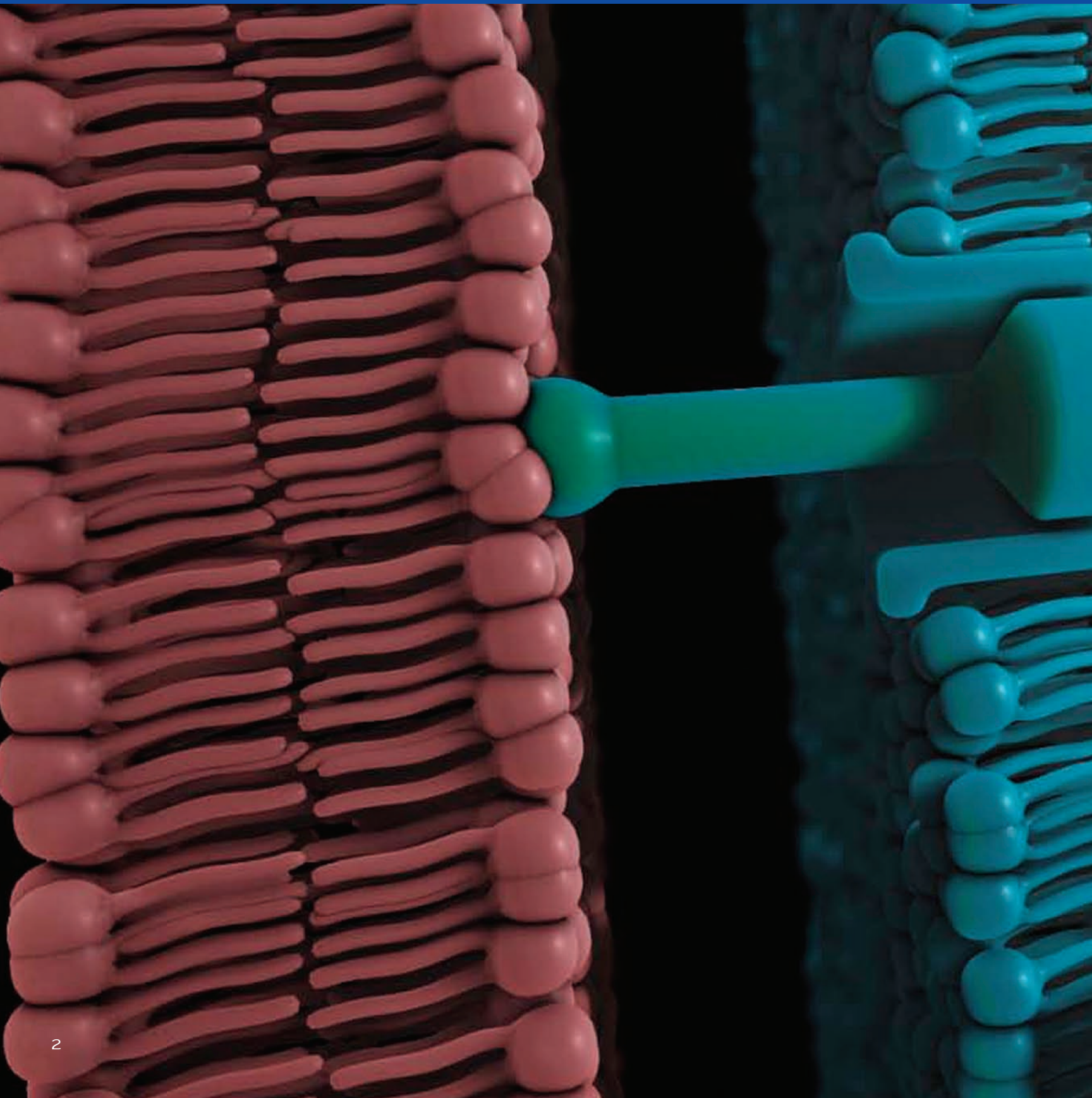


# Roots and Combining Forms

The Language of Health Care



## 1

*Case Report (CR) 1.1*

You are

... a medical assistant working for Russell Gordon, MD, a primary care physician at Fulwood Medical Center.

