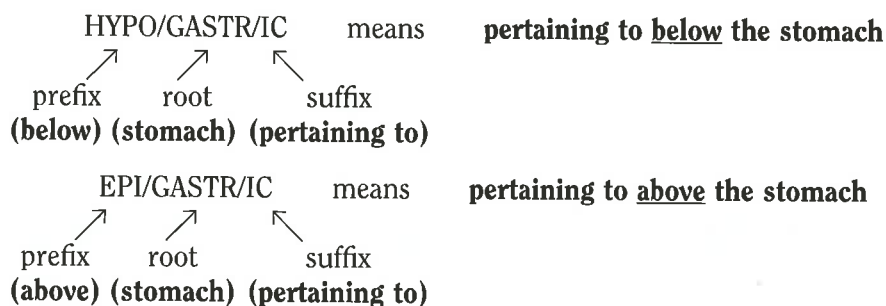
1. Read the meaning of medical terms from the suffix back to the beginning of the term and across.
2. Drop the combining vowel (usually o) before a suffix beginning with a vowel: **gastritis**, not “gastroitis.”
3. Keep the combining vowel between two roots: **gastroenterology**, not “gastrenterology.”

In addition to the root, suffix, and combining vowel, two other word parts are commonly found in medical terms. These are the **combining form** and the **prefix**. The combining form is simply the root plus the combining vowel. For example, you already are familiar with the following combining forms and their meanings:



Combining forms are used with many different suffixes. Remembering the meaning of a combining form will help you understand different medical terms.

The **prefix** is a small part that is attached to the *beginning of a term*. Not all medical terms contain prefixes, but the prefix can have an important influence on the meaning. Consider the following examples:



In summary, the important elements of medical terms are the following:

1. **Root:** foundation of the term
2. **Suffix:** word ending
3. **Prefix:** word beginning
4. **Combining vowel:** vowel (usually o) that links the root to the suffix or the root to another root
5. **Combining form:** combination of the root and the combining vowel



COMBINING FORMS, SUFFIXES, AND PREFIXES

1

In previous examples you have been introduced to the combining forms **gastr/o** (stomach), **hemat/o** (blood), and **cardi/o** (heart). This section of the chapter presents a list of additional combining forms, suffixes, and prefixes, with examples of medical words using those word parts. (Similar lists are included for each chapter in the book.) Write the *meaning* of the medical term in the space provided. Then check the correct pronunciation for each term with the Pronunciation of Terms list on page 25. Your CD contains audio pronunciations of terms from this list.

Most medical terms are derived from Greek and Latin roots. Greek, Roman, and Arabic physicians had developed medically useful concepts and associated vocabularies long before the 21st century. Although it is not necessary to memorize these Greek and Latin derivations, they are presented on the Evolve website.

Chapter Study Guide

1. Use slashes to divide each term into component parts (*aden/oma*), and write its meaning (*tumor of a gland*) in the space provided. Although most medical terms are divided easily into component parts and understood, others defy simple explanation. Information in *italics* under a medical term helps you define and understand the term. See the CD (Combining Forms, Suffixes, and Prefixes List) to check your meanings.
2. Complete the Exercises, pages 15 to 21, and check your answers against those provided on pages 22 to 24.
3. Write meanings for terms on the Pronunciation of Terms list, pages 25 to 27. Definitions are on the CD.
4. Complete the Review Sheet, pages 28 and 29. Check your answers with the Glossary, page 954. Finally, test yourself by writing Review Sheet terms and meanings on a separate sheet of paper.
5. Make your own flash cards. Using the Review Sheet as a guide, create flash cards that can be transported wherever you study!
6. Review terms using the audio pronunciations found on the CD.

Notice that you are actively engaging in the learning process by writing terms and their meanings and testing yourself repeatedly. Here is your study mantra: **Read, WRite, Recite, and Review**. I guarantee success if you follow these simple steps. This is a proven method—it really works!

