Roots and Combining Forms
The Language of Health Care
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.
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 **gast-**, 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:

- **GYNEC-**
  - root (female)
- **-O-**
  - combining vowel
- **LOGIST**
  - (one who studies)

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

- **RESPIR-**
  - root (breathing)
- **-A-**
  - combining vowel
- **-TORY**
  - (relating to)
“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

- CARDIO/O- (heart) - LOGY (study of) = CARDIOLOGY
- GYNEC/O- (female) - LOGIST (one who studies) = GYNECOLOGIST
- RESPIR/A- (breathing) - TORY (relating to) = RESPIRATORY

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

GASTR/O- (stomach) - ENTER/O- (intestine) - LOGY (study of) = GASTROENTEROLOGY

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.

Prefixes and suffixes are discussed in Chapter 2.

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.

LESSON 1.1 Roots and Combining Forms
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

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>tip or summit</td>
<td>a. patent</td>
</tr>
<tr>
<td></td>
<td>buttocks</td>
<td>b. mucus</td>
</tr>
<tr>
<td></td>
<td>poison</td>
<td>c. apex</td>
</tr>
<tr>
<td></td>
<td>clear, sticky secretion</td>
<td>d. breech</td>
</tr>
<tr>
<td></td>
<td>open</td>
<td>e. toxin</td>
</tr>
</tbody>
</table>

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 *dermat* means skin.  T  F
3. Many words contain more than one root.  T  F
4. The root *thorax* is the Latin word for lung.  T  F
5. Roots are usually of Latin or Greek origin.  T  F

6. Correction of incorrect statement:
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:

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)

<table>
<thead>
<tr>
<th>Term</th>
<th>Root</th>
<th>Meaning of Root</th>
</tr>
</thead>
<tbody>
<tr>
<td>cardiology</td>
<td>___________________</td>
<td>________________________________</td>
</tr>
<tr>
<td>gynecologic</td>
<td>___________________</td>
<td>________________________________</td>
</tr>
<tr>
<td>dermatitis</td>
<td>___________________</td>
<td>________________________________</td>
</tr>
<tr>
<td>arthroscopy</td>
<td>___________________</td>
<td>________________________________</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>a. to breathe</td>
<td>b. open</td>
<td>c. clear, sticky secretion</td>
<td>d. tip or summit</td>
<td>e. buttocks</td>
<td>f. chest</td>
<td>g. skin</td>
<td>h. joint</td>
<td>i. female</td>
<td>j. air</td>
<td>k. clear spring water</td>
<td>l. poison</td>
</tr>
</tbody>
</table>
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
   - gyneekologic
   - gynecologic

2. The ________________________________ system keeps you breathing.
   - respieratory
   - 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)

<table>
<thead>
<tr>
<th>Medical Term</th>
<th>Root</th>
<th>Combining Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. gynecologist</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. urology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. pneumothorax</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. cardiac</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. respiration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. dermatology</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. enteritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. neuritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. gastric</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Term</th>
<th>Root(s)</th>
<th>Combining Vowel</th>
<th>Combining Form</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. cardiology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. gynecologic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. dermatology</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. arthroscopy</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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)

<table>
<thead>
<tr>
<th>Type of Element</th>
<th>Meaning of Element</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. arthroplasty</td>
<td>________</td>
</tr>
<tr>
<td>2. ______________</td>
<td></td>
</tr>
<tr>
<td>3. endocarditis</td>
<td>________</td>
</tr>
<tr>
<td>4. ______________</td>
<td></td>
</tr>
<tr>
<td>5. respiratory</td>
<td>________</td>
</tr>
<tr>
<td>6. ______________</td>
<td></td>
</tr>
<tr>
<td>7. hypotension</td>
<td>________</td>
</tr>
<tr>
<td>8. ______________</td>
<td></td>
</tr>
<tr>
<td>9. hypergastric</td>
<td>________</td>
</tr>
<tr>
<td>10. _____________</td>
<td></td>
</tr>
</tbody>
</table>

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.

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)

<table>
<thead>
<tr>
<th>Term</th>
<th>Correct Spelling</th>
</tr>
</thead>
<tbody>
<tr>
<td>abdomin</td>
<td>abdomin</td>
</tr>
<tr>
<td>cardologist</td>
<td>cardiologist</td>
</tr>
<tr>
<td>respiratory</td>
<td>respiratory</td>
</tr>
<tr>
<td>maleum</td>
<td>malleus</td>
</tr>
<tr>
<td>gastroenterology</td>
<td>gastroenterology</td>
</tr>
<tr>
<td>illium</td>
<td>ilium</td>
</tr>
<tr>
<td>cardeopathy</td>
<td>cardeopathy</td>
</tr>
<tr>
<td>arthroscope</td>
<td>arthroscope</td>
</tr>
<tr>
<td>trapezium</td>
<td>trapezium</td>
</tr>
<tr>
<td>gynecologic</td>
<td>gynecologic</td>
</tr>
</tbody>
</table>

#### 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)

<table>
<thead>
<tr>
<th>Term</th>
<th>Brief Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>study of the stomach and intestines</td>
<td>study of the stomach and intestines</td>
</tr>
<tr>
<td>visual examination of a joint</td>
<td>visual examination of a joint</td>
</tr>
<tr>
<td>small bone in the middle ear</td>
<td>small bone in the middle ear</td>
</tr>
<tr>
<td>specialist in treating heart problems</td>
<td>specialist in treating heart problems</td>
</tr>
<tr>
<td>Latin word for belly</td>
<td>Latin word for belly</td>
</tr>
<tr>
<td>pertaining to breathing</td>
<td>pertaining to breathing</td>
</tr>
<tr>
<td>bone in the pelvis</td>
<td>bone in the pelvis</td>
</tr>
<tr>
<td>root meaning female</td>
<td>root meaning female</td>
</tr>
<tr>
<td>bone in the wrist</td>
<td>bone in the wrist</td>
</tr>
<tr>
<td>disease of the heart</td>
<td>disease of the heart</td>
</tr>
</tbody>
</table>
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)

   __________________________________________________________
   __________________________________________________________

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)
   a. arthroscopy
   b. dermatome
   c. cardiogram

5. Interpret the meaning of the roots and combining forms in commonly used medical terms. (LO 1.5)
   a. In the term cardiography, the root ______________________________ means ______________________________.
   b. In the term respiration, the root ______________________________ means ______________________________.
   c. In the term gastric, the root ______________________________ means ______________________________.

6. Use roots and combining forms to construct commonly used medical terms. (LO 1.6)
   a. An operation to limit food intake is a ______________________________ bypass.
   b. 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)
   a. patient ______________________________
   b. patent ______________________________