Your patient is

... Mrs. Connie Bishop, a 55-year-old woman who presents with swelling in her lower abdomen, shortness of breath, and the production of clear mucus when she coughs. She has no gynecologic or gastroenterologic symptoms. Her previous medical history shows recurrent dermatitis of her hands since her teenage years and an arthroscopy for a knee injury at age 40. Physical examination reveals a circular mass 6 inches in diameter in the left lower quadrant of her abdomen. There is no abnormality in her cardiovascular system.

Your role is to maintain her medical record and document her care, assist Dr. Gordon during his examinations, explain the examination and treatment procedures to Mrs. Bishop, and enable Dr. Gordon to refer her to a specialist.

## Chapter Learning Outcomes

Case Report (CR) 1.1 features several medical terms that illustrate how medicine has its own language. This language provides all the health professionals involved in the care of a patient with the ability to communicate with each other by using medical terms with precise meanings. To be a qualified health professional, you must be able to speak and write this language of medicine. If you can, you will be able to communicate with other health professionals and to document the care given to your patients. This chapter is designed to give you the information and tools you will need to:

**LO 1.1** Relate the logic of the language of medicine to your practice as a health care professional.

**LO 1.2** Define the terms **root**, **combining vowel**, and **combining form**.

**LO 1.3** Recognize that **roots** and **combining forms** are the core elements of any medical term.

**LO 1.4** Deconstruct medical terms into **roots** and **combining forms**.

**LO 1.5** Interpret the meaning of **roots** and **combining forms** in commonly used medical terms.

**LO 1.6** Use **roots** and **combining forms** to construct commonly used medical terms.

**LO 1.7** Identify the medical terms taken directly from Greek or Latin words.

**LO 1.8** Differentiate between medical terms that are spelled and/or pronounced similarly.

## LESSON OBJECTIVES

The technical language of medicine has been developed logically, mainly from Latin and Greek **roots**. The first steps to take to understand the language of medicine are to:

- 1.1.1 Describe the logic behind the terms used in the language of health care.
- 1.1.2 Select the **root** of each medical term.
- 1.1.3 Define the meanings of the roots of commonly used medical terms.
- 1.1.4 Define the terms **combining vowel** and **combining form**.
- 1.1.5 Construct **combining forms** for commonly used medical terms.
- 1.1.6 Identify the **combining vowel** and **combining form** of commonly used medical terms.

## THE ELEMENTS OF A MEDICAL TERM ARE:

- **prefix**—the beginning of some words
- **root**—the foundation of the word that provides its meaning
- **combining vowel**—vowel that joins a **root** to another **root** or to a **suffix**
- **combining form**—combination of a **root** and a **combining vowel**
- **suffix**—the ending of some words

## ROOTS:

- the constant, unchanging foundation of a medical term
- usually of Greek or Latin origin
- one or more is found in most medical terms

## COMBINING VOWEL:

- has no meaning of its own
- joins a **root** to another **root**
- joins a **root** to a **suffix**
- makes a word easier to pronounce
- “**o**”—the most common **combining vowel**, with “**a**” as the next most common

## LO 1.1, 1.2, 1.3, 1.5 Understanding the Logic of Medical Terminology

Understanding and being comfortable with the technical language of medicine are keys to a successful career as a health professional. Your ability to use language to communicate verbally and in writing is essential for patient safety, high-quality patient care, interaction with other health care professionals, and your own self-esteem as a health care professional.

Your confidence in using medical terms will increase as you understand the logic of how these terms are built from their individual parts, or **elements**. In addition, understanding the logic of this process will help you analyze, or “deconstruct,” a medical term, break the term down into its elements, or its “anatomy,” and also construct the elements into a whole to understand the meaning of a medical term.

The core element of any term is its **root**. You can use the following information about **roots** to help you understand Mrs. Bishop’s Case Report 1.1 on the previous spread.