COMBINING FORMS

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
aden/o	gland	adenoma	<i>tumor of a gland</i>
			<i>The suffix -oma means tumor or mass.</i>
arthr/o	joint	adenitis	_____
			<i>The suffix -itis means inflammation.</i>
arthr/o	joint	arthritis	_____

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
bi/o	life	<u>bi</u> ology _____ The suffix <i>-logy</i> is composed of the root <i>log</i> (study) and the final suffix <i>-y</i> (process or condition).	
		<u>bi</u> opsy _____ The suffix <i>-opsy</i> means process of viewing. Living tissue is removed from the body and viewed under a microscope.	
carcin/o	cancerous, cancer	<u>carcin</u> oma _____ A carcinoma is a cancerous tumor. Carcinomas grow from epithelial (surface or skin) cells that cover the outside of the body and line organs, cavities, and tubes within the body.	
cardi/o	heart	<u>cardi</u> ology _____	
cephal/o	head	<u>cephalic</u> _____ (sĕ-FĀL-ĭk) The suffix <i>-ic</i> means pertaining to. A cephalic presentation describes a “head first” position for the delivery of an infant.	
cerebr/o	cerebrum (largest part of the brain)	<u>cerebral</u> _____ The suffix <i>-al</i> means pertaining to. A cerebrovascular accident (CVA) or stroke occurs when blood vessels (<i>vascul/o</i> means blood vessel) are damaged in the cerebrum. This causes bleeding and decreased blood flow to nerve cells in specific areas of the brain. Figure 1-3 shows the cerebrum.	

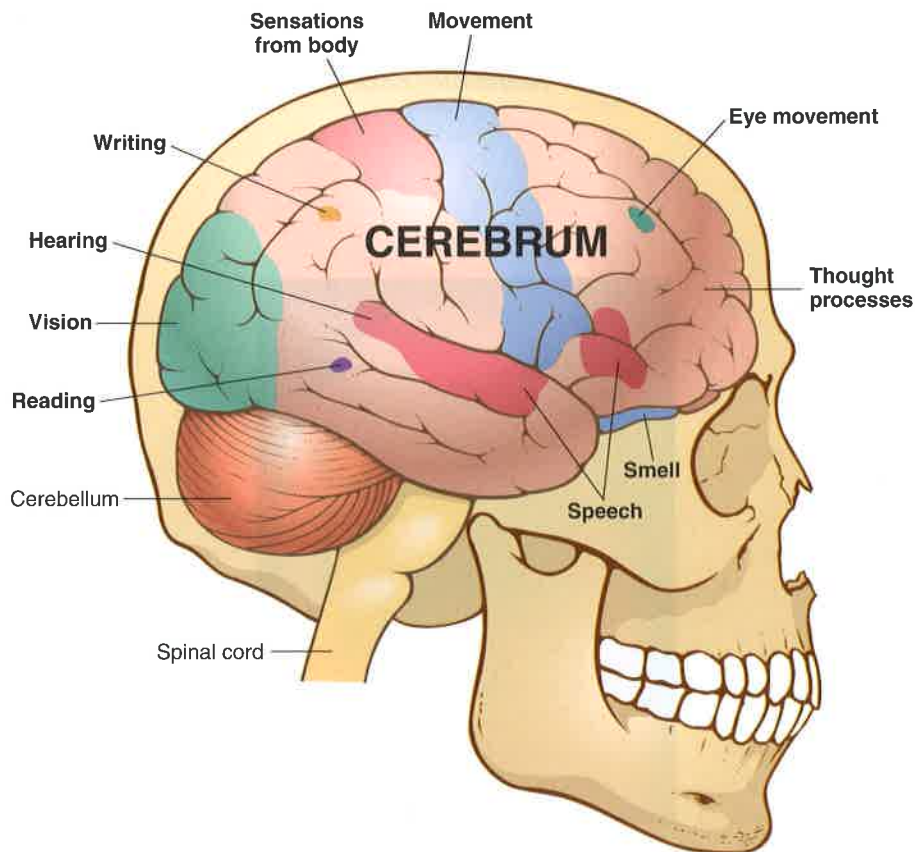



FIGURE 1-3 The cerebrum and its functional areas.

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
cis/o	to cut	<u>incision</u> _____ <i>The prefix in- means into, and the suffix -ion means process.</i>	
		<u>excision</u> _____ <i>The prefix ex- means out.</i>	
crin/o	to secrete (to form and give off)	<u>endocrine glands</u> _____ <i>The prefix endo- means within; endocrine glands (e.g., thyroid, pituitary, and adrenal glands) secrete hormones directly within (into) the bloodstream. Other glands, called exocrine glands, release their secretions (e.g., saliva, sweat, tears) through tubes (ducts) to the outside of the body.</i>	
cyst/o	urinary bladder; a sac or a cyst (sac containing fluid)	<u>cystoscopy</u> _____ <i>(sīs-TŌS-kō-pē) The suffix -scopy is a complex suffix that includes the root scop, meaning visual examination, and the final suffix -y, meaning process.</i>	
cyt/o	cell	<u>cytology</u> _____	
derm/o	skin	<u>dermatitis</u> _____	
dermat/o		<u>hypodermic</u> _____ <i>The prefix hypo- means under or below.</i>	
electr/o	electricity	<u>electrocardiogram</u> _____ <i>The suffix -gram means record. Abbreviated ECG (or sometimes EKG).</i>	
encephal/o	brain	<u>electroencephalogram</u> _____ <i>Abbreviated EEG.</i>	



FIGURE 1-4 Notice the **hematoma** under the nail. See page 9 under hematoma. (From Baren JM et al: Pediatric Emergency Medicine, 1st ed., Philadelphia, Saunders, 2007.)