Nearly every medical term has at least one **root**, the element that carries the core meaning of the word. Ninety percent of all roots arise from Greek and Latin words, and many of them have been in use for over 2000 years. For example,

**Gynecologic** uses the Greek root **gynec-**, meaning *female*.

**Dermatitis** has the root **dermat-**, from the Greek word for *skin*.

**Arthroscopy** has the root **arthr-**, derived from the Greek word for *joint*.

**Respiratory** uses the root **respir-**, from the Latin word for *to breathe*.

Many words contain more than one **root**. For example, **gastroenterology** has the **root gastr-**, from the Greek word for *stomach* and the **root -enter-**, from the Greek word for *intestine*. The term means the medical specialty of the stomach and intestines. The term **pneumothorax** has the **root pneum-**, from the Greek word **pneuma**, meaning *air*, and the **root -thorax**, the Latin word for *chest*. The term means the *presence of air in the chest outside the lungs*.

## Combining Vowels

You build medical terms on the foundation of a **root**. Adding a **combining vowel** to the end of a **root** joins that **root** to other word elements. This vowel has no meaning of its own. It is the vehicle that joins word elements to create medical terms. It also makes the word easier to pronounce. Creating medical terms is like assembling pieces of a jigsaw puzzle.

The vowel “**o**” is a **combining vowel**, as shown in **gynecologist**:



The vowel “**a**” is a **combining vowel**, as shown in **respiratory**:

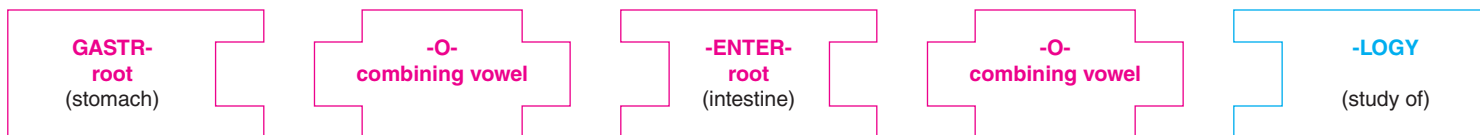


## Study Hint

Some confusion might exist over the terms “to breathe” and “breath.” *To breathe* (with the “e”) is the verb/action term. When you breathe, you take a *breath* (which is the noun term). If you misspell either word in an answer, your response will be scored as incorrect.

“O” is the most common **combining vowel**. The vowels “a,” “i,” and “u” are used less frequently. Some words have more than one **combining vowel**. Gastroenterology has two “o” **combining vowels** attached to different **roots**.

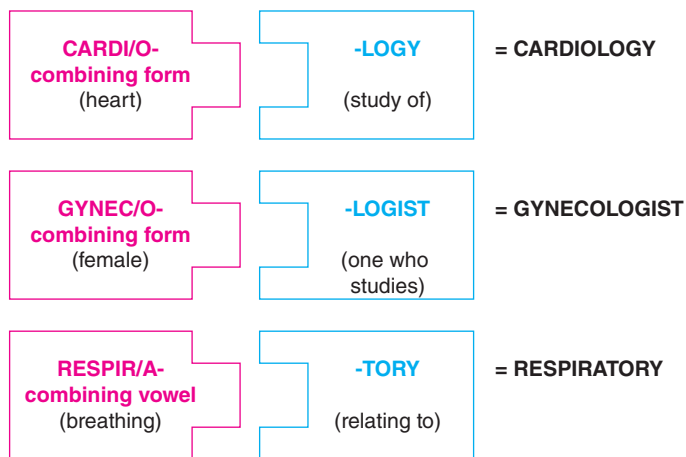
A combining vowel can be used to link two **roots** even when the second **root** begins with a vowel, as shown in gastroenterology:



## Combining Forms

A **root** with a **combining vowel** added to it is called a **combining form**. For example, the root **abd-**, the vowel “o,” or **abd/o-**, meaning *belly*, is the **combining form** for the word, **abdomen (abd/o-men)**.

Examples of **combining forms** are



An example of a word that has two **combining forms** is **gastroenterology**, the elements of which can be pieced together like this:



**Prefixes** and **suffixes** are discussed in Chapter 2.

## Keynote

A *gynecologist* is a medical specialist in the care of the female reproductive system. *Respiratory* means relating to respiration or breathing.

### COMBINING FORMS:

- combines a **root** and a **combining vowel**
- can be attached to another **root** or **combining form**
- can precede a **suffix**

## Keynote

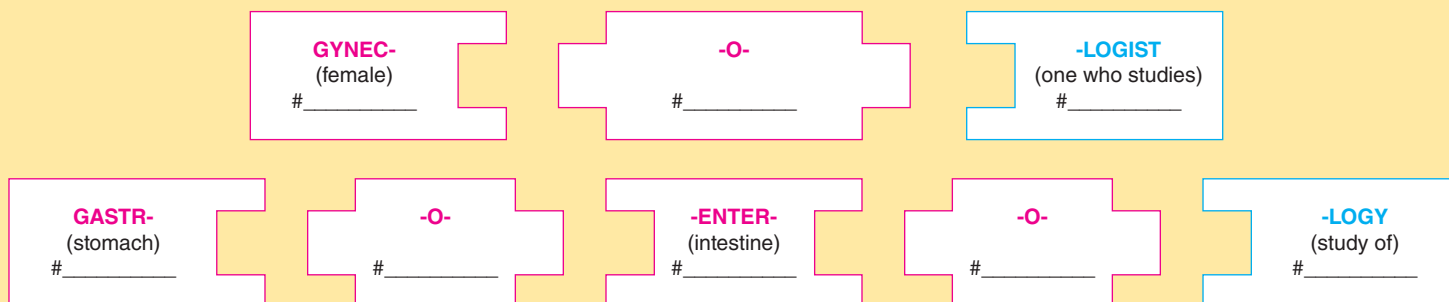
Gastroenterology is the medical specialty concerned with the function and disorders of the stomach, intestines, and associated organs.

## Keynote

When a medical term is being analyzed and broken down into its elements, a combining form will be shown with a / between the root and the combining vowel.

## Exercises

**A.** The jigsaw pieces are your visual aid to understanding the logic of how elements form medical terms. Number the puzzle pieces with each of the statements below that pertains to that part of the puzzle. Each puzzle piece will have several numbers. Fill in the blanks. **LO 1.4, 1.5, 1.6**



Place the numbers of the following statements into the correct puzzle piece.

1. This piece is a root.
2. This piece is a combining vowel.
3. This piece is the end of the term, or the suffix.
4. This piece needs to be in every term.
5. This piece attaches to a root.
6. This piece comes before a suffix.
7. This piece has no meaning of its own.
8. This piece is usually of Greek or Latin origin.

## LO 1.7 Greek, Latin, and Old English Words

Case Report 1.1, which describes Mrs. Connie Bishop's presentation, features several medical terms taken directly from Latin or Greek words or from Old English terms that do not break down (deconstruct) into word elements. Several of them are used in general language outside of medicine. These medical terms in Case Report 1.1 are:

- **patient**, an old English term meaning *to suffer* or *undergo*; the term refers to a person who is under medical or surgical treatment.
- **medical**, from a Latin term meaning *to heal*; it means *pertaining to the practice of medicine*.
- **breath**, an Old English word meaning *a single cycle of inhaling and exhaling*.
- **mucus**, a Latin word for *a clear, sticky secretion*.
- **knee**, an Old English word meaning *an angular shape*; today it refers to the **joint** (a Latin word for junction) between the upper and lower leg.
- **quadrant**, a Latin word meaning *a quarter*; the abdomen is divided into four *quadrants* by horizontal and vertical planes that intersect at the **umbilicus**, which is a Latin word for the navel or belly button.
- **record**, a Latin word meaning *to remember*; a medical *record* is a written account of a patient's medical history.
- **care**, an Old English word meaning *to worry*; when you care for your patients, you look after them and are concerned about them.
- **specialist**, a Latin word meaning *of a given species*; a *specialist* devotes professional attention to a particular subject area.