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
enter/o	intestines (usually the small intestine)	<u>enteritis</u> _____ <i>The small intestine is narrower but much longer than the large intestine (colon). See Figure 1-1, which shows the small and large intestines.</i>	
erythr/o	red	<u>erythrocyte</u> _____ <i>The suffix -cyte means cell. Erythrocytes carry oxygen in the blood.</i>	
gastr/o	stomach	<u>gastrectomy</u> _____ <i>The suffix -ectomy means excision or removal. All or, more commonly, part of the stomach is removed.</i> <u>gastrotomy</u> _____ <i>The suffix -tomy is another complex suffix, which contains the root tom, meaning to cut, and the final suffix -y, meaning process of.</i>	
glyc/o	sugar	<u>hyperglycemia</u>  _____ <i>The prefix hyper- means excessive, above, or more than normal. The suffix -emia means blood condition.</i>	
gnos/o	knowledge	<u>diagnosis</u> _____ <i>The prefix dia- means complete. The suffix -sis means state or condition of. A diagnosis is made after sufficient information has been obtained about the patient's condition. Literally, it is a "state of complete knowledge."</i> <u>prognosis</u> _____ <i>The prefix pro- means before. Literally "knowledge before," a prognosis is a prediction about the outcome of an illness, but it is always given after the diagnosis has been determined.</i>	
gynec/o	woman, female	<u>gynecology</u> _____	
hemat/o	blood	<u>hematology</u> _____	
hem/o		<u>hematoma</u> _____ <i>In this term, -oma means a mass or collection of blood, rather than a growth of cells (tumor). A hematoma forms when blood escapes from blood vessels and collects as a clot in a cavity or organ or under the skin. See Figure 1-4.</i> <u>hemoglobin</u> _____ <i>The suffix -globin means protein. Hemoglobin carries oxygen in red blood cells.</i>	
hepat/o	liver	<u>hepatitis</u> _____	



Hyperglycemia and Diabetes

Hyperglycemia (high blood sugar) most frequently is associated with **diabetes**. People with diabetes have high blood sugar levels because they lack **insulin** (in **type 1 diabetes**) or have ineffective insulin (in **type 2 diabetes**). Insulin is the hormone normally released by the pancreas (an endocrine gland near the stomach) to "escort" sugar from the bloodstream into cells. Sugar (glucose) is then broken down in cells to release energy. When insulin is not present, sugar cannot enter cells and builds up in the bloodstream (hyperglycemia).

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
iatr/o	treatment, physician	<u>iatrogenic</u> _____ <i>The suffix -genic means pertaining to producing, produced by, or produced in. Iatrogenic conditions are adverse effects that result from treatment or intervention by a physician.</i>	
leuk/o	white	<u>leukocyte</u> _____ <i>This blood cell helps the body fight disease.</i>	
log/o	study of	<u>dermatology</u> _____	
nephro/o	kidney	<u>nephritis</u> _____ <u>nephrology</u> _____	
neur/o	nerve	<u>neurology</u> _____	
onc/o	tumor	<u>oncology</u> _____ <u>oncologist</u> _____ <i>The suffix -ist means one who specializes in a field of medicine (or other profession).</i>	
ophthalm/o	eye	<u>ophthalmoscope</u> _____ <i>(ōf-THĀL-mō-skōp) The suffix -scope means an instrument for visual examination. (To help with spelling, notice that just as there are two eyes, there are two "h"s in this term.)</i>	
oste/o	bone	<u>osteitis</u> _____ <u>osteoarthritis</u> _____ <i>This condition of aging is actually a degeneration of bones and joints often accompanied by inflammation.</i>	
path/o	disease	<u>pathology</u> _____ <u>pathologist</u> _____ <i>A pathologist examines biopsy samples microscopically and examines dead bodies to determine the cause of death.</i>	
ped/o	child	<u>pediatric</u> _____ <i>Notice that ped/o is also in the term orthopedist. Orthopedists once were doctors who straightened (orth/o means straight) children's bones and corrected deformities. Nowadays, orthopedists specialize in disorders of bones and muscles in people of all ages.</i>	
psych/o	mind	<u>psychology</u> _____ <u>psychiatrist</u> _____	
radi/o	x-rays	<u>radiology</u> _____ <i>Low-energy x-rays are used for diagnostic imaging.</i>	
ren/o	kidney	<u>renal</u> _____ <i>Ren/o (Latin) and nephro/o (Greek) both mean kidney. Ren/o is used with -al (Latin) to describe the kidney, whereas nephro/o is used with other suffixes such as -osis, -itis, and -ectomy (Greek) to describe abnormal conditions and operative procedures.</i>	