Other examples not used in Case Report 1.1 include:

- **apex**, a Latin word meaning *tip* or *summit* (as in Mount Everest); the apex of the heart is the downward pointing tip of the cone-shaped heart.
- **patent**, a Latin word meaning *open* or *exposed*; a *patent* blood vessel is open to the circulation of freely flowing blood.
- **toxin**, a Greek word meaning *poison*; a *toxin* is a poisonous substance formed by a cell, such as a bacterium.
- **lymph**, a Latin word meaning *clear spring water*; *lymph* is a clear, shimmering fluid collected from the body tissues.
- **breech**, an Old English word meaning *buttocks*; in obstetrics, a fetus is in a *breech* presentation when the buttocks, rather than the head, are the presenting part at delivery.

## LO 1.8 Terms That Are Alike

Precision in both written and verbal communication is essential for a health professional, with great attention given to detail. There are many words in the medical language that are very similar to each other in both their spelling and pronunciation. Examples are

- **ilium**, pronounced **ill-ee-um**, a bone in the pelvis
- **ileum**, pronounced the same way, **ill-ee-um**, a segment of the small intestine
- **ureter**, the tube from the kidney to the bladder
- **urethra**, the tube from the bladder to the outside
- **trapezius**, a muscle in the back
- **trapezium**, a bone in the wrist
- **malleus**, a small bone in the middle ear
- **malleolus**, a bony protuberance at the ankle
- **neurology**, the study of diseases of the nervous system
- **urology**, the study of diseases of the kidney and bladder

## Exercises

**A.** The following medical terms are all of Greek or Latin origin. Match the meaning in the first column to the term in the second column. **LO 1.7**

- |                                  |           |
|----------------------------------|-----------|
| _____ 1. tip or summit           | a. patent |
| _____ 2. buttocks                | b. mucus  |
| _____ 3. poison                  | c. apex   |
| _____ 4. clear, sticky secretion | d. breech |
| _____ 5. open                    | e. toxin  |

**B.** Identify the incorrect statement about a root by circling it, and then rewrite it correctly on the line below. **LO 1.2**

- |   |   |   |
|---|---|---|
| 1. A root is the foundation of every medical term.            | T | F |
| 2. The root <i>dermat</i> means <i>skin</i> .                 | T | F |
| 3. Many words contain more than one root.                     | T | F |
| 4. The root <i>thorax</i> is the Latin word for <i>lung</i> . | T | F |
| 5. Roots are usually of Latin or Greek origin.                | T | F |
| 6. Correction of incorrect statement:                         |   |   |

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# Chapter 1 Review

## Anatomy of Word Building

### Challenge Your Knowledge

**A. Identify the statements below as either True or False:** Circle the correct answer. On the lines below, rewrite any false answer correctly. (LO 1.2, Remember)

- |  |   |   |
|--|---|---|
| 1. A term never has more than one root.                              | T | F |
| 2. Some terms will have no combining vowel.                          | T | F |
| 3. Modification may be necessary to make a word easier to pronounce. | T | F |
| 4. A vowel must always be present in a combining form.               | T | F |
| 5. Corrected statement:  |   |   |

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**B. The root is the core meaning of the term and the foundation on which the term is built.** Recognize the root in each of the following terms, and define it. (LO 1.3, Remember)

Term	Root	Meaning of Root
cardiology	_____	_____
gynecologic	_____	_____
dermatitis	_____	_____
arthroscopy	_____	_____

**C. Identify and underline the core foundation in each of the following terms.** (LO 1.2, 1.3, Remember)

1. cardiology
2. gastroenterology
3. respiratory
4. dermatitis
5. cardiologist
6. arthroscopy
7. cardiopathy
8. gastric
9. pneumothorax
10. gynecologist

**D. Once you have a good knowledge of roots and combining forms, you can identify what unknown terms relate to.** Below are medical terms you have not seen yet, but will recognize. Identify the root or combining form in each term and you will know the relationship it has to other terms. The first one is done for you. (LO 1.3, Remember, Analyze)

1. The term *hypogastric* relates to the stomach.
2. The term *neuroglia* relates to \_\_\_\_\_.
3. The term *cardiopulmonary* relates to \_\_\_\_\_.
4. The term *subdermal* relates to \_\_\_\_\_.
5. The term *arthralgia* relates to \_\_\_\_\_.
6. The term *endocarditis* relates to \_\_\_\_\_.
7. The term *pneumonitis* relates to \_\_\_\_\_.

*This is the logic of medical language.*

**E. Match the Greek/Latin elements in the first column with their meanings in the second column.** (LO 1.5, 1.7, Understand)

- |                  |                            |
|------------------|----------------------------|
| _____ 1. pneum   | a. to breathe              |
| _____ 2. gynec   | b. open                    |
| _____ 3. lymph   | c. clear, sticky secretion |
| _____ 4. thorax  | d. tip or summit           |
| _____ 5. arthr   | e. buttocks                |
| _____ 6. respir  | f. chest                   |
| _____ 7. mucus   | g. skin                    |
| _____ 8. patent  | h. joint                   |
| _____ 9. toxin   | i. female                  |
| _____ 10. apex   | j. air                     |
| _____ 11. dermat | k. clear spring water      |
| _____ 12. breech | l. poison                  |



# Chapter 1 Review

## Anatomy of Word Building

**F. Spelling is most important in medical terminology.** For example, **ilium** and **ileum** may be similar in appearance and sound, but the difference of one letter makes each a different body part. Choose the correct spelling for the following terms. Fill in the blanks. (LO 1.6, 1.8, *Understand*)

1. A Pap smear is part of a \_\_\_\_\_ exam.  
gynecologik      gyneckologic      gynecologic
2. The \_\_\_\_\_ system keeps you breathing.  
respiratory      respiratory      resspiratory
3. Inflammation of the heart is \_\_\_\_\_.  
carditus      carditis      cardiitis
4. A muscle in the back is the \_\_\_\_\_.  
trapeze      trapezium      trapezius
5. A bony protuberance in your ankle is the \_\_\_\_\_.  
maleus      malius      malleolus

**G. Use your newly acquired knowledge of medical language to correctly answer the following questions.** Let the roots and combining forms be your guide. Circle the best choice. (LO 1.5, 1.6, *Apply*)

1. This term means one who studies the female reproductive system.  
gynecologist      urologist      neurologist
2. This term relates to the intestines and the stomach.  
gastroenterology      cardiology      dermatology
3. This term relates to the process of breathing.  
apex      toxic      respiratory
4. This term relates to the stomach.  
gastritis      gynecology      dermatitis
5. This term relates to a joint.  
arthritis      urethritis      neuralgia

**H. Use the correct medical term to complete the sentence.** Fill in the blanks. (LO 1.6, 1.7, *Apply*)

1. A \_\_\_\_\_ is a specialist in the care of the heart.
2. \_\_\_\_\_ is a tube from the kidney to the bladder.
3. Urology is the study of diseases of the \_\_\_\_\_ and \_\_\_\_\_.
4. A segment of the small intestine is the \_\_\_\_\_.
5. \_\_\_\_\_ means the buttocks, not the head, present first at delivery.
6. \_\_\_\_\_ is the tube from the bladder to the outside.
7. \_\_\_\_\_ is a fluid collected from body tissues.
8. A bone in the wrist is the \_\_\_\_\_.
9. The bony protuberance at the ankle is the \_\_\_\_\_.
10. \_\_\_\_\_ is a bone in the pelvis.