COMBINING FORM	MEANING	TERMINOLOGY	MEANING
rhin/o	nose	<u>rhinitis</u> _____	
sarc/o	flesh	<u>sarcoma</u> _____ <i>This is a cancerous (malignant) tumor. A sarcoma grows from cells of “fleshy” connective tissue such as muscle, bone, and fat, whereas a carcinoma (another type of cancerous tumor) grows from epithelial cells that line the outside of the body or the inside of organs in the body.</i>	
sect/o	to cut	<u>resection</u> _____ <i>The prefix re- means back. A resection is a cutting back in the sense of cutting out or removal (excision). A gastric resection is a gastrectomy, or excision of the stomach.</i>	
thromb/o	clot, clotting	<u>thrombocyte</u> _____ <i>Also known as platelets, these cells help clot blood. A thrombus is the actual clot that forms, and thrombosis (-osis means condition) is the condition of clot formation.</i>	
ur/o	urinary tract, urine	<u>urology</u> _____ <i>A urologist is a surgeon who operates on the organs of the urinary tract and the organs of the male reproductive system.</i>	

SUFFIXES

SUFFIX	MEANING	TERMINOLOGY	MEANING
-ac	pertaining to	<u>cardiac</u> _____	
-al	pertaining to	<u>neural</u> _____	
-algia	pain	<u>arthralgia</u> _____ <u>neuralgia</u> _____	
-cyte	cell	<u>erythrocyte</u> _____	
-ectomy	excision, removal	<u>nephrectomy</u> _____	
-emia	blood condition	<u>leukemia</u> _____ <i>Literally, this term means “a blood condition of white (blood cells).” Actually, it is a condition of blood in which cancerous white blood cells proliferate (increase in number).</i>	
-genic	pertaining to producing, produced by, or produced in	<u>carcinogenic</u> _____ <i>Cigarette smoke is carcinogenic.</i> <u>pathogenic</u> _____ <i>A virus or a bacterium is a pathogenic organism.</i> <u>iatrogenic</u> _____ <i>In this term, -genic means produced by.</i>	
-globin	protein	<u>hemoglobin</u> _____	
-gram	record	<u>electroencephalogram</u> _____	

SUFFIX	MEANING	TERMINOLOGY	MEANING
-ic, -ical	pertaining to	gastric _____ neurologic _____ <i>Log/o means study of.</i>	
-ion	process	excision _____	
-ist	specialist	ophthalmologist  _____	
-itis	inflammation	cystitis _____	
-logy	process of study	endocrinology _____	
-oma	tumor, mass, swelling	hepatoma _____ <i>A hepatoma (hepatocellular carcinoma) is a malignant tumor of the liver.</i>	
-opsy	process of viewing	biopsy _____ <i>Biopsy specimens are obtained and viewed under a microscope.</i>	
-osis	condition, usually abnormal (slight increase in numbers when used with blood cells)	nephrosis _____ leukocytosis _____ <i>This condition, a slight increase in normal white blood cells, occurs as white blood cells multiply to fight an infection. Don't confuse leukocytosis with leukemia, which is a cancerous (malignant) condition marked by high levels of abnormal, immature white blood cells.</i>	
-pathy	disease condition	enteropathy _____ <i>(ĕn-tĕ-RŌP-ă-thĕ)</i> adenopathy _____ <i>(ă-dĕ-NŌP-ă-thĕ)</i>	
-scope	instrument to visually examine	endoscope _____ <i>End- means within. A cystoscope is a type of endoscope.</i>	
-scopy	process of visually examining with an endoscope	endoscopy _____ <i>(ĕn-DŌS-kŏ-pĕ)</i>	
-sis	state of; condition	prognosis _____	
-tomy	process of cutting, incision	osteotomy _____ <i>(ŏs-tĕ-ŌT-tŏ-mĕ)</i>	
-y	process, condition	gastroenterology _____	



Ophthalmologist, Optometrist, Optician

An **ophthalmologist** is a physician who specializes in diagnosing and treating disorders of the eye. An **optometrist** examines (metr/o = to measure) eyes and prescribes corrective lenses, but cannot treat eye diseases. An **optician** grinds lenses and fits glasses but does not examine eyes, prescribe corrective lenses, or treat eye diseases.