**I. Deconstruct the following medical terms by extracting their roots or combining forms.** Write *root* (R) or *combining form* (CF) on the line beside the term, to identify it as either a R or a CF. (LO 1.4, Analyze)

1. gynecologic \_\_\_\_\_
2. gastroenterology \_\_\_\_\_
3. dermatitis \_\_\_\_\_
4. arthroscopy \_\_\_\_\_
5. respiratory \_\_\_\_\_
6. cardiology \_\_\_\_\_

**J. Separate the terms that have only roots from the terms that have combining forms.** Put a check mark (✓) in the appropriate column, and then answer the questions below the chart. (LO 1.1, 1.2, 1.3, Analyze)

Medical Term	Root	Combining Form
1. gynecologist		
2. urology		
3. pneumothorax		
4. cardiac		
5. respiration		
6. arthritis		
7. dermatology		
8. enteritis		
9. neuritis		
10. gastric		

11. Which term has more than one root? \_\_\_\_\_
12. Which terms have similar endings? \_\_\_\_\_
13. What element changes a root into a combining form? \_\_\_\_\_
14. You build medical terms on the foundation of a \_\_\_\_\_.

**K. Root + combining vowel = combining form.** Deconstruct the following terms to determine the correct combining form (CF). Finding the root(s) (Rs) first will put you on the right track. Fill in the blanks. (LO 1.4, Analyze)

Term	Root(s)	Combining Vowel	Combining Form
1. cardiology	_____	_____	_____
2. gynecologic	_____	_____	_____
3. dermatology	_____	_____	_____
4. arthroscopy	_____	_____	_____

# Chapter 1 Review

## Anatomy of Word Building

- L. **Recognizing word elements will help you “dissect,” or deconstruct, a term.** The following terms have an element set in bold. Identify the type of element, and give a brief definition of its meaning. (LO 1.3, 1.4, Analyze)

Type of Element	Meaning of Element
1. <b>arthro</b> plasty _____	2. _____
3. <b>endo</b> carditis _____	4. _____
5. <b>respiratory</b> _____	6. _____
7. <b>hypo</b> tension _____	8. _____
9. <b>hyper</b> gastric _____	10. _____

- M. **Case Report Questions:** This Case Report is taken from the beginning of this chapter. You should feel more comfortable with the medical terminology now. Read the report again, and you will be able to answer the questions. Fill in the blanks. (LO 1.5, Analyze)

### Case Report 1.1

*You are*

... a medical assistant employed by Russell Gordon, MD, a primary care physician at Fulwood Medical Center.

*Your patient is*

... Mrs. Connie Bishop, a 55-year-old woman who presents with a swelling in her lower abdomen and shortness of breath. She has no gynecologic or gastroenterologic symptoms. Her previous medical history shows recurrent dermatitis of her hands since a teenager and an arthroscopy for a knee injury at age 40. Physical examination reveals a circular mass 6 inches in diameter in the left lower quadrant of her abdomen. There is no abnormality in her respiratory or cardiovascular system.

Your role is to maintain her medical record and document her care, assist Dr. Gordon during his examinations, explain the examination and treatment procedures to Mrs. Bishop, and facilitate her referral for specialist care.



### Study Hint

Many elements have more than one meaning. You must know the different meanings because that will make a difference in the use of the medical term.

1. What type of skin problem has Mrs. Bishop had since she was a teenager? \_\_\_\_\_
2. She “has no gynecologic or gastroenterologic symptoms.”  
Define **gynecologic**. \_\_\_\_\_  
Define **gastroenterologic**. \_\_\_\_\_
3. Her knee injury required what type of procedure? \_\_\_\_\_  
Describe this procedure. \_\_\_\_\_
4. She shows “no abnormality in her respiratory or cardiovascular system.” Explain this in layman’s terms.  
\_\_\_\_\_
5. What symptoms does Mrs. Bishop have that brought her to Dr. Gordon? \_\_\_\_\_