PREFIXES

PREFIX	MEANING	TERMINOLOGY	MEANING
a- an-	no, not, without	<u>anemia</u> _____ <i>Anemia is a decreased number of erythrocytes or an abnormality of the hemoglobin (a chemical) within the red blood cells. This results in decreased delivery of oxygen to cells of the body. Anemic patients look so pale that early physicians thought they were literally “without blood.”</i>	
aut- auto-	self, own	<u>autopsy</u> _____ <i>This term literally means “process of viewing by oneself.” Hence, an autopsy is the examination of a dead body with one’s own eyes to determine the cause of death and nature of disease.</i>	
dia-	through, complete	<u>diagnosis</u> _____ <i>The plural of diagnosis is diagnoses. 📌</i>	
end- endo-	within	<u>endoscopy</u> _____ <u>endocrinologist</u> _____	
epi-	above, upon	<u>epigastric</u> _____ <u>epidermis</u> _____ <i>This outermost layer of skin lies above the middle layer of skin, known as the dermis.</i>	
ex- exo-	out, outside of, outward	<u>excision</u> _____ <u>exocrine glands</u> _____	
hyper-	excessive, above, more than normal	<u>hyperthyroidism</u> 📌 _____ <i>The suffix -ism means process or condition.</i>	
hypo-	deficient, below, under, less than normal	<u>hypogastric</u> _____ <i>When hypo- is used with a part of the body, it means below.</i> <u>hypoglycemia</u> _____ <i>In this term, hypo- means deficient.</i>	
in-	into, in	<u>incision</u> _____	



Plurals

Terms ending in -is (diagnosis, prognosis) form their plural by dropping the -is and adding -es. See Appendix I, page 975, for other rules on formation of plurals.



Understanding Hyperthyroidism

In **hyperthyroidism**, a hyperactive **thyroid gland** (an endocrine gland in the neck) secretes a greater than normal amount of **thyroxine** (thyroid hormone, or **T₄**). Because thyroxine causes cells to burn fuel and release energy, signs and symptoms of hyperthyroidism are increased energy level and nervousness, **tachycardia** (increased heart rate), weight loss, and **exophthalmos** (bulging eyeballs).

PREFIX	MEANING	TERMINOLOGY	MEANING
peri-	surrounding, around	<u>pericardium</u> _____ <i>The suffix -um means a structure. The pericardium is the membrane that surrounds the heart.</i>	
pro-	before, forward	<u>prostate gland</u> _____ <i>This exocrine gland “stands” (-state) before or in front of the urinary bladder (see Figure 1-2). It produces semen, which contains fluid and sperm cells.</i>	
re-	back, backward, again	<u>resection</u> _____ <i>This is an operation in which tissue is “cut back” or removed. The Latin resectio means a trimming or pruning.</i>	
retro-	behind	<u>retrocardiac</u> _____	
sub-	below, under	<u>subhepatic</u> _____	
trans-	across, through	<u>transhepatic</u> _____	



PRACTICAL APPLICATIONS

This section provides an opportunity for you to use your skill in understanding medical terms and to increase your knowledge of new terms. Be sure to check your answers with the Answers to Practical Applications on page 24. You should find helpful explanations there.

SPECIALISTS

Match the **abnormal condition** in Column I with the **physician (specialist)** who treats it in Column II. Write the letter of the correct specialist in the space provided.

COLUMN I

1. heart attack _____
2. ovarian cysts _____
3. bipolar (manic-depressive) disorder _____
4. breast adenocarcinoma _____
5. iron deficiency anemia _____
6. retinopathy _____
7. cerebrovascular accident; stroke _____
8. renal failure _____
9. inflammatory bowel disease _____
10. cystitis _____

COLUMN II

- A. gastroenterologist
- B. hematologist
- C. nephrologist
- D. cardiologist
- E. oncologist
- F. gynecologist
- G. urologist
- H. ophthalmologist
- I. neurologist
- J. psychiatrist