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

## CHAPTER SUMMARY EXERCISES

**A. Spelling comprehension:** Circle the correct spelling of the term. (LO 1.5, 1.7, Remember)

- |                     |                   |                  |              |                  |
|---------------------|-------------------|------------------|--------------|------------------|
| 1. abdomin          | abdumin           | abdomen          | addumen      | adumen           |
| 2. cardilogist      | cardelogist       | cardiologist     | cardeologist | cardiollogist    |
| 3. respiratory      | rispiratory       | risperatory      | resspiratory | resperatory      |
| 4. maleum           | malleus           | malium           | mallium      | maileus          |
| 5. gastroenterology | gastricenterology | gastroenterology | gastrology   | gastraenterology |
| 6. iillium          | ilium             | ileum            | illeum       | ellium           |
| 7. cardeopathy      | cardeeopathy      | cardeopathie     | cardiopathy  | cardiopethy      |
| 8. arthriscopy      | arthroscopy       | artoscopy        | arterioscopy | arterioscopie    |
| 9. trapezium        | trapezius         | trapezius        | trapizium    | trapezeum        |
| 10. gyneckologic    | gynecologic       | gynicologic      | gynickologic | gynekologic      |

**B. Match the number of the correct spelling of the term in Exercise A with the brief description of the term below.** (LO 1.5, 1.7, Apply)

- |  |       |
|--|-------|
| 1. study of the stomach and intestines   | _____ |
| 2. visual examination of a joint         | _____ |
| 3. small bone in the middle ear          | _____ |
| 4. specialist in treating heart problems | _____ |
| 5. Latin word for <i>belly</i>           | _____ |
| 6. pertaining to breathing               | _____ |
| 7. bone in the pelvis                    | _____ |
| 8. root meaning <i>female</i>            | _____ |
| 9. bone in the wrist                     | _____ |
| 10. disease of the heart                 | _____ |

# Chapter 1 Review

## Anatomy of Word Building

C. Using your knowledge of terms 1–10 in Exercises A and B and their correct spelling, write a brief sentence for each of the terms as it might appear in patient documentation. (LO 1.5, 1.7, Apply)

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

D. Meet the goals of each of the Chapter Learning Outcomes and insert the correct answers to the questions. (LO 1.1–1.8, Analyze)

1. Topic: Relate the logic of the language of medicine to your practice as a health care professional. Be prepared to discuss this in class. Make a brief outline of your thoughts for this discussion. (LO 1.1)

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2. Define the terms *root*, *combining vowel*, and *combining form*. (LO 1.2)

- a. root: \_\_\_\_\_
- b. combining vowel: \_\_\_\_\_
- c. combining form: \_\_\_\_\_

3. Recognize that roots and combining forms are the foundation of any medical term. Identify the root or combining form in each of the following terms. (LO 1.3)

- a. gastrologist
- b. gynecologist
- c. neurologist

4. Deconstruct medical terms into their roots and combining forms. Underline the root or combining form in each of the following terms. **(LO 1.4)**
- arthroscopy
  - dermatome
  - cardiogram
5. Interpret the meaning of the roots and combining forms in commonly used medical terms. **(LO 1.5)**
- In the term *cardiography*, the root \_\_\_\_\_ means \_\_\_\_\_.
  - In the term *respiration*, the root \_\_\_\_\_ means \_\_\_\_\_.
  - In the term *gastric*, the root \_\_\_\_\_ means \_\_\_\_\_.
6. Use roots and combining forms to construct commonly used medical terms. **(LO 1.6)**
- An operation to limit food intake is a \_\_\_\_\_ bypass.
  - CPR is the abbreviation for \_\_\_\_\_ resuscitation.
7. Among the following medical terms, identify the ones that are taken directly from Greek or Latin words. Circle your choices. **(LO 1.7)**
- renal mucus hypothermic breath knee popliteal bilateral quadrant hyperbaric toxin umbilicus
8. Differentiate between medical terms that are spelled and/or pronounced similarly. What is the difference between “patient” and “patent”? **(LO 1.8)**
- patient \_\_\_\_\_
  - patent \_\_\_\_\_